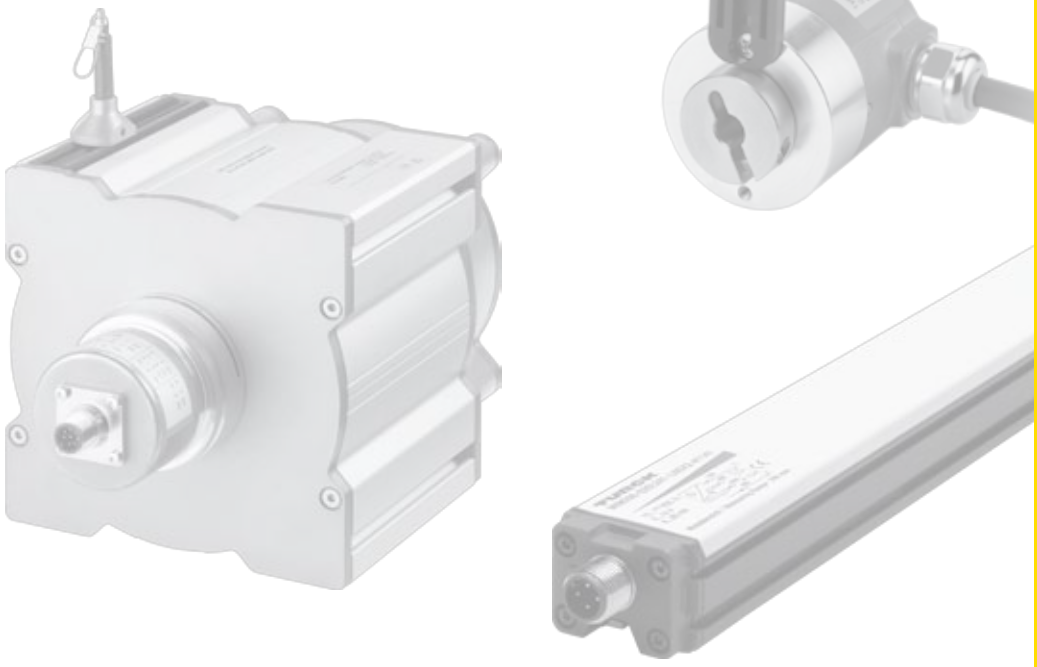
TURCK works

Industrial Automation

LINEAR AND ROTARY POSITION

Kübler by TURCK



····Sense It!····Connect It!····Bus It!····Solve It!

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TURCK

YOUR **AUTOMATION SOLUTIONS** PROVIDER


PROXIMITY SENSORS


CORDSETS


I/O STATIONS


MEASUREMENT


RFID


INTERFACE MODULES


CUSTOM CONNECTIVITY


POSITION


NETWORK MEDIA

TURCK's global support network consists of over 2,700 employees in 25 countries and 60 exclusive agencies worldwide that strive to meet customer expectations. Our sales, support and manufacturing facilities are strategically located across the world allowing us to respond to local market conditions and deliver customer specific solutions on a timely basis.

We are a world leader in **automation technology** with a diverse and broad product portfolio that provides customer specific applications with high performance, reliable and cost effective solutions. The synergy in our product portfolio and customization flexibility are key components of our value proposition.

Our expertise spans across two major industry categories: **Industrial Automation** and **Process Automation**. Each weighs in with its own unique requirements and methods of conducting business. This market centric approach ensures that we develop application specific solutions across a variety of vertical market segments.

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Industrial Automation

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NEW Sendix® absolute singleturn magnetic encoders

Magnetic encoders are an excellent alternative to traditional optical encoders where better sealing, wider temperature ratings, and resistance to shock and vibration is a key concern. We offer both M12 ***eurofast***® and potted versions of these encoders with analog, SSI, CANopen and SAE J1939.

Type 2450 / 2470
Page D4

- 24 mm diameter housing
- 12 bit SSI (4096 positions over 360°)
- -4 to +185°F (-20 to +85°C) temperature standard
- IP69K optional
- 5 VDC or 8-30 VDC supply

Type 3650 / 3670
Page D7

- Sendix 36 mm diameter housing
- 9 bit SSI
- IP69K
- -40 to +185°F (-40 to +85°C)

Type 3651 / 3671
Page D10

- Sendix 36 mm diameter housing
- 12 bit analog
- 4-20 mA or 0-10 VDC analog outputs
- IP69K
- -40 to +185°F (-40 to +85°C)

Type M3658 / M3678
Page D23

- Sendix 36 mm diameter housing
- 14 bit CANopen or SAE J1939
- IP69K
- -40 to +185°F (-40 to +85°C)

NEW Incremental encoders

Type 2430 / 2440
Page C5

- Magnetic incremental encoder
- 24 mm diameter housing
- Optional IP69K protection
- -20 to +185°F (-4 to +85°C)

Type 3610 / 3620
Page C8

- Now available with standard M12 ***eurofast***® connector
- 36 mm diameter housing
- IP65 protection
- -40 to +185°F (-40 to +85°C)

Type 5006
Page C21

- Sendix 50 mm diameter housing
- Stainless steel housing
- IP67 protection
- -40 to +185°F (-40 to +85°C)

Type 5821
Page C31

- 58 mm diameter housing
- Hollow shaft up to 28 mm
- IP64 protection
- -4 to +185°F (-20 to +85°C)

NEW 36 mm absolute optical encoders, 100% insensitive to magnetic fields

The Sendix® F36 absolute singleturn and multiturn encoder series is characterized by its compact, high performance and robust design. A hollow shaft diameter of up to 10 mm is available with a device size of only 36 mm. Sendix F36 is the first optical multiturn encoder without gears and is completely insensitive to magnetic fields. Its very precise optical sensors reach a high resolution of up to 17 bits for singleturn. The multiturn version has a resolution of up to 41 bits – with up to 16 million revolutions.

Type F3653 / F3673 singleturn Page D15

- SSI or BiSS interface
- Sendix 36 mm face
- Resolution up to 17 bits
- IP67 versions
- -40 to +194°F (-40 to +90°C)

Type F3663 / F3683 multiturn Page D69

- SSI or BiSS interface
- Sendix 36 mm face
- Resolution up to 24 bits
- IP67 versions
- -40 to +194°F (-40 to +90°C)

Type F3658 / F3678 singleturn Page D20

- CANopen
- Sendix 36 mm face
- Gearless multiturn
- Resolution up to 17 bits
- IP67 versions
- -40 to +194°F (-40 to +90°C)

Type F3668 / F3688 multiturn Page D73

- CANopen
- Sendix 36 mm face
- Resolution up to 32 bits
- IP67 versions
- -40 to +194°F (-40 to +90°C)

Kübler by Turck continues to expand it's offering of 58mm diameter Sendix absolute encoders with EtherCAT or CANopen fieldbus compatibility and a new stainless steel singleturn family.

Type 5858 / 5878 singleturn Page D54

- EtherCAT
- Sendix 58 mm diameter housing
- IP65 standard or IP67 optional
- -40 to +176°F (-40 to +80°C)

Type 5868 / 5888 multiturn Page D99

- EtherCAT
- Sendix 58 mm diameter housing
- IP65 standard or IP67 optional
- -40 to +176°F (-40 to +80°C)

Sendix absolute CAN interface with incremental track Page D89

- Sendix 58 mm diameter housing
- Type 5868 / 5888 multiturn
- 2048 pulses per revolution
- RS422 interface (TTL compatible) with signals A, $\overline{A}$, B, $\overline{B}$
- Fast simple start-up thanks to M12 ***eurofast***® connectors, diagnostic LEDs and parameters that can be programmed over the bus

Type 5876 stainless steel Page D65

- 58 mm diameter housing
- Singleturn absolute
- SSI or parallel
- IP67 standard
- -40 to +176°F (-40 to +80°C)

NEW Draw wire technology

Kübler by TURCK's draw wire family offers high performance in 4 different configurations that can measure from 1.25 meters up to 40 meters. All of these versions offer higher traverse speed, constant spring force, long service life and a wide variety of output signals.

Versions with analog output can be ordered with 4-20 mA, 0-10 VDC or potentiometer outputs. Draw wire sensors ordered with encoder outputs can be either incremental push-pull outputs or, if you select an absolute encoder, the signal outputs can be SSI, CANopen or PROFIBUS®.

Type A50 Page G8

- Measuring range up to 1,250 mm (4.1')
- Size: 50 x 50 mm
- -4 to +185°F (-20 to +85°C)
- Analog, potentiometer or incremental encoder outputs

Type B80 Page G11

- Measuring range up to 3,000 mm (9.8')
- Size: 80 x 80 mm
- -40 to +194°F (-40 to +90°C)
- Analog, potentiometer, incremental or absolute encoder outputs

Type C120 Page G16

- Measuring range up to 6,000 mm (19.6')
- Size: 120 x 120 mm
- -40 to +194°F (-40 to +90°C)
- Analog, potentiometer, incremental or absolute encoder outputs

Type D135 Page G21

- Measuring range up to 40,000 mm (131.2')
- Size: 135 x 135 mm
- -40 to +194°F (-40 to +90°C)
- Analog, potentiometer, incremental or absolute encoder outputs

NEW Linear measurement technology

Type LI20 / LI50 Page G2

- High shock and vibration resistance
- Metal housing for optimal protection
- Easy to apply magnetic target strip
- IP67 protection
- Incremental outputs

Mini measurement system Page G34

- Incremental encoder outputs
- Compact size (74 x 50 x 52 mm)
- One piece, easy to install

WIM Q25L Page G35

TURCK's WIM Q25L magnetic displacement sensor is used with an external magnet. The unit is available in 4 different measuring ranges and all units offer 4-20 mA and 0-10 VDC analog outputs . The overall length is short compared to the active measuring area due to the small blind zones (20.5 mm / 0.81") on each end. It's in-range function detects whether the magnet is within measuring range or not, and where it has left the effective range.

- 100, 125, 160 or 200 mm active measuring areas
- IP67
- -25 to +70°C (-13 to +158°F)
- Analog current and voltage outputs standard

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NEW Rotary transmission technology

Slip rings

Page F2

Slip rings transfer power and signals from a stationary to a rotating platform. The transmission between the stator and rotor units occurs through the use of rotating contacts which are specifically designed for long life.

- Rugged design for industrial use up to 800 RPM
- Modular system construction, load and signal channels can be combined selectively
- Long service life, up to 500 million revolutions
- Long maintenance cycles, up to 50 million revolutions
- Separate signal channels
- Fieldbus signals such as PROFIBUS® and CANopen; up to 12 MB

NEW Angular measurement technology

Dual axis inclinometer

Page H2

The TURCK inclinometer measures angular tilt in reference to gravity. At the heart of the TURCK inclinometer is a MEMS (micro-electro-mechanical system) device that incorporates a micro-electromechanical capacitive element into the sensor that utilizes two parallel plate electrodes, one stationary and one attached to a spring-mass system. Movement causes acceleration that produces deflection in the non-stationary electrode. This results in a measurable change in the capacitance between the two plates that is proportional to the angle of deflection.

- Compact housing measuring 20 x 30 x 60 mm
- Current or Voltage outputs, up to 170° of angle, for both X and Y axis
- Zero point adjustment standard
- 30g shock
- IP67
- -30 to +70°C (-40°C optional)

NEW Connectivity

M23 *multifast*® Cordsets

Page J7

- Overmolded shielded
- Encoder cables for CANbus and EtherCAT

Incremental encoders

Version		Miniature Shaft / blind hollow shaft	Miniature magnetic Shaft / blind hollow shaft	Compact Shaft / hollow shaft	Economy Shaft / hollow shaft
Series		**2400 / 2420**	**2430 / 2440**	**3610 / 3620**	**3700 / 3720**
Mechanical characteristics:					
Max. shaft/hollow shaft Ø		1/4”	6 mm / 4 mm	1/4” / 8 mm	1/4” / 8 mm
Max. housing diameter	[mm]	Ø 24 x 20 or 30 x20	Ø 24x24 or 24x30	Ø 36.5x35 or 36.5x31.5	Ø 37 x 32 mm
Max. speed	[RPM]	12,000	12,000	12,000	6,000
Max. shaft load radial/axial	[N]	18 / 20	18 / 20	40 / 31	20 / 10
Max. operating temperature	[°C]	-20 to +85	-20 to +85	-20 to +85	-20 to +70
Max. protection to		IP64 housing side	IP64 (IP69K optional)	IP65 housing side	IP67 housing side
EX approval for hazardous areas		-	-	optional zone 2/22	optional zone 2/22
Type of connection		Cable	Cable	Cable	Cable
Max. resolution	[PPR]	1024	256	2500	1024
Electrical characteristics:					
Output		Push-pull	RS422	Push-pull	RS422 or push-pull
Supply voltage	[VDC]	5-24 or 8-30	5 or 8-30	5-24 or 8-30	5 or 5-30
Max. pulse frequency	[kHz]	160	300	200	250
	Page	**C2**	**C5**	**C8**	**C11**

Incremental encoders

Version		Universal, compact Shaft / hollow shaft*	Universal, compact Shaft / hollow shaft*	Universal Shaft / hollow shaft	Hollow shaft Stainless steel
Series		**5000 / 5020** Sendix® incremental	**5006** Sendix® incremental	**580X / 582X**	**5826**
Mechanical characteristics:					
Max. shaft/hollow shaft Ø		3/8” / 5/8”	3/8”	8 mm / 1/2”	12 mm
Max. housing diameter	[mm]	Ø 50 (58) x 53 mm	Ø 50 (58) x 47 mm	Ø 58 x 66	Ø 58 x 41.5
Max. speed	[RPM]	12,000	12,000	12,000	12,000
Max. shaft load radial/axial	[N]	178 / 178	178 / 178	178 / 178	-
Max. operating temperature	[°C]	-40 to +85	-40 to +85	-20 to +90 (+110° [1])	-20 to +90
Max. protection to		IP67	IP67	IP65	IP66
EX approval for hazardous areas		optional zone 2/22	optional zone 2/22	optional zone 2/22	optional zone 2/22
Type of connection		Cable/plug	Cable/plug	Cable/Plug	Cable
Max. resolution	[PPR]	5000	5000	5000 (36,000 [2])	5000
Electrical characteristics:					
Output		RS422, push-pull 7272 or push-pull	RS422, push-pull 7272 or push-pull	RS422, push-pull Sine wave output*	RS422 or push-pull
Supply voltage	[VDC]	5 or 5-30	5 or 5-30	5. 5-30 or 10-30	5.5-30 or 10-30
Max. pulse frequency	[kHz]	300	300	300	300
	Page	**C14**	**C21**	**C24**	**C24**

[1] 5803
[2] 5805

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Incremental encoders


Version		Large bore Hollow shaft	Large bore - Heavy duty Hollow shaft	Magnetic measuring system
Series		**5821**	**A02H**	**RI20/Li20**
Mechanical characteristics:				
Max. shaft/hollow shaft Ø		28 mm	42 mm	30 mm
Max. housing diameter	[mm]	Ø 58 x 41	Ø 100 x 50	16 mm x 10 mm
Max. speed	[RPM]	3,000	6,000	6,000
Max. shaft load radial/axial	[N]	-	-	-
Max. operating temperature	[°C]	-20 to +85	-20 to +60	-20 to +80
Max. protection to		IP64	IP65	IP67
EX approval for hazardous areas		-	optional zone 2/22	-
Type of connection		Cable/Plug	Cable/Plug	Cable: PUR
Max. resolution	[PPR]	5000	5000	3600
Electrical characteristics:				
Output		RS422 or push-pull	RS422 or push-pull, sine wave	RS422 or push-pull
Supply voltage	[VDC]	5 or 8-30	5 or 11-24	4.8-30 V DC
Max. pulse frequency	[kHz]	300	50	163
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Absolute encoders / Singleturn

Version		Singleturn Miniature	Singleturn Sendix absolute	Singleturn Sendix absolute	Singleturn Sendix absolute
Series		**2450 / 2470**	**3650 / 3670** Sendix absolute	**3651 / 3671** Sendix absolute	**F3653/F3673** Sendix absolute
Mechanical characteristics:					
Max. shaft/hollow shaft Ø		6 mm	1/4" / 10 mm	8 mm / 10 mm	10 mm
Max. housing diameter	[mm]	Ø 24 x 24 or Ø 24 x 29	Ø 36 x 42 or Ø 36 x 48	Ø 36 x 42 or Ø 36 x 48	Ø 39 x 45
Max. speed	[RPM]	12,000	6,000	6,000	12,000
Max. shaft load radial/axial	[N]	18 / 20	40 / 31	40 / 31	40 / 31
Max. operating temperature	[°C]	-20 to +90	-40 to +85	-40 to +85	-40 to +90
Max. protection to		IP64	IP69K	IP69K	IP67
EX approval for hazardous areas		-	optional zone 2/22	optional zone 2/22	optional zone 2/22
Type of connection		Cable	Cable	Plug/Cable	Plug/Cable
Electrical characteristics:					
Max. resolution	[PPR]	4096 (12 Bit)	512 (9 Bit)	4096 (12 Bit)	131072 (17 Bit)
Version		Singleturn	Singleturn	Singleturn	Singleturn
Interface		SSI	SSI	analog	SSI/BiSS
Type of code		Gray	-	-	Binary or Gray
Supply voltage	[VDC]	5 or 8-30	5-30	18-30	5 or 10-30
	Page	**D4**	**D7**	**D10**	**D15**

Absolute encoders / Singleturn


Version		Singleturn Sendix absolute	Singleturn Sendix absolute	Singleturn Universal	Singleturn Sendix absolute
Series		**F3658 / F3678** Sendix absolute	**M3658 / M3678** Sendix absolute	**5850 / 5870**	**5853 / 5873** Sendix absolute
Mechanical characteristics:					
Max. shaft/hollow shaft Ø		8 mm / 10 mm	8 mm / 10 mm	1/4" / 12 mm	3/8" / 1/2"
Max. housing diameter	[mm]	Ø 36 x 42	Ø 36 x 42	Ø 58 x 66	Ø 58 x 38
Max. speed	[RPM]	12,000	6,000	12000 / 6000	12000
Max. shaft load radial/axial	[N]	40 / 31	40 / 31	178 / 178	178 / 178
Max. operating temperature	[°C]	-30 to +85	-40 to +85	-20 to +90	-40 to +90
Max. protection to		IP69K	IP69K	IP65	IP67
EX approval for hazardous areas		optional zone 2/22	optional zone 2/22	optional zone 2/22	optional zone 2/22
Type of connection		Plug/Cable	Plug/Cable	Plug/Cable	Plug/Cable
Electrical characteristics:					
Max. resolution	[PPR]	131072 (17 Bit)	16384 (14 Bit)	16384 (14 Bit)	131072 (17 Bit)
Version		Singleturn	Singleturn	Singleturn	Singleturn
Interface		CANopen	CANopen, J1939	SSI, Parallel, 4-20 mA	SSI, BISS*
Type of code		Profile DS 406 V3.1	Profile DS 406 V3.1	Gray, Binary, BCD	Binary, Gray
Supply voltage	[VDC]	8-30	8-30	5 or 10-30	5 or 10-30
	Page	**D20**	**D23**	**D31**	**D37**

* with optional incremental track

Absolute encoders / Singleturn

Version		Singleturn Sendix absolute	Singleturn, stainless steel, hollow shaft
Series		**5858 / 5878** Sendix absolute	**5876**
Mechanical characteristics:			
Max. shaft/hollow shaft Ø		10 mm / 15 mm	12 mm
Max. housing diameter	[mm]	ø 58 x 50	Ø 58 x 41.3
Max. speed	[RPM]	9000	6000
Max. shaft load radial/axial	[N]	178 / 178	-
Max. operating temperature	[°C]	-40 to +80	-20 to +80
Max. protection to		IP67	IP66
EX approval for hazardous areas		optional zone 2/22	optional zone 2/22
Type of connection		Plug/Cable	M12-Plug/Cable
Electrical characteristics:			
Max. resolution	[PPR]	65536 (16 Bit)	16384 (14 Bit)
Version		Singleturn	Singleturn
Interface		PROFIBUS, CANopen, EtherCat	SSI or Parallel
Type of code			Gray, Binary, BCD
Supply voltage	[VDC]	10-30	5 or 10-30
	Page	**D44**	**D65**

Absolute encoders / Multiturn

Version		**Multiturn Sendix absolute**	**Multiturn Sendix absolute**	**Multiturn Sendix absolute**	**Multiturn, shaft programmable**
Series		**F3663 / F3683** Sendix absolute	**F3668 / F3688** Sendix absolute	**5863 / 5883** Sendix absolute	**5862 / 5882**
Mechanical characteristics:					
Max. shaft/hollow shaft Ø		10 mm	10 mm	10 mm / 15 mm	10 mm / 12 mm
Max. housing diameter	[mm]	Ø 39 x 45	Ø 39 x 45	Ø 58 x 49.5	Ø 58 x 66
Max. speed	[RPM]	12,000	12,000	12,000	6,000
Max. shaft load radial/axial	[N]	40 / 31	40 / 31	178 / 178	178 / 178
Max. operating temperature	[°C]	-30 to +90	-30 to +85	-40 to +90	-20 to +70
Max. protection to		IP65 (IP67 on request)	IP65 (IP67 on request)	IP67	IP65
EX approval for hazardous areas		optional zone 2/22	optional zone 2/22	optional zone 2/22	optional zone 2/22
Type of connection		Plug/Cable	Cable	Plug/Cable	Plug/Cable
Electrical characteristics:					
Max. resolution	[PPR]	17 x 24 Bit	16 x 16 Bit	17 x 12 Bit progr.	13 x 12 Bit progr.
Version		Multiturn	Multiturn	Multiturn	Multiturn
Interface		SSI, BISS*	CANopen	SSI, BISS*	SSI, RS485, AWG-Pr.
Type of code		Gray or Binary	Binary	Gray or Binary	Gray or Binary
Supply voltage	[VDC]	5 or 10-30	10-30	10-30	5-30
	Page	**D69**	**D73**	**D76**	**D83**

Absolute encoders / Multiturn

Version		**Multiturn Sendix absolute**	**Multiturn, fieldbus shaft, blind hollow shaft**	**Multiturn, fieldbus hollow shaft/shaft**	**Multiturn, hollow shaft or shaft**
Series		**5868 / 5888** Sendix absolute	**5860**	**9080**	**9081, programmable**
Mechanical characteristics:					
Max. shaft/hollow shaft Ø		10 mm / 15 mm	15 mm	28 mm	28 mm
Max. housing diameter	[mm]	Ø 58 x 70	Ø 60 x 88	Ø 90 x 60	Ø 90 x 50
Max. speed	[RPM]	9,000	6,000	6000	6000
Max. shaft load radial/axial	[N]	178 / 178	178 / 178	178 / 178	178 / 178
Max. operating temperature	[°C]	-40 to +80	-0 to +80	-10 to +70	-20 to +70
Max. protection to		IP67	IP65 (IP66 on request)	IP65 (IP66 on request)	IP65
EX approval for hazardous areas		optional zone 2/22	optional zone 2/22	optional zone 2/22	optional zone 2/22
Type of connection		Plug/Cable	Cable, M12 connection	Cable, M12 connection	Plug
Electrical characteristics:					
Max. resolution	[PPR]	16 x 12 Bit	13 x 12 Bit	13 x 12 Bit	13 x 12 Bit progr.
Version		Multiturn	Multiturn/Binary	Multiturn/Binary	Multiturn
Interface		CANopen/CANlift, PROFIBUS®, EtherCat	DeviceNet™	PROFIBUS®-DP/ CANopen/ DeviceNet™	SSI, RS485, AWG-Pr.
Type of code					Gray or Binary
Supply voltage	[VDC]	10-30	10-30	10-30	5-30
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Linear Measurement Technology

Version		Linear measurement system	Linear measurement system	Draw wire	Draw wire
Series		**Li20 / B1**	**Li50 / B2**	**A50**	**B80**
Mechanical characteristics:					
Measure range	[mm]	up to 90,000	up to 90,000	up to 1,250	up to 3,000
Resolution	[mm]	0.01	0.005	0.05	0.05
Traveling speed max.	[m/s]	25	16.25	10	10
Acceleration max.	[m/s]	-	-	100	140
Service live		-	-	> 2 mill. compl. cycles	> 2 mill. compl. cycles
Dimensions	[mm]	10 x 25 x 40	10 x 25 x 40	77 x 135 x 70	110 x 165 x 143
Temperature range	[°C]	-20 to +80	-20 to +80	-20 to +85	-20 to +85
Materials:					
Housing		Zinc die-cast	Zinc die-cast	Titanium anodized Al.	Titanium anodized Al.
Wiring		-	-	Stainless steel wire	Stainless steel wire
Suitable encoders/interfaces:		Push-pull, RS422	Push-pull, RS422	Incremental encoder 3610 or analog output: 0-10 V, 4-20 mA, potentiometer	Incremental encoders Absoulte encoders Fieldbus encoders Analog output
	Page	**G2**	**G5**	**G8**	**G11**

Linear Measurement Technology



Version		Draw wire	Draw wire	Miniature draw wire	Standard draw wire	Mini mesaurement system
Series		**C120**	**D135**			
Mechanical characteristics:						
Measure range	[mm]	up to 6,000	up to 40,000	up to 2,000	up to 6,000	∞
Resolution	[mm]	0.08	0.08	0.1	0.1	0.1
Traveling speed max.	[m/s]	10	10	0.8	3	2,000 RPM
Acceleration max.	[m/s²]	140	140	-	-	-
Service live		> 2 mill. compl. cycles	> 2 mill. compl. cycles	-	-	-
Dimensions	[mm]	155 x 234 x 135	135 x 254 x 141	40 x 40 x 55	105 x 115	74 x 50 x 52
Temperature range	[°C]	-20 to +85	-20 to +85	-10 to +80	-20 to +80	-20 to +85
Materials:						
Housing		Titanium anodized Al.	Titanium anodized Al.	Plastic reinforced	Aluminum	Aluminum
Wiring		Stainless steel wire	Stainless steel wire	Steel wire	Steel wire, paraleine	-
Suitable encoders/interfaces:		Incremental encoders Absoulte encoders Fieldbus encoders Analog output	Incremental encoders Absoulte encoders Fieldbus encoders Analog output	Encoder (2400) or potentiometer	Incremental encoders Absoulte encoders Fieldbus encoders	Encoder (2400) included
	Page	**G16**	**G21**	**G28**	**G32**	**G34**

TURCK
Industrial Automation

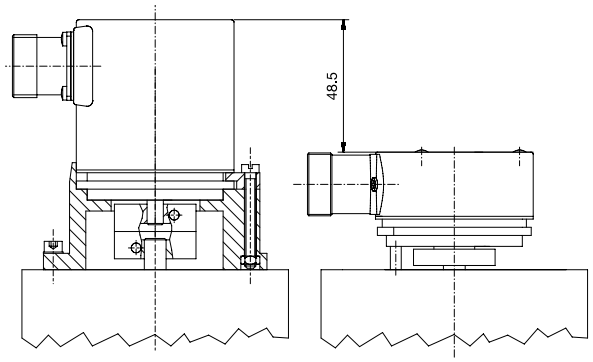
Rotary Measurement Technology

Introduction:

Encoders may be used in applications where length, position, speed or an angular position is measured. They transform mechanical movements into electrical signals, and can be divided into incremental and absolute measuring systems.

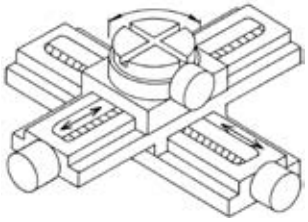
Incremental encoders generate pulses, where the number of pulses can be a measure of speed, length or position. In absolute encoders, every position corresponds to a unique code pattern, so that the actual position is recognized.

Kübler by TURCK can supply all encoders, whether its a solid shaft or hollow shaft version. Using a hollow shaft encoder saves up 30% of costs and up to 50% of the required space, compared to a shaft encoder. This is achieved by avoiding additional couplings, brackets and other assembly aids.

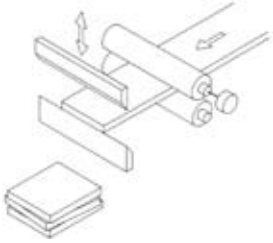


Application examples:

Positioning

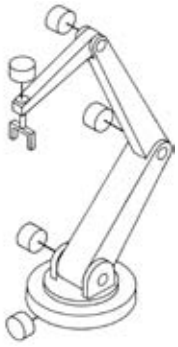


Length measurement

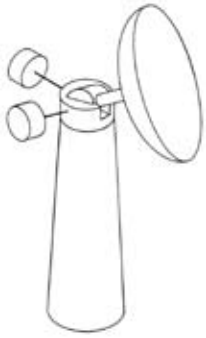


Detecting a fork's position

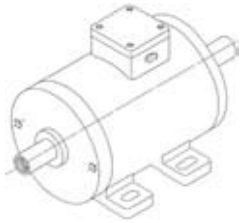
Detecting position



Angular measurement



Velocity measurement
e.g. in drive engineering (geared motors)



Approvals:

Conformity: All Kübler by TURCK encoders fully comply with CE-regulations according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3.and are intensively tested in our EMC laboratories.

Rotary Measurement Technology

Approvals:

Kübler by TURCK products may also be supplied with EX approval for use in Hazardous Areas Zones 2 and 22. All equipment that is destined for use in explosion-protected areas must be installed according to Directive 94/9/EG (ATEX 100a). Kübler by TURCK products approved for use in hazardous areas carry additional labeling in line with RL 94/9/EG and EN 50014. Many of these products are UL (**Underwriters Laboratories Inc.**) approved.

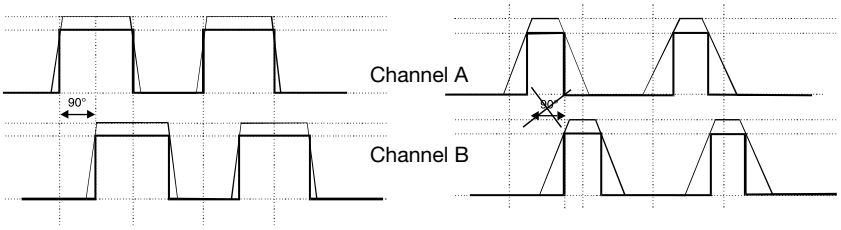
Kübler by TURCK products comply with RoHS standards.

Aging compensation:

LEDs inevitably lose power over a period of time. As a result, the output signal degrades. The phase shift between channel A and B of 90° also degrades, and the direction of rotation may no longer be detected. A special electronic circuit built into the Kübler by TURCK specific ASIC prevents this effect.

Signals of a new encoder or encoders with aging compensation:

Signals of an older encoder without aging compensation:



Benefit: The aging compensation circuit ensures the same signal, even after many years of operating time. Machine downtime is reduced dramatically, while reliability is increased.

Temperature compensation:

This specialized circuit ensures that the quality of the signal will stay on the same high level over the whole working temperature range.

Benefit: The positioning accuracy of a machine will not be affected by temperature changes.

Current consumption:

The values for current consumption in this catalog apply for ambient temperature (23°C). Because of the temperature compensation, the current consumption of the encoder rises with the temperature. This increase in current is taken into consideration when giving the figure for maximum current consumption. The output currents are dependent on the user's input circuit and are therefore not included in the figures given; these should be calculated and added in.

Short-circuit protection:

The outputs of all the encoders are short-circuit protected, provided that the supply voltage is correctly wired. If an output is connected by mistake to 0 V or +Ub or with another output, the device will not be damaged. As soon as the error is corrected, the encoder is ready for use again.

Benefit: Wiring circuit errors during installation that often occur in the hectic day-to-day industrial environments do not lead to the encoder being permanently damaged.

Environmental conditions:

A significant influence on the lifetime of the encoder is set by the environment in which the encoder is operating, for example the ambient temperature, the expected shaft load and the possible grade of dust/dirt and humidity/liquids

The support design and the use of high quality components makes our encoders suitable for applications in rough conditions.

Many references from customers including Bosch, Siemens and Bombardier are proof of this high quality.

Rotary Measurement Technology

Temperature:
Definition according to
DIN standards 32 878

Working temperature: Is defined as the environmental temperature in which the encoder will produce the signals defined in the data sheets.

Operating temperature: Is defined as the environmental temperature that the encoder can withstand without getting damaged.

Dirt/dust and humidity/water:

An ingress protection (IP) classification according to EN 60529 describes how the encoder is protected against particles and water. The first digit following IP defines the size of the particles. The higher the number, the smaller the particles. The second digit defines the resistance against water. The higher the number, the higher the water pressure can be. Kübler by TURCK encoders have a protection up to IP67.

Protection against particles (first digit):

0	Not protected
1	Protected against particles 50 mm and larger
2	Protected against particles 12.5 mm and larger
3	Protected against particles 2.5 mm and larger
4	Protected against particles 1.0 mm and larger
5	Protected against dust
6	Dust proof

IP69K acc. to DIN 40050 Part 9: protected against high-pressure water/steam jet cleaning

Protection against particles (second digit):

0	Not protected
1	Protected against vertically falling drops of water
2	Protected against falling drops of water up to 15° from vertical
3	Protected against water sprayed up to 60° from vertical
4	Protected against water sprayed from all directions, limited ingress permitted
5	Protected against low pressure jets from all directions, limited ingress permitted
6	Protected against strong jets of water, e.g. for use on ship decks, limited ingress permitted
7	Protection against the affects of immersion between 15 cm and 1 m
8	Protected against long periods of immersion under pressure

Designation of colors:
to DIN standard 757

Abbreviation	Color	Abbreviation	Color
BK	black	VT	violet
BN	brown	GY	gray
RD	red	WH	white
OG	orange	PK	pink
YE	yellow	GD	gold
GN	green	TQ	turquoise
BU	blue	SR	silver

Safety-Lock™:
Safety-Lock*plus*™:

Safety-Lock: Interlocked bearings, large bearing span and extra strong outer bearings ensure stability when subjected to vibration.

Safety-Lockplus: Mechanically protected shaft seal.


Safety-Lock™

Rotary Measurement Technology - Encoders

Installing encoders:

Encoder shafts and bearings are subjected to loads for a variety of reasons:
- Installation tolerances when mounting the encoders (radial and angular displacement)
- Thermal changes, e.g. linear expansion of the drive shaft
- Effects of wear, e.g. radial runout of the drive shaft or vibrations

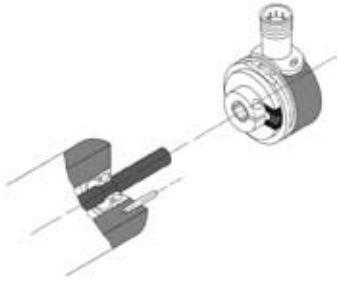
These load factors have a direct effect on the life expectancy of the shaft bearings and on the quality of the signal. For this reason Kübler by TURCK provides a wide variety of accessories that should be used to compensate for these forces. For encoders with a solid shaft, this is generally done by using shaft couplings between the drive shaft and the encoder shaft. The solution with hollow shaft encoders is to use flex couplings, fixing brackets or torque stops between the encoder bracket and the mounting surface. Not using a coupling generally leads to unacceptably high loads on the bearings; the ensuing wear will cause the encoder to fail prematurely.

In order to avoid permanent damage of the encoder, certain bearing loads should not be exceeded. If hollow shaft encoders are correctly installed and the torque stops or flex couplings that are available from Kübler by TURCK are used, then no problems will occur. For solid shaft encoders, the maximum permitted axial and radial loads are shown in the appropriate technical data.

Mounting examples for hollow shaft encoders:

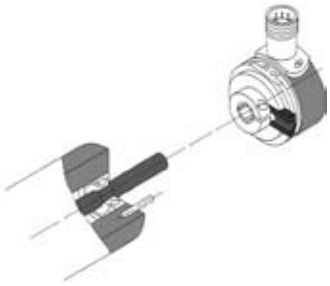
Mounting a hollow shaft encoder with torque stop and pin is easiest and fastest. Standard hollow shaft encoders are equipped with the torque stop.

Application: If axial play is less than 0.5 mm and a resolution of up to 2500 ppr (if no pulse doubling is used).



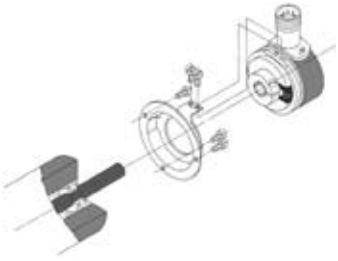
Mounting of a hollow shaft encoder with extended torque stop and long pin.

Application: Especially recommended if there is a large axial play. Due to the larger mounting radius of the pin, the resolution can be higher (up to 3600 ppr, if no pulse doubling is used).



Mounting of a hollow shaft encoder with a flex coupling.

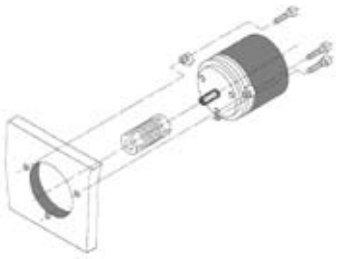
Application: For higher resolution or if no pin can be used due to mechanical restrictions. No restrictions on resolution.



Rotary Measurement Technology - Encoders

Mounting examples for shaft encoders with servo bracket:

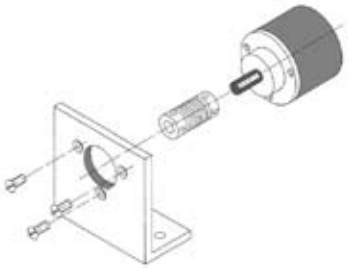
Mounting with fastening eccentrics and coupling (to reduce shaft overload).



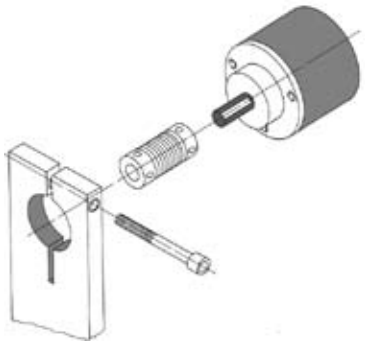
Mounting with assembly bell, fastening eccentrics and coupling (to prevent shaft overload and to insulate the encoder thermally and electrically).

Mounting examples for shaft encoders with clamping bracket:

Mounting with an angular bracket and coupling (to reduce shaft overload).



Mounting with a commonly used clamping device and coupling (to reduce shaft overload).



Rotary Measurement Technology - Encoders

Loading of encoder shaft bearings using coupling forces:

With all spring couplings (shaft coupling, flex coupling, fixing bracket), alignment and axial errors are converted to a force that corresponds to the spring constant of the coupling. This force has to be absorbed by the encoder shaft bearings. When installing an encoder, this should be done with as little force as possible, i.e. without any unnecessary initial tension on the coupling. If this is adhered to, adequate tolerance compensation is guaranteed for the whole service life of the encoder bearings.

This force does not occur with torque stops for hollow shaft encoders, where the encoder is prevented from turning by means of a pin or rod. Although the encoder is prevented from rotating due to a rigid interlock, the encoder is still free to move in any other direction. This is dependent on it being mounted in such a way that it has freedom to move radially and axially (thermal linear expansion of the drive shaft).

Possible errors in accuracy due to couplings:

1. Deviations in accuracy caused by torsion of a spring coupling (in particular shaft couplings)

This deviation in accuracy is defined by the torque to be transmitted (bearing friction and mass moment of inertia) and by the torsional spring constant of the torque stop.

The following applies:

$$\text{Max. error (degree)} = \frac{\text{max. torque [Ncm]}}{\text{torsional spring constant [Ncm/degree]}}$$

The following table serves to estimate the ratio between such an error and the smallest increment of an encoder:

Relationship between the resolution of an encoder in bit and the smallest increment in angular degrees:

Resolution	binary	10 bit	11 bit	12 bit	13 bit	14 bit	17 bit
	ppr	1024	2048	4096	8192	16384	131072
Increment	degrees	0.352	0.176	0.088	0.044	0.022	0.0028
	degrees:min:sec	0:21:06	0:10:33	0:05:16	0:02:38	0:01:19	0:00:10
	sec	1266	633	316	158	79	010

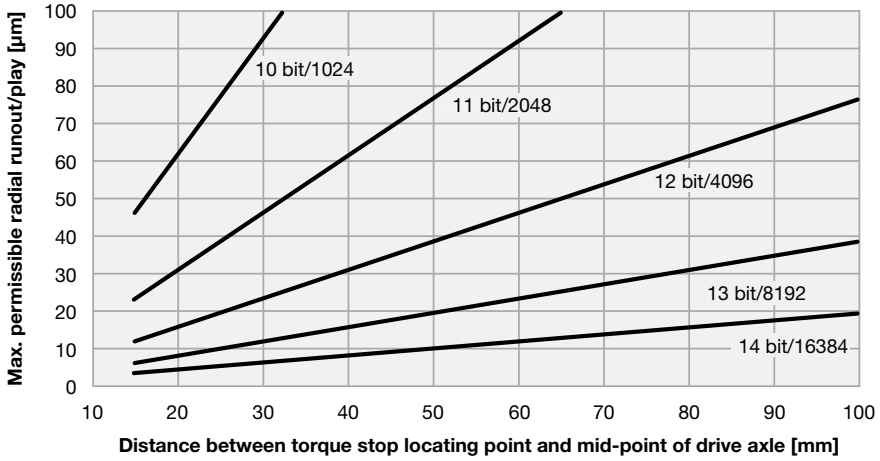
2. Deviations in accuracy caused by radial play in the drive shaft with asymmetrical mounting of the couplings

Here, one has to differentiate between couplings that are mounted in an axially symmetrical manner around the shaft (all shaft couplings, many flex couplings) and asymmetrically mounted couplings (many flex couplings, all mounting brackets and pin-based torque stops).

With asymmetrical couplings, deviations in accuracy can arise due to radial movements of the drive shaft (radial runout/play). These deviations are dependent on the amount of the radial play and the distance of the torque stop locating point from the drive shaft.

The relationship is shown in the following diagram:

Maximum permissible radial runout to achieve an accuracy >1/2 LSB when using an asymmetrical 1 point torque stop:



Rotary Measurement Technology - Encoders

Particular shaft loading due to toothed-wheels, gear-pulleys and similar elements:

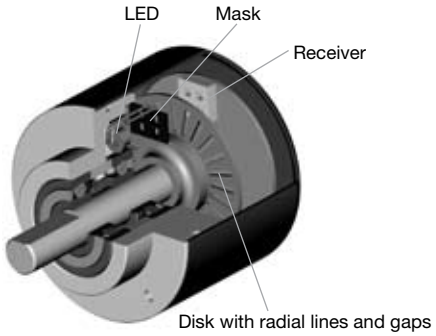
Measuring wheels, toothed wheels or gear pulleys, which are mounted directly on the encoder shaft, exert radial forces on the latter, dependent on pre-stressing and angular acceleration. Kübler by TURCK encoders are designed to absorb these forces to a great extent. The maximum permissible load capacity of the shaft is shown in the technical data for the encoder. If these load values are exceeded, the encoder shaft must be isolated from the radial load by selecting an appropriate shaft with its own bearings that can absorb the forces. Kübler by TURCK offers suitable bearing blocks and bearing boxes for this purpose (please refer to the page E1, Accessories in this catalog).

Rotary Measurement Technology - Incremental Encoders

Incremental encoders assembly and function:

Kübler by TURCK encoders operate on an electro-optical scanning principle.

A disk with a radial grating of lines and gaps rotates between a light source (an LED) and a receiver which produces a sine wave signal proportional to the light received.



Sendix® incremental

Mechanical advantages of Kübler by TURCK encoders:

Sturdy bearing construction:
"Safety-Lock™ design"

- Interlocked bearings, large bearing span and strong outer bearings ensure stability when subjected to vibration.
- Ideal for outdoor use thanks to its solid die-cast housing and radial shaft seal, as well as IP67 protection rating and a temperature range from -40 to 185°F (-40 to 85°C).

Processing of the signals:

The sine wave signals are processed in an electronic circuitry, usually a Kübler by TURCK specific ASIC. This is necessary because most controllers require digital signals with a certain voltage level. Signals are pre-processed in the encoder by the output circuit depending on the application.

Selecting an incremental encoder:

When selecting a suitable incremental encoder, refer to the general selection criteria shown on page B1.

Multiplication of pulses:

The resolution of a two channel encoder can be multiplied by two or four using special edge detecting.

An encoder with physically 5,000 pulses per revolution can generate 20,000 pulses per revolution using this technique.

Inverted signals:

When used in environments with high of electrical noise and/or very long cable distances, it is recommended to use encoders with inverted (complementary) signals. These signals are available with RS422 and sine wave outputs. Kübler by TURCK also offers push-pull outputs.

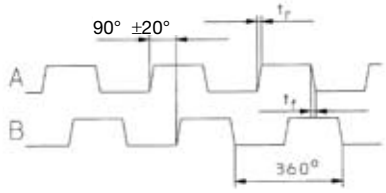
Rotary Measurement Technology - Incremental Encoders

Number of channels:

Encoders with one output channel:
Encoders with one output channel are used where no direction sensing is needed, e.g. speed control or length measuring.

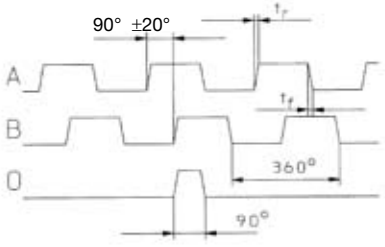
Encoders with two output channel:
Applications to sense the direction of a rotation require encoders with two channels (A and B) being shifted 90° out of phase. By detecting the phase shift, the direction can be located.

- Shaft turning clockwise, top-view of shaft
- Inverted signals available
- 0-pulse is linked to AND with channel A and B
  tr = rise time
  tf = fall time



Encoders with three output channels:
In addition to two channels, a zero signal is also available, that appears once per turn. This can be used as a reference signal during the first revolution after power up.

- Shaft turning clockwise, top-view of shaft
- Inverted signals available
- 0-pulse is linked to AND with channel A and B
  tr = rise time
  tf = fall time



Resolution:

An encoder is equipped with a measuring wheel. Every revolution corresponds to a distance of 200 mm (circumference). The accuracy should be 0.1 mm. What is the required resolution (ppr)?

Given:
Circumference of the measuring wheel:
U = 200 [mm]

Accuracy of the system:
G = 0.1 [mm]

Wanted: Resolution of the encoder:
A = ? [pulses/resolution]

$$\text{resolution} = \frac{\text{circumference}}{\text{accuracy}} = \frac{U}{G}$$

Sensor outputs:

The sensor outputs are used if the distance from the encoder to the control unit is very long and the voltage supply at the encoder could drop due to this long distance.

The input impedance of the sensor inputs (Controller) is very high, and the voltage drop on the sensor output line is almost zero. Due to this it is possible to detect the actual supply voltage of the encoder (e.g. 4.2 V instead of 5 V). Based on this information the controller will increase the voltage supply to e.g. 5.8 V. This feature is generally available on selected 5000, 5800 and A02H encoder models. Please refer to the selection guides for more information on this feature.

Rotary Measurement Technology - Incremental Encoders

Pulse frequency:

The required pulse frequency can be calculated based on the number of pulses per revolution (ppr) and the speed (rpm). The maximum pulse frequency is listed for each encoder. The pulse frequency can be from 300 kHz to 800 kHz.

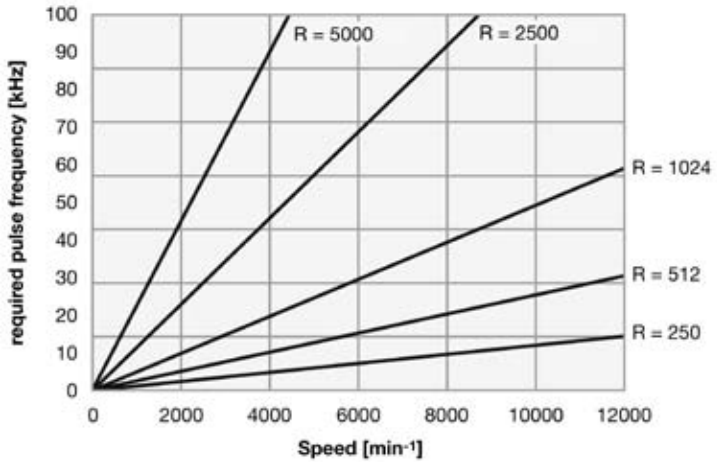
Example:
How to calculate the required pulse frequency f_{max}:

Given: speed
n= 3000 RPM
Resolution of the encoder
R = 1000 ppr

$$f_{max} = \frac{n \times A}{60}$$

The required pulse frequency is 50 kHz. Now you can compare this result with the data of the encoder you would like to choose.

This diagram can be used as a quick guide for the most common resolutions:



Outputs and voltage supplies (overview):

Kübler by TURCK offers a wide range of possible outputs and voltage supplies for any application:

Output	Inverted signals	Voltage supply
RS422	Yes	5 VDC
RS422	Yes	10-30 VDC or 5-30 VDC
Push pull output	No	10-30 VDC or 5-30 VDC
Push pull output	Yes	10-30 VDC or 5-30 VDC
Push pull (7272)	Yes	5-30 VDC
Sine wave voltage output	Yes	5 VDC
Sine wave voltage output	Yes	10-30 VDC

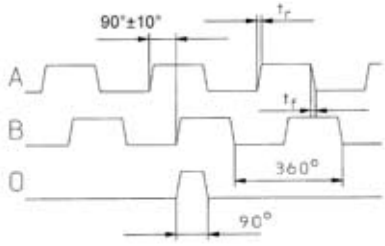
If the encoder is used in an environment with high electrical noise and long cables, it is recommended to use inverted signals.

Rotary Measurement Technology - Incremental Encoders

Digital outputs:

The sine wave signal from the optical system is first digitized to have square wave signals available.

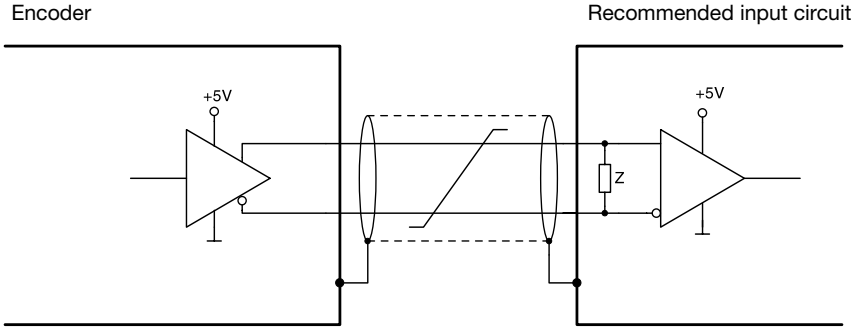
- Shaft turning clockwise, top view of shaft
- Inverted signals are available
- 0-pulse is linked to channel A and B



There are two possible outputs available to transmit the signals, RS422 (TTL compatible) or push-pull (PNP or NPN). When choosing the suitable output for the application, the following points have to be considered:

- The corresponding unit / controller the encoder will be connected to
- The distance from the encoder to the receiver unit
- The sensitivity against electrical noise or other interference

RS422:
Output circuit and recommended input circuit



RS422 line driver

RS422 line receiver
e.g. AM26 C 32
Z = 120 Ω

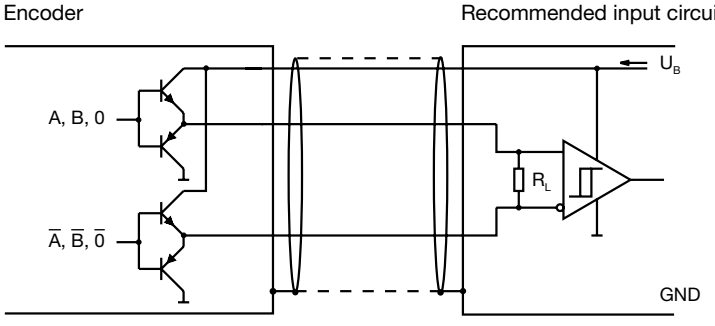
Push-pull outputs:

Push-pull outputs are suitable for count interface cards, electronic counters or PLC inputs. They are available in **two versions:**

Push-pull:
- Push-pull with integrated wave impedance adjustment, recommended cable impedance 40-150 Ω
- Recommended for long cable lengths, high pulse frequencies and output voltages to 30 V
- With or without inverted (complementary) signals

Push-pull (7272):
- Universal line driver 5-30 V with low-level (max 0.5 V)
- Recommended for cable lengths up to 30 m
- With inverted signals

Output circuit and recommended input circuit push-pull with inverted signals:

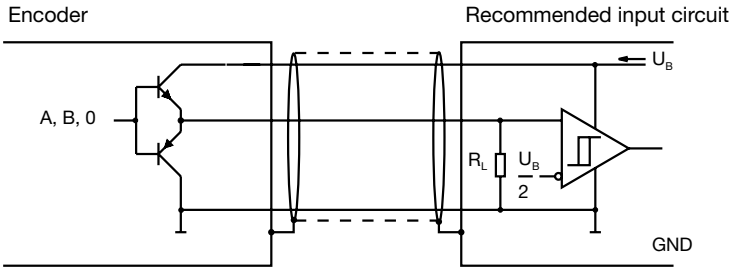


integrated push-pull driver

R_L = 1 kΩ

Rotary Measurement Technology - Incremental Encoders

Output circuit and recommended input circuit push-pull without inverted signals:



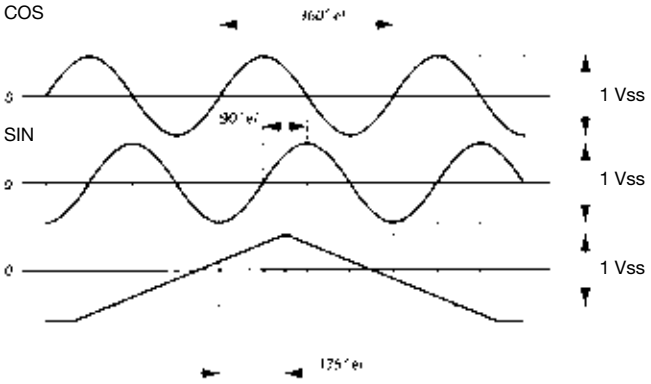
Integrated push-pull driver

R_L = 1 kΩ

Sine wave outputs:

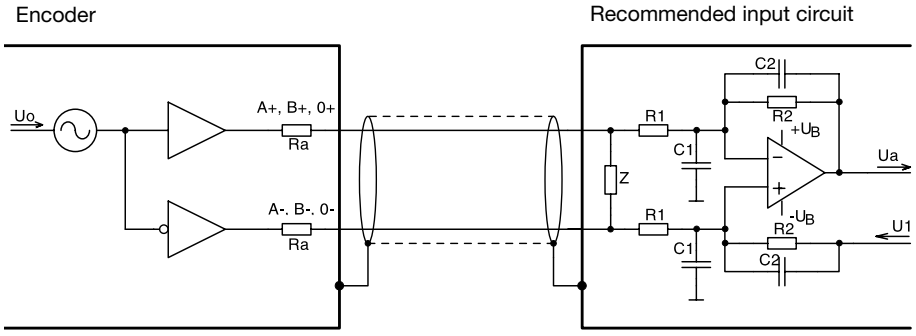
The sine wave signals are available as voltage signals. They can be further processed and multiplied by a factor of 10, 20, 50, 100, 400, 500, 1000 res. binary factors (512, 1024). Due to the interpolation of the two signals, which are 90° out of phase, a very high resolution can be achieved.

This makes these signals useful for applications where very high resolutions are required. Further they are very suitable for digital drives with a very slow and precise movement, e.g. for grinding machines or lifts and elevators.



- Shaft turning clockwise, top view of shaft
- 0-pulse is generated once per turn

Output circuit and recommended input circuit for sine wave voltage signals:



R_a = 10 Ω
C_1 = 150 pF
C_2 = 10 pF
R_1 = 10 kΩ
R_2 = 33 kΩ
U_0 = 2.5 V ±0.5 V

Z = 120 Ω
U_1 = U0

OPV: e.g. MC33074

Rotary Measurement Technology - Incremental Encoders

Cable lengths for incremental encoders:

Depending on the output circuit and the electrical noise, the following cable lengths are recommended.

Output circuit:	Max. cable length:	Encoder connected to:
Push-pull without inverted signals	328 ft (100 m*)	Kübler by TURCK counter/PLC
Push-pull with inverted signals	820 ft (250 m*)	PLC/IPC [1)]
Push-pull with inverted signals (7272)	98 ft (30 m)	
RS422 with inverted signals	Up to 3280 ft (1000 m) (> 164 ft (> 50 m)*)	PLC/IPC [1)]
Voltage sine with inverted signals	164 ft (50 m)	PLC/IPC [1)]

[1)] IPC = industrial PC
* depends on frequency

Annotations:
- Depending on the application the recommended cable length can be shorter, especially in areas with strongly electrical noise.
- Always use shielded cables
- The core diameter of the signal cores should be ≥ 0.14 mm² (26 AWG)
- The core diameter of the voltage supply cores should be large enough depending on the cable length, that the voltage supply of the encoder is high enough and the signals do not go below the minimum levels! We strictly recommend the use of the cable types written down in the accessories.

Rotary Measurement Technology - Absolute Encoders

Design and function:

Absolute encoders have a disk with a digital coding on concentric tracks. This code is read by a Kübler by TURCK Opto-Asic. A unique bit pattern is assigned to each position.

In the event of a power failure, true position verification is available as soon as power is up again – even if the shaft was moved during the dead state. Also, no reference drives after starting-up are necessary, as with incremental systems. Thus, safety is increased and the time taken for reference drives is saved.

Sendix® absolute

Mechanical advantages of Kübler by TURCK encoders:

Sturdy bearing construction:
"Safety-Lock™ design"
- Interlocked bearings, large bearing span and strong outer bearings ensure stability when subjected to vibration.
- Ideal for outdoor use thanks to its solid die-cast housing and radial shaft seal, as well as IP67 protection rating and a temperature range from -40 to 185°F (-40 to 85°C).

Selecting an absolute encoder:

When selecting an absolute encoder, the following parameters should be considered in addition to the recommendations on page B1: supply voltage, type of code and interface (SSI, parallel, fieldbus, 4-20 mA)

Versions:

Singleturn encoders: Depending on the number of divisions, they generate up to 131,072 (17 Bit) unique positions per turn. This corresponds to an angular resolution of 0.0028 (= 0.168'). After one revolution the process re-starts.

Singleturn encoders can be used in applications where revolution is sufficient, e.g. measurement of angles, robotics.

Multiturn encoders: Are available with up to 131,072 (17 Bit) definite angular positions per revolution in addition to 16,777,216 (24 Bit) definite revolutions. This corresponds to 2.19 trillion (41 Bit) definite positions.

Multiturn encoders can be used for positioning applications, e.g. automatic storage, retired systems, lift elevators, cranes, machine tool, etc.

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Industrial Automation

Rotary Measurement Technology - Absolute Encoders

Output Codes:

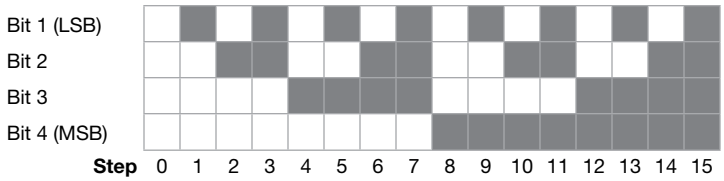
Bits	Binary	Gray	BCD
0	0000	0000	0000 0000
1	0001	0001	0000 0001
2	0010	0011	0000 0010
3	0011	0010	0000 0011
4	0100	0110	0000 0100
5	0101	0111	0000 0111
6	0110	0101	0000 1000

Bits	Binary	Gray	BCD
7	0111	0100	0000 0111
8	1000	1100	0000 1000
9	1001	1101	0000 1001
10	1010	1111	0000 1010
11	1011	1110	0000 0001
12	1100	1010	0000 0010

Code types:

Binary Code:

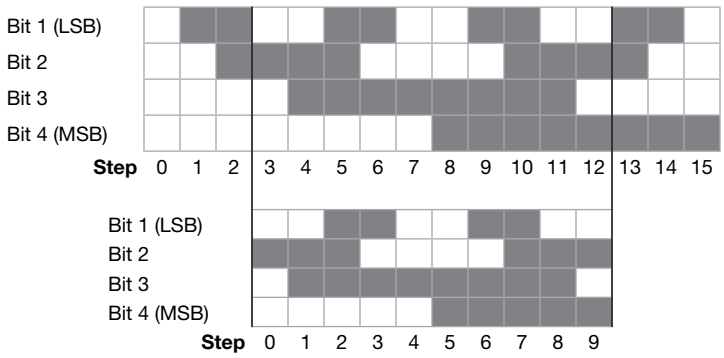
Binary Code can be processed very simply by computer systems. Gray code inside the encoder is converted via the ASIC to binary code. Binary codes have more than one bit transition for each position change. For this reason, optical systems using binary code may cause occasional transition errors. In most applications this does not present a problem due to the absolute nature of the encoder and the position is normally corrected.



Gray Code:

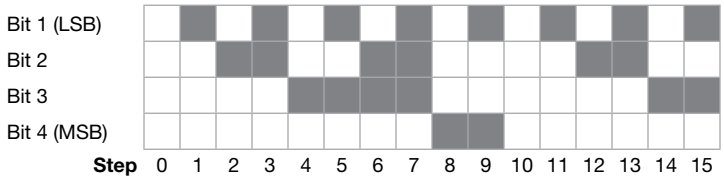
The Gray Code is a single-step code. This indicates that only 1 bit is changed from one position to the next. This leads to a high position reliability. The Gray Code is used to optically read out the position for all absolute encoders.

Gray excess: The extraction of a defined part of the Gray Code leads to the gray excess code. This code enables the generation of non-binary based divisions, e.g. 360, 720, 1000, 1440.



Reversion of the gray code: The code values increase when the shaft is turning clockwise. If the most significant bit (MSB) is inverted, the code values decrease when the shaft is turning clockwise.

BCD Code:



Rotary Measurement Technology - Absolute Encoders

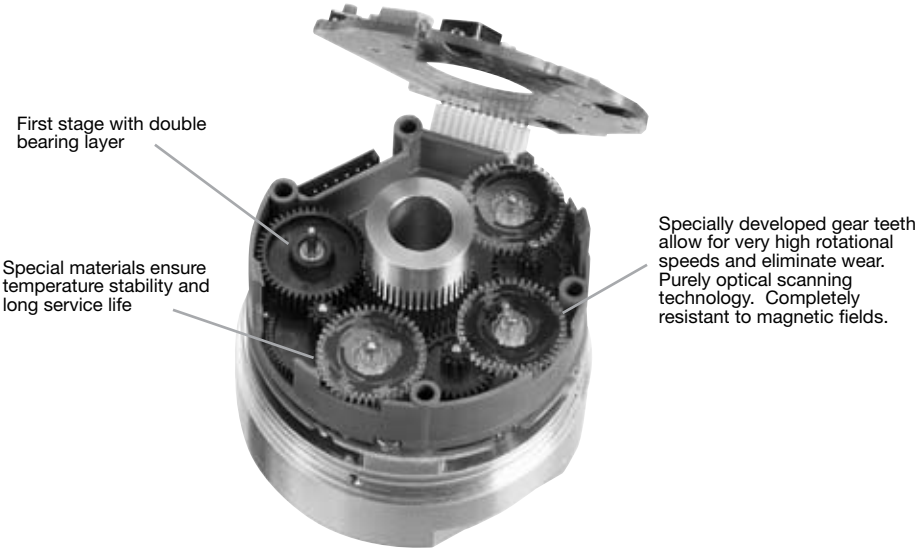
OptoASIC and Intelligent Scan Technology™:

OptoASIC and Intelligent Scan Technology (IST) is the latest development in Absolute encoder technology. The development of an OptoASIC with Intelligent Scan Technology. IST enabled Kübler by TURCK to build the first optical multiturn encoder without gears or magnetic sensors.

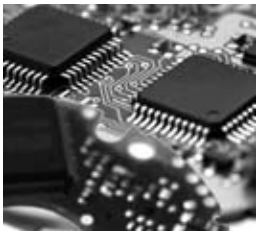
Eliminating mechanical parts like gears allowed Kübler by TURCK to make the encoder smaller than others currently on the market. The F36 offers total resolution of up to 41 bits, a programmable multiturn encoder with up to 16 million revolutions and a high-precision single turn with up to 17 bits resolution, all in a 39 mm diameter housing that is up to 45 mm long.

The multiturn gear module (12 bit resolution)

Geared multiturn encoders are the Sendix multiturn types 5863, 5868, 5883 and 5888.



Patented Integrative Technology®:



Integrative Technology, developed and patented, is a package of measures that ensures compact construction, high signal quality, high shock resistance – up to 2,500 m/s2 – high reliability and a high level of immunity to EMC.

This is achieved using an Opto ASIC: a multilayer board, shock resistant and space-saving method of mounting the sensor unit. The use of a highly optimized ASIC interface ensures the integration of several hundred individual components. Components that had previously been needed to balance the system, such as balancing potentiometers, can be dispensed with.

Advantages of Integrative Technology: Singleturn shaft encoders are available with the same dimensions as their incremental correspondents. This allows an easy mechanical substitution.

Mechanical or electronic gears?

Absolute singleturn and multiturn encoders have established themselves as the standard method for measuring linear displacement or angular position. With absolute encoders, a reference trip is no longer needed after system start-up or a power-down. Multiturn encoders are now being employed where incremental encoders had dominated, for example with geared motors or in lifts.

Today, all manner of multiturn encoders are available in a variety of designs. As a rule, the manufacturers offer either mechanical gears for 'counting turns' or electronic counters with electronic data storage. For many years encoder companies have made both absolute multiturn encoders with gears or without gears, and then criticized each other for the perceived drawbacks to the designs. Kübler by TURCK offers both absolute mutliturn encoders without mechanical gears and with mechanical gears. Not having mechanical gears allows Kübler by TURCK to make more compact absolute multiturn encoders. These encoders require batteries, whereas geared multiturn encoders do not have batteries. Battery life is often a discussion point. Based on how the encoder is actually used the calculated battery life could be as long as 75 years.

Rotary Measurement Technology - Absolute Encoders

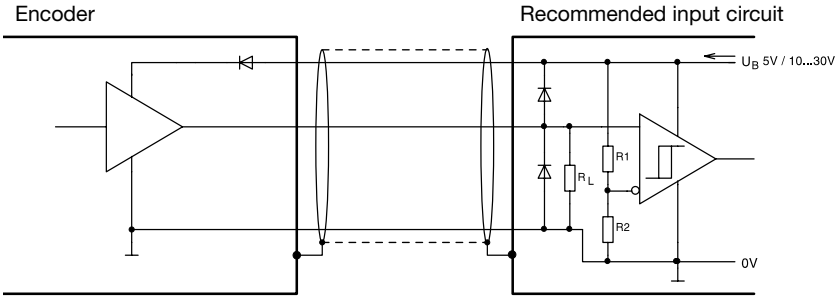
Outputs:

Different interfaces are available to transfer the position data to a controller. Kübler by TURCK offers a variety of outputs detailed in the following sections.

Parallel output:

This type of transfer is very fast. All bits of a position are transferred simultaneously each via a separate line.

Output circuit and recommended input circuit parallel interface:



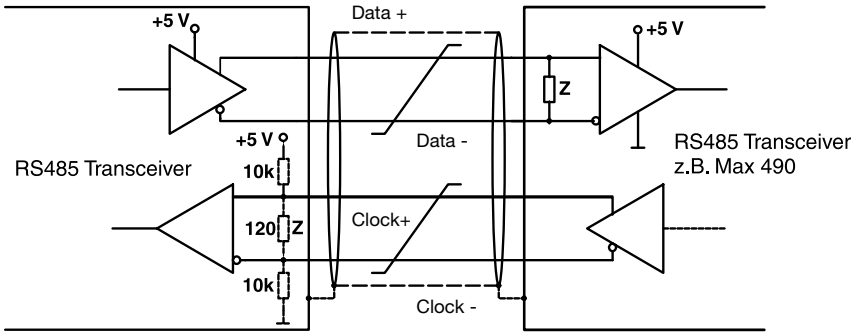
Integrated push-pull driver

Servo Serial Interface (SSI):

Compared to the parallel interface, the SSI interface requires less components and the EMC-characteristics are much better. Furthermore, less cores are needed for transmission and the possible cable length is much longer.

Output circuit and recommended input circuit for multiturn encoders with SSI output:

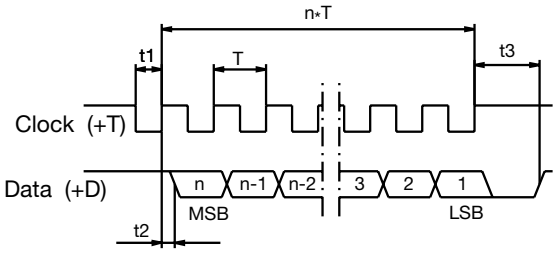
Encoder types 5850, 5870 and 7031 have inputs galvanically isolated by opto-couplers.



Encoder with SSI
z.B. 5862, 5882, 9081

Receiving Device
Z = 120 Ohm

Data transmission SSI:



t1 = T / 2
t2 < 1 / (4 x fmax)
t3 = Monoflop time (see below)
n = Resolution in Bit
$1/f_{max}$ = < T = < 1 / fmin
f_{min} = min. SSI clock rate (see data sheet)
f_{max} = max. SSI clock rate (see data sheet)

At rest, the clock and data lines are at a high level. With the first falling clock-pulse edge, the current encoder data is stored in the buffer ready to be sent. With the next rising clock-pulse edge, the data is transmitted bit by bit, starting with the MSB. The transfer of a complete data word requires n+1 rising clock-pulse edges (n=resolution in Bit), e.g. 14 clock signals for a complete readout of a 13 Bit encoder. After the next positive-going clock-pulse edge, the data line will remain at a low level until the encoder is ready for a new data word. The clock line must stay high for at least as long, and then can begin a new read-out sequence again with the next falling edge.

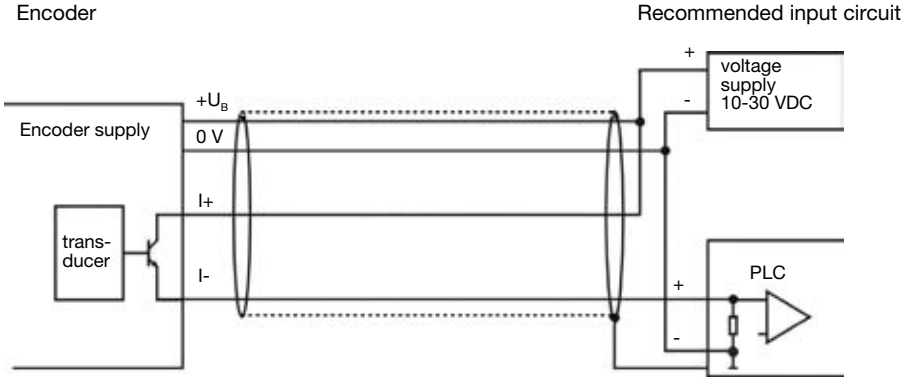
Rotary Measurement Technology - Absolute Encoders

Please note!

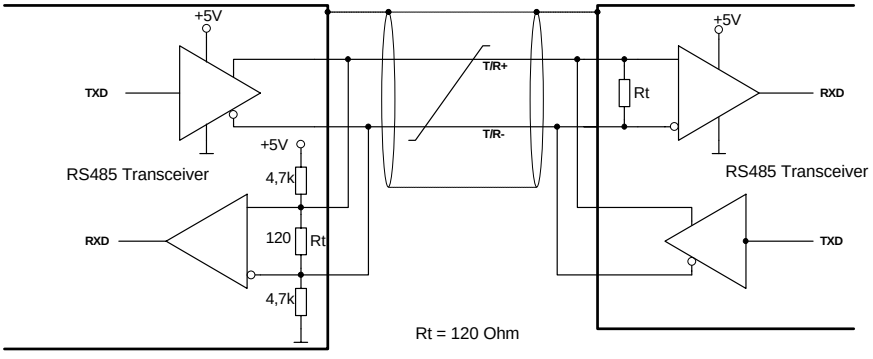
Only for type series 5850, 5870, 5862, 5882 and 9081: Updating the data occurs sequentially with the read-out cycle. Therefore, the data is as up-to-date as the interval time between two read-outs. A periodic read-out of the encoder in the application is recommended, using appropriately short cycle times, so that current position values are constantly maintained. It is not possible to read out the same data word several times.
Monoflop time of the encoder: t3 = max. 40µs

Only for Sendix Absolute encoders: Updating the data occurs immediately with the first falling edge of the clock signal. The data is always up-to-date. If a repeated read-out of the same data word is desired, then a new clock sequence must be started within the time interval t3. If the clock sequence is terminated before the necessary number of clock pulses needed for a complete readout of the data word has been transmitted, then the data line will go high again and signal that the last read-out sequence has been aborted. It will also indicate that it is ready for a new data word to be sent. Monoflop time of the encoder: t3 = see data sheet.

Type of connection and recommended input circuit for encoder type 5850 and 7031 with current interface 4-20 mA:



Output circuit and recommended input circuit for encoder with RS485 interface (half-duplex) e.g. 5862, 5882, 9081:



Encoders with internal termination have a fixed terminating resistor Rt built in. This variant is designed for point-to-point transmissions between two devices. With devices having external termination, the user must activate the terminating resistor by placing a jumper between pins 5 and 6. This option is suitable to the construction of bus systems with several encoders. With bus systems, the EIA-485 standard recommends terminating each end of a data link circuit with a terminating resistor. The RS-485 interface is asynchronous. In half-duplex operation, it is not possible to send and receive at the same time. The data transmission is controlled via ESC commands.

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Rotary Measurement Technology - Absolute Encoders

PROFIBUS CANopen DeviceNet EtherCAT

Cable length:

The following maximum cable lengths are recommended, depending on the output circuitry and any noise sources present.

Interface and output circuit:	Max. cable length:	Connected to:
Parallel CMOS/TTL	6.5 ft (2 m)	SPS/IPC [1]
Parallel push-pull	328 ft (100 m)	SPS/IPC [1]
SSI	up to 3,280 ft (1,000 m) [2]	SPS/IPC [1]
RS422 /RS485	3,280 ft (1,000 m)	SPS/IPC [1]
Analog 4-20 mA	656 ft (200 m)	

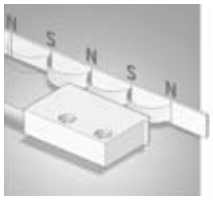
[1] IPC = Industrial PC
[2] Depends on clock frequency: at 100 kHz L_{max} approx. 250 m; at f = 250 kHz L_{max} approx. 50 m

Annotations:
- Depending on the application the max. allowed cable length can be shorter, especially in areas with strong electrical noise.
- Always use shielded cables
- The core diameter of the signal cores should be ≥ 0.14 mm²
- The core diameter of the voltage supply cores should be large enough depending on the cable length, that the voltage supply of the encoder is high enough and the signals do not go below the minimum levels! We strictly recommend the use of the cable types written down in the accessories.

Linear Measurement Technology

Magnetic measuring system up to 90 m measuring length up to 0.005 mm resolution:

A magnetic sensor is guided across a magnetic band without coming into contact with it. The changes in polarity on the magnetic band are counted and intermediate values are interpolated. Our engineers have fine-tuned the system to such a degree that resolutions up to 0.005 mm are possible.



The system is not affected by dust, shavings or humidity and is resistant to many liquids and to oil. Assembly is easy - the magnetic band just has to be glued into place. There are no problems for calibration. The distance between the sensor and the magnetic band can be up to 2 mm. Repeat accuracy is very high.

Where is our linear measurement system used?

The measuring system offers an economical alternative to optical systems in applications where the high accuracy of the glass rules is not absolutely necessary but where up until now no other suitable alternative has been available.

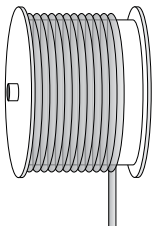
Because of its rugged construction, the measuring system can now be used even in tough industrial environments.

The system is not affected by vibration, nor is it damaged if subjected to high shock loads. Our flexible magnetic band can fit around very large shafts. The maximum length of the magnetic band is 90 m.

Linear Measurement Technology

Draw wire systems:

At the core of a draw wire encoder is a drum mounted on bearings, onto which a wire is wound. The winding takes place via a spring-loaded device. The number of revolutions is measured by means of an encoder. If the circumference of the drum is known, then the length can be calculated from it.



Thus, draw wire systems convert linear motion into rotary motion. This is then measured with encoders. Our spectrum ranges from miniature draw wire versions to models capable of measuring 40 m.

- Specially for demanding applications
- With analog sensors (0-10 V, 4-20 mA, potentiometer) or encoders (incremental, absolute, fieldbus)
- Measuring lengths from 250 mm up to 40,000 mm
- High travelling speed
- High acceleration
- Simple wire fixing using clip
- Quick mounting
- Diamond-polished ceramic guide
- Titanium anodized aluminium housing
- Dynamic spring traction by means of a constant force spring, long service life, approx. 2 million complete cycles.

Length measuring kits
unlimited length resolution up to 0.1 mm

Kübler by TURCK provides the measuring wheel, encoder and counter – all from one source, all in one **complete kit.** This complete kit saves you time and effort, as there is no need to assemble the component parts.

TURCK
Industrial Automation

Table of contents

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Rotary Measurement Technology - Incremental Encoders

Incremental encoders - miniature shaft/hollow shaft

Miniature	Type 2400/2420	C2
Miniature magnetic	Type 2430/2440	C5
Miniature	Type 3610/3620	C8
Miniature	Type 3700/3720	C11

Incremental encoders - standard shaft/hollow shaft

Sendix, compact	Type 5000/5020	C14
Sendix, stainless steel	Type 5006	C21
Universal	Type 5800/5820	C24
High temperature	Type 5803/5823	C24
Sine wave output	Type 5804/5824	C24
High resolution	Type 5805/5825	C24
Stainless steel	Type 5826	C24
Large bore	Type 5821	C31

Incremental encoders - heavy duty

Large bore	Type A02H	C34

Magnetic ring encoders

Type RI20/LI20		C39

Miniature type 2400 (shaft) / 2420 (blind hollow shaft)

High rotational speed | Temperature | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Rugged

- Wide temperature range -4 to +185°F (-20 to +85°C)
- Robust strain relief on cable outlet
- Highly flexible cable withstands constant flexing from +32 to +158°F (0 to 70°C)
- Very high EMC standard
  - Kübler by TURCK encoder type 24xx meet German Railways standard EN 50121

Compact

- **Can be used where space is tight**
  Overall diameter of only 24 mm
  Shaft diameter min. 4 mm

Versatile

- Low power consumption despite high scanning rate
- Short-circuit proof
- Temperature compensation
- Broad input voltage range (5-24 V or 8-30 V)
- Shaft and hollow shaft up to 1024 ppr

Mechanical characteristics:

Speed:	max. 12,000 RPM
Rotor moment of inertia:	approx. 5.5 x 10^{-3} oz-in^2 (0.1 x 10^{-6} kgm^2)
Starting torque:	< 0.14 oz-in (< 0.001 Nm)
Radial load capacity of shaft:	4 lbs (18 N)
Axial load capacity of shaft:	4.5 lbs (20 N)
Weight:	approx 0.14 lbs (0.06 kg)
Protection acc. to EN 60529:	IP64 housing side, IP64 shaft side on request
Working temperature:	-4 to 185°F (-20 to +85°C) [1]
Materials:	Shaft: stainless steel Blind hollow shaft: brass
Shock resistance acc. to DIN-IEC 68-2-27:	100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s^2), 55-2,000 Hz

[1] Non-condensing

Electrical characteristics:

Output circuit:	Push-pull (7272) [3]	Push-pull (7272) [3]
Supply voltage:	5-24 VDC	8-30 VDC
Power consumption (no load):	max. 50 mA	max. 50 mA
Permissible load/channel:	max. 50 mA	max. 50 mA
Pulse frequency:	max. 160 kHz	max. 160 kHz
Signal level high:	min. +V = -2.5 V	min. +V = -3 V
Signal level low:	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 1 µs	max. 1 µs
Fall time t_f:	max. 1 µs	max. 1 µs
Short-circuit proof outputs [1]:	yes [2] [4]	yes [2] [4]
UL certified:	File 224618	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3		
RoHS compliant acc. to EU guideline 2002/95/EG		

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.)
(If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute

Miniature type 2400 (shaft) / 2420 (blind hollow shaft)

Standard wiring:

Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Cable:	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Part number key: 2400 shaft version

T5.2400.XXXX.XXXX

Type

Flange

1 = Ø 24 mm
2 = Ø 30 mm
3 = Ø 28 mm
more options on request

Shaft

1 = Ø 4 mm x 10 mm
2 = Ø 6 mm x 10 mm
3 = Ø 5 mm x 10 mm with flat
4 = 1/4" x 10 mm with flat
6 = 6 mm x 10 mm with flat

Pulse rate

4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, 100, 120, 125, 180, 200, 250, 300, 360, 400, 500, 512, 1000, 1080, 1024
(e.g. 360 pulses=> 0360)
Other pulse rates on request

Type of connection

1 = axial cable (2 m PVC cable Ø 4.5 mm)
2 = radial cable (2 m PVC cable Ø 4.5 mm)

Output and voltage supply

2 = 5-24 VDC, push-pull (with inverted signals)
4 = 8-30 VDC, push-pull (with inverted signals)

Part number key: 2420 blind hollow shaft version

T5.2420.XXXX.XXXX

Type

Flange

1 = Ø 24 mm with torque pin

Blind hollow shaft (insert depth max. 14 mm)

1 = Ø 4 mm
2 = Ø 6 mm
4 = Ø 1/4"

Pulse rate

4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, 100, 120, 125, 180, 200, 250, 300, 360, 400, 500, 512, 1000, 1080, 1024
(e.g. 360 pulses=> 0360)
Other pulse rates on request

Type of connection

1 = axial cable (2 m PVC cable)
2 = radial cable (2 m PVC cable)

Output and voltage supply

2 = 5-24 VDC, push-pull (with inverted signals)
4 = 8-30 VDC, push-pull (with inverted signals)

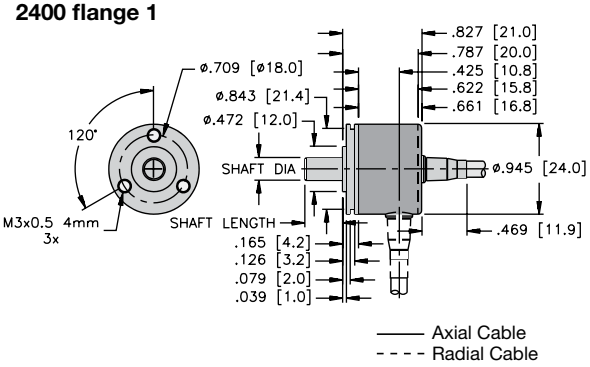
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

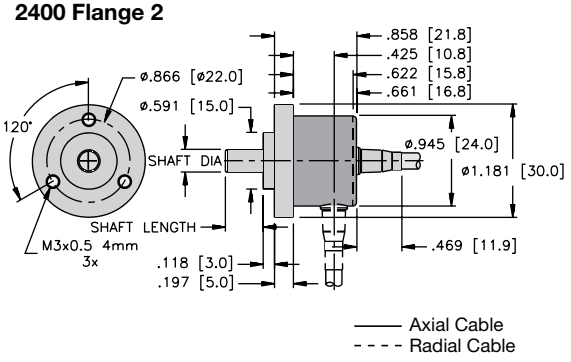
Miniature type 2400 (shaft) / 2420 (blind hollow shaft)

Dimensions: 2400 shaft version

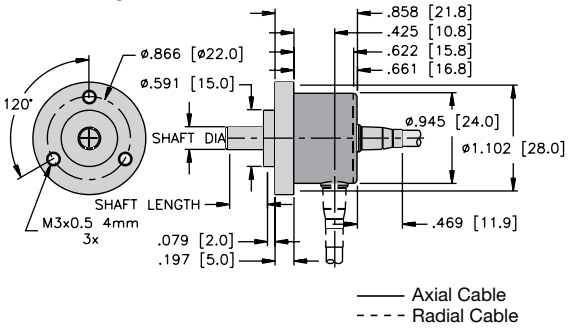
2400 flange 1



2400 Flange 2



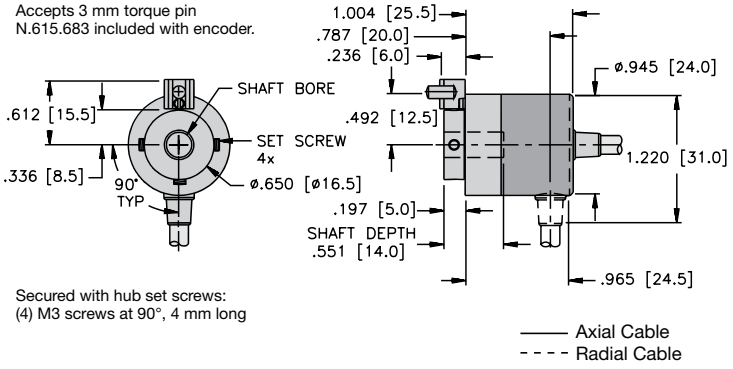
2400 flange 3



Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: 2420 blind hollow shaft version

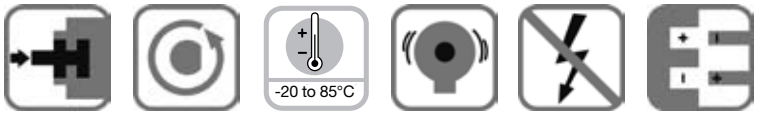
2420 flange 1



Mounting advice:
The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time. A cylindrical pin (N.615.683 per ISO 2338-A-3m6 x 10), for use as a torque stop, is supplied.

TURCK
Industrial Automation

Miniature magnetic type 2430 (shaft) / 2440 (blind hollow shaft)



Safety-Lock™ | High rotational speed | Temperature | Shock/vibration resistant | Short-circuit proof | Reverse polarity protection

Rugged
- The non-contact magnetic technology prevents wear and guarantees a long service life.
- Robust strain relief on cable outlet.
- Wide temperature range from -4 to +185°F (-20 to +85°C).

RoHS compliant

Compact
- **Can be used where space is tight:** Overall diameter of 24 mm, shaft diameter min 4 mm.

Versatile
- Power supply either 5 V DC or 8-30 VDC.
- Flexible connection options: can be supplied with radial or axial cable outlet.

Mechanical characteristics:

Speed:	max. 12,000 RPM
Rotor moment of inertia:	approx. 5.5 x 10^{-3} oz-in^2 (0.1 x 10^{-6} kgm^2)
Starting torque:	< 0.14 oz-in (< 0.001 Nm)
Radial load capacity of shaft:	4 lbs (18 N)
Axial load capacity of shaft:	4.5 lbs (20 N)
Weight:	approx 0.14 lbs (0.06 kg)
Protection acc. to EN 60529:	IP64 housing side, IP64 shaft side on request
Working temperature:	-4 to 185°F (-20 to +85°C) [1]
Materials:	Shaft: stainless steel Clamping flange: MS58
Shock resistance acc. to DIN-IEC 68-2-27:	100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s^2), 55-2,000 Hz

[1] Non-condensing

Electrical characteristics:

Output circuit:	RS 422 (TTL- compatible)	RS 422 (TTL- compatible)
Supply voltage:	8-30 VDC	5 V ±5%
Current consumption (no load):	typ. 40 mA	typ. 40 mA
Current consumption (with inversion):	max. 90 mA	max. 90 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA
Pulse frequency:	max. 300 kHz	max. 300 kHz
Signal level high:	min. 2.5 V	min. 2.5 V
Signal level low:	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 200 ns
Fall time t_f:	max. 200 ns	max. 200 ns
Min. pulse width:	0.5 µs [1]	0.5 µs [1]
Short-circuit proof outputs [2]:	yes [3] [4]	yes [3] [4]
UL certified:	File 224618	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3		
RoHS compliant acc. to EU guideline 2002/95/EG		

[1] For max. speed use counter with input frequency, min. 500 kHz.
[2] If supply voltage correctly applied
[3] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.)
(If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[4] Approximately one minute

Miniature magnetic type 2430 (shaft) / 2440 (blind hollow shaft)

Pin configuration:

Signal:	Common (0 V)	+V	$\overline{A}$	A	$\overline{B}$	B	$\overline{Z}$	Z
Color:	WH	BN	GN	YE	GY	PK	BU	RD

Part number key: 2430 shaft version

T8.2430.XXXX.XXXX

Type

Flange
1 = Ø 24 mm
2 = Ø 30 mm
3 = Ø 28 mm

Shaft
1 = Ø 4 mm
2 = Ø 6 mm
3 = Ø 5 mm x 10 mm with flat

Pulse rate
1-128 factory programmable
(e.g. 128 pulses=> 0128)
Other pulse rates on request

Type of connection
1 = axial cable (2 m PVC cable Ø 4.5 mm)
2 = radial cable (2 m PVC cable Ø 4.5 mm)

Output and voltage supply
2 = 8-30 VDC, RS422 (with inverted signals)
4 = 5 V, RS422 (with inverted signals)

Part number key: 2440 blind hollow shaft version

T8.2440.XXXX.XXXX

Type

Flange
1 = Ø 24 mm

Blind hollow shaft (insertion depth max. 14 mm)
1 = Ø 4 mm

Pulse rate
1-128 factory programmable
(e.g. 128 pulses=> 0128)
Other pulse rates on request

Type of connection
1 = axial cable (2 m PVC cable Ø 4.5 mm)
2 = radial cable (2 m PVC cable Ø 4.5 mm)

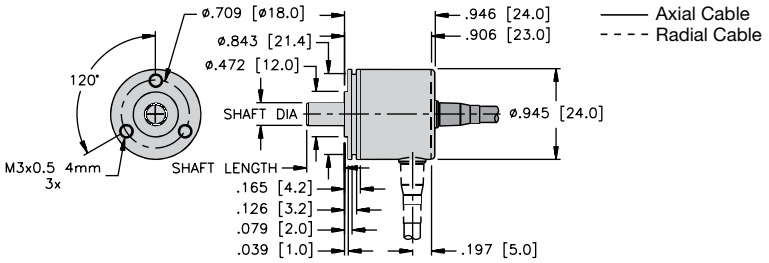
Output and voltage supply
2 = 8-30 VDC, RS422 (with inverted signals)
4 = 5 V, RS422 (with inverted signals)

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

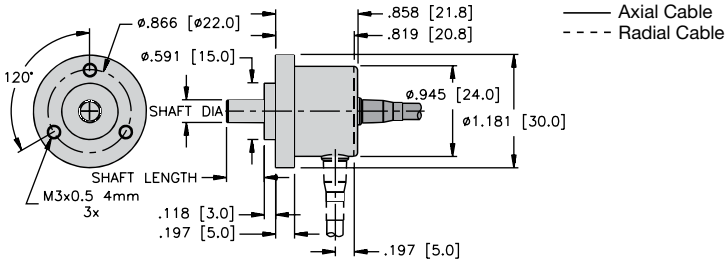
Miniature magnetic type 2430 (shaft) / 2440 (blind hollow shaft)

Dimensions: 2430 shaft version

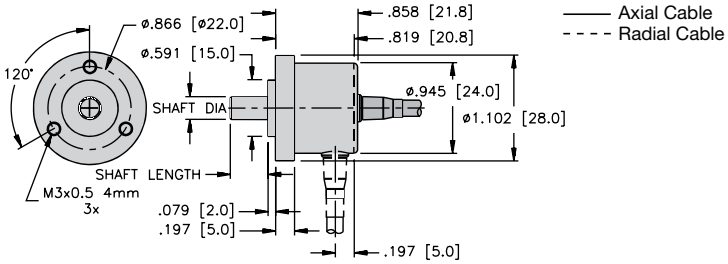
2430 flange 1



2430 flange 2



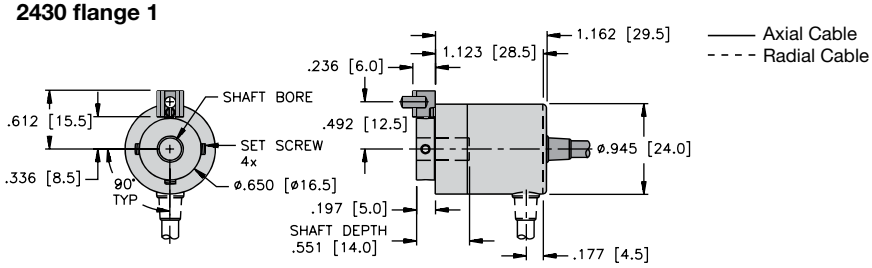
2430 flange 3



Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: 2440 blind hollow shaft version

2430 flange 1



Mounting advice:
The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time. A cylindrical pin (N.615.683 per ISO 2338-A-3m6 x 10), for use as a torque stop, is supplied.

Compact type 3610 (shaft) / 3620 (hollow shaft)

High rotational speed | Temperature | Shock/vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Rugged

- Chromated housing resistant to cooling lubricants and other environmental influences
- IP65 from housing side
- Robust strain relief on cable outlet.
- Highly flexible cable (withstands constant flexing at +32 to +158°F (0 to 70 °C))
- Short-circuit proof
- Wide temperature range -4 to +185°F (-20 to +85°C)
- Temperature and aging compensation

Compact

- **Can be used where space is tight**
  Overall diameter of only 36.5 mm
  Shaft diameter min. 4 mm

Versatile

- Hollow shaft version: Fits directly onto drive shaft - no couplings needed - saves up to 30% on cost and 60% on installation space and time
- Universal application in mechanical engineering, vehicles, conveyors and elevators
- Low current consumption despite high scanning rate
- Broad input voltage range (5-18 V or 8-30 V)

Mechanical characteristics:

Speed:	Shaft version: max. 12,000 RPM Hollow shaft version: max. 6,000 RPM
Rotor moment of inertia:	approx. 1.1 x 10^{-2} oz-in^2 (0.2 x 10^{-6} kgm^2)
Starting torque:	< 7 oz-in (< 0.05 Nm)
Radial load capacity of the shaft:	9 lbs (40 N)
Axial load capacity of the shaft:	7 lbs (31 N)
Weight:	approx. 0.175 lbs (0.08 kg)
Protection acc. to EN 60 529:	IP65, housing side, IP64 shaft side on request

Working temperature:	-4 to +185°F (-20 to +85°C) [1]
Materials:	Shaft: stainless steel; Hollow shaft: brass Housing: chromated Aluminium Cable: PVC
Shock resistance acc. to DIN-IEC 68-2-27:	approx. 100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	approx. 10 g (100 m/s^2), 55-2,000 Hz

[1] Non-condensing

Electrical characteristics:

Output circuit:	Push-pull (7272) [3]	Push-pull (7272) [3]
Supply voltage:	5-18 VDC	8-30 VDC
Power consumption (no load) with inverted signal:	< 40 mA	< 40 mA
Permissible load/channel:	max. ±50 mA	max. ±50 mA
Pulse frequency:	max. 200 kHz	max. 200 kHz
Signal level high:	min. +V -2.5 V	min. +V -3 V
Signal level low:	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 1 µs	max. 1 µs
Fall time t_f:	max. 1 µs	max. 1 µs
Short-circuit proof outputs [1]:	yes [2] [4]	yes [2] [4]
Reverse connection protection at +V:	yes	yes
UL certified:	File 224618	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3		
RoHS compliant acc. to EU guideline 2002/95/EG		

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.) (If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute

TURCK
Industrial Automation

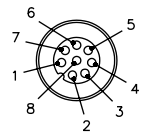
Compact type 3610 (shaft) / 3620 (hollow shaft)

Standard wiring:

Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Cable:	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Wiring Diagram:

Male encoder view



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 8T-930-*

* Length in meters.

Part number key: 3610 shaft version

T8.3610.XXXX.XXXX

Type

Flange

2 = servo flange
3 = clamping flange

Shaft

1 = Ø 4 mm
2 = Ø 5 mm
3 = Ø 6 mm x 12.5 mm
5 = Ø 1/4" x 12.5 mm

Pulse rate

25, 100, 200, 360, 500, 600, 1000, 1024,
1500, 2000, 2048, 2500, 3600
(e.g. 500 pulses => 0500)
Other pulse rates available on request

Type of connection

1 = axial cable (2 m PVC cable)
2 = radial cable (2 m PVC cable)
3 = radial 8-pin M12 ***eurofast*** connector
4 = axial 8-pin M12 ***eurofast*** connector

Output and voltage supply

2= 5-18 VDC, push-pull with inverted signals
4 = 8-30 VDC , push-pull with inverted signals
5 = 8-30 VDC, RS422 with inverted signals
6 = 5 VDC, RS422 with inverted signals

Part number key: 3620 hollow shaft version

T8.3620.XXXX.XXXX

Type

Flange

1 = hollow shaft with short torque stop
2 = hollow shaft with long torque stop
5 = hollow shaft with slotted flex mount

Hollow shaft

2 = Ø 6 mm through hollow shaft
3 = Ø 6.35 mm (1/4" through hollow shaft)
4 = Ø 8 mm through hollow shaft

Pulse rate

25, 100, 200, 360, 500, 600, 1000, 1024,
1500, 2000, 2048, 2500, 3600
(e.g. 500 pulses => 0500)
Other pulse rates available on request

Type of connection

E = radial cable (2 m PVC cable)
4 = radial 8-pin M12 ***eurofast*** connector

Output and voltage supply

2= 5-18 VDC, push-pull with inverted signals
3 = 8-30 VDC, push-pull without inverted signals,
4 = 8-30 VDC, push-pull with inverted signals
5 = 8-30 VDC, RS422 with inverted signals
6 = 5 VDC, RS422 with inverted signals

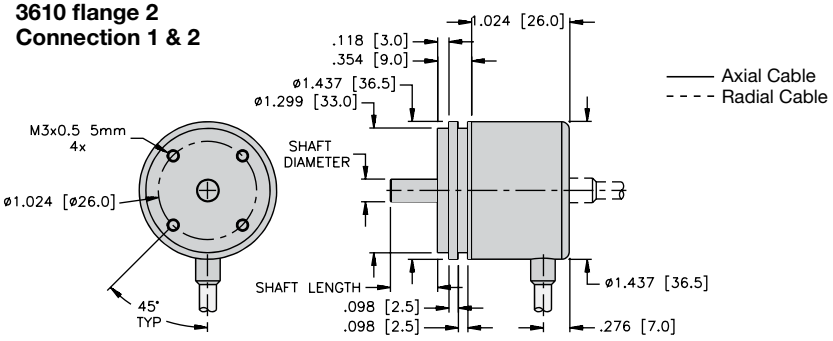
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

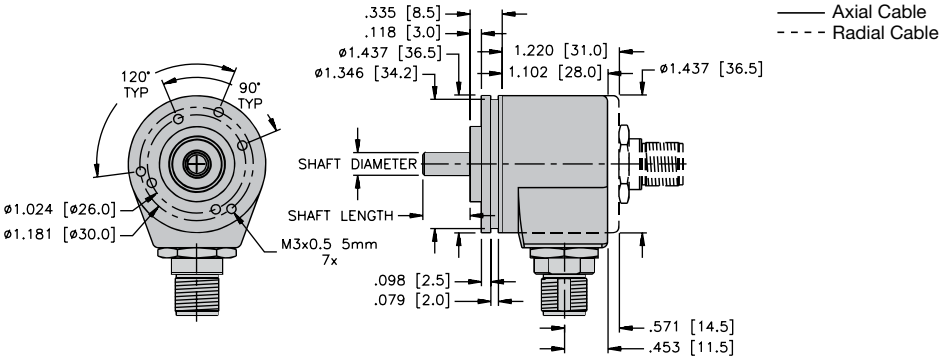
Compact type 3610 (shaft) / 3620 (hollow shaft)

Dimensions: 3610 shaft version

3610 flange 2
Connection 1 & 2



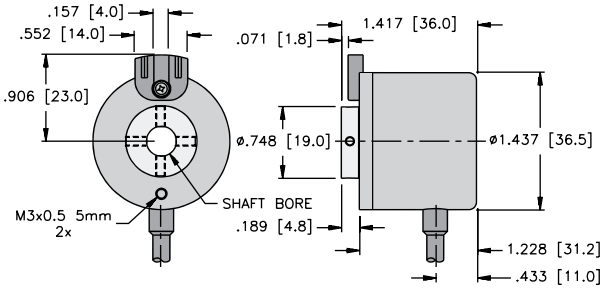
3610 flange 3
M12 *eurofast*® connection 3 & 4



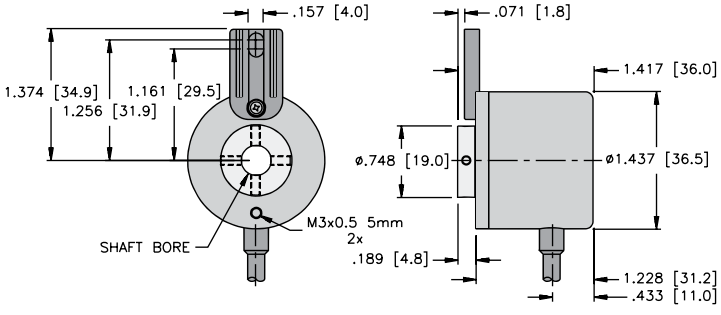
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: 3620 hollow shaft version

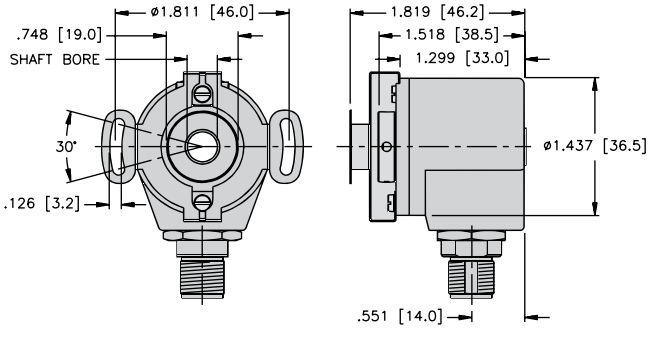
3620 flange 1
Connection E



3620 flange 2
Connection E



3620 flange 5
M12 *eurofast*® connection 4



TURCK
Industrial Automation

Economy encoder type 3700 (shaft) / 3720 (hollow shaft)

High rotational speed | Temperature | Shock/vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Rugged

- Temperature and aging compensation
- Short-circuit proof outputs
- Flange and cover made from a new High-Tech-Material (composite material)
- High component integration leads to low profile design, high performance and economical pricing
- "Tube Tech®" cable outlet guarantees 10x higher strain relief than traditional cabling methods and ensures IP67 protection

RoHS compliant 2/22

Compact

- Compact size only Ø 37 x 33 mm

Versatile

- Hollow shaft version: Fits directly onto drive shaft - no couplings needed - saves up to 30% on cost and 60% on installation space and time
- 1 1/2" (37 mm) diameter housing suitable for replacing resolvers

Mechanical characteristics:

Speed:	max. 6,000 RPM
Rotor moment of inertia:	Shaft version: approx. 2.2×10^{-2} oz-in^2 (0.4×10^{-6} kgm^2) Hollow shaft version: approx. 7.7×10^{-2} oz-in^2 (1.4×10^{-6} kgm^2)
Starting torque:	Shaft version: < 1.0 oz-in (< 0.007 Nm) Hollow shaft version: < 1.4 oz-in (< 0.01 Nm)
Radial load capacity of the shaft:	4.5 lbs (20 N)
Axial load capacity of the shaft:	2.25 lbs (10 N)
Weight:	approx. 0.22 lbs (0.1 kg)
Protection acc. to EN 60 529:	bearing, shaft: IP65; cable outlet: IP67

EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-4 to 158°F (-20 up to +70°C) [1] [2]
Materials:	Shaft/hollow shaft: stainless steel; housing, flange: composite PPA, 40 % KF (carbon fibre); cable: PVC
Shock resistance acc. to DIN-IEC 68-2-27:	approx. 100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	approx. 10 g (100 m/s^2), 10-2,000 Hz

[1] For versions with push-pull output and supply voltage >15 VDC: max. 131°F (55°C)
[2] Non-condensing

Electrical characteristics:

Output circuit:	RS422 (7272)	Push-pull (7272) [3]	Push-pull (7272) [3]
Supply voltage:	5 V (±5%)	5-30 VDC	10-30 VDC
Power consumption (no load) with inverted signal:	typ. 40 mA / max. 90 mA	typ. 50 mA / max. 100 mA	typ. 50 mA / max. 50 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA	max. ±20 mA
Pulse frequency:	max. 250 kHz	max. 250 kHz	max. 250 kHz
Signal level high:	min. 2.5 V	min. +V - 2.0 V	min. +V - 2.0 V
Signal level low:	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 1 µs	max. 1 µs
Fall time t_f:	max. 200 ns	max. 1 µs	max. 1 µs
Short-circuit proof outputs [1]:	yes [2] [4]	yes [2] [4]	yes
Reverse connection protection at +V:	no	no	yes
UL certified:	File 224618		
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3			
RoHS compliant acc. to EU guideline 2002/95/EG			

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.) (If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute

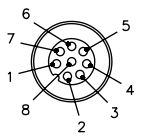
Economy encoder type 3700 (shaft) / 3720 (hollow shaft)

Standard wiring:

Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
M12 ***eurofast***®	Coupling Nut	1	2	3	4	5	6	7	8
Cable:	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Wiring Diagram:

Male encoder view



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 8T-930-*

* Length in meters.

Part number key: 3700 shaft version

T8.3700.XXXX.XXXX

Type

Flange

1 = flange without adapter
A = flange adapter, mounted

Shaft

1 = Ø 4 mm
2 = Ø 5 mm
3 = Ø 6 mm
4 = Ø 1/4”
6 = Ø 8 mm

Pulse rate

10, 50, 60, 100, 180, 200, 250, 300, 360,
400, 500, 512, 600, 1000, 1024
(e.g. 250 pulses => 0250)
Other pulse rates available on request

Type of connection

1 = axial cable* (1 m PVC-cable)
2 = radial cable* (1 m PVC-cable)
I = axial cable with molded 8-pin, M12 ***eurofast*** connector
J = radial cable with molded 8-pin, M12 ***eurofast*** connector

Output and voltage supply

1 = 5 VDC, ±5 %, RS422
3 = 5-30 VDC, push pull with inverted signals,
4 = 10-30 VDC, push pull with inverted signals

* Tube Tech® cable outlet guarantees 10x higher strain relief than traditional cabling methods plus higher IP-Protection. Other cable lengths on request.

Part number key: 3720 hollow shaft version

T8.3720.XXXX.XXXX

Type

Flange

1 = hollow shaft with short torque stop
2 = hollow shaft with long torque stop
5 = hollow shaft with slotted flex mount

Hollow shaft

1 = Ø 4 mm
2 = Ø 5 mm
3 = Ø 6 mm
4 = Ø 1/4”
6 = Ø 8 mm

Pulse rate

10, 50, 60, 100, 180, 200, 250, 300, 360,
400, 500, 512, 600, 1000, 1024
(e.g. 250 pulses => 0250)
Other pulse rates available on request

Type of connection

1 = radial cable* (1 m PVC-cable)
9 = radial M12 ***eurofast***® pigtail

Output and voltage supply

1 = 5 VDC, ±5 %, RS422
3 = 5-30 VDC, push pull (with inverted signals)
4 = 10-30 VDC, push pull (with inverted signals)

* Tube Tech® cable outlet guarantees 10x higher strain relief than traditional cabling methods plus higher IP-Protection. Other cable lengths on request.

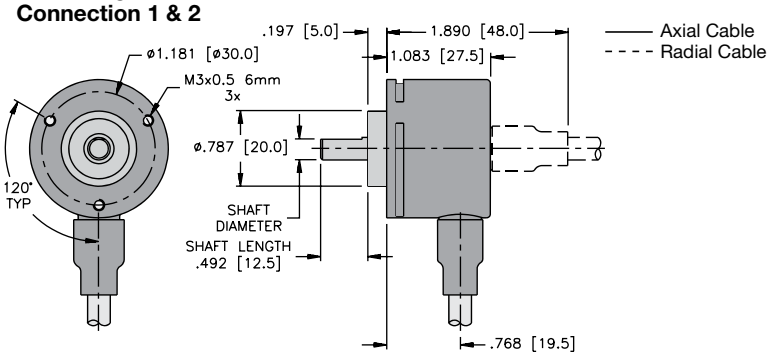
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

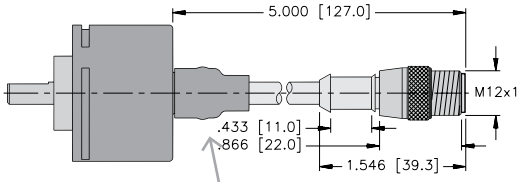
Economy encoder type 3700 (shaft) / 3720 (hollow shaft)

Dimensions: 3700 shaft version

3700 flange 1
Connection 1 & 2

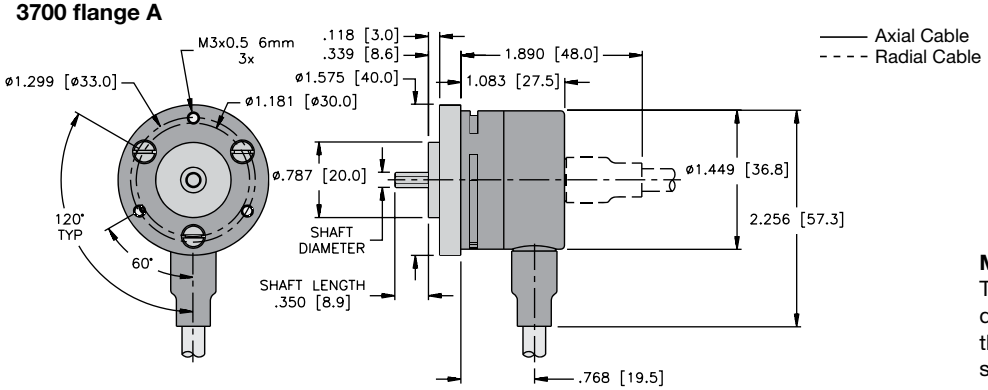


3700 optional molded M12 *eurofast*®
Connection I



Tube Tech® cable outlet improves strain relief and environmental protection vs. traditional cable grommets.

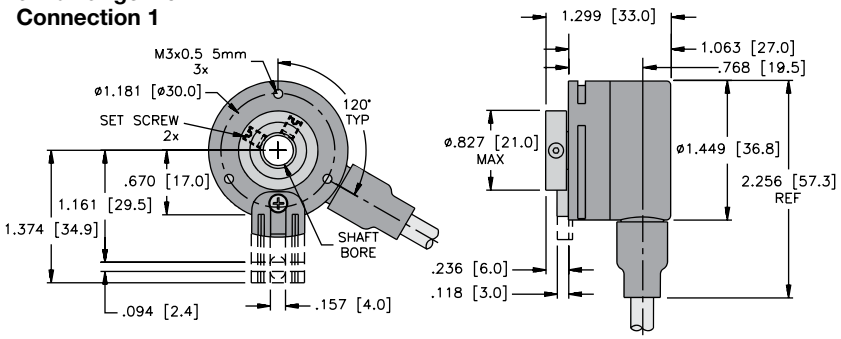
3700 flange A



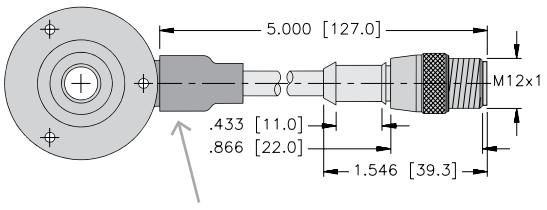
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: 3720 hollow shaft version

3720 flange 1 & 2
Connection 1

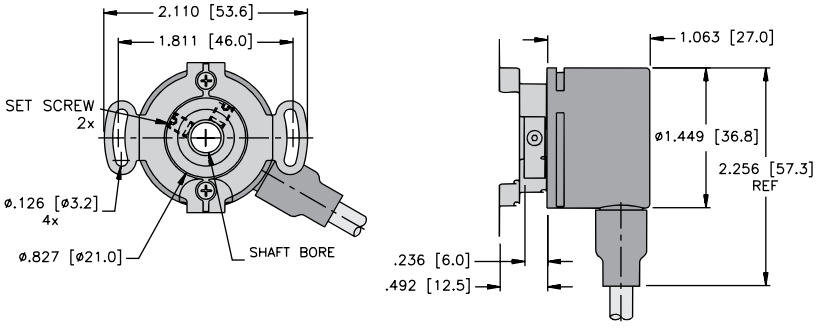


Optional molded M12 *euorfast*®
Connection 9



Tube Tech® cable outlet improves strain relief and environmental protection vs. traditional cable grommets.

3720 flange 5
Connection 1



Sendix incremental type 5000 (shaft) / 5020 (hollow shaft)

Safety-Lock™ | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Versatile

- **The right connection for every application:** Cable, M12 connector, M23 connector, and MIL Spec Connectors.
- **Wide variety of standard industrial mounting options:** Servo, square, clamping flanges.
- **Standardized designs for worldwide use:** Compatible with US and European standards; 5-30 V supplies; Various output options; Up to 5,000 ppr.

Sendix® incremental

RoHS compliant | cULus | Ex | 2/22

Compact

- **Small footprint:** Outer diameter 2"x 2" Can utilize 2" or 2.5" flanges.

Rugged and Tough

- **High tolerance to vibration, shock and alignment issues:** Sturdy double bearing "Safety Lock Design".
- **Environmentally protected design:** Die-cast housings; butyl rubber shaft seals and o-rings; robust stainless steel hubs, flanges, and disc tables. Ratings up to IP67.
- **Wide temperature range:** -40 to +185°F (-40 to +85°C)
- Also available in seawater resistant version, certified acc. to salt-spray test IEC 68-2-11 ≥ 672 hours

Mechanical characteristics:

Speed IP65 [1]:	max. 12,000 RPM
Speed IP67 [2]:	max. 6,000 RPM
Rotor moment of inertia:	Shaft: approx. 0.098 oz-in^2 (1.8×10^{-6} kgm^2) Hollow shaft: approx. 0.328 oz-in^2 (6.0×10^{-6} kgm^2)
Starting torque:	< 1.4 oz-in (< 0.01 Nm), IP65 < 7 oz-in (< 0.05 Nm), IP67
Radial load capacity of the shaft:	40 lbs (178 N)
Axial load capacity of the shaft:	40 lbs (178 N)

[1] For continuous operation 6000 RPM
[2] For continuous operation max. 3000 RPM
[3] With connector: -40°F (-40°C), cable fixed: -22°F (-30°C), cable moved: -4°F (-20°C)

Weight:	approx. 0.9 lbs (0.4 kg)
Protection acc. to EN 60 529 without shaft sealing:	IP65
Protection acc. to EN 60 529 with shaft sealing:	IP67
Ex approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +185°F (-40[3] to +85°C)
Shaft:	stainless steel
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s^2), 6 ms
Vibration resistance to DIN-IEC 68-2-6:	10 g (100 m/s^2), 10-2,000 Hz

Electrical characteristics:

Output circuit:	RS 422 (TTL compatible)	RS 422 (TTL compatible)	Push-pull (IC-DL)	Push-pull (7272) [3]
Supply voltage:	5-30 VDC	5 V ±5%	10-30 V DC	5-30 V DC
Power consumption (no load):	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA	max. ±30 mA	max. ±20 mA
Pulse frequency:	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level high:	min. 2.5 V	min. 2.5 V	min. +V -1.0 V	min. +V -2.0 V
Signal level low:	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Fall time t_f:	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Short-circuit proof outputs [1]:	yes [2] [4]	yes [2] [4]	yes	yes [2] [4]
Reverse connection protection at +V:	yes	no	yes	no
UL certified:	File 224618			
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3				
RoHS compliant acc. to EU guideline 2002/95/EG				

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.)
(If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute

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Sendix incremental type 5000 (shaft) / 5020 (hollow shaft)

Standard wiring / pin configuration: [1] [2]

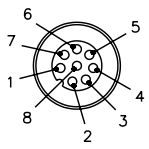
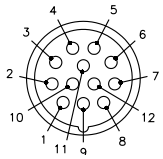
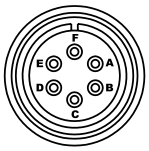
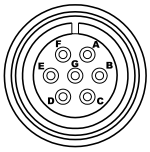
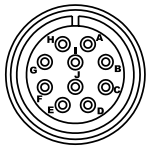
Connection Type	Case Ground	Common (0V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	N/C	N/C	0V [1] Sens	+V [2] Sens
M23 ***multifast*** ®	Coupling nut	10	12	5	6	8	1	3	4	-	-	11	2
MS 6-pin	-	A	B	E	-	D	-	C	-	-	-		
MS 7-pin	G	F	D	A	-	B	-	C	-	-	-		E
MS 10-pin	J	F	D	A	G	B	H	C	I	-	-		E
M12 ***eurofast*** ®	Coupling nut	1	2	3	4	5	6	7	8	-	-		
Cable	Shield/drain	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU

[1] The sensor cables are connected to the supply voltage internally, if long feeder cables are involved they can be used to adjust or control the voltage at the encoder.
[2] Isolate unused outputs before initial startup.

Special connector pin configuration:

		Connection Type	Case Ground	Common (0V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Wiring Code	7	M12 ***eurofast***	Coupling nut	7	2	1	3	4	5	6	8
	1	MS 6-pin	-	A, F	B	D	-	E	-	C	-
	4	MS 7-pin	G	F	D	A	C	B	E	-	-
	6	MS 10-pin	G	F	D	A	H	B	I	C	J

Wiring diagrams:

Male Encoder View				
				
M12 ***eurofast*** pinout	M23 ***multifast*** pinout	MS pinout (6-pin)	MS pinout (7-pin)	MS pinout (10-pin)
Mating cordset: **E-RKC 8T-930-***	Mating cordset: **E-CKM 12-931-***	Mating cordset: **E-MK 6-930-***	Mating cordset: **E-MK 7-930-***	Mating cordset: **E-MK 10-931-***

* Length in meters.

Sendix incremental type 5000 (shaft) / 5020 (hollow shaft)

Part number key: 5000 shaft version

T8.5000.XXXX.XXXX.PXXXX.XXXX

Options for special output only.

Type

Flange - 2" (50 mm)
1 = servo flange w/shaft seal (IP67)
2 = servo flange
3 = square flange w/shaft seal (IP67)
4 = square flange

Flange - 58 mm
7 = clamping flange w/shaft seal (IP67)
8 = clamping flange
A = servo flange w/shaft seal (IP67)
B = servo flange

Flange - 2.5" (63.5 mm)
C = square flange w/shaft seal (IP67)
D = square flange
E = servo flange w/shaft seal (IP67)
F = servo flange

Shaft Options for 2" Flange
1 = Ø 6 mm x 10 mm
2 = Ø 1/4" x 5/8"
3 = Ø 10 mm x 20 mm
4 = Ø 3/8" x 5/8"
5 = Ø 12 mm x 20 mm
6 = Ø 8 mm x 15 mm

Shaft Options for 58 mm and 2.5" Flange
1 = Ø 6 mm x 10 mm
3 = Ø 10 mm x 20 mm
4 = Ø 3/8" x 5/8"
5 = Ø 12 mm x 20 mm
6 = Ø 8 mm x 15 mm
7 = Ø 1/4" x 7/8"
8 = Ø 3/8" x 7/8"

Optional Cable Length
0050 = 5 meters [1]

Special Connector Pin Configuration
See page C15

Capacitor
0 = standard
A = no bypass capacitor (vector motor)
(only valid with output codes 1, 3, 4, 5)

Special Output Signal Formats
See page C42

Pulse Rate
See below

Connection Type
1 = axial cable (1 meter)
2 = radial cable (1 meter)
3 = axial 8-pin M12 ***eurofast***® connector
4 = radial 8-pin M12 ***eurofast*** connector
7 = axial 12-pin M23 ***multifast***® connector
8 = radial 12-pin M23 ***multifast*** connector
9 = radial MS, 6-pin
W = radial MS, 7-pin
Y = radial MS, 10-pin
A = optional axial cable length
B = optional radial cable length

Input / Output Circuit
1 = 5-30 VDC, TTL (26C31)
3 = 5-30 VDC, open collector (7273)
4 = 5 VDC, TTL (26C31)
5 = 10-30 VDC, line driver (IC-DL)
8 = 5-30 VDC, line driver
(7272 without bypass capacitor)

[1] Available with connection type A only.

Part number key: 5020 hollow shaft version

T8.5020.XXXX.XXXX.PXXXX.XXXX

Options for special output only.

Type

Flange - 2"
1 = torque stop w/shaft seal (IP67)*
2 = torque stop (IP65)*
3 = single point tether w/shaft seal (IP67)
4 = single point tether (IP65)
5 = flex mount w/shaft seal, pitch circle Ø 57.2 mm (IP67)
6 = flex mount, pitch circle Ø 57.2 mm (IP65)
7 = flex mount w/shaft seal, pitch circle Ø 65 mm (IP67)
8 = flex mount, pitch circle Ø 65 mm (IP65)
C = slotted flex mount w/shaft seal, pitch circle Ø 63 mm (IP67)
D = slotted flex mount, pitch circle Ø 63 mm (IP65)

Bore
1 = Ø 6 mm
2 = Ø 1/4"
3 = Ø 10 mm
4 = Ø 3/8"
5 = Ø 12 mm
6 = Ø 1/2"
7 = Ø 5/8"
8 = Ø 15 mm
9 = Ø 8 mm
A = Ø 14 mm

Input / Output Circuit
1 = 5-30 VDC, TTL (26C31)
3 = 5-30 VDC, open collector (7273)
4 = 5 VDC, TTL (26C31)
5 = 10-30 VDC, line driver (IC-DL)
8 = 5-30 VDC, line driver (7272 without bypass capacitor)

Optional Cable Length
0050 = 5 meters [1]

Special Connector Pin Configuration
See page C15

Capacitor
0 = standard
A = no bypass capacitor (vector motor)
(only valid with output codes 1, 3, 4, 5)

Special Output Signal Formats
See page C42

Pulse Rate
See below

Connection Type
1 = radial cable (1 meter)
2 = radial 8-pin M12 ***eurofast*** connector
4 = radial 12-pin M23 ***multifast*** connector
5 = radial MS, 6-pin
6 = radial MS, 7-pin
7 = radial MS, 10-pin
A = optional radial cable length
E = tangential cable (1 Meter)

* Requires 4 mm torque pin
[1] Available with connection type A only.

Standard Pulse Rates (PPR):
Metal: 1, 4, 5, 10, 12, 25, 30, 36, 50, 60, 80, 100, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024
All 5000 series encoders, 1024 and below assembled in the USA
Glass: 1200, 1250, 2000, 2048, 2500, 3000, 3600, 4096, 5000 (Built in Germany)

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

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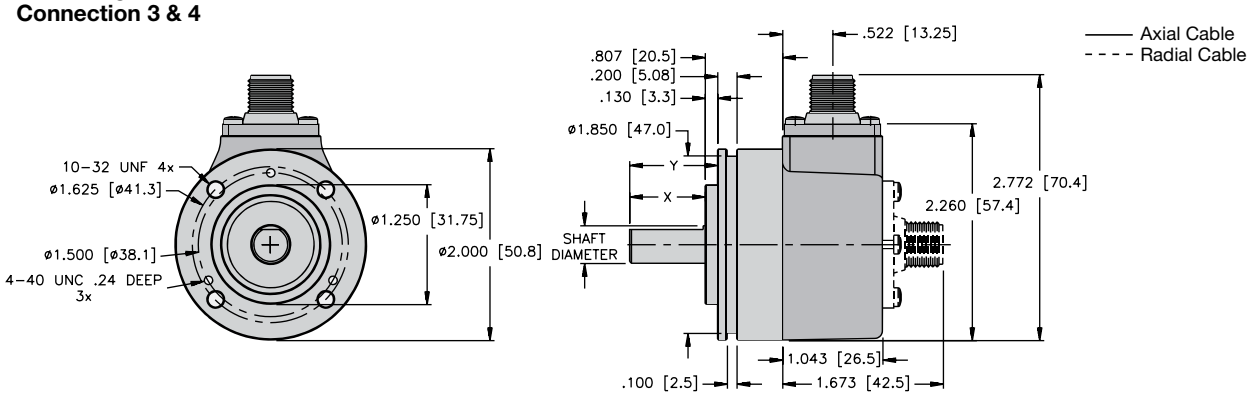
Industrial Automation

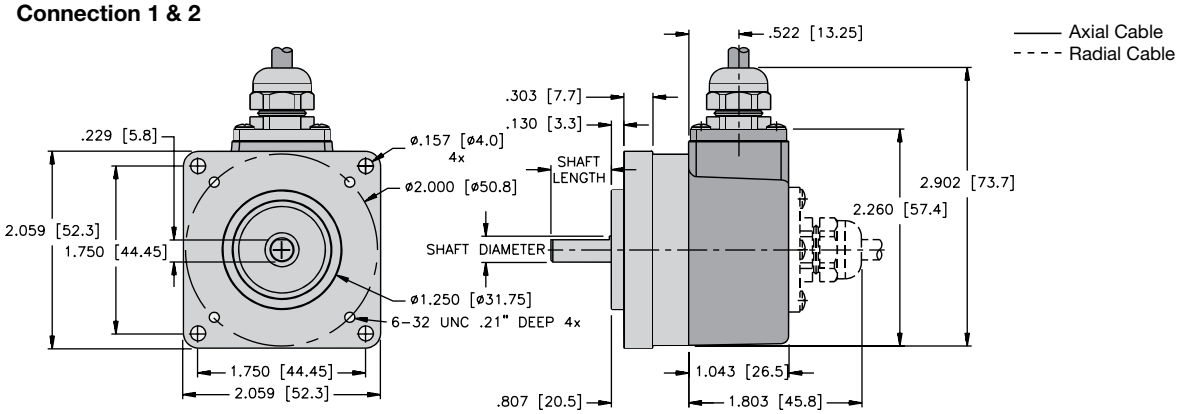
Sendix incremental type 5000 (shaft) / 5020 (hollow shaft)

Dimensions: 5000 shaft version

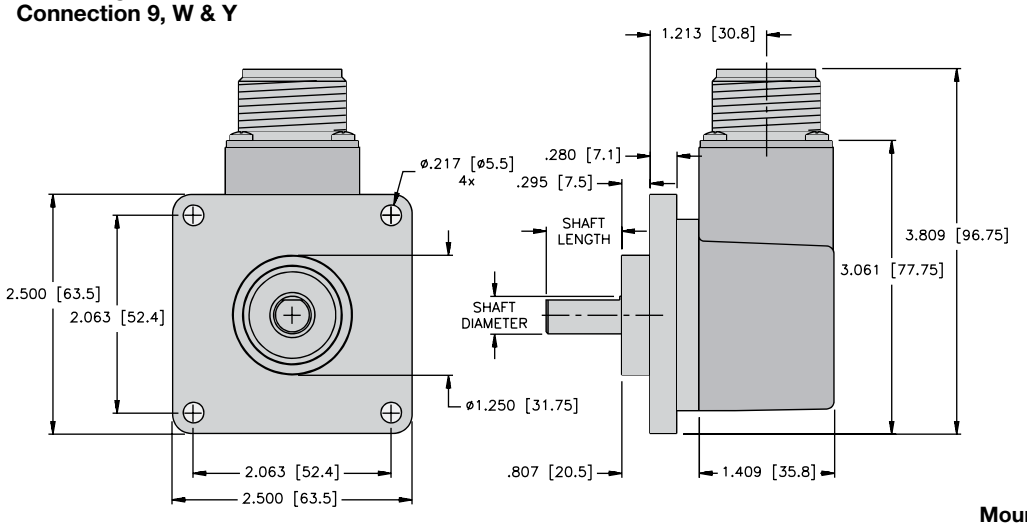
5000 flange 1 & 2
Connection 3 & 4



5000 flange 3 & 4
Connection 1 & 2



5000 flange C & D
Connection 9, W & Y

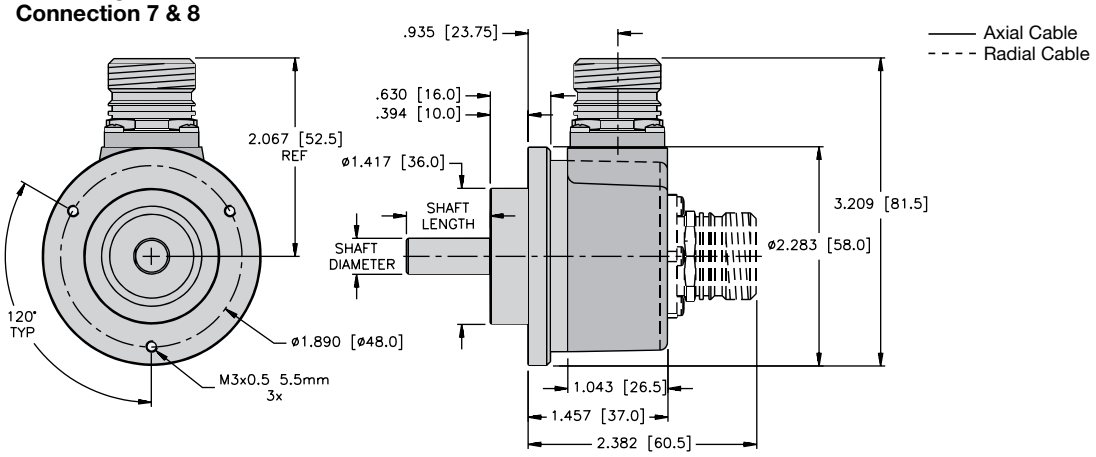


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

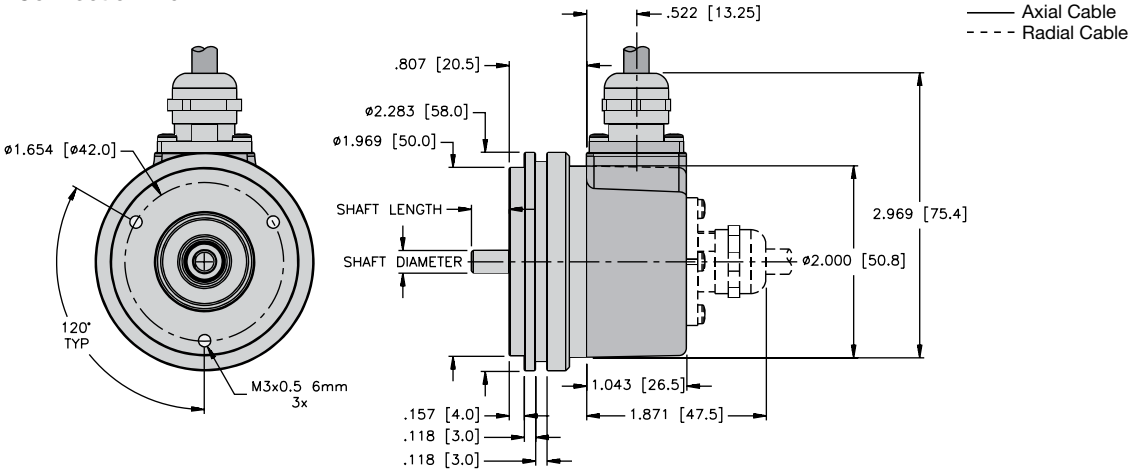
Sendix incremental type 5000 (shaft) / 5020 (hollow shaft)

Dimensions: 5000 shaft version

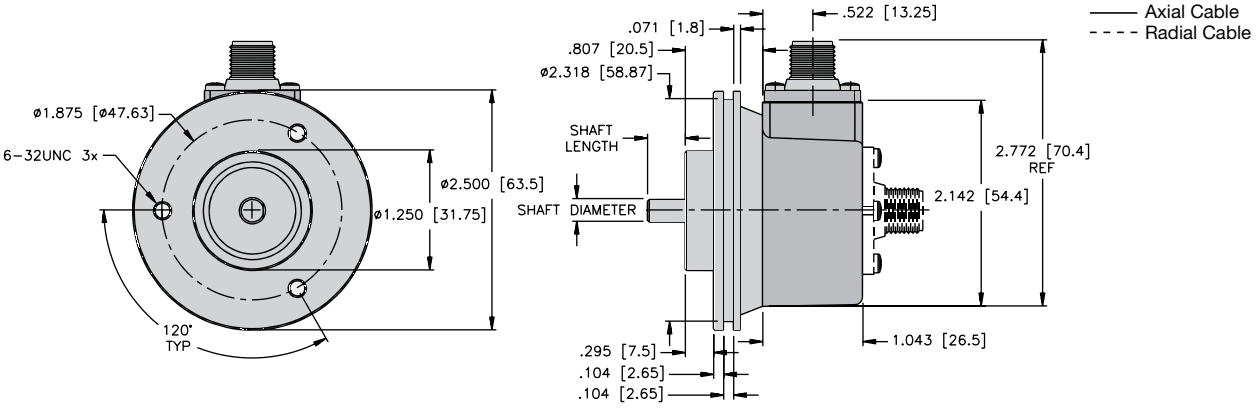
5000 flange 7 & 8
Connection 7 & 8



5000 flange A & B
Connection A & B



5000 flange E & F
Connection 3 & 4

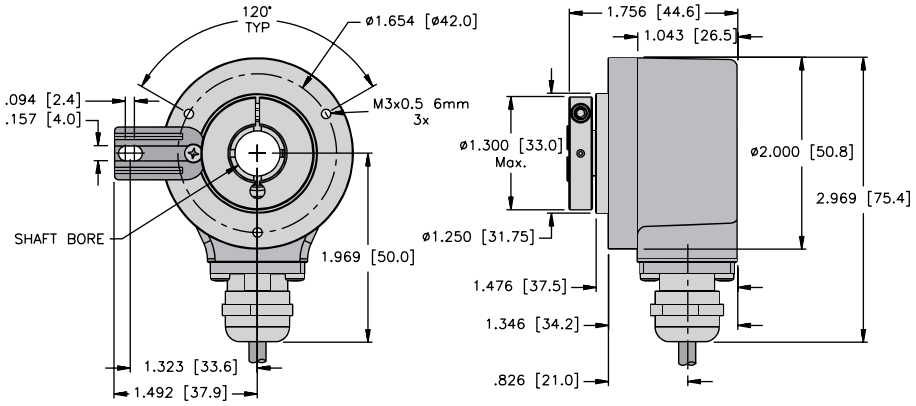


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

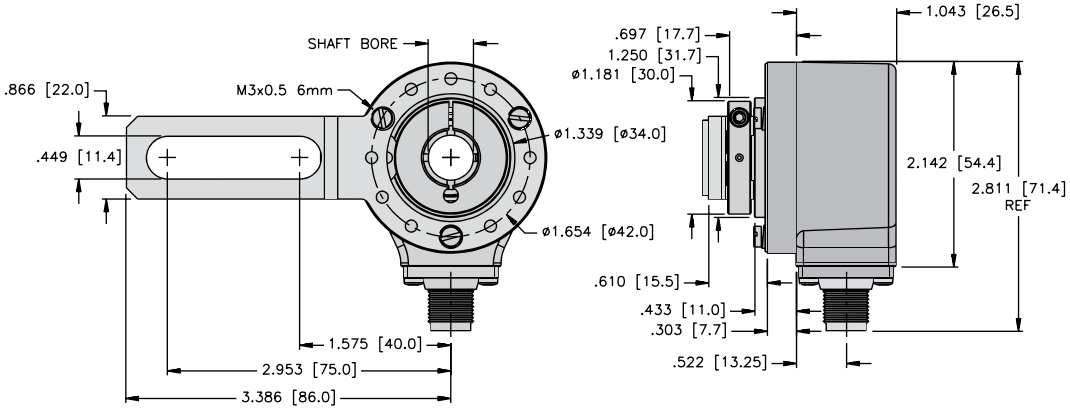
Sendix incremental type 5000 (shaft) / 5020 (hollow shaft)

Dimensions: 5020 hollow shaft version

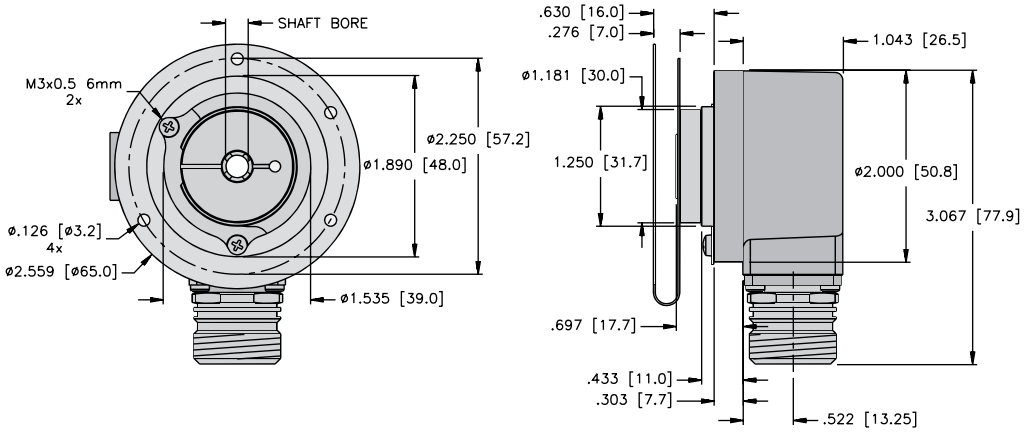
5020 flange 1 & 2
Connection 1



5020 flange 3 & 4
Connection 2



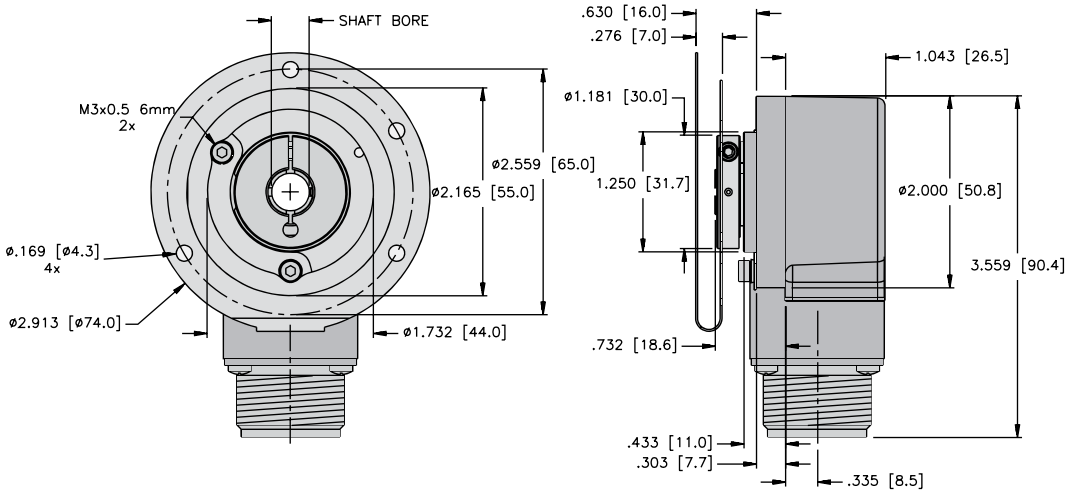
5020 flange 5 & 6
Connection 4



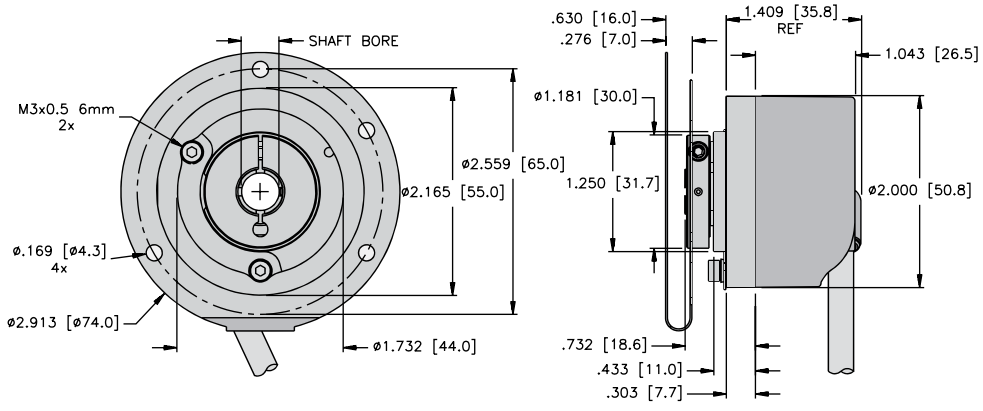
Sendix incremental type 5000 (shaft) / 5020 (hollow shaft)

Dimensions: 5020 hollow shaft version

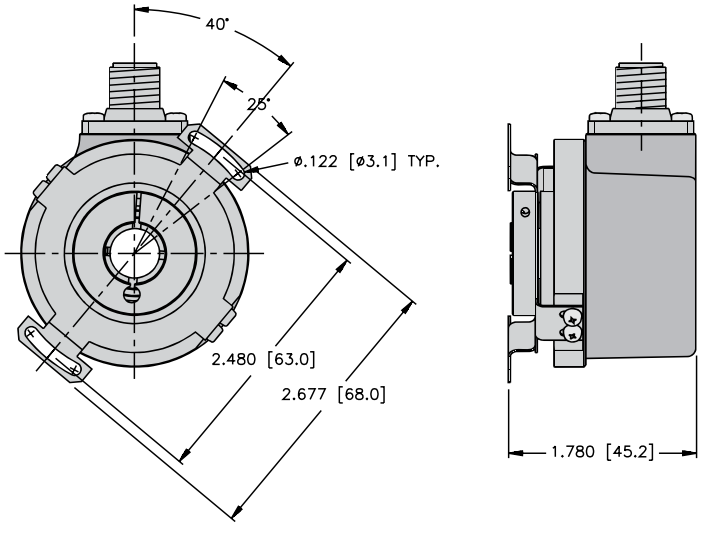
5020 flange 7 & 8
Connection 5, 6 & 7



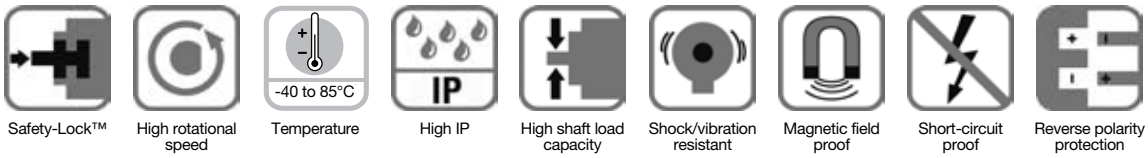
5020 flange 7 & 8
Connection E



5020 flange C & D
Connection 2



Sendix incremental type 5006 stainless steel



Safety-Lock™ | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Versatile
- **Reliable mounting in a wide variety of installation situations:** Comprehensive and proven mounting options
- **Standard encoder for use worldwide:** compatible with ll US and European standards, supply voltage 5-30 VDC, various interface options, max. 5000 ppr.

Sendix® incremental

RoHS compliant | UL | Ex | 2/22

Compact
- **Can be used even where space is tight:** outer diameter 50 mm, installation depth max. 47 mm.

Rugged
- Stays sealed even when subjected to harsh everyday use:
  – Protection IP67
  – Rugged stainless-steel housing
  – Viton seals
  – High security against failures in the field, ideal for use in outdoor applications
- **Can be used in a wide temperature range:** -40 to +185°F (-40 to +85°C)
- **Increased ability to withstand vibration and installation errors:** Eliminates machine downtime and repairs, Sturdy “Safety-Lock™ Design” bearing structure

Mechanical characteristics:

Speed [1]:	max. 6,000 RPM
Rotor moment of inertia:	approx. 0.098 oz-in^2 (1.8 x 10^{-6} kgm^2)
Starting torque:	< 7 oz-in (< 0.05 Nm), IP67
Radial load capacity of the shaft:	40 lbs (178 N)
Axial load capacity of the shaft:	40 lbs (178 N)
Protection acc. to EN 60 529 with shaft sealing:	IP67
EX approved for hazardous areas:	optional zone 2 and 22

[1] For continuous operation 3,000 RPM

Working temperature:	-40 to +185°F (-40 to +85°C)
Materials:	Housing, flange, shaft: stainless steel Connector: stainless steel Seals: viton
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s^2), 6 ms
Vibration resistance to DIN-IEC 68-2-6:	10 g (100 m/s^2), 10-2,000 Hz

Electrical characteristics:

Output circuit:	RS 422 (TTL compatible)	Push-pull (IC-DL)	Push-pull (7272)
Supply voltage:	5 V ±5%	10-30 VDC	5-30 VDC
Power consumption (no load):	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load/channel:	max. ±20 mA	max. ±30 mA	max. ±20 mA
Pulse frequency:	max. 300 kHz	max. 300 kHz	max. 300 kHz [3]
Signal level high:	min. 2.5 V	min. +V -1.0 V	min. +V -2.0 V
Signal level low:	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 1 µs	max. 1 µs
Fall time t_f:	max. 200 ns	max. 1 µs	max. 1 µs
Short-circuit proof outputs[1]:	yes [2]	yes	yes [2] [4]
Reverse connection protection at +V:	yes	yes	no
UL certified:	File 224618		
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3			
RoHS compliant acc. to EU guideline 2002/95/EG			

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.) (If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute

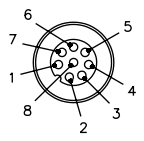
Sendix incremental type 5006 stainless steel

Standard wiring:

Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Cable:	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Wiring Diagram:

Male encoder view



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 8T-930-*

* Length in meters.

Part number key: 5006 shaft version

T8.5006.XXXX.XXXX

Type

Flange

7 = clamping flange, Ø 58, IP67
A = servo flange, Ø 58, IP67
C = rectangular flange 2.5”, IP67

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
3 = Ø 10 mm x 20 mm
8 = Ø 3/8” x 7/8”

Pulse rate

360, 512, 1000, 1024, 2000, 2048, 2500,3600, 4096, 5000
(e.g. 500 pulses => 0500)
Other pulse rates available on request

Type of connection

4 = radial 8-pin, M12 ***eurofast*** connector

Note: all connector versions without mating connector.

Output and voltage supply

2 = 5-30 VDC, push-pull (7272 with inverted signal)
4 = 5 VDC, RS 422 (with inverted signal)
5 = 10-30 VDC, push-pull (with inverted signal)

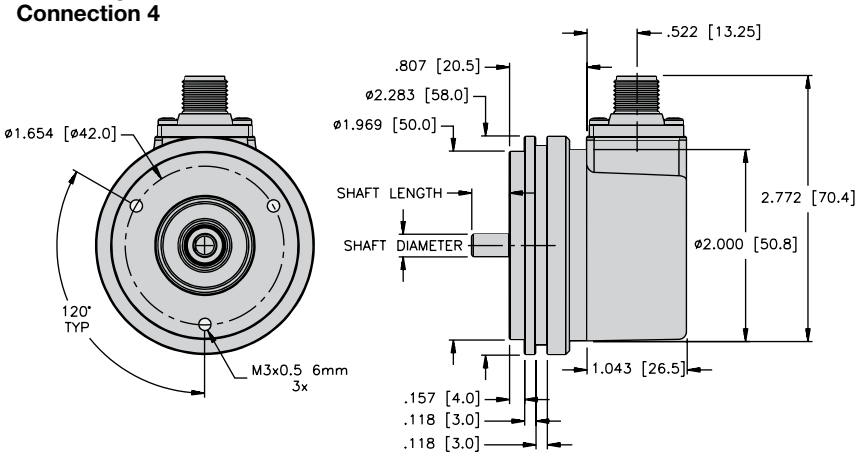
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

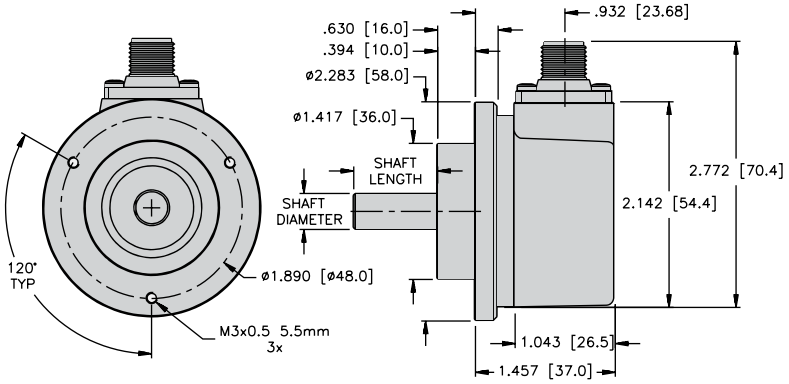
Sendix incremental type 5006 stainless steel

Dimensions: 5006 shaft version

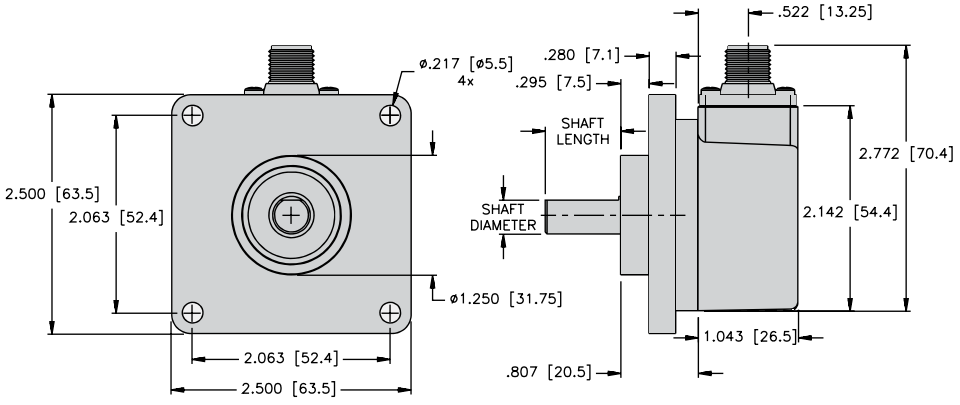
5006 flange A
Connection 4



5006 flange 7
Connection 4



5006 flange C
Connection 4



Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Universal, type 580X (shaft) / 582X (hollow shaft)


High rotational speed


Shock/vibration resistant


Magnetic field proof


Short-circuit proof


Reverse polarity protection

Rugged
- Short-circuit proof outputs
- Reverse connection protection (at +V= 10-30 VDC)
- Highly flexible PUR-cable
- High shaft load
- 5803/5823: High temperature up to 230°F (110°C)
- 5826: Stainless steel housing

RoHS compliant cULus Ex 2/22

Compact
- Ø 58 mm housing, industry standard

Versatile
- Shaft/hollow shaft
- 5800/5820: Standard
- 5804/5824: Voltage sine wave outputs
- 5805: High resolution up to 36000 ppr
- Many variations, also customized versions

Mechanical characteristics:

Speed with seal:	Shaft version: max. 12,000 RPM Hollow shaft version [4]: max. 6,000 RPM
Speed without seal:	Hollow shaft version max. 12,000 RPM
Rotor moment of inertia:	Shaft version: approx. 0.098 oz-in^2 (1.8 x 10-6 kgm^2) Hollow shaft version: approx. 0.328 oz-in^2 (6 x 10-6 kgm^2)
Starting torque:	Shaft version: < 1.4 oz-in (< 0.01 Nm) Hollow shaft version: < 7 oz-in (<0.05 Nm)
Radial load capacity of the shaft*:	40 lbs (178 N)
Axial load capacity of the shaft*:	40 lbs (178 N)
Weight:	approx. 0.9 lbs (0.4 kg)

Protection acc. to EN 60 529 :	IP65, IP66 for type 5826
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-4 to +185°F (-20 to +85°C) [1] [2] [3] 5803/5823: -4 to +221°F (-20 to + 105°C)
Materials:	Shaft: stainless steel
Shock resistance acc. to DIN-IEC 68-2-27:	approx. 100 g (1000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	approx. 10 g (100 m/s^2), 10-2000 Hz

[1] Constant flexing: -4 to +158°F (-20-+70°C)
[2] Non-condensing
[3] Hollow shaft version with seal: -4 to +176°F (-20-+80°C)
[4] For continuous operation 6,000 RPM, ventilated

Electrical characteristics sine wave output:

Output circuit:	Sine wave U = 1 Vpp	Sine wave U = 1 Vpp
Supply voltage:	5 V (±5%)	10-30 VDC
Current consumption (no load) with inverted signals:	typ. 65 mA / max. 110 mA	typ. 65 mA / max. 110 mA
-3 dB frequency:	≥180 kHz	max. ±30 mA
Pulse frequency:	max. 300 kHz	max. 300 kHz
Signal channels A/B:	1 Vpp (±20%)	1 Vpp (±20%)
Signal channels 0:	0.1-1.2 V	0.1-1.2 V
Short-circuit proof outputs[1]:	yes	yes
Reverse connection protection at +V:	no	yes
UL certified:	File 224618	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3		
RoHS compliant acc. to EU guideline 2002/95/EG		

[1] If supply voltage correctly applied

TURCK Industrial Automation

Universal, type 580X (shaft) / 582X (hollow shaft)

Electrical characteristics RS422 / Push-pull:

Output circuit:	RS 422 (TTL compatible)	RS 422 (TTL compatible)	Push-pull (7272) [1]	Push-pull (7272) [1]	Open collector (7373)
Supply voltage:	5 V (±5 %) or 10-30 VDC	5-30 VDC	10-30 VDC	10-30 VDC	5-30 VDC
Power consumption (no load) without inverted signal:	-	-	typ. 55 mA / max. 125 mA	typ. 55 mA / max. 125 mA	100 mA
Power consumption (no load) with inverted signal:	typ. 40 mA / max. 90 mA	typ. 40 mA / max. 90 mA	typ. 80 mA / max. 150 mA	typ. 80 mA / max. 150 mA	100 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA	max. ±30 mA	max. ±30 mA	20 mA sink @ 30 VDC
Pulse frequency:	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level high:	min. 2.5 V	min. 2.5 V	min. +V -2.5 V	min. +V -1.5 V	n/a
Signal level low:	max. 0.5 V	max. 0.5 V	max. 2.0 V	max. 2.0 V	n/a
Rise time t_r:	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	
Fall time t_f:	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	
Short-circuit proof outputs[1]:	yes [2]	yes [2]	yes	yes	yes
Reverse connection protection at +V:	5 V: no, 10-30 V: yes	yes	yes	no	no
UL certified:	File 224618				
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3					
RoHS compliant acc. to EU guideline 2002/95/EG					

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out: (If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted) (If +V = 5-30 V, short-circuit to channel or 0 V is permitted)

Standard wiring / pin configuration:

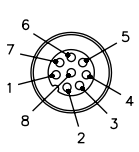
Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	-	-	Com / Sensor	+V Sensor
M23 ***multifast***®	Coupling Nut	10	12	5	6	8	1	3	4	-	-	11	2
MS 7-pin	G	F	D	A	-	B	-	C	-	-	-	-	E
MS 10-pin	J	F	D	A	G	B	H	C	I	-	-	-	E
M12 ***eurofast***®	Coupling Nut	1	2	3	4	5	6	7	8	-	-	-	-
Cable:	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU

Special connector pin configuration:

		Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	-	-
Output Code	07	M23 ***eurofast***	Coupling Nut	7	2	1	3	4	5	6	8	-	-
	02	MS 7-pin	G	F	D	A	C	B	E	-	-	-	-
	03	MS 7-pin	G	F	D	A	-	B	-	C	-	-	-
	04	MS 7-pin	G	F	D	A	C	B	E	-	-	-	-
	05	MS 7-pin	G	F	D	A	-	B	-	C	-	-	-
	06	MS 10-pin	G	F	D	A	H	B	I	C	J	-	-

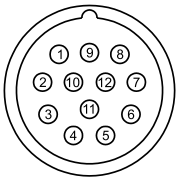
Wiring diagrams:

Male encoder view



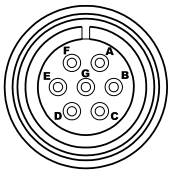
M12 ***eurofast*** pinout

Mating cordset:
E-RKC 8T-930-*



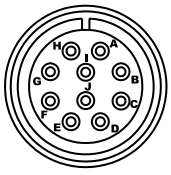
M23 ***multifast*** pinout

Mating cordset:
E-CK 12-931-*



MS pinout (7-pin)

Mating cordset:
E-MK 7-930-*



MS pinout (10-pin)

Mating cordset:
E-MK 10-931-*

* Length in meters.

Universal, type 580X (shaft) / 582X (hollow shaft)

Part number key: 580X shaft version

T8.580X.XXXX.XXXX.PXXXX

Options for special output only.

Type
0 = standard
3 = high temperature
4 = sine wave
5 = high resolution

Flange
1 = Ø 58 clamping flange
2 = Ø 58 servo flange
M =2.5" (Ø 63.5 mm) square flange
P = 2.5" (Ø 63.5 mm) servo flange
S = 2.62" (Ø 66.5 mm) servo flange
Z = 2.5" (63.5 mm) square flange with shaft seal

Shaft (Ø x L)
1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
B = Ø 1/4" x 7/8"
P = Ø 3/8" x 7/8"
W =Ø 8 mm x 20.5 mm

Output and voltage supply

Type 5800
4 = 5 VDC, RS422 *
5 = 10-30 VDC, RS422 *
6 = 10-30 VDC, push-pull *
7 = 10-30 VDC, push-pull **
8 = 5-30 VDC, push-pull
9 = 5-30 VDC, push-pull *
R = 5-30 VDC, open collector (7273)
T = 5-30 VDC, push-pull *

Type 5803 and 5805 [2]
4 = 5 VDC, RS422 *
5 = 10-30 VDC, RS422 *
6 = 10-30 VDC, push-pull *
7 = 10-30 VDC, push-pull **
9 = 5-30 VDC, push-pull (IC-WE)
R = 5-30 VDC, open collector (7273)
T = 5-30 VDC, line driver (7272)
Y = 5-30 VDC, RS422 *

Type 5804 [2]
1 = 5 VDC, sine, 1 Vpp *
2 = 10-30 VDC, sine, 1 Vpp *

Special connector pin configuration
See page C25

Special Output Signal Formats
See page C42

Pulse rate
1, 5, 10, 15, 20, 25, 30 50, 60, 100, 125, 200, 250, 256, 300, 360, 500, 512, 600, 700, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2400, 2500, 3000, 3600, 4000, 4096, 5000
Type 5805: 6000, 7200, 8000, 8192, 9000, 10000, 18000, 20000, 36000
(e.g. 250 pulses => 0250)
Other pulse rates available on request

Type of connection
1 = axial cable (1 m PUR cable)
2 = radial cable (1 m PUR cable)
3 = axial 12-pin M23 ***multifast*** ® plug without mating connector
5 = radial 12-pin M23 ***multifast*** plug without mating connector
D = axial MS, 10-pin (MS 3102R18-1P)
G = radial 8-pin M12 ***eurofast*** ® connector
T = axial 8-pin M12 ***eurofast*** connector
W =radial 7-pin plug, "MIL"-specified [1] without mating connector
Y = radial 10-pin plug, "MIL"-specified [1] without mating connector
Z = axial MS, 7-pin (MS 3102R165-1P)

[1] Only for type 5800
[2] P04XX is the only option code for 5804 and 5805
* With inverted signal
** Without inverted signal

Part number key: 582X hollow shaft version

T8.582X.XXXX.XXXX.PXXXX

Options for special output only.

Type
0 = standard
3 = high temperature
4 = sine wave
5 = high resolution
6 = stainless steel

Flange
1 = flange for through shaft
2 = flange for blind hollow shaft [1]
3 = flange for through shaft and flex mount
4 = flange for blind hollow shaft and flex mount [1]
length of drive shaft ≤30 mm

Hollow shaft
1 = Ø 6 mm without seal
2 = Ø 6 mm with seal
3 = Ø 8 mm without seal
4 = Ø 8 mm with seal
5 = Ø 10 mm without seal
6 = Ø 10 mm with seal [2]
7 = Ø 12 mm without seal
8 = Ø 12 mm with seal [2]
A = Ø 1/2"
B = Ø 1/4"
K = Ø 3/8" with seal
R = Ø 3/8"
S = Ø 1/4" with seal
U = Ø 1/2" with seal

[1] Not for type 5826
[2] For type 5826 only.
* With inverted signal.

Special connector pin configuration
See page C25

Special Output Signal Formats
See page C42

Pulse rate
1, 5, 10, 15, 20, 25, 30, 50, 60, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 360, 400, 500, 512, 600, 700, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2400, 2500, 3000,3600, 4000, 4096, 5000
Type 5825: 6000, 7200, 8000, 8192, 9000, 10000, 18000, 20000, 36000
(e.g. 250 pulses => 0250)
Other pulse rates available on request

Type of connection
1 = radial cable (1 m PVC-cable)
2 = radial 12-pin M23 ***multifast*** plug without mating connector
C = radial 8-pin M12 ***eurofast*** connector

Output and voltage supply

Type 5820 and 5826
1 = 5 VDC, RS422 *
3 = 10-30 VDC, push-pull *
4 = 10-30 VDC, RS422 *
6 = 5-30 VDC, push-pull *
7 = 5-30 VDC, RS422 *

Type 5823 and 5825
1 = 5 VDC, RS422 *
3 = 10-30 VDC, push-pull *
4 = 10-30 VDC, RS422 *

Type 5824
1 = 5-30 VDC, sine, 1 Vpp *
2 = 10-30 VDC, sine, 1 Vpp *

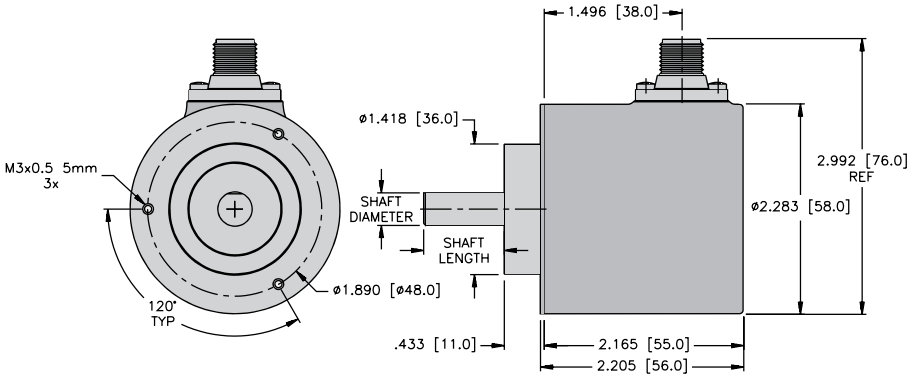
Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

TURCK
Industrial Automation

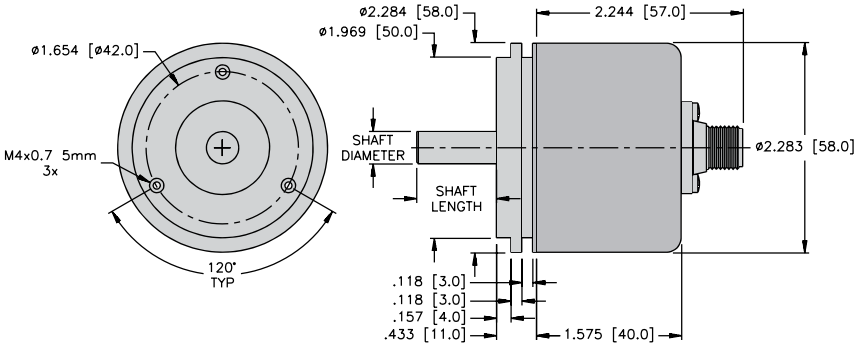
Universal, type 580X (shaft) / 582X (hollow shaft)

Dimensions: 580X shaft version

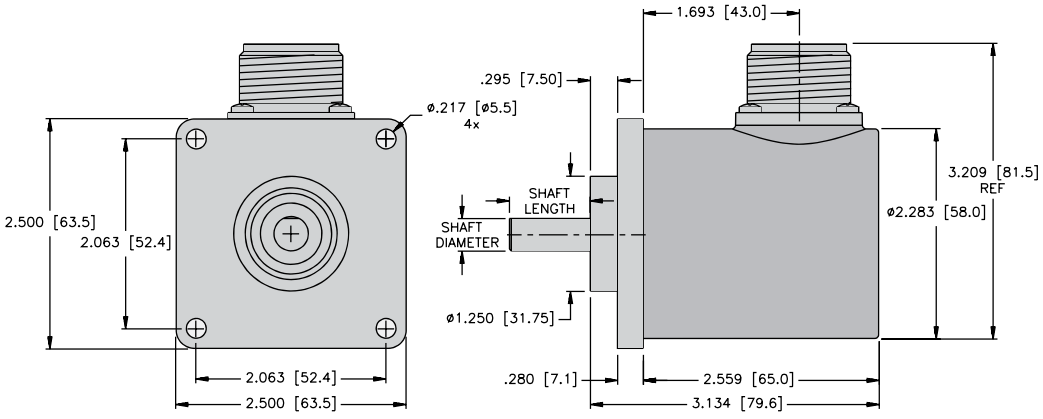
580X flange 1
Connection G



580X flange 2
Connection T



580X flange M & Z
Connection W & Y

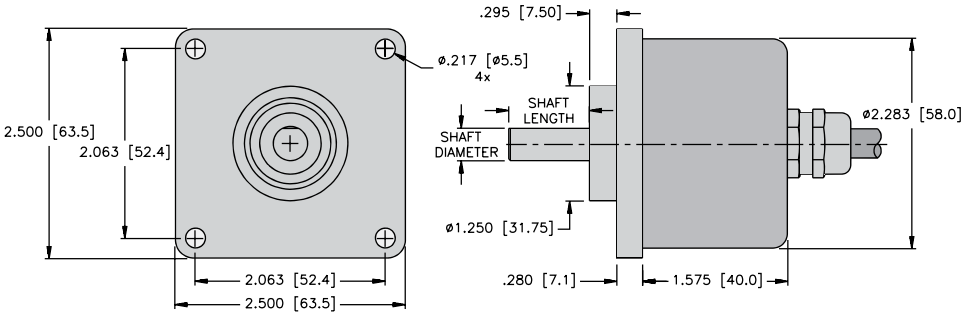


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

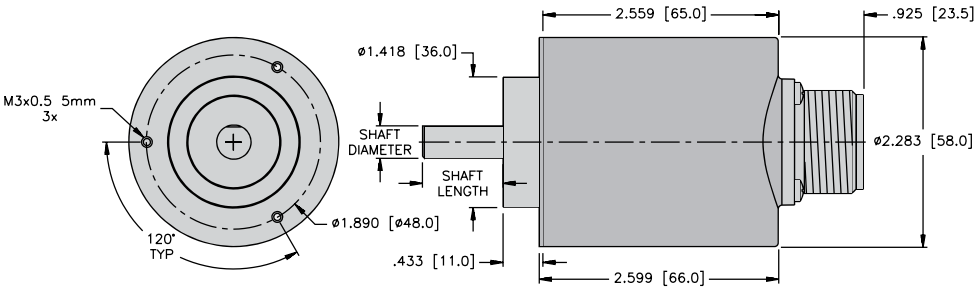
Universal, type 580X (shaft) / 582X (hollow shaft)

Dimensions: 580X shaft version

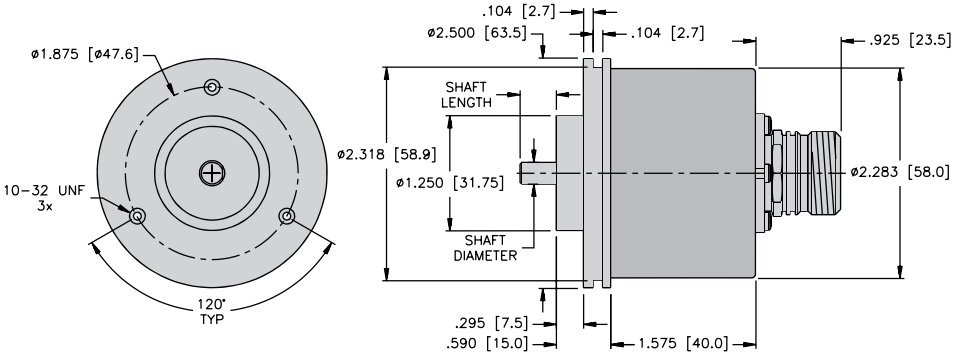
580X flange M & Z
Connection 1



580X flange 1
Connection D & Z



580X flange P
Connection 3

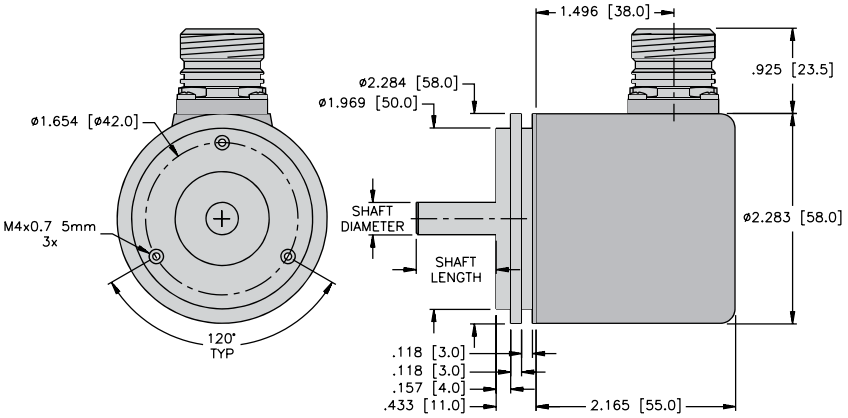


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

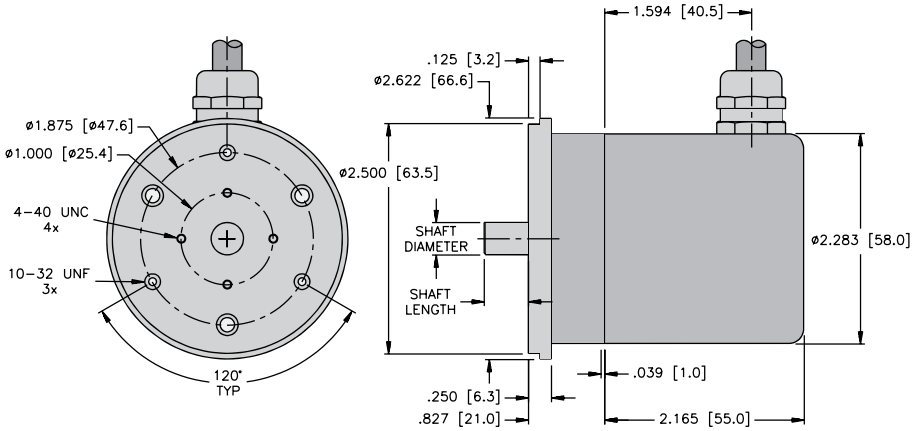
Universal, type 580X (shaft) / 582X (hollow shaft)

Dimensions: 580X shaft version

580X flange 2
Connection 5



580X flange S
Connection 2

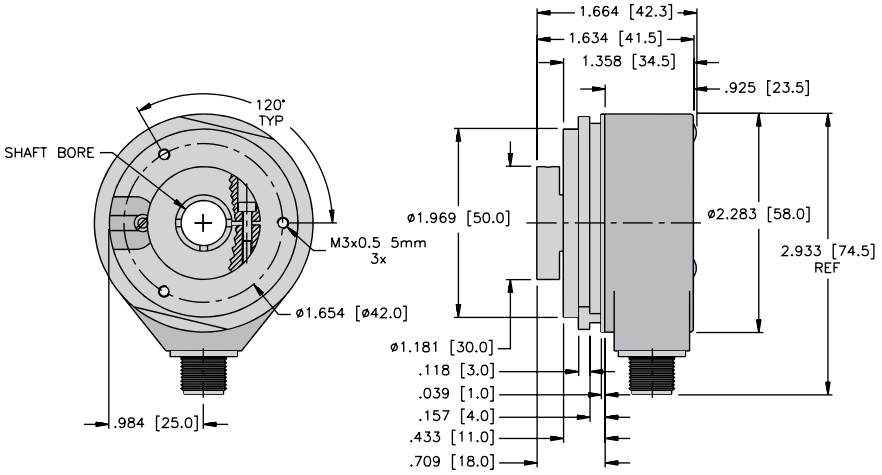


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

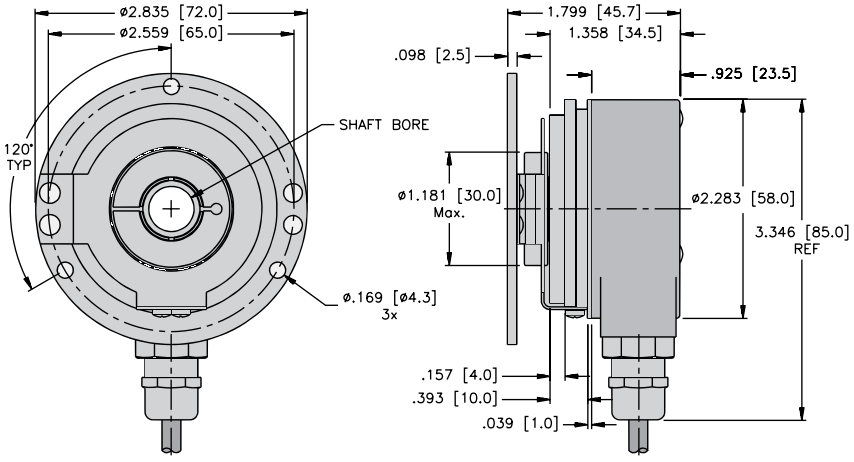
Universal, type 580X (shaft) / 582X (hollow shaft)

Dimensions: 582X hollow shaft version

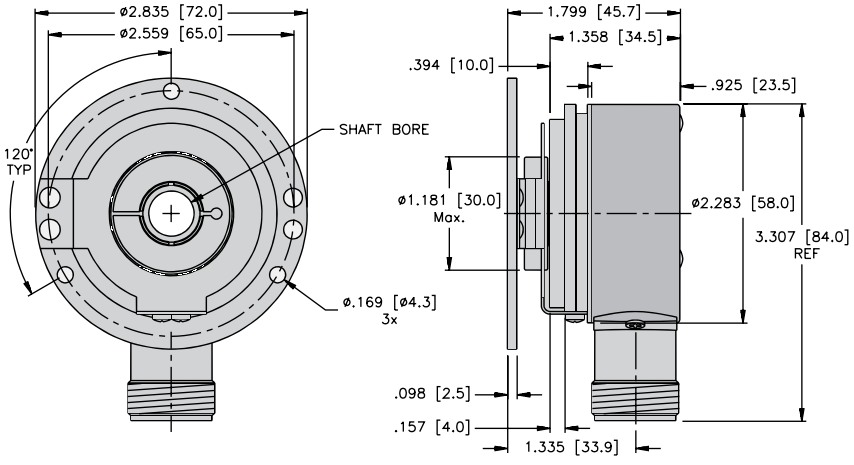
582X flange 1
Connection 2



582X flange 3
Connection 1



582X flange 2
Connection C



Mounting advice:

The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time.

When mounting a hollow shaft encoder, we recommend using a torque stop pin or a flex bracket (see page E1, Accessories).

TURCK
Industrial Automation

Large bore type 5821 (hollow shaft)

Temperature | Shock/vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Rugged
- Short-circuit proof
- Wide temperature range: -4 to 185°F (-20 to +85°C)

Compact
- Overall diameter of 58 mm

Versatile
- Bore sizes up to 28 mm diameter
- PPR up to 5,000
- RS422 or push-oull outputs

Mechanical characteristics:

Speed:	max. 3,000 RPM
Rotor moment of inertia (shaft version):	approx. 0.19 oz-in^2 (3.5 x 10^{-6} kgm^2)
Starting torque:	< 1.4 oz-in (< 0.1 Nm)
Weight:	0.09 lbs (0.04 kg)
Protection acc. to EN 60529:	IP64
Working temperature:	-4 to 185°F (-20 to +85°C)
Materials:	steel
Shock resistance acc. to DIN-IEC 68-2-27:	100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s^2), 35-2,000 Hz

Electrical characteristics:

Output circuit:	RS 422	Push-pull (7272)
Supply voltage:	5 V ±5% / 8-30 V	8-30 VDC
Power consumption (no load):	typ. 40 mA	< 40 mA
Power consumption (with inverted signal):	max. 90 mA	max. 100 mA
Permissible load/channel:	max. ±20 mA	max. ±40 mA
Pulse frequency:	max. 300 kHz	max. 200 kHz
Signal level high:	min. 2.5 V	min. +V - 3 V
Signal level low:	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 1 s
Fall time t_f:	max. 200 ns	max. 1 s
Short-circuit proof outputs [1]:	yes	yes [2] [3]
Reverse connection of supply voltage:	yes	yes
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3		
RoHS compliant acc. to EU guideline 2002/95/EG		

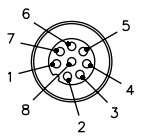
[1] If supply voltage correctly applied.
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.) (If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Approximately one minute

Large bore type 5821 (hollow shaft)

Standard wiring:

Output:	0 V GND	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	Shield
M12 ***eurofast***®	1	2	3	4	5	6	7	8	
Color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Wiring Diagram:

Male encoder view

M12 ***eurofast***® pinout
Mating cordset: **E-RKC 8T-930-***

* Length in meters.

Part number key: 5821 hollow shaft version

T8.5821.XXXX.XXXX

Type

Flange

1 = with spring element

Hollow shaft

3 = Ø 28 mm
5 = Ø 25 mm
6 = Ø 24 mm
C = Ø 20 mm
other versions avialable on request

Pulse rate

50, 60, 100, 125, 400, 500, 512, 960, 1000, 1024, 2000, 2048, 5000
(e.g. 100 pulses=> 0100)
Other pulse rates on request

Type of connection

1 = radial cable (1 m PVC cable)
E = radial 8-pin M12 ***eurofast*** connector

Output and power supply

1 = 5 V, RS 422 (with inverted signals)
3 = 8-30 VDC, push-pull (with inverted signals)
4 = 8-30 VDC, RS 422 (with inverted signals)

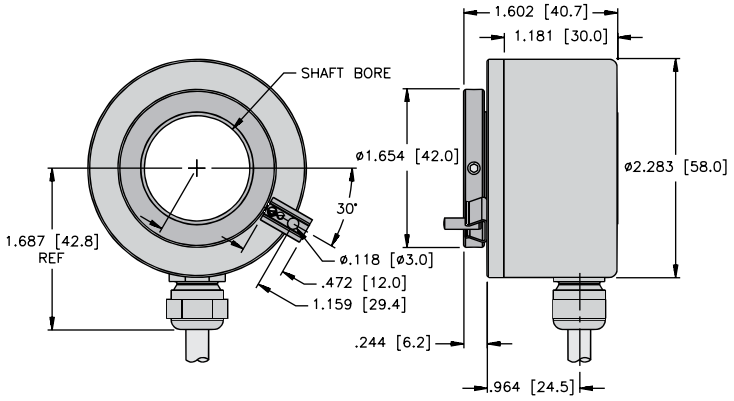
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

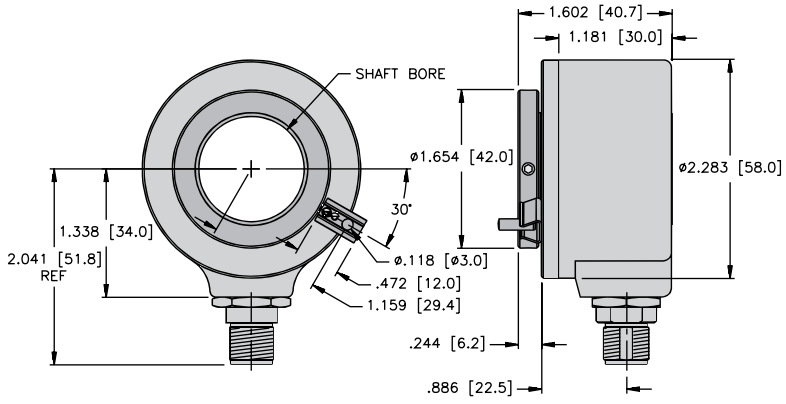
Large bore type 5821 (hollow shaft)

Dimensions: 5821 hollow shaft version

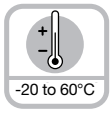
5821 flange
Cable connection 1



5821 flange
M12 *eurofast*® connection E



Large bore type A02H (hollow shaft)



Temperature

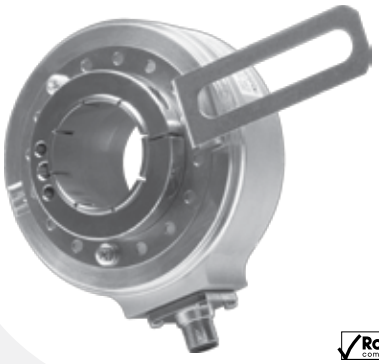

Shock/vibration resistant


Short-circuit protection


Reverse polarity protection


High rotational speed

Rugged
- Balanced, stainless-steel clamping rings, special bearing-shaft connection increases stability and vibration resistance.
- Optional plastic isolating inserts protect against damage from shaft currents.
- New type of mechanical construction, ideal for handling tough mechanical stresses and strains.



RoHS compliant · cULus · Ex · 2/22

Economical
- Alternative to traditional heavy duty encoders that are often over-engineered and expensive.

Versatile
- Very compact. Optional isolating inserts protect against damage from shaft currents, e.g. with AC vector motors.
- Only 49 mm clearance needed.
- Hollow shaft diameter up to Ø 42 mm.
- RS422, push-pull or SIN/COS outputs.
- Extended speed range up to 6,000 RPM.
- High-quality construction, balanced, stainless steel - ensures quiet vibration-free running.

Mechanical characteristics:

Speed:	max. 6,000 RPM at 158°F (70°C) [1] max. 3,500 RPM at 176°F (80°C) [1]
Rotor moment of inertia:	< 12 oz-in^2 (< 220 x 10^{-6} kgm^2) [2]
Starting torque with sealing:	< 28.3 oz-in (< 0.2 Nm)
Weight:	approx. 1.8 lbs (0.8 kg)
Protection acc. to EN 60 529:	IP65
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-4 to +176°C (-20 to +80°C) [3]
Shaft:	stainless steel H7
Shock resistance acc. to DIN-IEC 68-2-27	200 g (2,000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s^2), 10-2,000 Hz

[1] During the run-in-phase of approx. 2 hours, reduce the limits for working temperature max or speed max by 1/3
[2] Dependent on the shaft diameter
[3] Non-condensing

Electrical characteristics sine wave output:

Output circuit:	Sine U = 1 Vss	Sine U = 1 Vss
Supply voltage:	5 V (±5 %)	10-30 VDC
Current consumption (no load) with inverted signal:	typ. 65 mA / max. 110 mA	typ. 65 mA / max. 110 mA
-3 dB frequency:	≥ 180 kHz	≥ 180 kHz
Signal level channels A/B:	1 Vss (±20%)	1 Vss (±20%)
Signal level channel 0:	0.1-1.2 V	0.1-1.2 V
Short-circuit proof outputs[1]:	yes	yes
Reverse connection protection at +V:	no	yes
UL certified	File 224618	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3		
RoHS compliant acc. to EU guideline 2002/95/EG		

[1] If supply voltage correctly applied

Large bore type A02H (hollow shaft)

Electrical characteristics RS422 or push-pull output:

Output circuit:	RS 422 (TTL compatible)	Push-pull	Push-pull (7272) [3]
Supply voltage:	5 V (±5 %) or 10-30 VDC	10-30 VDC	5-30 VDC
Power consumption (no load) without inverted signal:	-	typ. 55 mA / max. 125 mA	-
Power consumption (no load) with inverted signal:	typ. 40 mA / max. 90 mA	typ. 80 mA / max. 150 mA	typ. 50 mA / max. 100 mA
Permissible load/channel:	max. ±20 mA	max. ±30 mA	max. ±20 mA
Pulse frequency:	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level high:	min. 2.5 V	min. +V -3 V	min. +V -2.0 V
Signal level low:	max. 0.5 V	max. 2.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 1 µs	max. 1 µs
Fall time t_f:	max. 200 ns	max. 1 µs	max. 1 µs
Short-circuit proof outputs[1]:	yes [2]	yes	yes
Reverse connection protection at +V:	5 V: no, 10-30 V: yes	yes	no
UL certified:	File 224618		

Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted) (If +V = 5-30 V, short-circuit to channel or 0 V is permitted)
[3] Max. recommended cable length 30 m

Standard wiring / pin configuration:

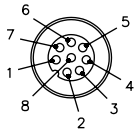
Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	-	-
M23 ***multifast*** ®	Coupling Nut	10	12	5	6	8	1	3	4	-	-
MS 7-pin	G	F	D	A	-	B	-	C	-	-	-
MS 10-pin	J	F	D	A	G	B	H	C	I	-	-
M12 ***eurofast*** ®	Coupling Nut	1	2	3	4	5	6	7	8	-	-
Cable:	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT

Special connector pin configuration:

		Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	-	-
Output Code	7	M23 ***eurofast***	Coupling Nut	7	2	1	3	4	5	6	8	-	-
	2	MS 7-pin	G	F	D	A	C	B	E	-	-	-	-
	6	MS 10-pin	G	F	D	A	H	B	I	C	J	-	-

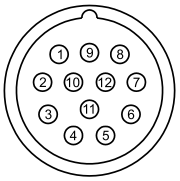
Wiring diagrams:

Male encoder view



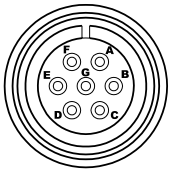
M12 ***eurofast*** pinout

Mating cordset:
E-RKC 8T-930-*



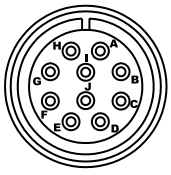
M23 ***multifast*** pinout

Mating cordset:
E-CK 12-931-*



MS pinout (7-pin)

Mating cordset:
E-MK 7-930-*



MS pinout (10-pin)

Mating cordset:
E-MK 10-931-*

* Length in meters.

Large bore type A02H (hollow shaft)

Part number key: A02H hollow shaft version

T8.A02H.XXXX.XXXX.PXXXX

Options for special output only.

Type

Flange

1 = face mount
2 = short anti-rotation spring
3 = long anti-rotation spring
5 = tether arm (long)
6 = 4 1/2" C-face tether

Hollow shaft

1 = Ø 42 mm
2 = Ø 38 mm
3 = Ø 28 mm
4 = Ø 25.4 mm (1") [1]
5 = Ø 25 mm [1]
6 = Ø 24 mm
A = Ø 30 mm [1]
B = Ø 40 mm
C = Ø 20 mm [1]
D = Ø 1/2"
E = Ø 5/8" [1]
F = Ø 3/4" [1]
G = Ø 1-1/8" [1]
H = Ø 35 mm
M = Ø 19 mm
N = Ø 1-1/4" [1]
P = Ø 32 mm [2]

Output circuit and voltage supply

1 = RS422 (with inverted signal), 5 V supply voltage
3 = push-pull (with inverted signal), 10-30 V supply voltage
4 = RS422 (with inverted signal), 10-30 V supply voltage
5 = push pull (with inverted signal), 5-30 V supply voltage
8 = SIN/COS 1 Vpp (with inverted signal), 5 V supply voltage [3]
9 = SIN/COS 1 Vpp (with inverted signal), 10-30 V supply voltage [3]
A = line driver 7272, 5-30 V supply voltage
B = 5-30 VDC / open collector (7273)
D = 5-30 VDC / TTL (26C31)
E = 5-30 VDC / TTL line driver (7272)

Special connector pin configuration

0 = standard wiring
Other = see page C35

Special insert options

A = isolation insert not included
B = isolation insert included [4]

Special output signal formats

00 = standard output
Other = see page C42

Pulse rate

50*, 360*, 512*, 600*, 1000*, 1024, 1500, 2000, 2048, 2500, 4096, 5000
* not for SIN/COS version (SIN/COS version not available with pulses <1024)
(e.g. 360 pulses => 0360) Other pulse rates on request

Type of connection

1 = cable radial (1 m PVC-cable)
2 = radial 12-pin plug without mating connector
D= radial MS, 10-pin (MS 3102R18-1P)
E = radial connector M12 8-pin
K = radial MS, 7-pin (MS 3102R165-1P)

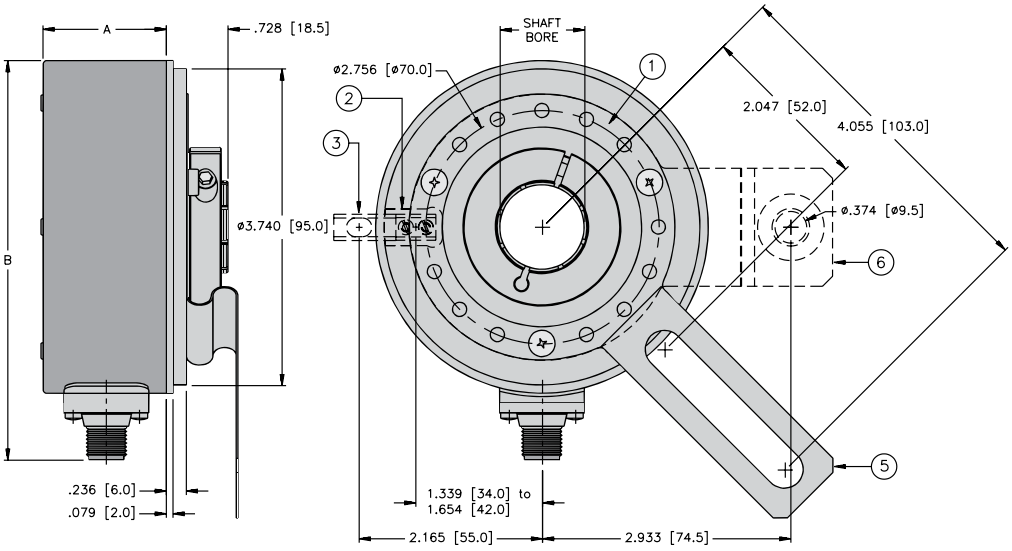
[1] Boxes available with isolation inserts.
[2] This bored size only available as an isolation insert.
[3] P04XX is the only valid output code for SIN/COS outputs.
[4] Includes plastic hollow shaft inserts for electrical isolation.

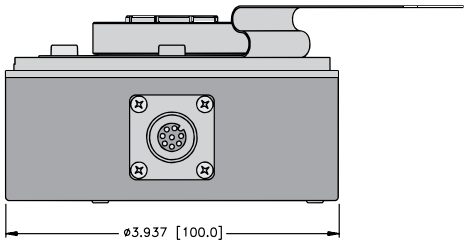
Accessories:

- See page J1, Connectivity, for cables and connectors

Dimensions: A02H hollow shaft version

A02H flange





1 = face mount
2 = short anti-rotation spring
3 = long anti-rotation spring
5 = tether arm (long)
6 = 4 1/2" C-face tether

Dimensions for Radial Connector - in [mm]

	Connection Style				
DIM	**Cable**	**M12**	**M23**	**MS** (7-pin)	**MS** (10-pin)
A	1.181 [30.0]	1.181 [30.0]	1.181 [30.0]	1.457 [37.0]	1.457 [37.0]
B	-	4.705 [119.5]	4.961 [126.0]	5.079 [129.0]	5.394 [137.0]

Large bore type A02H (hollow shaft)

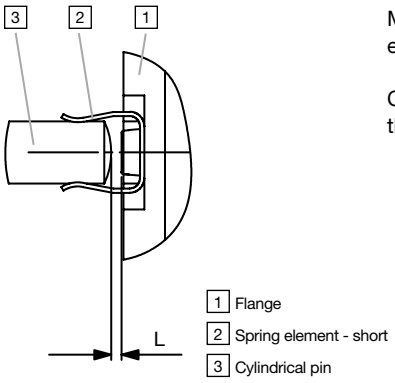
Mating shaft requirements:

Type of flange	Axial end play	Radial runout	Angular offset
Type 2 (anti-rotational spring short)	max. ±1 mm	max. ±0.3 mm	max. ±2°
Type 3 (anti-rotational spring long)	max. ±1 mm	max. ±0.3 mm	max. ±2°
Type 5 (tether arm long)	max. ±0.5 mm	max. ±0.3 mm	max. ±2°
Type 6 (C-face tether)	max. ±0.5 mm	max. ±0.3 mm	max. ±2°

Mounting:

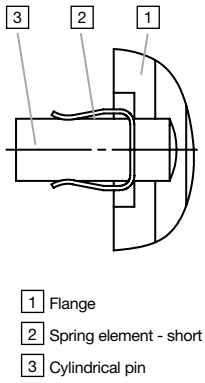
Mounting using the spring element - short:

When mounting the encoder, ensure that dimension **L** is larger than the maximum axial play of the drive in the direction of the arrow.



Mounting using the spring element - long:

Cylindrical pin fed through the bore of the spring.



Large bore type A02H (hollow shaft) accessories

Isolation insert

Part Number:	Inner Dimensions
8.0010.4013.0000	12.7 mm (1/2")
8.0010.4070.0000	15.875 mm (5/8")
8.0010.4019.0000	16 mm
8.0010.4080.0000	18 mm
8.0010.4090.0000	19.05 mm (3/4")
8.0010.4011.0000	20 mm
8.0010.4012.0000	25 mm
8.0010.4050.0000	25.4 mm (1")
8.0010.4014.0000	28.58 mm (1-1/8")
8.0010.4016.0000	30 mm
8.0010.4060.0000	31.75 mm (1-1/4")
8.0010.4015.0000	32 mm

The A02H encoder is used for AC vector motor and general industrial applications. For AC vector motor applications, the encoder should be electrically isolated from the motor chassis to minimize encoder bearing currents and ground noise. An isolation insert for the hollow shaft is provided with the encoder by specifying B0 in the "special insert option" decode. **When ordering isolation inserts separately, choose option A0 with a bore diameter of 38 mm.**

For general industrial applications, isolation is not required and the decode for "special insert options" can be left blank.

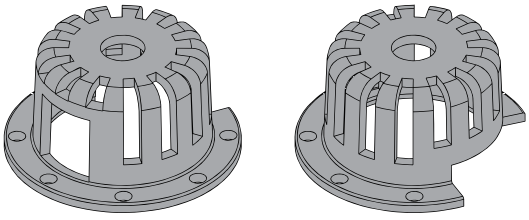
Isolation insert for hollow shaft Ø 42 mm:
External diameter 42 mm
Internal diameter 38 H7 in accordance with ISO 286-2
Order Number: **T8.0010.4017.0000**

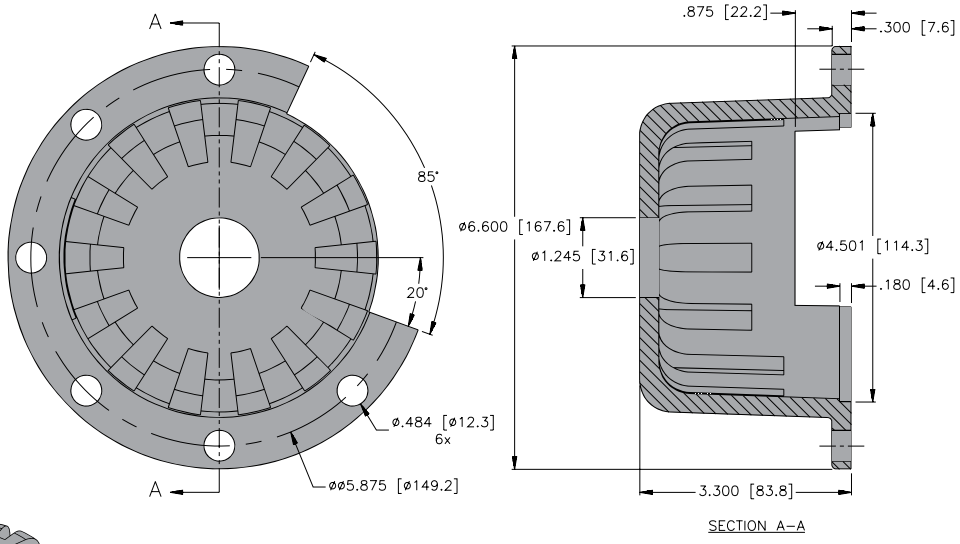
Large bore type A02H (hollow shaft) accessories

Part Number:
ENCODER COVER KIT

Description:
Cover kit for 4.5” C-face motors

Included: (3) 3/8 x 16 x 3/4 bolts, (3) washers

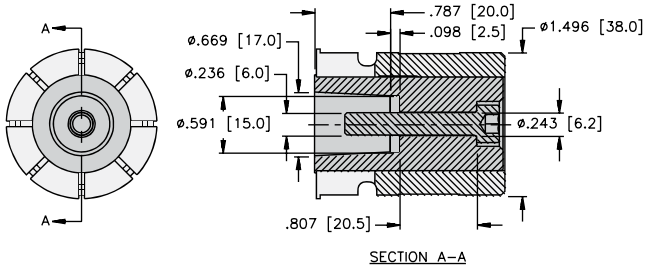




Part Number:
8.0010.4028.0000

Description:
Mounting kit adapts the A02H hollow shaft encoder for mounting onto a tapered shaft. Tapered shafts are used for high-precision direct coupling to direct devices. An isolating insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.

Included: Insert for cone blind hole, cone 1:10, 17 mm length, insulation insert, allen screw for tightening



TURCK
Industrial Automation

Magnetic rings RI20/ LI20

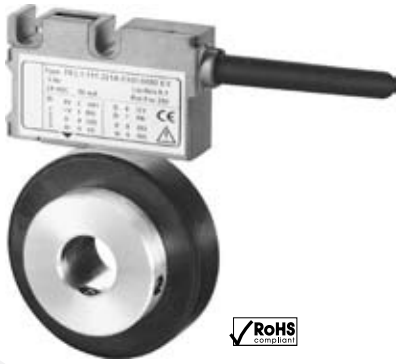
High rotational speed | High IP | Shock/vibration resistant | Reverse polarity protection

Robust

- **Increased ability to withstand vibrations and rough installation.** Eliminates machine downtime and repairs. High shock and vibration resistance, thanks to non-contact technology.
- **Stays sealed even when subjected to harsh everyday use. Offers security against failures in the field.** Potted housing with up to IP67 protection.

Compact

- Installation depth only 16 mm, width of magnetic ring 10 mm



- Large hollow shaft up to 30 mm Can be used even where space is very tight

Simple installation

- **Fast start-up of the measuring system** Easy fixing of the magnetic ring and the sensor head
- **Easy mounting with large tolerances possible** Distance of sensor head to magnetic ring from 0.1-1.0 mm
- Tolerates lateral misalignment +1 mm
- Warning signal when magnetic field is too weak (LED)

Technical data magnetic sensor LI20:

Output circuit:	Push-Pull	RS422
Supply voltage:	4.8-30 VDC	4.8-26 VDC
Load/channel, max. cable length:	±20 mA, max. 30 m	120 Ohm, RS422 standard
Current consumption (without load):	typ. 25 mA, max. 60 mA	
Short-circuit proof outputs [1]:	yes	yes [2]
Min. Pulse interval:	1 µs (edge interval) corresp. to 4 µs/period (see signal figures at right)	
Output signal:	A, $\overline{A}$, B, $\overline{B}$, I, $\overline{I}$	
Reference signal:	Index periodical	
Accuracy:		
System accuracy:	typ. ±0.3° with shaft tolerance g6	
Repeat accuracy:	±1 increment	
Admissible alignment tolerance:	see draft "Mounting tolerances"	
Gap sensor / magnetic ring:	0.1-1.0 mm (recommended 0.4 mm)	
Offset:	max. ±1 mm	
Tilting:	max. 3°	
Torsion:	max. 3°	
Environmental conditions:		
Working temperature:	-4 to +185°F (-20 to +80°C)	
Shock resistance:	30 g (300 m/s²), 10-2000 Hz	
Protection class:	IP67 according to DIN 60 529 (housing)	
Humidity:	100%, condensation possible	
Housing:	Zinc die-cast	
General data:		
Cable:	2 m, PUR 8 x 0.14 mm², shielded, may be used in flexing cable installations	
Status-LED:	Green: Pulse-index; Red: Error, revs too high or magnetic field too weak (for T8.LI20.XXXX.X020 and T8.LI20.XXXX.X050)	
CE compliant acc. to:	EN 61 000-6-1, EN 61 000-6-4, EN 61 000-6-3, EN 61 000-4-8 (magnetic field)	
RoHS compliant acc. to EU guideline 2002/95/EG		

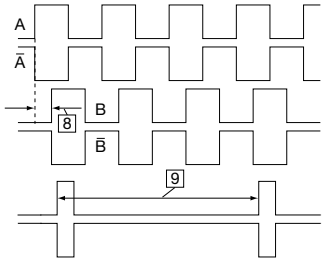
[1] With supply voltage correctly applied
[2] A max. of one channel only may be short-circuited: (when +V = 5 V, a short-circuit to another channel, 0 V, or +V is permissible.) (when +V = 5-30 V, a short-circuit to another channel or to 0 V is permissible.)

Technical data magnetic ring RI20:

Pole gap:	2 mm from pole to pole
Temperature ranges:	Working temperature: -4 to +185°F (-20 to +80°C) Storage temperature: -4 to +185°F (-20 to +80°C)
Mounting:	Screwed on shaft
System accuracy:	typ. +0.3° (at 77°F (25°C)), Sensor/Magnetic ring distance 0.5 mm and drive shaft tolerance g6 in accordance with ISO 286-2

Signal figures

with rotation of the magnetic ring in the CW-direction (see draft "Mounting tolerances")



8 Min. Pulse interval: pay attention to the instructions in the technical data

9 periodic index signal (every 2mm) the logical assignment A, B and I-signal can change

Magnetic rings RI20/ LI20

Part number key: LI20

T8.LI20.11X1.2XXX

Model

Design

1 = standard

Supply voltage

1 = standard

Interface and Supply voltage

1 = 4.8-26 VDC, RS422/4
2 = 4. 8-30 VDC, push-pull/4

Code*

005
016
020
050

* Annotations see table “selection guide”, col 3

Reference Signal

2 = index periodic

Type of connection

1 = cable (PUR), 2 m

Part number key: magnetic ring RI20

Part number key/type	Outer diameter	Bore diameter
T8.RI20.031.0800.111	Ø 31 mm	8 mm
T8.RI20.031.1000.111	Ø 31 mm	10 mm
T8.RI20.031.1200.111	Ø 31 mm	12 mm
T8.RI20.031.1500.111	Ø 31 mm	15 mm
T8.RI20.031.1587.111	Ø 31 mm	15.875 mm (5/8")
T8.RI20.031.2000.111	Ø 31 mm	20 mm
T8.RI20.041.0800.111	Ø 41.2 mm	8 mm
T8.RI20.041.1500.111	Ø 41.2 mm	15 mm
T8.RI20.045.0800.111	Ø 45 mm	8 mm
T8.RI20.045.0925.111	Ø 45 mm	9.525 mm (3/8")
T8.RI20.045.1200.111	Ø 45 mm	12 mm
T8.RI20.045.1500.111	Ø 45 mm	15 mm
T8.RI20.045.1800.111	Ø 45 mm	18 mm
T8.RI20.045.2500.111	Ø 45 mm	25 mm
T8.RI20.045.2540.111	Ø 45 mm	25.4 mm (1")
T8.RI20.045.3000.111	Ø 45 mm	30 mm

Selection guide: magnetic sensor Li20/magnetic ring RI20

Pulses/ ppr	Part number key for magnetic ring RI20	Part number key for magnetic sensor*	Max. rpm
250	T8.RI20.031.XXXX.111	T8.LI20.11X1.2005	12,000
1000	T8.RI20.031.XXXX.111	T8.LI20.11X1.2020	2,400
2500	T8.RI20.031.XXXX.111	T8.LI20.11X1.2020	3,900
1024	T8.RI20.041.XXXX.111	T8.LI20.11X1.2016	7,000
360	T8.RI20.045.XXXX.111	T8.LI20.11X1.2005	12,000
3600	T8.RI20.045.XXXX.111	T8.LI20.11X1.2050	2,700

*At the listed rotational speed the min. pulse interval is 1 µs, this corresponds to 250 kHz. For the maximum rotational speed range a counter with a count input frequency of not less then 250 kHz should be provided.

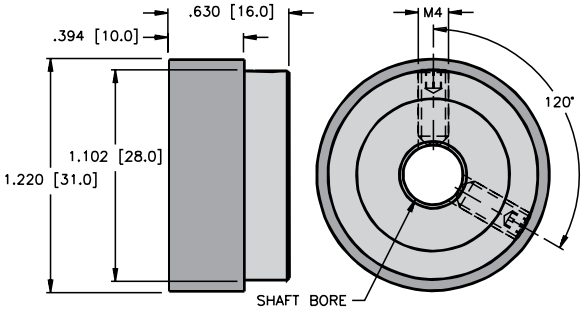
Pin assignment:

Signal:	0 V, GND	+V	A	$\overline{A}$	B	$\overline{B}$	I	$\overline{I}$
Color:	WH	BN	GN	YE	GY	PK	BU	RD

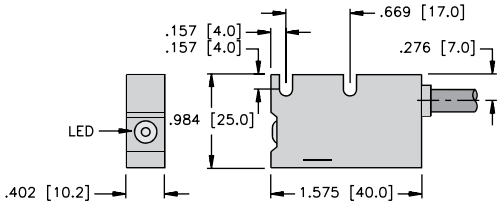
Shield is on the housing

Dimensions: RI20 magnetic ring

T8.RI20.031.XXXX.111, Ø 31 mm



Dimensions: Magnetic sensor LI20



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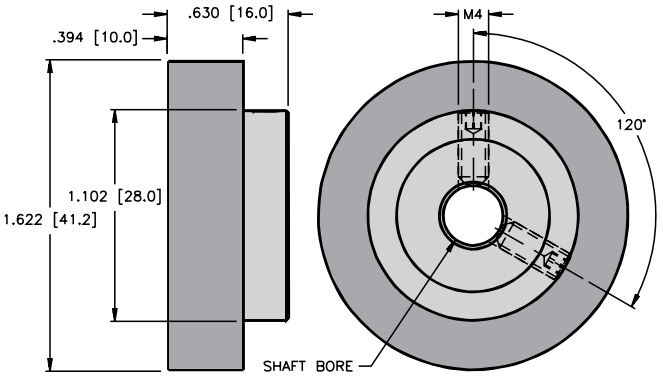
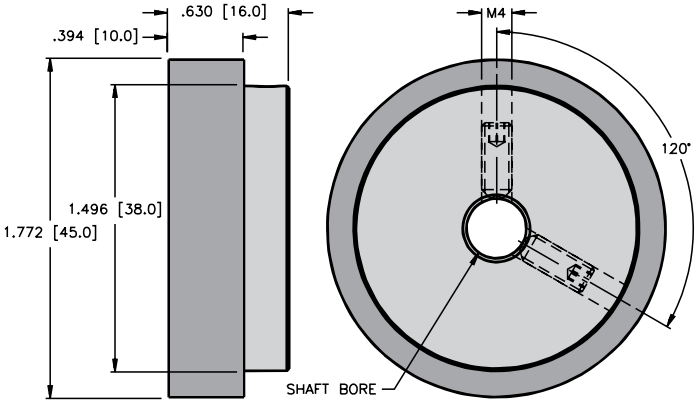
Magnetic rings RI20/ LI20

Dimensions: RI20 magnetic ring

T8.RI20.041.XXXX.111, Ø 41.2 mm



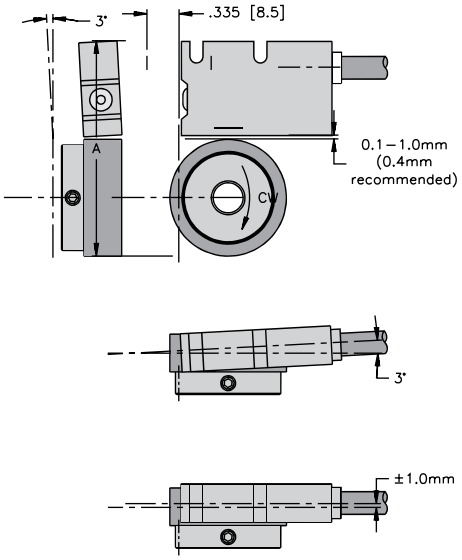
T8.RI20.045.XXXX.111, Ø 45 mm



Recommended tolerance of the drive shaft diameter: g6 in accordance with ISO 286-2

Permissible mounting tolerances:

RI20 and linear read head



Part Number	Dimension A
T8.RI20.031.XXXX.111	56.4 [1)]
T8.RI20.041.XXXX.111	66.6 [1)]
T8.RI20.051.XXXX.111	70.4 [1)]

[1)] With Distance Sensor / Magnetic ring = 0.4 mm

Display type 572 for LI20

Counter series for demanding applications, with two individually scalable encoder inputs. HTL or TTL in each case A, $\overline{A}$, B, $\overline{B}$ for count frequencies up to 1 MHz per channel. Operating modes can be selected for position or event counter, total counter, difference counter, cut-to-length display, diameter calculator, batch counter and more.

- Two separate freely scalable count inputs - HTL or TTL; also with inverted inputs
- Max. input frequency 1 MHz/ channel
- Four freely programmable fast solid-state outputs, each with 350 mA output current
- Step or tracking preset
- AC and DC supply voltage
- Can be used as a counter or position display with limit values
- Monitoring function, where two values are monitored or calculated with respect to each other
- Four fast programmable inputs with various functions such as reset, gate, display memory , reference input or switching between the display values.
- Optional scalable analog output 0/4-20 mA, +/-10 V or 0-10 V
- Two auxiliary power supplies for sensors: 5.2 VDC and 24 VDC
- Standard interface RS232

Part number key specification:
Position display, 6 digits, with 4 fast switch outputs and serial interface: **6.572.0116.D05**

Position display, 6 digits, with 4 fast switch outputs and serial interface and scalable analog output: **6.572.0116.D95**

Position display, 8 digits, with 4 fast switch outputs and serial interface: **6.572.0118.D05**

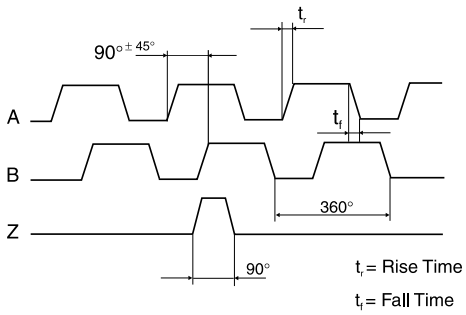
Position display, 8 digits, with 4 fast switch outputs and serial interface and scalable analog output: **6.572.0118.D95**

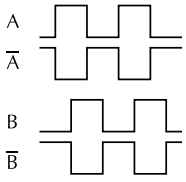
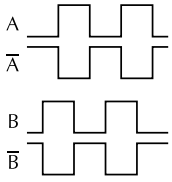
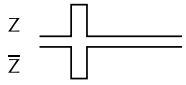
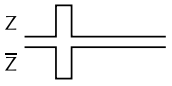
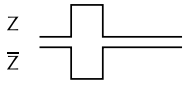
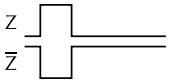
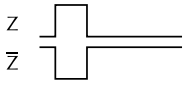
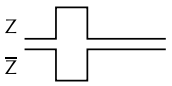
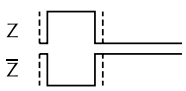
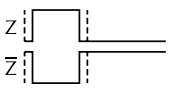
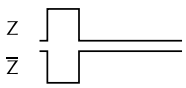
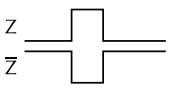
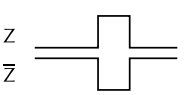
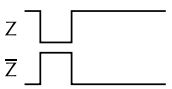
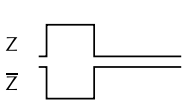
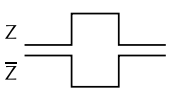
Wave Forms

Outputs

All Kübler by TURCK encoders come standard with six channels where A leads B in the clockwise direction and the standard index is gated with A & B. The tolerance of the wave form affects the control and, in some cases, may affect the smoothness of system operation.

Wave Form Tolerances



A leads B when the shaft is turned in the clockwise direction viewing the shaft or collet end. This is the Kübler by TURCK standard. This format applies to the pin key codes listed below.		B leads A when the shaft is rotated in the clockwise direction viewing the shaft or collet end. This format applies to the pin key codes listed below.	
A leads B, Z gated with A & B. This is the Kübler by TURCK standard. Z is 90° wide.		**Code 04:** B leads A, Z gated with A & B. Z is 90° wide.	
Code 01: A leads B, Z gated with B. Z is 180° wide.		**Code 05:** B leads A, Z gated with B. Z is 180° wide.	
Code 02: A leads B, Z gated with A. Z is 180° wide.		**Code 06:** B leads A, Z gated with A. Z is 180° wide.	
Code 03: A leads B, Z ungated. Z is 330° to 360° wide.		**Code 07:** B leads A, Z is ungated. Z is 330° to 360° wide.	
Code 08: A leads B, Z is 180° wide.		**Code 09:*** B leads A, Z gated with $\overline{B}$. Z is 180° wide.	
Code 13:* A leads B, Z gated with $\overline{B}$. Z is 180° wide.		**Code 10:** B leads A, Z is a negative marker gated with B. Z is 180° wide.	
Code 11: A leads B, Z is a minimum with of 270° (electrical degrees).		**Code 12:** B leads A. Z has a minimum width of 270°.	

TURCK
Industrial Automation

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Absolute multiturn encoders - Shaft/hollow shaft

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Absolute singleturn encoder selection guide

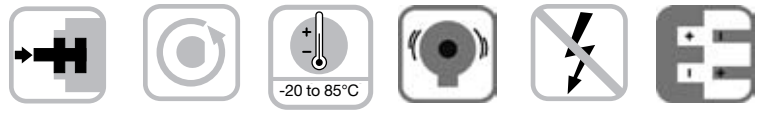
		Sendix® absolute															
		2450	2470	3651	3671	F3653	F3673	F3658	F3678	M3658	M3678	5853	5873	5858	5878	5850	5870	5876
Interface	SSI	X	X	3650[1]	3670[1]	X	X					X	X			X	X	X
	SSI and Incremental track					X	X					X	X					
	SSI and SIN/COS track					X	X					X	X					
	BISS					X	X					X	X					
	BISS and Incremental track					X	X					X	X					
	BISS and SIN/COS track					X	X					X	X					
	Parallel															X	X	X
	Analog output			X	X											X		
	RS485																	
	PROFIBUS®-DP													X	X			
	CANopen							X	X	X	X			X	X			
	CANlift																	
	EtherCAT													X	X			
	DeviceNet™																	
	J1939									X	X							
Mechanical characteristics	Shaft max. (mm)	6	-	8	-	10	-	10	-	8	-	10	-	10	-	10	-	-
	Blind hollow shaft max. (mm)	-	6	-	10	-	10	-	10	-	10	-	-	-	15	-	12	12
	Through hollow shaft max. (mm)	-	-	-	-	-	8	-	8	-	-	-	15	-	-	-	12	12
Performance characteristics	Max. speed RPM (thousands)	12	12	6	6	12	12	12	12	6	6	12	9	9	9	12	6	6
	Mechanical gears																	
	Non-contact gears																	
	Resolution max. (Bit)	12	12	12 [2]	12 [2]	17	17	17	17	14	14	17	17	16	16	14	14	14
	Programmable							X	X	X	X			X	X			
	Control outputs																	
	Set key (optional)											X	X	X	X			
	Status LED (optional)			X	X			X	X	X	X	X	X	X	X			
	Safety-Lock™			X	X	X	X	X	X	X	X	X	X	X	X			
	Temperature min.	-4°F (-20°C)	-4°F (-20°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-22°F (-30°C)	-22°F (-30°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-4°F (-20°C)	-4°F (-20°C)	-4°F (-20°C)
	Temperature max.	+185°F (+85°C)	+185°F (+85°C)	+185°F (+85°C)	+185°F (+85°C)	+194°F (+90°C)	+194°F (+90°C)	+185°F (+85°C)	+185°F (+85°C)	+185°F (+85°C)	+185°F (+85°C)	+194°F (+90°C)	+194°F (+90°C)	+176°F (+80°C)	+176°F (+80°C)	+185°F (+85°C)	+176°F (+80°C)	+176°F (+80°C)
	IP max.	IP64	IP64	IP69K	IP69K	IP67	IP67	IP67	IP67	IP69K	IP69K	IP67	IP67	IP67	IP67	IP65	IP65	IP66
Catalog page		**D4**	**D4**	**D10** [1]	**D10** [1]	**D15**	**D15**	**D20**	**D20**	**D23**	**D23**	**D37**	**D37**	**D44**	**D44**	**D31**	**D31**	**D65**

[1] Catalog page D7
[2] 3650 / 3670: 9 Bit

Absolute multiturn encoder selection guide

		Sendix® absolute												
		F3663	F3683	F3668	F3688	5863	5883	5868	5888	5860	5862	5882	9080	9081
Interface	SSI	X	X			X	X				X	X		X
	SSI and Incremental track	X	X			X	X				X	X		X
	SSI and SIN/COS track	X	X			X	X							
	BISS	X	X			X	X							
	BISS and Incremental track	X	X			X	X							
	BISS and SIN/COS track	X	X			X	X							
	Parallel													
	Analog output													
	RS485										X	X		X
	PROFIBUS®-DP							X	X				X	
	CANopen			X	X			X	X				X	
	CANlift							X	X					
	EtherCAT							X	X					
	DeviceNet™									X			X	
	J1939													
Mechanical characteristics	Shaft max. (mm)	10	-	10	-	10	-	10	-	10	10	-	12	12
	Blind hollow shaft max. (mm)	-	10	-	10	-	15	-	15	15	-	-	-	-
	Through hollow shaft max. (mm)	-	8	-	8	-	14	-	-	-	-	12	28	28
Performance characteristics	Max. speed RPM (thousands)	12	12	12	12	12	9	9	9	6	6	6	6	6
	Mechanical gears					X	X	X	X					
	Non-contact gears	X	X	X	X					X	X	X	X	X
	Resolution max. (Bit)	41	41	32	32	29	29	28	28	25	25	25	25	25
	Programmable							X	X	X	X	X	X	X
	Control output										X	X		X
	Set key (optional)					X	X	X	X					
	Status LED (optional)			X	X	X	X	X	X				X	
	Safety-Lock™	X	X	X	X	X	X	X	X					
	Temperature min.	-22°F (-30°C)	-22°F (-30°C)	-22°F (-30°C)	-22°F (-30°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-4°F (-20°C)	-4°F (-20°C)	-4°F (-20°C)	+14°F (-10°C)	-4°F (-20°C)
	Temperature max.	+194°F (+90°C)	+194°F (+90°C)	+185°F (+85°C)	+185°F (+85°C)	+194°F (+90°C)	+194°F (+90°C)	+176°F (+80°C)	+176°F (+80°C)	+176°F (+80°C)	+158°F (+70°C)	+158°F (+70°C)	+158°F (+70°C)	+158°F (+70°C)
	IP max.	IP67	IP67	IP67	IP67	IP67	IP67	IP67	IP67	IP65	IP65	IP65	IP65	IP65
Catalog page		**D69**	**D69**	**D73**	**D73**	**D76**	**D76**	**D89**	**D89**	**D110**	**D83**	**D83**	**D115**	**D122**

Absolute singleturn encoder type 2450 (shaft) / 2470 (blind hollow shaft) SSI



Locked bearing | High rotational speed | Temperature | Shock/vibration resistant | Short-circuit protection | Reverse polarity protection

Rugged
- **Non-contact measuring system:** ensures long service life and the reliability of the application.
- **Wide temperature range of -4 to +185°F (-20 to +85°C)**.
- **Robust cable outlet:** provides high strain-relief.

Compact
- **Can be used where space is tight:** Overall diameter of only 24 mm, shaft diameter min 4 mm.

Versatile
- **High resolution, 12 Bit:** 4096 different positions at 360°.
- **Power supply range of:** 5 VDC or 8-30 VDC.
- **Flexible connection of power supply:** Radial or axial cable connection.

Mechanical characteristics:

Speed:	max. 12,000 RPM
Rotor moment of inertia:	approx. 5.5 x 10^{-3} oz-in^2 (0.1 x 10^{-6} kgm^2)
Starting torque with sealing:	< 0.14 oz-in (< 0.001 Nm)
Radial load capacity of shaft:	4 lbs (18 N)
Axial load capacity of shaft:	4.5 lbs (20 N)
Weight:	approx. 0.14 lbs (0.06 kg)
Protection acc. to EN 60 529:	IP50 shaft side, IP64 housing side, IP64 shaft side on request
Working temperature:	-4 to +185°F (-20 to +85°C) [1]
Shaft:	stainless steel, clamping ring MS 58'
Shock resistance acc. to DIN-IEC 68-2-27	100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s^2), 55-2,000 Hz

[1] Non-condensing

Electrical characteristics SSI Interface:

Sensor:	
Supply voltage:	5 (+0,4) VDC or 8-30 VDC [1]
Current consumption (without output load):	< 40 mA
Reverse polarity protection at power supply (+V):	Yes
Measuring range:	360°
Resolution/Code:	12 Bit/Grey
Linearity 77°F (25°C):	<1.5°
Repeat accuracy:	<0.1°
Data refresh rate:	typ 100 µs

SSI interface:	
Clock speed:	100 kHz-750 kHz
Output driver:	RS485
Monoflop time typ./max.K:	16 µs/20 µs
Short-circuit proof outputs:	Yes [2]
Permissible load/channel	typ. 120 Ohm (corresponding RS485)

[1] The supply voltage at the encoder input must not be less than 4.75 V (5 V - 5%)
[2] Short-circuit to 0 V or to output, only one channel at a time, supply voltage correctly applied

General characteristics:

Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4, EN 61000-6-3 and EN 61000-4-8 (behavior under magnetic influence).

RoHS compliant acc. to EU guideline 2002/95/EG

Pin configuration:

Signal:	Common (0 V)	+V	+T	-T	+D	-D
Color:	WH	BN	GN	YE	GY	PK

TURCK
Industrial Automation

Absolute singleturn encoder type 2450 (shaft) / 2470 (blind hollow shaft) SSI

Part number key: 2450 shaft version

T8.2450.XXXX.G121

Type

Flange
1 = Ø 24 mm
2 = Ø 30 mm
3 = Ø 28 mm
4 = Ø 24 mm, IP64 flange

Shaft
1 = Ø 4 mm x 10 mm
2 = Ø 6 mm x 10 mm
3 = Ø 5 mm x 10 mm with flat

Gray Code 12 Bit resolution

Type of connection
1 = axial cable (2 m PVC cable Ø 4.5 mm)
2 = radial cable (2 m PVC cable Ø 4.5 mm)

Output and voltage supply
1 = 5 VDC, SSI
2 = 8-30 VDC, SSI

Part number key: 2470 blind hollow shaft version

T8.2470.1XXX.G121

Type

Flange
1 = Ø 24 mm

Blind hollow shaft (14 mm insertion depth)
1 = Ø 4 mm
2 = Ø 6 mm

Gray Code 12 Bit resolution

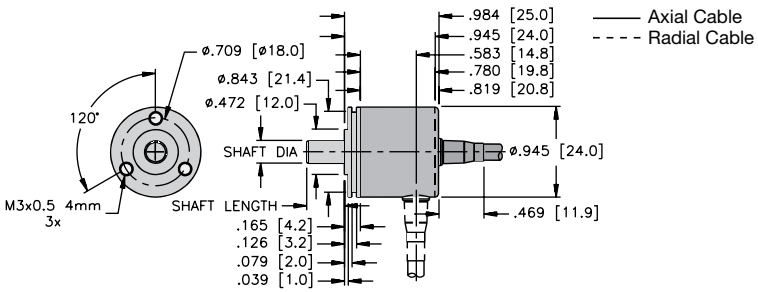
Type of connection
1 = axial cable (2 m PVC cable Ø 4.5 mm)
2 = radial cable (2 m PVC cable Ø 4.5 mm)

Output and voltage supply
1 = 5 VDC, SSI
2 = 8-30 VDC, SSI

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

Dimensions: 2450 shaft version

2450 flange 1
Cable connection 1 & 2

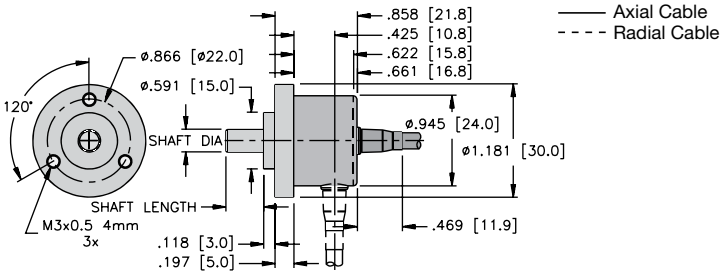


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

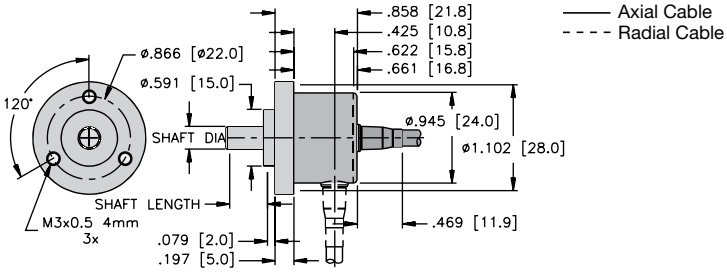
Absolute singleturn encoder type 2450 (shaft) / 2470 (blind hollow shaft) SSI

Dimensions: 2450 shaft version

2450 flange 2
Cable connection 1 & 2



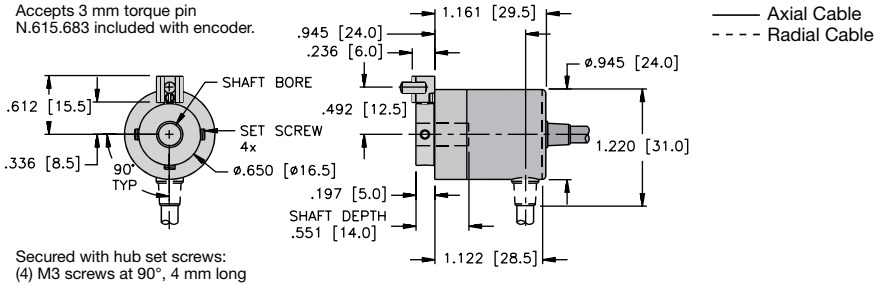
2450 flange 3
Cable connection 1 & 2



Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: 2470 blind hollow shaft version

2470 flange 1
Cable connection 1 & 2



Mounting advice:
The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time. A cylindrical pin (N.615.683 per ISO 2338-A-3m6 x 10), for use as a torque stop, is supplied.

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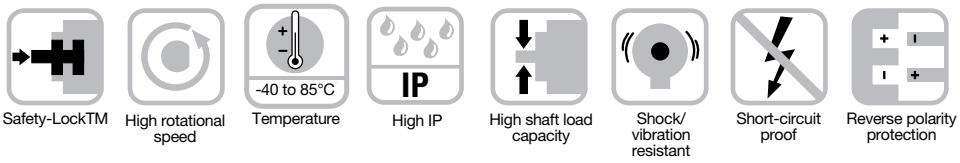
Sendix absolute, singleturn encoder type 3650 (shaft) / 3670 (blind hollow shaft) SSI



Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Short-circuit proof | Reverse polarity protection

Rugged

- **Non-contact measuring system:** Ensures long service life and the reliability of the application.
- **Stays sealed even when subjected to harsh everyday use.** Solid die-cast housing with up to IP69K protection offers security against failures in the field.
- **Wide temperature range of -40 to +185°F (-40 to +85°C).**
- **Increased ability to withstand vibration and installation errors.** High shock (> 500 g) and vibration resistance (> 30 g) eliminates machine downtime and repairs.

Sendix® absolute

SSI

RoHS compliant Ex 2/22

Compact

- **Can be used where space is tight:** Overall diameter of only 36 mm.
- **Shaft version can be mounted on a tight radius:** fixing holes on Ø 26 mm.
- **Hollow shaft version is ideal for large shafts:** blind hollow shaft up to 10 mm.

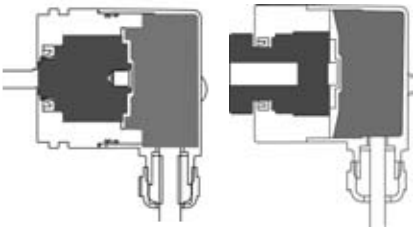
Versatile

- **Enables simple installation:** Reference point can be identified via LED (green).
- **May be fixed on various diameters:** Fixing holes on Ø 26mm and Ø 30mm.
- **May be used in outdoor applications with large fluctuations in temperature:** Resistant against humidity and condensation.

Mechanical characteristics:

Max. speed:	6,000 RPM
Starting torque:	< 8.5 oz-in (< 0.06 Nm)
Radial load capacity of shaft:	9.0 lbs (40 N)
Axial load capacity of shaft:	7.0 lbs (31 N)
Weight:	approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529 / DIN 40050-9:	IP67 / IP69K
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature range::	-40 to +185°F (-40 to +85°C)
Materials:	Shaft: stainless steel, Flange: aluminium, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:	500 g (5,000 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	30 g (300 m/s²), 10-2,000 Hz
Permanent shock resistance acc. to DIN-IEC 68-2-29:	100 g (1,000 m/s²), 2 ms
Vibration (broad-band random) to DIN-IEC 68-2-64:	5-2,500 Hz, 10 g (100 m/s²) - rms

All-round protection thanks to Safety-Lockplus™ and Sensor-Protect™ technology



Safety-Lockplus™:
IP69K protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.

Sensor-Protect™:
Fully encapsulated electronics, separate mechanical bearing assembly.

Sendix absolute, singleturn encoder type 3650 (shaft) / 3670 (blind hollow shaft) SSI

Electrical characteristics SSI Interface:

Sensor:	
Supply voltage:	5 - 30 VDC [1]
Current consumption (without output load):	typ 22 mA, max. 41 mA
Reverse polarity protection at power supply ($+_V$):	Yes
Measuring range:	360°
Resolution/Code:	9 Bit/Binary
Linearity 77°F (25°C):	<1.0%
Repeat accuracy:	<0.2%
Data refresh rate:	typ 100 µs
Status LED:	Green, reference point at 2.1°

RoHS compliant acc. to EU guideline 2002/95/EG	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4, EN 61000-6-3 and EN 61000-4-8 (behavior under magnetic influence).	
SSI interface:	
Clock speed:	100 kHz-750 kHz
Output driver:	RS485
Monoflop time typ./max.K:	16 µs/20 µs
Short-circuit proof outputs:	Yes [2]
Permissible load/channel	typ. 120 Ohm (corresponding RS485)

[1] The supply voltage at the encoder input must not be less than 4.75 V (5 V - 5%)
[2] Short-circuit to 0 V or to output, only one channel at a time, supply voltage correctly applied

Pin configuration:

Signal:	Common (0 V)	+V	0 V Sens	+V Sens	+Clock	-Clock	+Data	-Data
Color:	WH	BN	BU	RD	GN	YE	GY	PK

Part number key: 3650 shaft version

T8.3650.XXXX.XXXX

Type

Flange
2 = servo flange

Shaft (Ø x L)
3 = Ø 6 mm x 12.5 mm
6 = Ø 6.35 mm (1/4") x 12.5 mm

Output and voltage supply
2 = 5-30 VDC, SSI

Type of connection
2 = radial cable (1 m PUR cable)

Code type and division
B9 = 9 Bit binary

Option 1
1 = count direction cw*
2 = count direction ccw*

Option 1
1 = IP67
2 = IP69K

Part number key: 3670 blind hollow shaft version

T8.3670.XXXX.XXXX

Type

Flange
2 = flange with long torque stop
5 = flange with slotted flex mount

Blind hollow shaft (18 mm depth)
2 = Ø 6 mm
3 = Ø 6.35 mm (1/4“)
4 = Ø 8 mm
6 = Ø 10 mm

Output and voltage supply
2 = 5-30 VDC, SSI

Type of connection
2 = radial cable (1 m PUR cable)

Code type and division
B9 = 9 Bit binary

Option 1
1 = count direction cw*
2 = count direction ccw*

Option 1
1 = IP67
2 = IP69K

*cw = increasing code values when shaft turning clockwise (cw). Top view on shaft.

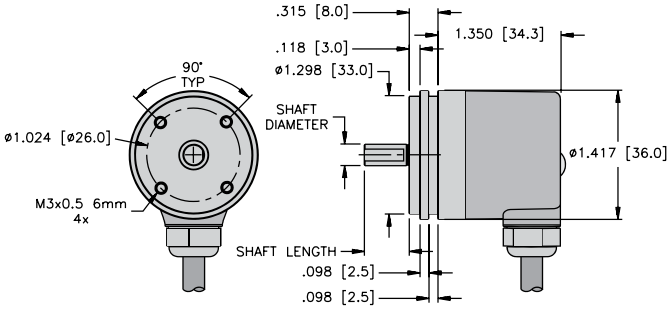
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

Sendix absolute, singleturn encoder type 3650 (shaft) / 3670 (blind hollow shaft) SSI

Dimensions: 3650 shaft version

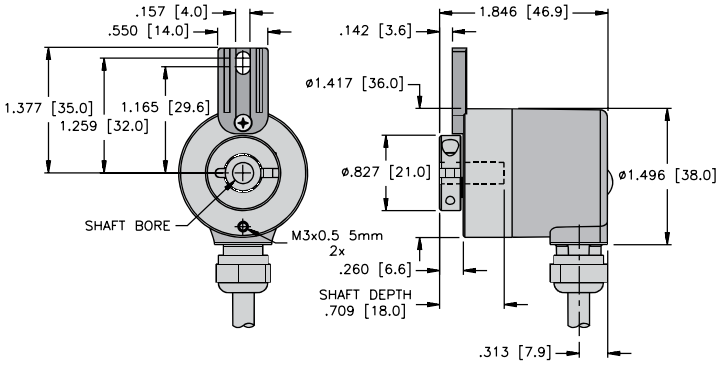
3650 flange 2
Cable connection 2



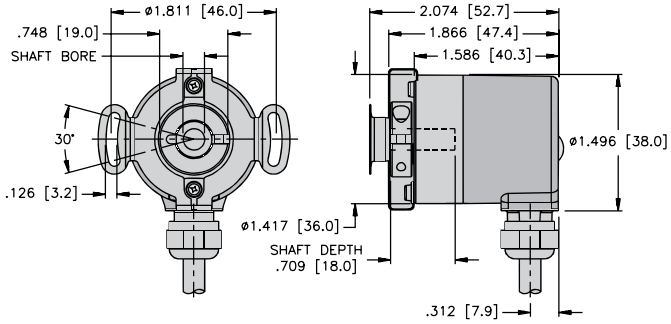
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: 3670 blind hollow shaft version

3670 flange 2
Cable connection 2



3670 flange 5
Cable connection 2



Sendix absolute, singleturn encoder type 3651 (shaft) / 3671 (blind hollow shaft) analog

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Short-circuit proof | Reverse polarity protection | Output

Rugged

- **Non-contact measuring system:** Ensures long service life and the reliability of the application.
- **Stays sealed even when subjected to harsh everyday use.** Solid die-cast housing with up to IP69K protection offers security against failures in the field.
- **Wide temperature range of -40 to +185°F (-40 to +85°C).**
- **Increased ability to withstand vibration and installation errors.** High shock (> 500 g) and vibration resistance (> 30 g) eliminates machine downtime and repairs.

Sendix® absolute

RoHS compliant Ex 2/22

Compact

- **Can be used where space is tight:** Overall diameter of only 36 mm.
- **Shaft version can be mounted on a tight radius:** fixing holes on Ø 26 mm.
- **Hollow shaft version is ideal for large shafts:** blind hollow shaft up to 10 mm.

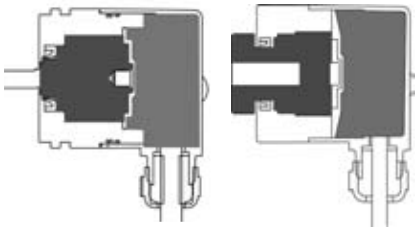
Versatile

- **Interface of 4-20 mA, 0-10 V:** One size available for different applications.
- **Measuring range of 45°, 90°, 180° and 360°.**
- **Easy diagnosis in case of fault condition:** Error indication via red LED (only current output).
- **Hollow shaft version may be fixed individually:** Torque stop and flex coupling available.
- **May be used in outdoor applications with large fluctuations in temperature:** Resistant against humidity and condensation.

Mechanical characteristics:

Max. speed:	6,000 RPM
Starting torque:	< 8.5 oz-in (< 0.06 Nm)
Radial load capacity of shaft:	9.0 lbs (40 N)
Axial load capacity of shaft:	7.0 lbs (31 N)
Weight:	approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529 / DIN 40050-9:	IP67 / IP69K
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature range::	-40 to +185°F (-40 to +85°C)
Materials:	Shaft: stainless steel, Flange: aluminium, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:	500 g (5,000 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	30 g (300 m/s²), 10-2,000 Hz
Permanent shock resistance acc. to DIN-IEC 68-2-29:	100 g (1,000 m/s²), 2 ms
Vibration (broad-band random) to DIN-IEC 68-2-64:	5-2,500 Hz, 10 g (100 m/s²) - rms

All-round protection thanks to Safety-Lockplus™ and Sensor-Protect™ technology



Safety-Lockplus™:
IP69K protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.

Sensor-Protect™:
Fully encapsulated electronics, separate mechanical bearing assembly.

TURCK
Industrial Automation

Sendix absolute, singleturn encoder type 3651 (shaft) / 3671 (blind hollow shaft) analog

Electrical characteristics current interface 4-20 mA:

Sensor:	
Supply voltage:	18-30 VDC
Current consumption (without output load):	typ 32 mA, max. 38 mA
Reverse polarity protection at power supply (+V):	Yes
Measuring range:	45°, 90°, 180° or 360°
Resolution/Code:	12 Bit
Linearity 77°F (25°C):	< 1° (360° measurement range)
Repeat accuracy:	< 0.1° (360 ° measurement range)
Status LED:	Red: sensor break detection, output load monitoring Green: reference point (CW: 0° to 1°) (CCW: 0° to -1°)

4-20 mA current loop

Output load:	max. 900 ohms at 24 VDC
Setting time:	1 ms (Rload = 400 Ohm, 77°F (25°C))

Short-circuit proof outputs: when the supply voltage is correctly applied, then output to output is short-circuit protected, but not output to 0 V or to +V.

Supply voltage and sensor output signal are not galvanically isolated.

Electrical characteristics voltage interface 0-10 V:

Sensor:	
Supply voltage:	18-30 VDC
Current consumption (without output load):	typ 32 mA, max. 38 mA
Reverse polarity protection at power supply (+V):	Yes
Measuring range:	45°, 90°, 180° or 360°
Resolution/Code:	12 Bit
Linearity 77°F (25°C):	< 1° (360° measurement range)
Repeat accuracy:	< 0.1° (360 ° measurement range)

0-10 V voltage output:	
Current output:	max. 10 mA
Setting time:	< 1 ms (Rlast > 1 KOhm, 77°F (25°C))
Short-circuit proof outputs:	Yes[2)]

Supply voltage and sensor output signal are not galvanically isolated.

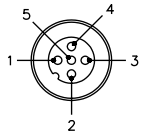
[2)] Short-circuit proof outputs: when the supply voltage is correctly applied, then output to output is short-circuit protected, but not output to 0 V or to +V.

Pin configuration:

Signal:	Common (0 V)	+V	+I	-I
Color:	WH	BN	GN	YE
M12 pin:	3	2	4	5

Wiring Diagram:

Male encoder view



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 4.5T-1695-*/A

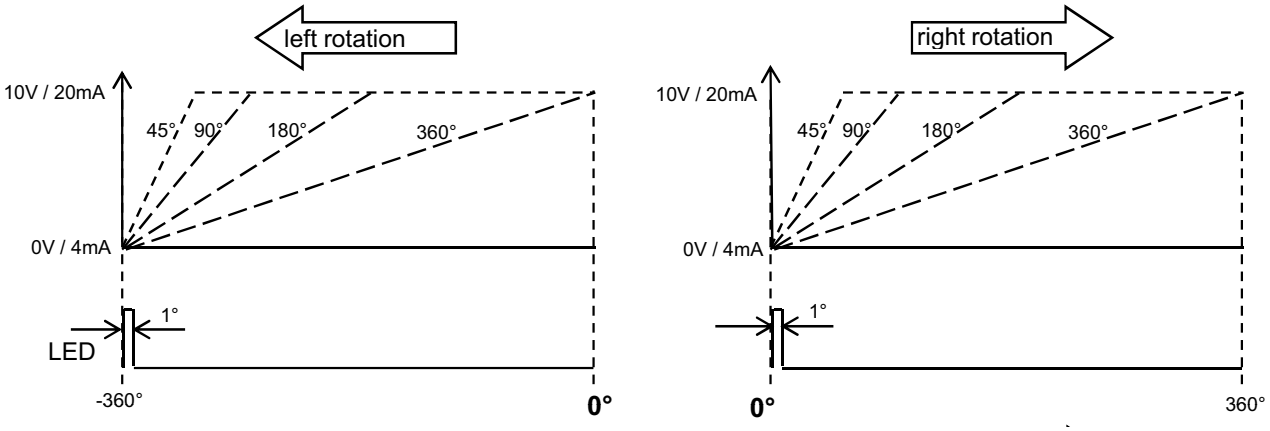
* Length in meters.

Sendix absolute, singleturn encoder type 3651 (shaft) / 3671 (blind hollow shaft) analog

Note: Encoders must be ordered with a clockwise or counterclockwise profile. This determines whether the analog output increases or decreases in the given direction.

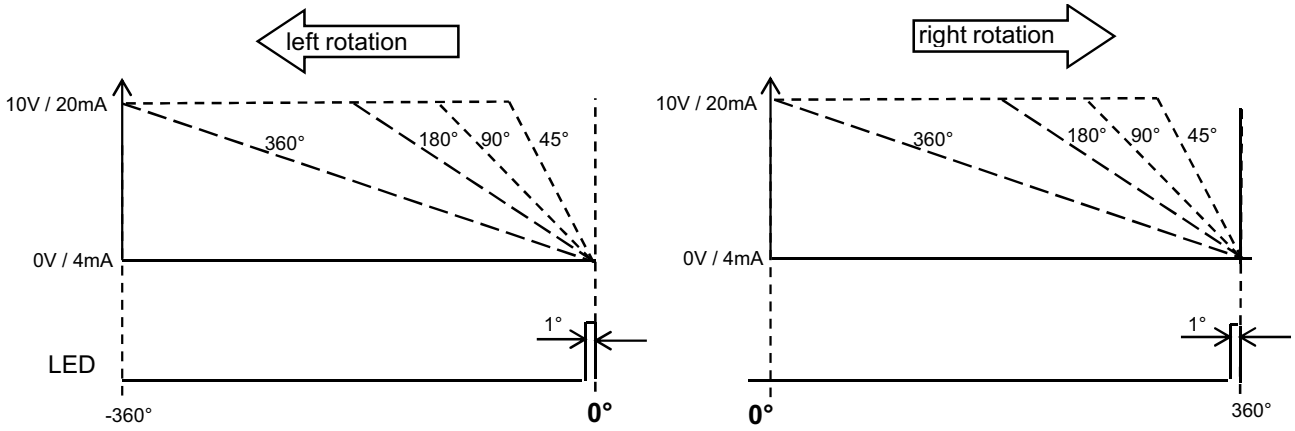
Example (output signal profile):
Measuring range 45° / 90° / 180° / 360°

Clockwise (CW) version



Example (output signal profile):
Measuring range 45° / 90° / 180° / 360°

Counterclockwise (CCW) version



General characteristics:

Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4, EN 61000-6-3 and EN 61000-4-8 (behavior under magnetic influence).

RoHS compliant acc. to EU guideline 2002/95/EG.

TURCK Industrial Automation

Sendix absolute, singleturn encoder type 3651 (shaft) / 3671 (blind hollow shaft) analog

Part number key: 3651 shaft version

T8.3651.XXXX.XXXX

Type

Flange

2 = servo flange

Shaft (Ø x L)

3 = Ø 6 mm x 12.5 mm
5 = Ø 6.35 mm (1/4") x 12.5 mm
6 = Ø 8 mm x 12.5 mm

Output and voltage supply

3 = 18-30 VDC, current output
4 = 18-30 VDC, voltage output

Type of connection

2 = radial cable (1 m PUR)
4 = radial 8-pin M12 ***eurofast*** ® connector

Option 1

1 = IP67
2 = IP69K

Option 1

1 = count direction cw*
2 = count direction ccw*

Output

3 = 4-20 mA
4 = 0-10 V

Measurement range

1 = 1 x 360°
2 = 1 x 180°
3 = 1 x 90°
4 = 1 x 45°

*cw = increasing code values when shaft turning clockwise (cw). Top view on shaft.

Part number key: 3671 blind hollow shaft version

T8.3671.XXXX.XXXX

Type

Flange

2 = flange with long torque stop
5 = flange with slotted flex mount

Blind hollow shaft (18 mm insertion depth)

2 = Ø 6 mm
3 = Ø 6.35 mm (1/4")
4 = Ø 8 mm
6 = Ø 10 mm

Output and voltage supply

3 = 18-30 VDC, current output
4 = 18-30 VDC, voltage output

Type of connection

2 = radial cable (1 m PUR)
4 = radial 8-pin M12 ***eurofast*** connector

Option 1

1 = IP67
2 = IP69K

Option 1

1 = count direction cw*
2 = count direction ccw*

Output

3 = 4-20 mA
4 = 0-10 V

Measurement range

1 = 1 x 360°
2 = 1 x 180°
3 = 1 x 90°
4 = 1 x 45°

*cw = increasing code values when shaft turning clockwise (cw). Top view on shaft.

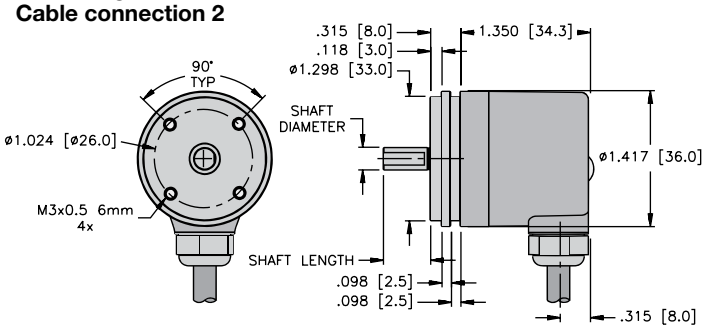
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

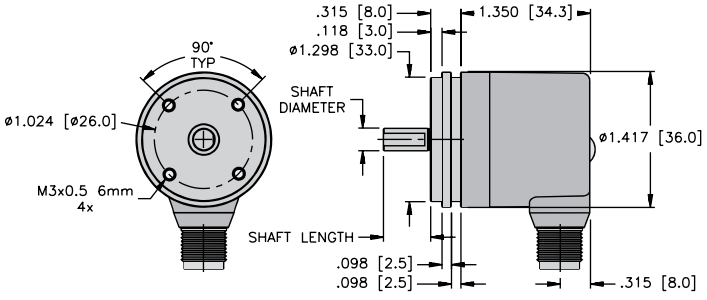
Sendix absolute, singleturn encoder type 3651 (shaft) / 3671 (blind hollow shaft) analog

Dimensions: 3651 shaft version

3651 flange 2
Cable connection 2



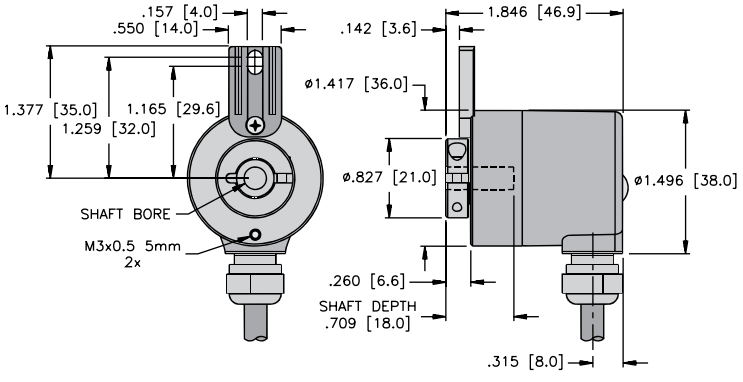
3651 flange 2
M12 *eurofast*® connection 4



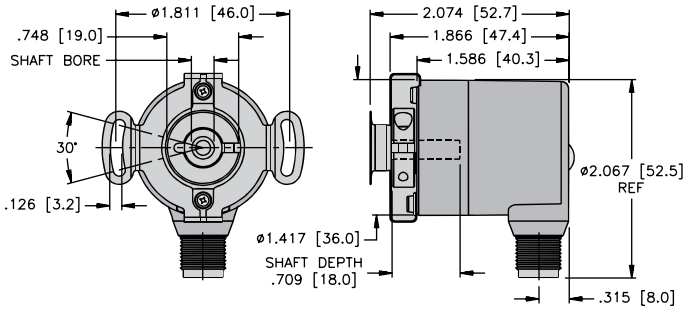
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: 3671 blind hollow shaft version

3671 flange 2
Cable connection 2



3671 flange 5
M12 *eurofast* connection 4



TURCK
Industrial Automation

Sendix absolute, singleturn type F3653 (shaft) / F3673 (blind / hollow shaft) SSI/BiSS

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN/COS

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability:** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range of -40 to +194°F (-40 to +90°C).**
- **Easy diagnosis in case of fault condition.** Status indication by means of LED, sensor, voltage and temperature monitoring.

Sendix® absolute

SSI

BiSS INTERFACE

pending 2/22

Fast

- **High accuracy:** Update rate of the whole position value above 100 kHz for a max. jitter of 1 µs (real-time).
- **High productivity due to very short regulation cycles:** Clock rate with SSI up to 2 MHz, with BiSS up to 10 MHz.
- **High-resolution feedback system achievable in real-time:** SinCos incremental outputs.

Versatile

- **Connections for every application:** Tangential cable or M12 connector.
- **Open interfaces ensure flexibility and independence:** SSI or BISS with Sine-Cosine-Option incremental track RS422.
- Multiple mounting brackets for easy installation.
- **Compact design.**
- **Fast and easy start-up on site:** Preset and reversal of rotation direction by control inputs.
- **Direct mounting on standard diameter shafts up to 10 mm through hollow shaft up to 8 mm.**

Mechanical characteristics:

Max. speed: Shaft or blind hollow shaft version without shaft sealing (IP65): Shaft version (IP67) or blind hollow shaft (IP65) with shaft sealing:	12,000 RPM, continuous operation 10,000 RPM 10,000 RPM, continuous operation 8,000 RPM
Starting torque without shaft sealing:	< 1 oz-in (< 0.007 Nm)
Starting torque with shaft sealing:	< 1.4 oz-in (< 0.01 Nm)
Radial load capacity of shaft:	9 lbs (40 N)
Axial load capacity of shaft:	7.0 lbs (31 N)
Weight:	approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature: Cable routing	-40 to +194°F (-40 to +90°C) fixed installation: -22°F (-30°C) flexible installation: -4°F (-20°C)
Materials:	Shaft/Hollow shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:	> 250g (> 2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (>100 m/s²), 55-2,000 Hz

Sendix absolute, singleturn type F3653 (shaft) / F3673 (blind / hollow shaft) SSI/BiSS

General electrical characteristics:

Supply voltage:	5 VDC ± 5 % or 10-30 VDC
Current consumption (without output load):	5 VDC: max. 70 mA, 24 VDC: max. 20 mA
Reverse polarity protection at power supply (+V):	yes

Conforms to CE requirements according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3

RoHS compliant according to EU guideline 2002/95/EG

General interface characteristics:

Output driver:	RS485 transceiver type
Permissible load/channel:	max. ± 20 mA
Signal level high:	typ. 3.8 V
Signal level low at I_{load} = 20 mA:	typ. 1.3 V
Short-circuit proof outputs:	yes [2]

Interface characteristics SSi:

Singleturn resolution:	10-17 bit [3]
Code:	Binary or Gray
SSI clock rate:	< 14 bit: 50 kHz-2 MHz < 15 bit: 50 kHz-125 kHz
Monoflop time:	> 15 µs [3]

Note:
If clock starts cycling within monoflop time, a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. Max. update rate is dependent on clock speed, data length and monoflop time.

Time jitter (data request to position latch):	< 1 µs up to 14 bits, < 4 µs at 15-17 bits
Status and Parity bit:	optional on request

Interface characteristics BiSS:

Singleturn resolution:	10-17 bit, customer programmable [3]
Code:	Binary
Interfaces:	RS485
Clock rate:	up to 10 MHz
Max. update rate:	< 10 µs, depending on clock speed and data length
Time jitter (data request to position latch):	< 1 µs

Note:
- Bidirectional, programmable parameters are: resolution, code, direction, alarms and warnings
- Multicycle data output, e.g. for temperature
- CRC data verification

Incremental output (A/B). 2048 ppr:

	Sin/Cos	RS 422 (TTL compatible)
Max. -3dB frequency:	400 kHz	400kHz
Signal level:	1 Vpp (± 20%)	high: min. 2.5 V low: max. 0.5 V
Short-circuit proof:	yes [2]	yes [2]

SET input:

Input characteristics:	active HIGH
Input type:	comparator
Signal level high:	min. 60 % of V+ (supply voltage), max: V+
Signal level low:	max. 25 % of V+ (supply voltage)
Input current:	< 0.5 mA
Min. pulse duration (SET):	10 ms
Timeout after SET input:	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET key. Other preset values can be factory programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. During this time the LED is ON and the status output is at LOW.

DIR input:

A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.

Status output and LED:

Output driver:	Open collector, internal pull up resistor 22 kOhm
Permissible load:	-20 mA
Signal level high:	+V
Signal level low:	< 1 V
Active at:	Low

The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open-collector with int. pull-up 22k).

If the LED is ON (status output LOW) this indicates:
- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or aging
- Over- or under-temperature
- Undervoltage

In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

Power-on delay:

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

[2] Short-circuit to 0 V or to output, one channel at a time, supply voltage correctly applied
[3] Other options upon request

TURCK Industrial Automation

Sendix absolute, singleturn type F3653 (shaft) / F3673 (blind / hollow shaft) SSI/BiSS

Pin configuration:

Interface 1 and 2 (SSI or BiSS, SET, DIR, Status) (Connection 1, 2)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	SET	DIR	Status	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	Shield

Interface 1 and 2 (SSI or BiSS, SET, DIR) (Connection 3)

Signal:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	Sheild/PE
M12 pin:	1	2	3	4	5	6	7	8	PH

Interface 3 and 4 (SSI or BiSS, SET, DIR, 2048 Sin/Cos) (Connection 1, 2)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Interface 5 (SSI or BiSS, SET, DIR, voltage sense outputs) (Connection 1, 2)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	0 V sens	+V sens	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	RD/BU	VT	Shield

Interface 6 (SSI or BiSS, SET, DIR, 2048 Sin/Cos, voltage sense outputs) (Connection 1, 2)

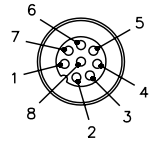
Output:	GND	+V	+Clock	-Clock	+Data	-Data	0 V sens	+V sens	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Interface 7 and 8 (SSI or BiSS, SET, DIR, 2048 Sin/Cos) (Connection 1, 2)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BK	VT	RD	RD/BU	Shield

Wiring diagrams:

Male Encoder View



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 8T-264-*

* Length in meters.

Sendix absolute, singleturn type F3653 (shaft) / F3673 (blind / hollow shaft) SSI/BiSS

Part number key: F3653 shaft version

T8.F3653.XXXX.XX1X

Type

Flange

2 = servo flange Ø 36 mm, IP67
4 = servo flange Ø 36 mm, IP65

Shaft (Ø x L)

1 = Ø 6 mm x 12.5 mm
2 = Ø 6.35 mm (1/4") x 12.5 mm
3 = Ø 8 mm x 15 mm
4 = Ø 9.525 mm (3/8") x 15.875 mm (5/8")
5 = Ø 10 mm x 20 mm

Output and voltage supply

1 = 5 VDC, SSI or BiSS
2 = 10-30 VDC, SSI or BiSS
3= 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422
8 = 10-30 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422

Inputs/outputs

2 = SET, DIR input (additional status output)

Options (service)

1 = no option

Resolution

A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

Code

B = SSI, binary
C = BiSS, binary
G = SSI, gray

Type of connection

1 = tangential cable outlet (1 m PUR)
3 = tangential cable outlet (5 m PUR)
8 = axial 8-pin M12 ***eurofast***® connector (only for output types 1 and 2)

Part number key: F3673 blind / hollow shaft version

T8.F3673.XXXX.XX1X

Type

Flange

1 = torque stop Ø 36 mm, IP65
2 = slotted flex mount Ø 36 mm, IP65

Hollow shaft

1 = Ø 6 mm
2 = Ø 6.35 mm (1/4")
3 = Ø 8 mm
4 = Ø 10 mm blind hollow shaft (14.5 mm depth)

Output and voltage supply

1 = 5 VDC, SSI or BiSS
2 = 10-30 VDC, SSI or BiSS
3= 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422
8 = 10-30 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422

Inputs/outputs

2 = SET, DIR input (additional status output)

Options (service)

1 = no option

Resolution

A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

Code

B = SSI, binary
C = BiSS, binary
G = SSI, gray

Type of connection

1 = tangential cable outlet (1 m PUR)
3 = tangential cable outlet (5 m PUR)
8 = axial 8-pin M12 ***eurofast*** connector (only for output types 1 and 2)

Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

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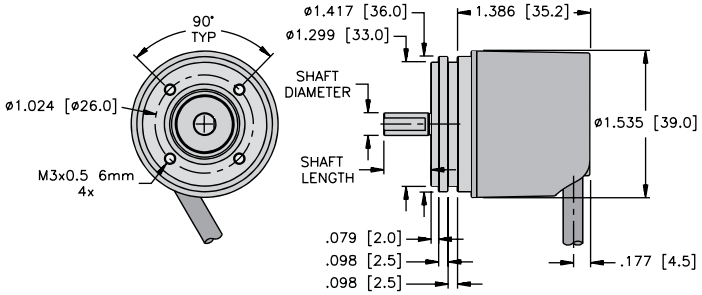
Industrial Automation

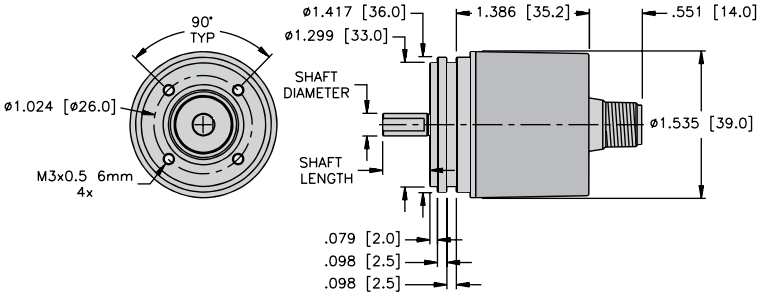
Sendix absolute, singleturn type F3653 (shaft) / F3673 (blind / hollow shaft) SSI/BiSS

Dimensions: F3653 shaft version

F3653 flange 2 & 4
Cable connection 1 & 3



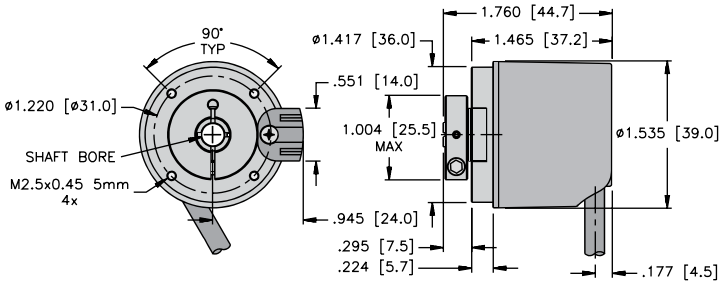
F3653 flange 2 & 4
M12 *eurofast*® connection 8



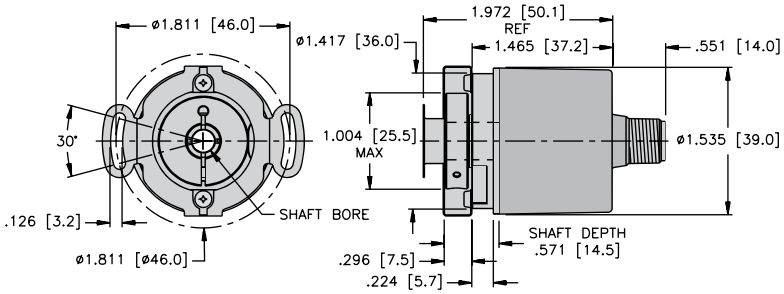
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: F3673 hollow shaft version

F3673 flange 1
Cable connection 1 & 3



F3673 flange 2 (blind hollow shaft)
M12 *eurofast* connection 8



Sendix absolute, singleturn type F3658 (shaft) / F3678 (blind hollow shaft) CANopen

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN/COS

Rugged
- Sturdy bearing construction: Safety Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors, thanks to IP67 protection.
- Wide temperature range: -22 to +185°F (-30 to +85°C).

Sendix® absolute
CANopen

RoHS compliant | pending | Ex 2/22

Compact
- **Overall size of 36 x 42 mm:** Hollow shaft of up to 8 mm, blind hollow shaft of up to 10 mm.

Versatile
- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- High-precision optical sensor technology can achieve a resolution of up to 17 bits.

Mechanical characteristics:

Max. speed: Shaft or blind hollow shaft version without shaft sealing (IP65): Shaft version (IP67) or blind hollow shaft (IP65) with shaft sealing:		12,000 RPM, continuous operation 10,000 RPM 10,000 RPM, continuous operation 8,000 RPM
Starting torque without shaft sealing:		< 1 oz-in (< 0.007 Nm)
Starting torque with shaft sealing:		< 1.4 oz-in (< 0.01 Nm)
Radial load capacity of shaft:		9.0 lbs (40 N)
Axial load capacity of shaft:		7.0 lbs (31 N)
Weight:		approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529:		Housing: IP67 Shaft: IP65, opt. IP67
EX approval for hazardous areas:		optional zone 2 and 22
Working temperature: (Cable type)	fixed: flexible:	-22 to +185°F (-30 to +85°C) -4 to +185°F (-20 to +185°C)
Materials:		Shaft/Hollow shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:		> 250g (> 2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:		> 10 g (>100 m/s²), 55-2,000 Hz

Diagnostic LED (two-color, red/green):

LED ON or blinking	red: green:	error display status display

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (no load):	24 V DC max. 60 mA
Reverse connection of the supply voltage (+V):	yes
RoHS compliant acc. to EG-guideline 2002/95/EG	
CE compliant acc. to EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3	

Interface characteristics CANopen:

Resolution Singleturn:	1-65536 (16 bit), scaleable: 1-65536
Default value Singleturn:	8192 (13 bit)
Code:	Binary
Interface:	CAN High-Speed according to ISO 11898, Basic- and Full-CAN , CAN Specification 2.0 B
Protocol:	CANopen profile DS 406 V3.1 with manufacturer specific add-ons LSS-Service DS305 V2.0
Baud rate:	10-1000 kbit/s (software configurable)
Node address:	1-127 (software configurable)
Termination switchable:	software configurable
LSS Protocol	CIA LSS protocol DS305 Global command support for node address and baud rate. Selective commands via attributes of the identity object

TURCK
Industrial Automation

Sendix absolute, singleturn type F3658 (shaft) / F3678 (blind hollow shaft) CANopen

General information about CANopen

The M3658 and M3678 CANopen encoder series support the latest CANopen communication profile according to DS 301 V4.02 . In addition, device specific profiles, like the DS 406 V3.1, are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again. Position, speed and status of the working area output values may be combined in a freely variable way as PDO mapping.

The encoders are available with a connector or a cable connection. The device address and baud rate may be set/modified by means of the software. A two-color LED indicates the operating or fault status of the CANbus, as well as the status of the internal diagnostics. Node address, baud rate and CANbus termination are programmable.

CANopen Communication Profile DS301 V4.02

The following functionality is integrated. Class C2 functionality:

- NMT Slave
- Heartbeat Protocol
- Identity Object
- Error Behavior Object
- Variable PDO Mapping self-start programmable (Power on to operational), 3 sending PDO's
- Node address, baud rate and CANbus/programmable termination

CANopen Encoder Profile DS406 V3.1

The following parameters may be programmed:

- Event mode
- One work area with upper and lower limit and the corresponding output states
- Variable PDO mapping for position, speed, work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status: 1 LED, two-color
- Customer-specific memory - 16 Bytes
- "Watchdog controlled" device

LSS Layer Setting Services DS305 V2.0

- Global support of Node-ID and baud rate
- Selective protocol via identity object (1018h)

Pin configuration:

Signal:	+V	0 V	CAN GND	CAN High	CAN Low
Color:	BN	WH	GY	GN	YE

Part number key: F3658 shaft version

T8.F3658.XX2X.2112

Type

Flange

1 = clamping flange, Ø 36 mm, IP67
2 = servo flange, Ø 36 mm, IP67
3 = clamping flange, Ø 36 mm, IP65
4 = servo flange, Ø 36 mm, IP65

Shaft (Ø x L)

1 = Ø 6 mm x 12.5 mm
2 = Ø 6.35 mm (1/4") x 12.5 mm
3 = Ø 8 mm x 15 mm
4 = Ø 9.525 mm (3/8") x 15.875 mm (5/8")
5 = Ø 10 mm x 20 mm

Fieldbus profile

21 = CANopen encoder profile DS406 V3.1

Type of connection

1 = tangential cable (1 m PUR cable)
3 = tangential cable (5 m PUR cable)

Output and voltage supply

2 = 10-30 VDC, CANopen DS301 V4.0

Part number key: F3678 blind hollow shaft version

T8.F3678.XX2X.2112

Type

Flange

1 = Ø 36 mm, with torque stop, IP65
2 = Ø 36 mm, with slotted flex mount, IP65

Blind hollow shaft (14.5 mm depth)

4 = Ø 10 mm
5 = Ø 6 mm
6 = Ø 6.35 mm (1/4")
7 = Ø 8 mm

Fieldbus profile

21 = CANopen encoder profile DS406 V3.1

Type of connection

1 = tangential cable (1 m PUR cable)
3 = tangential cable (5 m PUR cable)

Output and voltage supply

2 = 10-30 VDC, CANopen DS301 V4.0

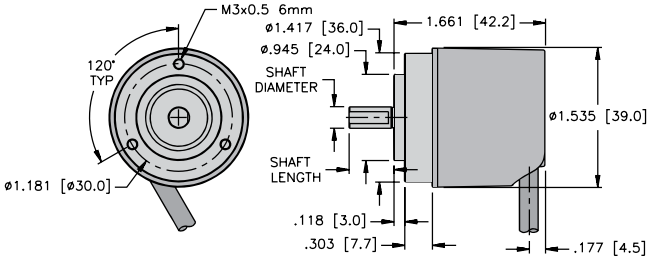
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

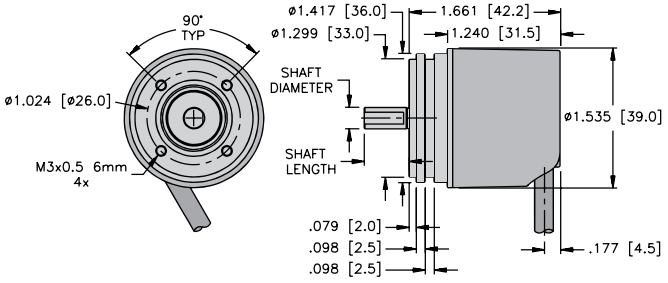
Sendix absolute, singleturn type F3658 (shaft) / F3678 (blind hollow shaft) CANopen

Dimensions: F3658 shaft version

F3658 flanges 1 & 3
Cable connection 1 & 3



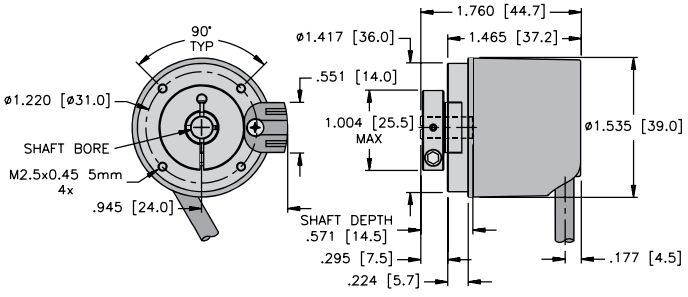
F3658 flanges 2 & 4
Cable connection 1 & 3



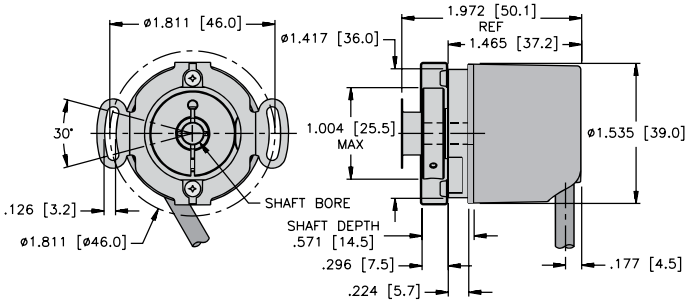
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: F3678 blind hollow shaft version

F3678 flange 1
Cable connection 1 & 3



F3658 flanges 2
Cable connection 1 & 3



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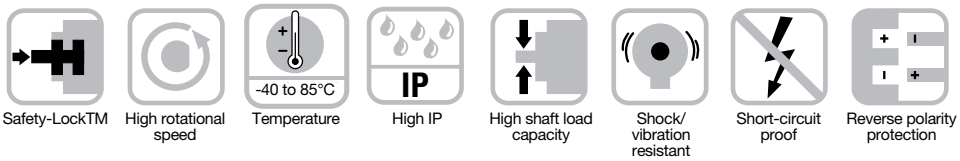
Industrial Automation

Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) CANopen



Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Short-circuit proof | Reverse polarity protection

Rugged

- **Non-contact measuring system:** Ensures long service life and the reliability of the application.
- **Stays sealed even when subjected to harsh everyday use.** Solid die-cast housing with up to IP69K protection offers security against failures in the field.
- **Wide temperature range of -40 to +185°F (-40 to +85°C).**
- **Increased ability to withstand vibration and installation errors.** High shock (> 500 g) and vibration resistance (> 30 g) eliminates machine downtime and repairs.

Sendix® absolute
CANopen

RoHS compliant | Ex | 2/22

Compact

- **Can be used where space is tight:** Overall diameter of only 36 mm.
- **Shaft version can be mounted on a tight radius:** fixing holes on Ø 26 mm.
- **Hollow shaft version is ideal for large shafts:** blind hollow shaft up to 10 mm.

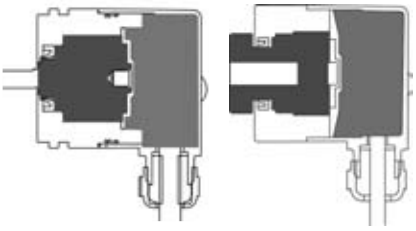
Versatile

- **CANopen fieldbus with the latest profiles.**
- **Connections for every application:** M12 connector or cable connection.
- **Real-time data:** Position, speed or working area. Variable PDO mapping in the memory.
- **Fast, error-free start-up, without setting any switches.** LSS services for configuration of the node address and baud rate via CIA DS 305 V2.0. Node address, baud rate and termination can be programmed via the bus.
- **Hollow shaft version may be fixed individually:** Torque stop and flex coupling available.
- **May be used in outdoor applications with large fluctuations in temperature:** Resistant against humidity and condensation.

Mechanical characteristics:

Max. speed:	6,000 RPM
Starting torque:	< 8.5 oz-in (< 0.06 Nm)
Radial load capacity of shaft:	9.0 lbs (40 N)
Axial load capacity of shaft:	7.0 lbs (31 N)
Weight:	approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529 / DIN 40050-9:	IP67 / IP69K
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature range::	-40 to +185°F (-40 to +85°C)
Materials:	Shaft: stainless steel, Flange: aluminium, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:	50 g (5,000 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	30 g (300 m/s²), 10-2,000 Hz
Permanent shock resistance acc. to DIN-IEC 68-2-29:	100 g (1,000 m/s²), 2 ms
Vibration (broad-band random) to DIN-IEC 68-2-64:	5-2,500 Hz, 10 g (100 m/s²) - rms

All around protection thanks to Safety-Lockplus™ and Sensor-Protect™ technology



Safety-Lockplus™:
IP69K protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.

Sensor-Protect™:
Fully encapsulated electronics, separate mechanical bearing assembly.

Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) CANopen

General electrical characteristics:

Sensor:	
Supply voltage:	8-30 VDC
Current consumption (without output load):	24 VDC, max. 25 mA
Reverse polarity protection at power supply (+V):	Yes
Measuring range:	360°
Linearity:	< 1
Repeat accuracy 77°F (25°C):	< 0.1
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4, EN 61000-6-3 and EN 61000-4-8 (behavior under magnetic influence).	
RoHS compliant acc. to EU guideline 2002/95/EG	

Diagnostic LED (two-color, red/green):

LED ON or blinking red: Error display
LED ON or blinking green: Status display

Interface characteristics CANopen:

Resolution:	1-16384 (14 bit), (scalable: 1-16384)
Default value:	16384 (14 bit)
Code:	Binary
Interface:	CAN High-Speed according to ISO 11898,
	Basic and Full CANCAN Specification 2.0 B
Protocol:	CANopen profile DS 406 V3.1 with manufacturer-specific add-ons LSS-Services DS305 V2.0
Baud rate:	10-1000 kbit/s (Software configurable)
Node address:	1-127 (Software configurable)
Termination switchable:	Software configurable
LSS Services:	CIA LSS protocol DS305 Global command support for node address and baud rate Selective commands via attributes of the identity object

General information about CANopen

The 3658 series of encoders support the latest CANopen communication profile according to DS 301 V4.02 . In addition, device-specific profiles are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANopen fieldbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

Position and status output values may be combined in a freely variable way as mapping.

The encoders are available with a connector or a cable connection. The device address and baud rate can be set or modified by means of the software. The two-color LED indicates the operating or fault status of the CANopen fieldbus, as well as the status of the internal diagnostics. Node address, baud rate and CANopen termination are programmable.

CANopen Communication Profile DS301 V4.02

The following Class C2 functionality is integrated:

- NMT Slave
- Heartbeat Protocol
- Identity Object
- Error Behavior Object
- Variable PDO Mapping self-start programmable (power on to operational), 3 Sending PDO's
- Node address, baud rate and CANopen
- Programmable termination

CANopen Encoder Profile DS406 V3.1

The following parameters may be programmed:

- Event mode
- One work area with upper and lower limit and the corresponding output states
- Variable PDO mapping for position, speed and work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status – one LED, two colors
- Customer-specific memory – 16 Bytes
- Watchdog controlled device

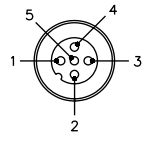
LSS Layer Setting Services DS305 V2.0

- Global support of Node-ID and baud rate
- Selective protocol via identity object (1018h)

Pin configuration:

Signal:	+V	Common (0 V)	CAN GND	CAN High	CAN Low
Color:	BN	WH	GY	GN	YE
M12 pin:	2	3	1	4	5

Wiring Diagram:

Male encoder view

M12 ***eurofast*** ® pinout
Mating cordset: **E-RKC 4.5T-1695-*/A**

* Length in meters.

Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) CANopen

Part number key: M3658 shaft version

T8.M3658.XXXX.21XX

Type

Flange
2 = servo flange

Shaft (Ø x L)
3 = Ø 6 mm x 12.5 mm
5 = Ø 6.35 mm (1/4") x 12.5 mm
6 = Ø 8 mm x 12.5 mm

Output and voltage supply
C = 8-30 VDC, CANopen DS301 V4.02

Option 1
1 = IP67
2 = IP69K

Option 1
1 = standard

Fieldbus profile
21 = CANopen encoder profile DS406 V3.1

Type of connection
2 = radial cable (1 m PUR)
4 = radial 8-pin M12 ***eurofast*** ® connector

Part number key: M3678 blind hollow shaft version

T8.M3678.XXXX.21XX

Type

Flange
2 = flange with long torque stop
5 = flange with slotted flex mount

Blind hollow shaft (18 mm depth)
2 = Ø 6 mm
3 = Ø 6.35 mm (1/4")
4 = Ø 8 mm
6 = Ø 10 mm

Output and voltage supply
C = 8-30 VDC, CANopen DS301 V4.02

Option 1
1 = IP67
2 = IP69K

Option 1
1 = standard

Fieldbus profile
21 = CANopen encoder profile DS406 V3.1

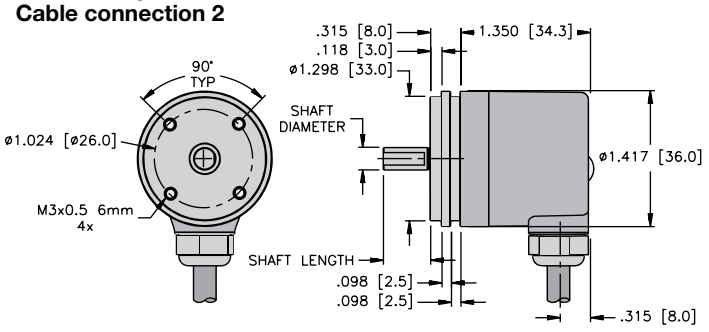
Type of connection
2 = radial cable (1 m PUR)
4 = radial 8-pin M12 ***eurofast*** connector

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

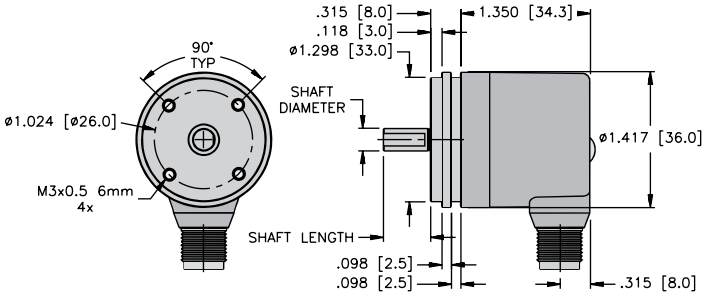
Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) CANopen

Dimensions: M3658 shaft version

M3658 flange 2
Cable connection 2



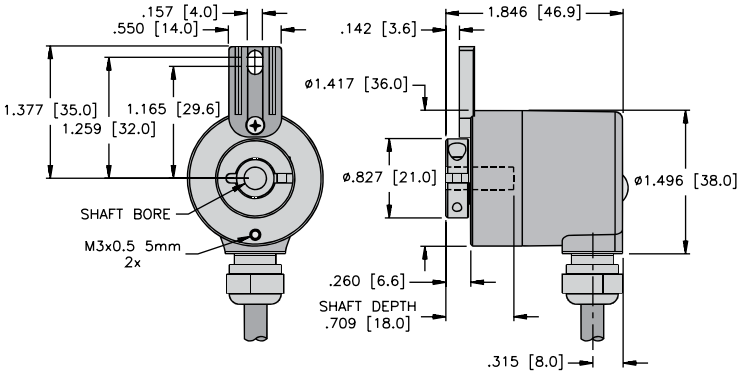
M3658 flange 2
M12 *eurofast*® connection 4



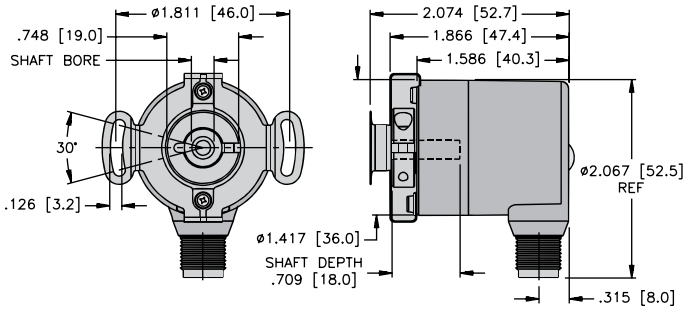
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: M3678 blind hollow shaft version

M3678 flange 2
Cable connection 2

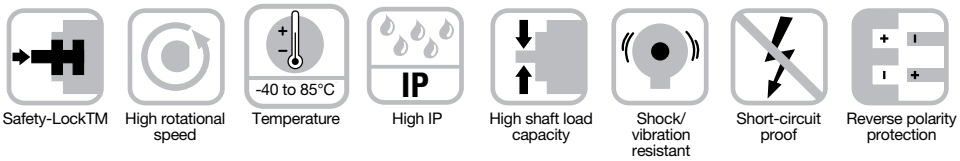


M3678 flange 5
M12 *eurofast* connection 4



TURCK
Industrial Automation

Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) SAE J1939



Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Short-circuit proof | Reverse polarity protection

Rugged

- **Non-contact measuring system:** Ensures long service life and the reliability of the application.
- **Stays sealed even when subjected to harsh everyday use.** Solid die-cast housing with up to IP69K protection offers security against failures in the field.
- **Wide temperature range of -40 to +185°F (-40 to +85°C).**
- **Increased ability to withstand vibration and installation errors.** High shock (> 500 g) and vibration resistance (> 30 g) eliminates machine downtime and repairs.

RoHS compliant | Ex | 2/22

Compact

- **Can be used where space is tight:** Overall diameter of only 36 mm.
- **Shaft version can be mounted on a tight radius:** fixing holes on Ø 26 mm.
- **Hollow shaft version is ideal for large shafts:** blind hollow shaft up to 10 mm.

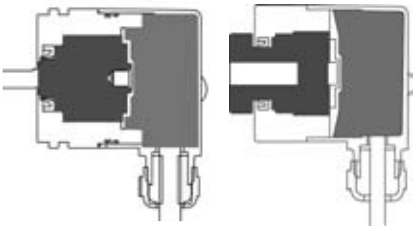
Versatile

- **Latest fieldbus performance:** SAE J1939 with CAN Highspeed according to ISO 11898.
- **Connections for every application:** M12 connector or cable connection.
- **Simple, fast recognition of the operating status:** Bicolored LED signalizes Bus-Status or potential errors.
- **Fast, error-free start-up, no need to set switches:** Automatic address allocation via Address Claiming (ACL).
- **May be used in outdoor applications with large fluctuations in temperature:** Resistant against humidity and condensation.

Mechanical characteristics:

Max. speed:	6,000 RPM
Starting torque:	< 8.5 oz-in (< 0.06 Nm)
Radial load capacity of shaft:	9.0 lbs (40 N)
Axial load capacity of shaft:	7.0 lbs (31 N)
Weight:	approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529 / DIN 40050-9:	IP67 / IP69K
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature range::	-40 to +185°F (-40 to +85°C)
Materials:	Shaft: stainless steel, Flange: aluminium, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:	50 g (5,000 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	30 g (300 m/s²), 10-2,000 Hz
Permanent shock resistance acc. to DIN-IEC 68-2-29:	100 g (1,000 m/s²), 2 ms
Vibration (broad-band random) to DIN-IEC 68-2-64:	5-2,500 Hz, 10 g (100 m/s²) - rms

All-round protection thanks to Safety-Lockplus™ and Sensor-Protect™ technology



Safety-Lockplus™:
protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.

Sensor-Protect™:
Fully encapsulated electronics, separate mechanical bearing assembly.

Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) SAE J1939

General electrical characteristics:

Supply voltage:	8-30 VDC
Current consumption (without output load):	24 VDC, max. 25 mA
Reverse polarity protection at power supply (+V):	Yes
Measuring range:	360°
Linearity:	< 1°
Repeat accuracy 77°F (25°C):	< 0.1°
Data refresh:	400 µs

Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4, EN 61000-6-3 and EN 61000-4-8 (behavior under magnetic influence).

RoHS compliant acc. to EU guideline 2002/95/EG

Interface characteristics CANopen:

Resolution:	1-16384 (14 bit), (scalable: 1-16384)
Default value:	16384 (14 bit)
Code:	Binary
Interface:	CAN High-Speed according to ISO 11898
	Basic and Full CAN CAN Specification 2.0 B
Protocol:	J1939
Baud rate:	250 kbit/s (Software configurable)
Node address:	1-255 (via address claiming)
Termination:	Software configurable

Diagnostic LED (two-color, red/green):

LED ON or blinking red: Error display

LED ON or blinking green: Status display

General information concerning SAE J1939

The protocol J1939 originates from the international Society of Automotive Engineers (SAE) and operates on the physical layer with high speed CAN as per ISO11898. The application emphasis lies in the area of the power train and chassis of commercial vehicles. It serves to transfer diagnostic data (for example, motor speed, position, temperature) and control information. Series M3658 and M3678 encoders support the total functionality of J1939.

This protocol is a multimaster system with decentralized network management that does not involve channel-based communication. It supports up to 254 logic nodes and 30 physical control devices per segment. The information is described as Parameters (signals) and combined on 4 memory pages (Data Pages) into Parameter Groups (PGs). Each parameter group can be identified via a unique number, the Parameter Group Number (PGN). Independently of this, each signal is assigned a unique SPN (Suspect Parameter Number).

The major part of the communication occurs cyclically and can be received by all control devices without the explicit request for data (Broadcast). Furthermore, the parameter groups are optimized to a length of 8 data bytes. This enables very efficient utilization of the CAN protocol.

If greater amounts of data need to be transferred, then transport protocols (TP) can be used: BAM (Broadcast Announce Message) and CMDT (Connection Mode Data Transfer). With BAM TP the transfer of data occurs as a broadcast.

Encoder implementation SAE J1939

- PGNs that are adaptable to the customer's application
- Resolution of address conflicts -> Address Claiming (ACL)
- Continuous checking whether control addresses have been assigned twice within a network
- Change of control device addresses during run-time
- Unique identification of a control device with the help of a name that is unique worldwide
- This name serves to identify the functionality of a control device in the network
- Predefined PGs for Position, Speed and Alarm
- 250 kBit/s, 29-Bit Identifier
- Watchdog controlled device

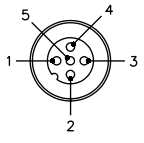
A two-color LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.

Terminal assignment:

Signal:	+V	0 V	CAN GND	CAN High	CAN Low
M12 pin:	2	3	1	4	5
Color:	BN	WH	GY	GN	YE

Wiring Diagram:

Male encoder view



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 4.5T-1695-*/A

* Length in meters.

TURCK
Industrial Automation

Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) SAE J1939

Part number key: M3658 shaft version

T8.M3658.XXXX.32XX

Type

Flange
2 = servo flange

Shaft (Ø x L)
3 = Ø 6 mm x 12.5 mm
5 = Ø 6.35 mm (1 1/4") x 12.5 mm
6 = Ø 8 mm x 12.5 mm

Output and voltage supply
C = 8-30 VDC, CAN highspeed

Option 1
1 = IP67
2 = IP69K

Option 1
1 = standard

Fieldbus profile
32 = J1939

Type of connection
2 = radial cable (1 m PUR)
4 = radial 8-pin M12 ***eurofast*** ® connector
seawater resistant version available on request

Part number key: M3678 blind hollow shaft version

T8.M3678.XXXX.32XX

Type

Flange
2 = flange with long torque stop
5 = flange with slotted flex mount

Blind hollow shaft (18 mm depth)
2 = Ø 6 mm
3 = Ø 6.35 mm (1/4")
4 = Ø 8 mm
6 = Ø 10 mm

Output and voltage supply
C = 8-30 VDC, CAN highspeed

Option 1
1 = IP67
2 = IP69K

Option 1
1 = standard

Fieldbus profile
32 = J1939

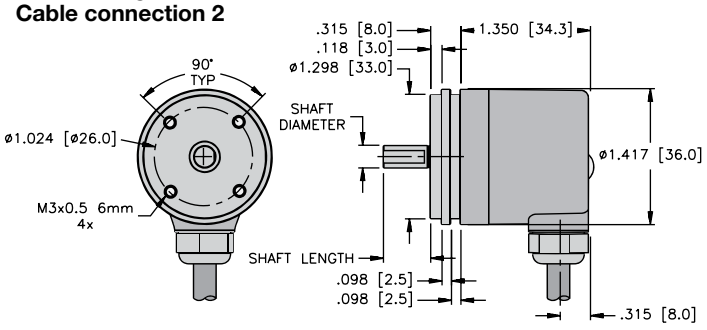
Type of connection
2 = radial cable (1 m PUR)
4 = radial 8-pin M12 ***eurofast*** ® connector
seawater resistant version available on request

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

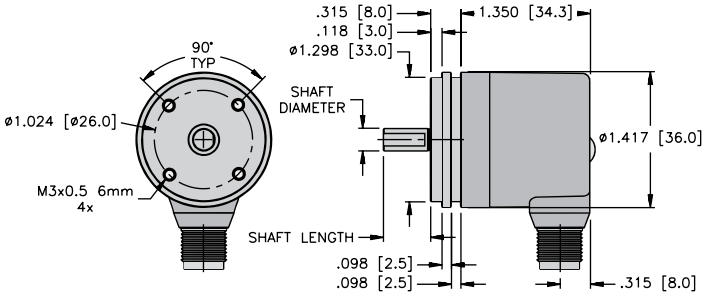
Sendix absolute, singleturn encoder type M3658 (shaft) / M3678 (blind hollow shaft) SAE J1939

Dimensions: M3658 shaft version

M3658 flange 2
Cable connection 2



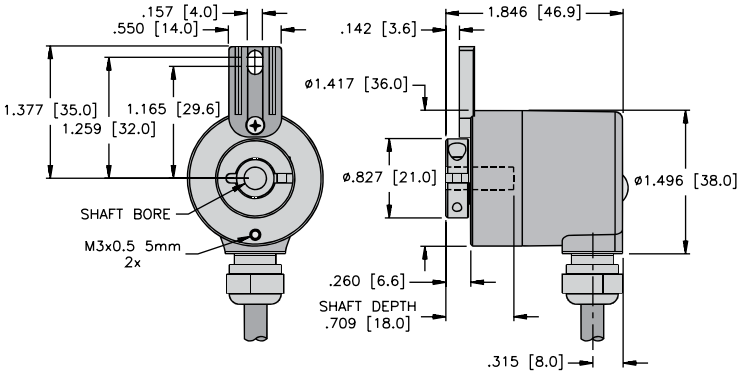
M3658 flange 2
M12 *eurofast*® connection 4



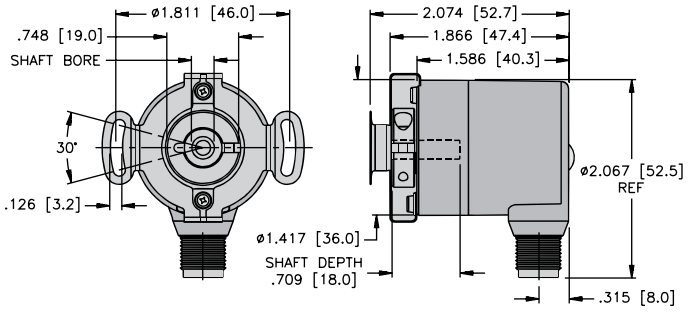
Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

Dimensions: M3678 blind hollow shaft version

M3678 flange 2
Cable connection 2



M3678 flange 5
M12 *eurofast* connection 4



TURCK
Industrial Automation

Universal type 5850 (shaft) / 5870 (hollow shaft) — analog, parallel

High rotational speed | Temperature | Shock/ vibration resistant | Short-circuit proof | Reverse polarity protection

Rugged
- Highest shock resistance on the market: (≥ 200 g (2,500 m/s²)), 6 ms acc. to DIN IEC 68-2-27).
- IP65 rated shaft version and IP66 rated hollow shaft version.
- Short-circuit proof outputs.
- Patented construction integrates all components; use of an opto-asic and 6-layer technology on a single PCB with resolution of up to 14 bits.

RoHS compliant | cULus | Ex | 2/22

Compact
- Housing Ø 58 mm.

Versatile
- Parallel interface.
- Divisions: up to 16384 (14 bits), sinleturn.
- Gray, Binary or BCD code.
- Various options.
- Shaft version: current interface 4 to 20 mA.

Mechanical characteristics:

Speed:	Shaft version: max. 12,000 RPM Hollow shaft version[1]: max. 6,000 RPM
Rotor moment of inertia:	Shaft version: approx. 0.098 oz-in² (1.8 x 10^{-6} kgm²) Hollow shaft version: approx. 0.328 oz-in² (6 x 10^{-6} kgm²)
Starting torque:	Shaft version: < 1.4 oz-in (< 0.01 Nm) Hollow shaft version: < 7 oz-in (< 0.05 Nm)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 0.88 lbs (0.4 kg)
Protection acc. to EN 60 529:	Shaft version: IP65 Hollow shaft verion: IP66
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-4 to +185°F (-20 to +85°C) [3]
Shaft:	stainless steel
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] For continuous operation 1500 RPM [2] 176°F (80°C), shaft version and cable connection
[3] 158°F (70°C), hollow shaft version and cable connection

Electrical characteristics SSI or parallel interface:

Interface type:		Parallel	Parallel
Supply voltage (+V):		5 VDC (± 5 %)	10-30 VDC
Output driver:		Push-pull	Push-pull
Current consumption typ.: / (no load) max.:		109 mA / 169 mA	109 mA / 169 mA
Permissible load/channel:		max. +/- 10 mA	≥ 180 kHz
Signal level high:		min. 3.4 V	min. +V - 2.8 V
Signal level low	(I_{Load} = 10 mA): (I_{Load} = 1 mA):	max. 1.5 V max. 0.3 V	max. 1.8 V -
Rise time t_r (without cable):		max. 0.2 µs	max. 1 µs
Fall time t_f (without cable):		max. 0.2 µs	max. 1 µs
Short-circuit proof outputs: [1]		yes	yes
Reverse connection protection at +V :		no	yes
UL certified		File 224618	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3			
RoHS compliant acc. to EU guideline 2002/95/EG			

[1] If supply voltage correctly applied

Universal type 5850 (shaft) / 5870 (hollow shaft) — analog, parallel

Pin configuration (Parallel interface, up to 13 bits and max. 2 options, 17 pin plug):

Signal:	Common (0 V)	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	Coupling Nut
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU	WH GN	BN GN	WH YE	YE BN	WH GY	Case Ground
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	

Pin configuration (Parallel interface, 14 bits and max. 2 options, cable version):

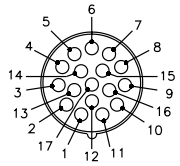
Signal:	Common (0 V)	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	14
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU	WH GN	BN GN	WH YE	YE BN	WH GY	GY BN

Pin configuration (Parallel interface, 14 bits, 1 option, 17 pin plug):

Signal:	Common (0 V)	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR /LH	14	Coupling Nut
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Case Ground

Wiring diagrams:

Male Encoder View



M23 ***multifast*** ® pinout

Mating cordset:
E-CK 17-942-*/A

* Length in meters.

Control inputs:

Up/down input to switch the counting direction
By default, absolute encoders deliver increasing code values when shaft rotates clockwise. When the shaft rotates counter-clockwise, the output delivers decreasing code values. The same applies to models with current interfaces. When the shaft rotates clockwise, the output delivers increasing current values, and decreasing values when it rotates counter-clockwise.

If the up/down input receives the corresponding signal (high), this feature is reversed. Clockwise rotation will deliver decreasing code values while counter-clockwise rotation will delivers increasing code values.

The response time is:
- 0.4 ms for 5 VDC supply voltage.
- 2 ms for 10-30 VDC supply voltage.

SET input
This input is used to reset (to zero) the encoder. A control pulse (high) sent to this input allows storing the current position value as new zero position in the encoder.
For models equipped with a current interface, the analog output (4-20 mA) will be set accordingly to the value 4 mA.
Note : Before activating the SET input after supplying the encoder with the supply voltage, a counting direction (clockwise or counter-clockwise) must be defined univocally on the up/down input.

The response time is:
- 0.4 ms for 5 VDC supply voltage.
- 2 ms for 10-30 VDC supply voltage.

LATCH input
This input is used to "freeze" the current position value. The position value will be statically available on the parallel output as long as this input will remain active (high).

The response time is:
- 140 µs for 5 VDC supply voltage
- 200 µs for 10-30 VDC supply voltage

Switching level of the control inputs:

Supply Voltage:	5 VDC	10-30 VDC
Low:	≤ 1.7 V	≤ 4.5 V
High:	≥ 3.4 V	≥ 8.7 V

TURCK Industrial Automation

Universal type 5850 (shaft) / 5870 (hollow shaft) — analog, parallel

Electrical characteristics current interface 4-20 mA (Shaft version):

Sensor part:		
Interface type:	4-20 mA	4-20 mA
Supply voltage (+V):	10-30 VDC	5 VDC
Current consumption typ.: (no load) max.:	70 mA 84 mA	70 mA 84 mA
Current loop:		
Supply voltage (Us):	10-30 VDC	
Analog signal:	4-20 mA	
max. input resistance of the input circuit:	200 Ω (Us = 10 V), 1 kΩ (Us = 30 V)	

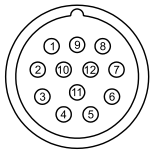
Measuring range:	0-360°
Max. failure (25°C):	0.2°
Resolution:	13 Bit
Building up time:	max. 2 ms
Temperature coefficient:	0.1°/10 K
Current if detector error:	≤ 3.5 mA
Sensor and current loop are galvanically isolated	
UL certified	File 224618
Conforms to CE requirements according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
RoHS compliant according to EU guideline 2002/95/EG	

Pin configuration (Current interface 4-20 mA, 12 pin plug):

Signal:	Common (0 V)	+V	-	-	I+	I-	ST	VR					Coupling nut
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU	Case ground
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	

Wiring diagrams:

Male Encoder View



M23 ***multifast*** ® pinout

Mating cordset:
E-CKM 12-1687-*/A

* Length in meters.

Code type and division with parallel output (5850 / 5870)

Interface and supply voltage, version 3 or 4 (Parallel):

Division	Part number key Gray/Gray-Excess	Part number key Binary	Part number key BCD
250	E02	B02	D02
360	E03	B03	D03
500	E05	B05	D05
720	E07	B07	D07
900	E09	B09	D09
1000	E01	B01	D01
1024 (10 Bit)	G10	B10	D10
1250	E12	BA1	DA2
1440	E14	B14	DA1
1800	E18	BA2	D18
2000	E20	B20	D20
2500	E25	B25	
2880	E28	B28	
3600	E36	B36	
4000	E40	B40	
4096 (12 Bit)	G12	B12	
5000	E50	B50	
7200	E72	B72	
8192 (13 Bit	G13	B13	
16384 (14 Bit)	G14	B14	

Code type and division for encoder with analog output (5850)

Interface and supply voltage, version 7 or 8 (4-20 mA)

8192 (13 Bit)	G13

Universal type 5850 (shaft) / 5870 (hollow shaft) — analog, parallel

Part number key: 5850 shaft version

T8.5850.XXXX.XXXX

Type

Flange
1 = clamping flange
2 = servo flange

Shaft (Ø x L)
1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm

Output and voltage supply
3 = 5 VDC, parallel
4 = 10-30 VDC, parallel
7 = 5 VDC, 4-20 mA
8 = 10-30 VDC, 4-20 mA

Type of connection
1 = axial cable (1 m PVC-cable)
2 = radial cable(1 m PVC-cable)
3 = axial 12-pin M23 ***multifast*** ® plug without mating connector
5 = radial 12-pin M23 ***multifast*** plug without mating connector

Options
2 = SET and V/R
3 = SET and Latch [1]
4 = V/R [1] and Latch
ALARM output on request

Code type and division
See table on page D33

[1] For version with 14 bits parallel output and 17-pin plug.

Part number key: 5870 hollow shaft version

T8.5870.XXXX.XXXX

Type

Flange
1 = flange type 1 with through shaft
2 = flange type 1 with blind hollow shaft
3 = flange type 3 with flex mount
4 = flange type 3 with blind hollow shaft

Hollow shaft
6 = Ø 10 mm
8 = Ø 12 mm

Output and voltage supply
3 = 5 VDC, parallel
4 = 10-30 VDC, parallel

Type of connection
1 = radial cable (1 m PVC-cable)
2 = radial 12-pin M23 ***multifast*** plug without mating connector

Options
2 = SET [1] and V/R
3 = SET and Latch [1]
4 = V/R [1] and Latch
ALARM output on request

Code type and division
See table on page D33

[1] For version with 14 bits parallel output and 17-pin plug.

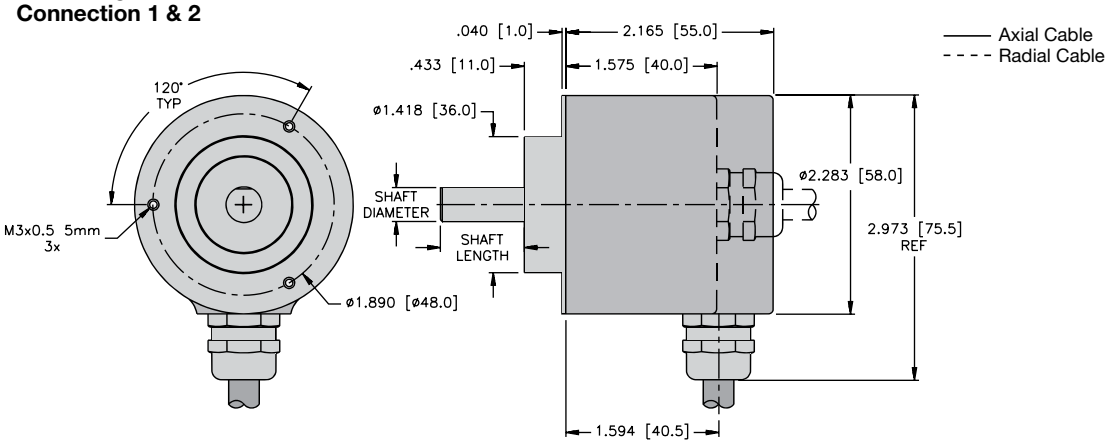
Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

TURCK
Industrial Automation

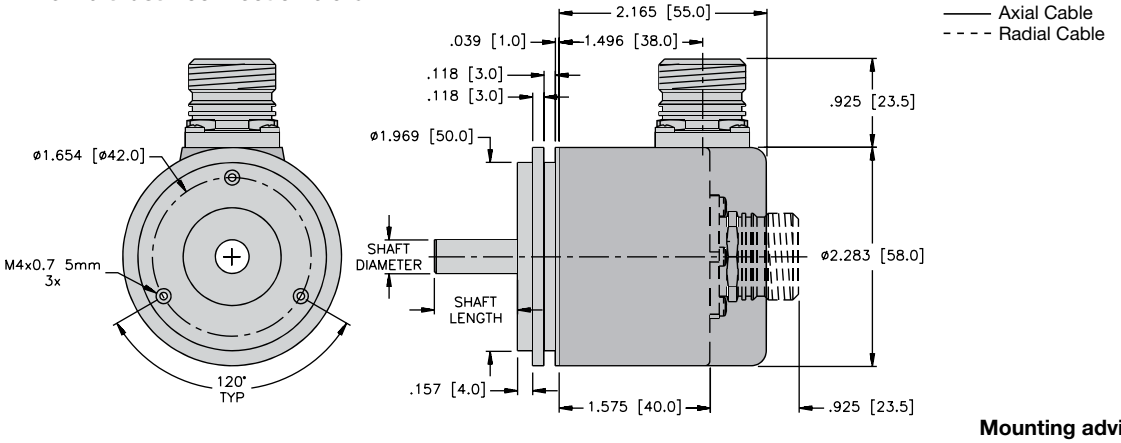
Universal type 5850 (shaft) / 5870 (hollow shaft) analog, parallel

Dimensions: 5850 shaft version

5850 flange 1
Connection 1 & 2



5850 flange 2
M23 *multifast*® connection 3 & 5

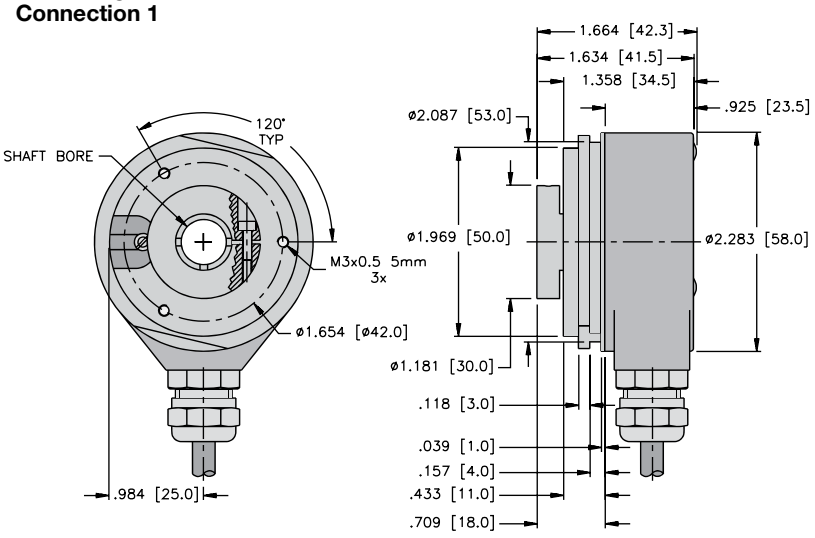


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page E1, Accessories).

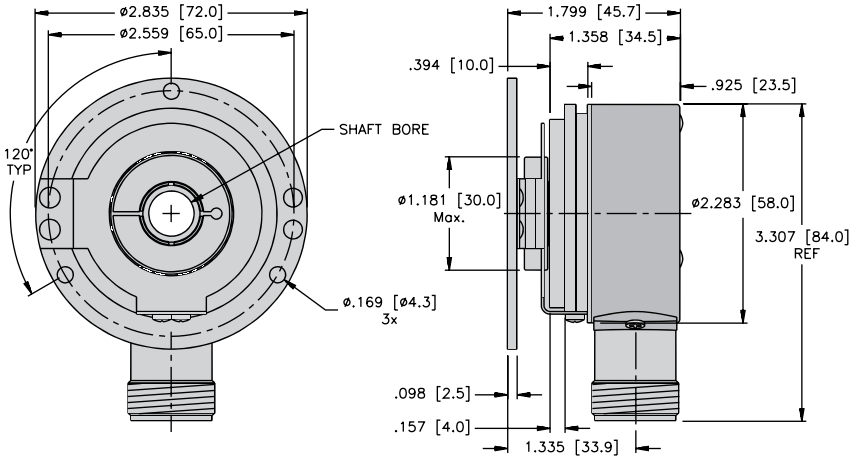
Universal type 5850 (shaft) / 5870 (hollow shaft) — analog, parallel

Dimensions: 5870 hollow shaft version

5870 flange 1 & 2
Connection 1



5870 flange 3 & 4
M23 *multifast*® connection 2



Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time.

When mounting a hollow shaft encoder, we recommend using a torque stop pin or a flex mount.

TURCK
Industrial Automation

Sendix absolute, singleturn type 5853 (shaft) / 5873 (hollow shaft) SSI/BiSS

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN/COS

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability.** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range of -40 to +194°F (-40 to +90°C).**
- **Easy diagnosis in case of fault condition.** Status indication by means of LED, sensor, voltage and temperature monitoring.

Sendix® absolute

SSI

BiSS INTERFACE

RoHS compliant | cULus | Ex | 2/22

Fast

- **High accuracy:** Update rate of the whole position value above 100 kHz for a max. jitter of 1 µs (real-time).
- **High productivity due to very short regulation cycles:** Clock rate with SSI up to 2 MHz, with BiSS up to 10 MHz.
- **High-resolution feedback system achievable in real-time:** SinCos incremental outputs.

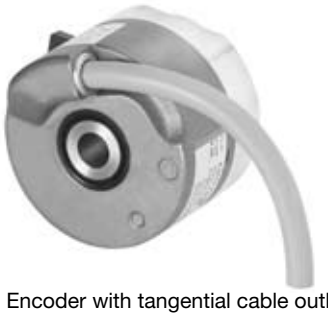
Versatile

- **Connections for every application:** Cable, M12 connector or M12 connector.
- **Open interfaces ensure flexibility and independence:** SSI or BISS with Sine-Cosine-Option.
- Multiple mounting brackets for easy installation.
- **Only the functionality really needed by the user is implemented:** Status LED and set key are optional.
- **Fast and easy start-up:** Set key or preset by means of a control input.
- **Direct mounting on large diameter shafts through hollow shaft up to 15 mm.**

Mechanical characteristics:

Shaft version:	
Max. speed without shaft sealing (IP65) up to 158°F (70°C):	12,000 RPM, continuous 10,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	8,000 RPM, continuous 5,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	11,000 RPM, continuous,9 000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	8,000 RPM, continuous 5,000 RPM
Hollow shaft version:	
Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 6,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	4,000 RPM, continuous 2,000 RPM
Starting torque without shaft sealing (IP65):	Shaft version: < 1.4 oz-in (< 0.01 Nm) Hollow shaft version: < 4.25 oz-in (< 0.03 Nm)
Starting torque with shaft sealing (IP67):	< 7 oz-in (< 0.05 Nm)
Moment of inertia:	Shaft version: 0.16 oz-in^2 (3.0 x 10^{-6} kgm^2) Hollow shaft version: 0.328 oz-in^2 (6.0 x 10^{-6} kgm^2)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 0.77 lbs (0.35 kg)
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +194°F (-40 to +90°C) [1]
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PVC
Shock resistance acc. to DIN-IEC 68-2-27:	> 250g (> 2,500 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (>100 m/s^2), 55-2,000 Hz

[1] Cable versions: -22 to +167°F (-30 to +75°C)



Encoder with tangential cable outlet

Sendix absolute, singleturn type 5853 (shaft) / 5873 (hollow shaft) SSI/BiSS

General electrical characteristics:

Supply voltage:	5 VDC + 5 % or 10-30 VDC
Current consumption (without output load):	5 VDC: max. 70 mA, 24 VDC: max. 20 mA
Reverse polarity protection at power supply (+V):	Yes (only 10-30 VDC)
UL certified:	File 224618

Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3

RoHS compliant acc. to EU guideline 2002/95/EG

General interface characteristics:

Output driver:	RS485 Transceiver type
Permissible load/channel:	max. + 20 mA
Signal level high:	typ. 3.8 V
Signal level low at I_{load} = 20 mA:	typ. 1.3 V
Short-circuit proof outputs:	Yes [2]

Interface characteristics SSi:

Singleturn resolution:	10-14 bits and 17 bits [3]
Code:	Binary or Gray
SSI clock rate:	< 14 bits: 50 kHz-2 MHz
Monoflop time:	> 15 µs [3]

Note:
If clock starts cycling within monoflop time, a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. Maximum update rate is dependent on clock speed, data length and monoflop time.

Time jitter (data request to position latch):	< 1 µs up to 14 bits, < 4 µs at 15-17 bits
Status and Parity bit:	optional on request

Interface characteristics BiSS:

Singleturn resolution:	10-14 bits and 17 bits customer programmable [3]
Code:	Binary
Interfaces:	RS485
Clock rate:	up to 10 MHz
Max. update rate:	< 10 µs, depending on clock speed and data length
Time jitter (data request to position latch):	< 1 µs

Note:
- Bidirectional, programmable parameters are: resolution, code, direction, alarms and warnings
- Multicycle data output, e.g. for temperature
- CRC data verification

[2] Short-circuit to 0 V or to output, one channel at a time, supply voltage correctly applied
[3] Other options upon request

SET (zero or defined value) and DIRection (CW/CCW) control inputs:

Input characteristics:	High active
Receiver type:	Comparator
Signal level high:	min. 60 % of V+ (Supply voltage), max: V+
Signal level low:	max. 25 % of V+ (Supply voltage)
Input current:	< 0.5 mA
Min. pulse duration (SET):	10 ms
Timeout after SET input:	14 ms
Reaction Time (DIR input):	1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET key. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. During this time, the LED is ON and the status output is at LOW.

Status output and LED:

Output driver:	Open collector, internal pull up resistor 22 kOhm
Permissible load:	-20 mA
Signal level high:	+V
Signal level low:	< 1 V
Active at:	Low

The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open-collector with int. pull-up 22k).

If the LED is ON (status output LOW) this indicates:
- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or aging
- Over- or under-temperature
- Undervoltage

In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

DIR input:

A HIGH signal switches the direction of rotation from the default clockwise to counter-clockwise. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.

Option incremental output (A/B), 2048 ppr:

	Sin/Cos	RS422 (TTL compatible)
-3dB frequency:	400 kHz	400 kHz
Signal level:	1 Vpp (+ 20 %)	high: min. 2.5 V low: max. 0.5 V
Short-circuit proof:	Yes [2]	Yes [2]

Power-on delay:

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

Sendix absolute, singleturn type 5853 (shaft) / 5873 (hollow shaft) SSI/BiSS

Pin configuration:

Output circuit 1 or 2 and (2 control inputs, 1 status output) (Connection 1,2,3 or 4)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Status	NC	NC	NC	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	Shield

Output circuit 5 and (2 control inputs, 1 status output, voltage monitor outputs) (Connection 1,2,3 or 4)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Status	NC	0 V Sens	+V Sens	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY/PK	RD/BU	Shield

Output circuit 3, 4, 7 or 8, and (2 control inputs or incremental track, sine/cosine) (Connection 1,2,3 or 4)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Sin A	Sin inv A-	Cos B	Cos inv B-	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

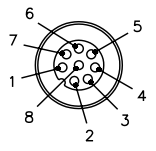
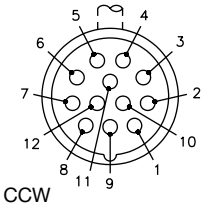
Output circuit 6 or 9, and (sine/cosine or incremental monitor, voltage outputs) (Connection 1,2,3 or 4)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	Sin A	Sin inv A-	Cos B	Cos inv B-	0 V Sens	+V Sens	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Output circuit 1 or 2, and (2 control inputs) (Connection 5 or 6)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	SET	DIR	Shield/PE
M12 pin:	1	2	3	4	5	6	7	8	PH

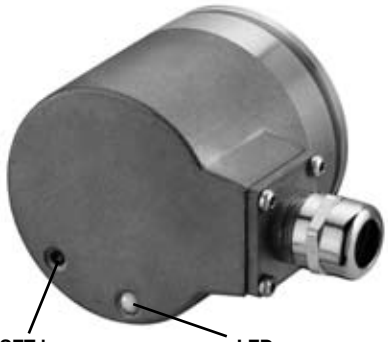
Wiring diagrams:

Male Encoder View	
	
M12 ***eurofast***® pinout	M23 ***multifast***® pinout
Mating cordset: **E-RKC 8T-264-***	Mating cordset: **E-CKM 12-1687-*/A**

* Length in meters.

SET key: For quick, simple on-site start-up.

LED: Status indication for sensor, voltage and temperature monitoring.



SET key: For quick, simple on-site start-up.

LED: Status indication for sensor, voltage and temperature monitoring.

Sendix absolute, singleturn type 5853 (shaft) / 5873 (hollow shaft) SSI/BiSS

Part number key: 5853 shaft version

T8.5853.XXXX.XXXX

Type

Flange

1 = clamping flange Ø 58 IP65
2 = servo flange Ø 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Output and voltage supply

1 = 5 VDC, SSI or BiSS interface,
2 = 10-30 VDC, SSI or BiSS
3 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS, with supply voltage monitoring output
6 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos, with supply voltage monitoring output
7 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
8 = 10-30 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
9 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.) with supply voltage monitoring output

Options [1]

1 = no option
2 = status LED
3 = SET button and status LED [4]

Input/output [3]

2 = SET, DIR inputs and additional status output

Resolution [2]

A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

Code

B = SSI, binary
C = BiSS, binary
G = SSI, Gray

Type of connection

1 = axial cable (1 m PVC)
2 = radial cable (1 m PVC)
3 = axial 12-pin M23 ***multifast*** ® connector
4 = radial 12-pin M23 ***multifast*** connector
5 = axial 8-pin M12 ***eurofast*** ® connector
6 = radial 8-pin M12 ***eurofast*** connector

[1] Status LED internally monitors encoder parameters such as sensor condition, temperature, under and over voltage.
[2] Preset value, factory-programmable.
[3] Set and Direction are physical inputs for setting: 0 position (or any factory predefined value) controls rotation of shaft (CW/CCW) for increasing counts. Status output is discrete output linked to the LED status indicator.
[4] The Set button and Status LED are located on the rear of the encoder cover. Same functionality as SET control input, protected against accidental activation, can only be depressed with the tip of a ballpoint pen or similar.

Part number key: 5873 hollow shaft version

T8.5873.XXXX.XXXX

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Hollow shaft

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm
8 = Ø 9.52 mm [3/8"]
9 = Ø 12.7 mm [1/2"]

Output and voltage supply

1 = 5 VDC, SSI or BiSS interface,
2 = 10-30 VDC, SSI or BiSS
3 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS, with supply voltage monitoring output
6 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos, with supply voltage monitoring output
7 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
8 = 10-30 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
9 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.) with supply voltage monitoring output

Options (service)

1 = no option
2 = status LED
3 = SET button and status LED

Input/output [1]

2 = SET, DIR inputs additional status output

Resolution [1]

A = 10 bits ST
1 = 11 bits ST
2 = 12 bits ST
3 = 13 bits ST
4 = 14 bits ST
7 = 17 bits ST

Code

B = SSI, binary
C = BiSS, binary
G = SSI, Gray

Type of connection

2 = radial cable (1 m PVC)
4 = radial 12-pin M23 ***multifast*** connector
6 = radial 8-pin M12 ***eurofast*** connector (only with output circuits 1 and 2)
E = tangential cable outlet (1 m PVC cable)

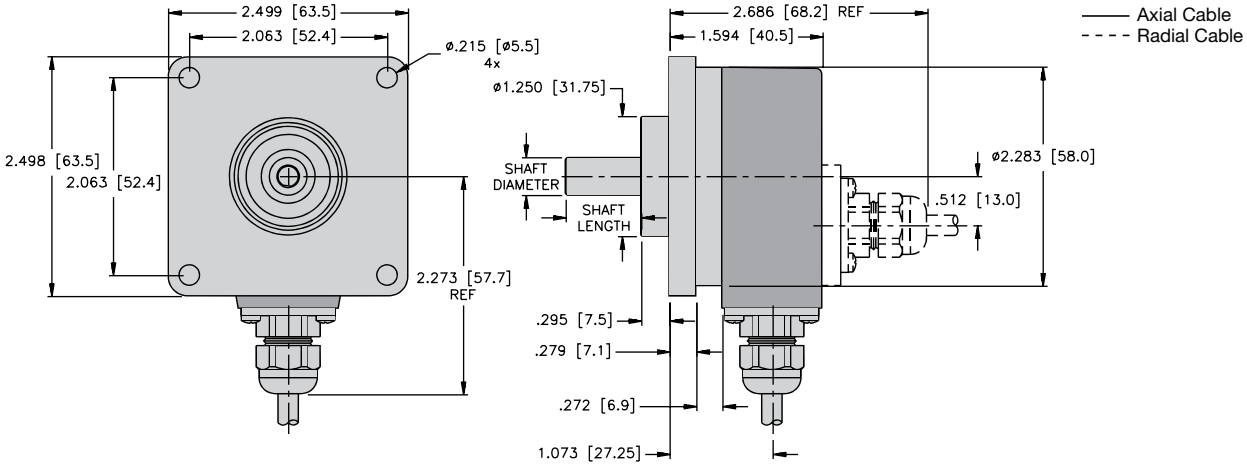
[1] Resolution, preset value and counting direction factory-programmable

TURCK
Industrial Automation

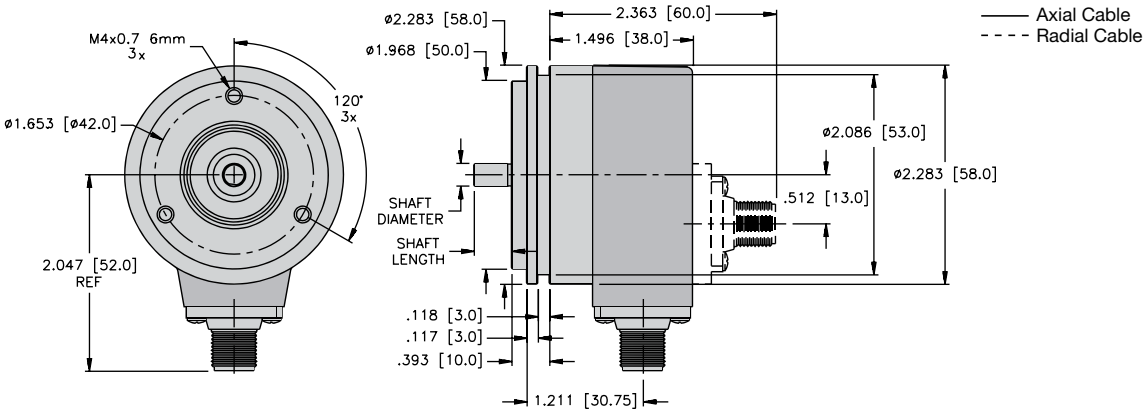
Sendix absolute, singleturn type 5853 (shaft) / 5873 (hollow shaft) SSI/BiSS

Dimensions: 5853 shaft version

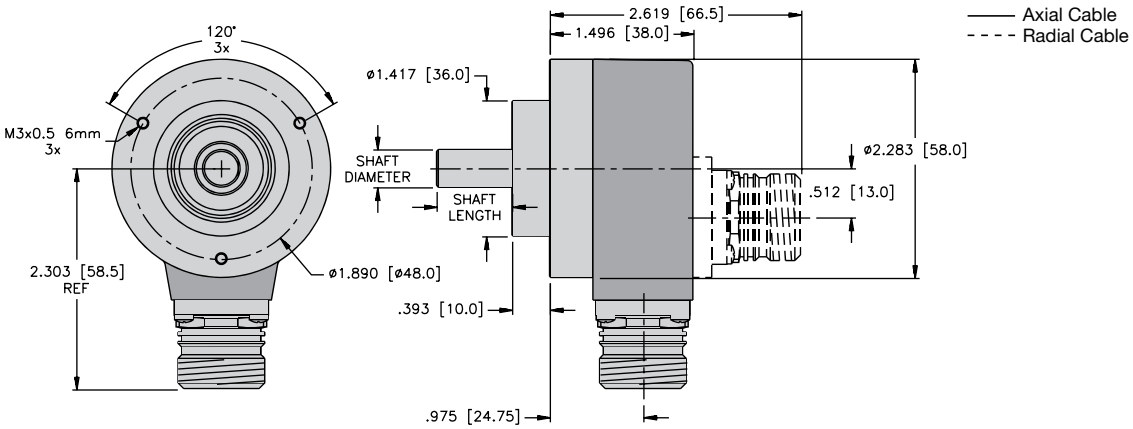
5853 flanges 5 & 7
Cable connection 1 & 2



5853 flanges 2 & 4
M12 *euroftast*® connection 5 & 6



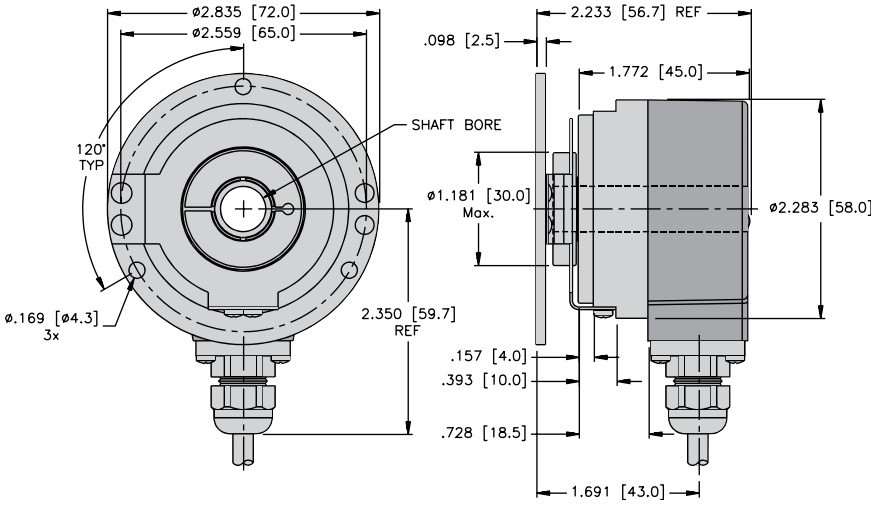
5853 flanges 1 & 3
M23 *multifast*® connection 3 & 4



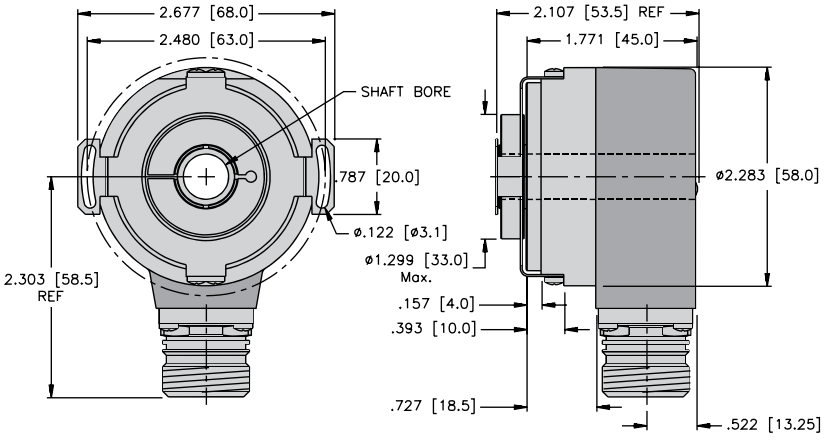
Sendix absolute, singleturn type 5853 (shaft) / 5873 (hollow shaft) SSI/BiSS

Dimensions: 5873 hollow shaft version

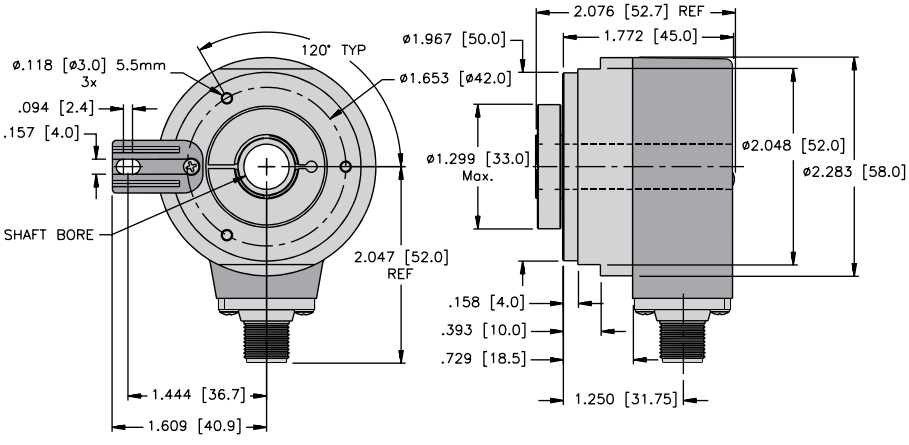
5873 flanges 3 & 4
Cable connection 2



5873 flanges 5 & 6
M23 *multifast*® connection 4



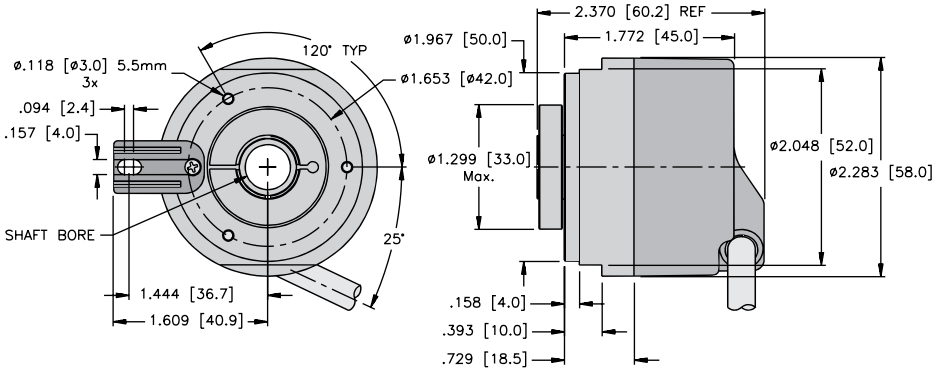
5873 flanges 1 & 2
M12 *eurofast*® connection 6



Sendix absolute, singleturn type 5853 (shaft) / 5873 (hollow shaft) SSI/BiSS

Dimensions: 5873 hollow shaft version

5873 flanges 1 & 2
Cable connection E



Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability.** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** remains sealed even when subjected to harsh everyday use.
- **Wide temperature range.**

Sendix® absolute

CANopen

RoHS compliant | UL | Ex | 2/22

Fast

- **Genuine time-servo position detection of several axes.** Extended CAN Sync Mode with real-time position acquisition.
- **Fast data availability while reducing the load on the bus and the controller.** Intelligent functions like the transmission of speed, acceleration or exiting a working area.

Versatile

- **CANopen fieldbus with the latest profiles.**
- **Connections for every application:** Bus terminal cover with M12 connector or cable connection or fixed connection with M12, M23 or D-Sub connector.
- **Real-time data:** Position, speed or working area. Variable PDO mapping in the memory.
- **Fast, error-free start-up, without setting any switches.** Node address, baud rate and termination can be programmed via the bus.

Mechanical characteristics:

Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 7,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	7,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 6,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Starting torque without shaft sealing (IP65):	< 1.4 oz-in (< 0.01 Nm)
Starting torque with shaft sealing (IP67):	Shaft version: < 7 oz-in (< 0.05 Nm) Hollow shaft version: < 4.25 oz-in (<0.03 Nm)
Moment of inertia:	Shaft version: 0.16 oz-in² (3.0 x 10^{-6} kgm²) Hollow shaft version: 0.328 oz-in² (6.0 x 10^{-6} kgm²)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 1.17 lbs (0.53 kg) with bus terminal cover approx. 1.10 lbs (0.50 kg) with fixed connection
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +176°F (-40 to +80°C)
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc
Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (> 100 m/s²), 55-2,000 Hz

SET key: For quick, simple on-site start-up.

Green, red and yellow LEDs: Failure-free operation immediately visible on the bus.

TURCK
Industrial Automation

Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (without output load):	24 VDC, max. 60 mA
Reverse polarity protection at power supply (+V):	Yes
UL certified:	File 224618

Conforms to CE requirements according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3

RoHS compliant acc. to EU guideline 2002/95/EG

SET control button (zero or defined value, option):

Protected against accidental activation, can only be depressed with the tip of a ball pen or similar.

Diagnostic LED (yellow):

LED on with:
optical sensor path faulty (code error, LED error),
low voltage and over-temperature

Interface characteristics CANopen:

Singleturn resolution (maximum, scalable):	1-65536 (16 bits), default scale value is set to 8192 (13 bits)
Code:	Binary
Interface:	CAN High-Speed according ISO 11898, Basic- and Full-CAN CAN Specification 2.0 B
Protocol:	CANopen profile DS 406 V3.1 with manufacturer-specific add-ons

Baud rate:	12 Mbits/s (set by DIP switches/software configurable)
Node address:	1-127 (set by rotary switches/software configurable)
Termination switchable:	Set by DIP switches, software configurable

General information about CANopen

The 5858 series of encoders support the latest CANopen communication profile according to DS 301 V4.02. In addition, device-specific profiles are available, such as DS 406 V3.1.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters may be programmed via the CANopen fieldbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

Position, speed, acceleration and status output values may be combined in a freely variable way as PDO mapping.

The encoders are available with a connector or a cable connection. The device address and baud rate can be set or modified by means of the software. Models with a bus terminal cover and integrated T-shaped coupler allow a particularly easy installation via M12 connectors. The device address is set by means of two hexadecimal rotary switches. Furthermore, another DIP switch allows setting the baud rate and switching on a termination resistor. Three LEDs indicate the operating or fault status of the CANopen fieldbus, as well as the status of internal diagnostics.

CANopen Communication Profile DS 301 V4.02

The following Class C2 functionality is integrated:

- NMT Slave
- Heartbeat Protocol
- High Resolution Sync Protocol Identity Object
- Error Behavior Object
- Variable PDO Mapping self-start programmable (power on to operational), 3 Sending PDO's
- One receiving PDO for servo preset operation with minimal jitter
- Node address, baud rate and CANbus
- Programmable termination

CANopen Encoder Profile DS 406 V3.1

The following parameters may be programmed:

- Event mode
- Units for speed selectable (Steps/Sec or RPM)
- Factor for speed calculation (e.g. measuring wheel periphery), integration time for speed value of 1 to 32
- Two work areas with two upper and lower limits and the corresponding output states
- Variable PDO mapping for position, speed, acceleration and work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status – 3 LEDs
- Optional – 32 CAMs programmable
- Customer-specific memory – 16 Bytes

Key features:

The object 6003h "Preset" is assigned to an integrated key, accessible from the outside "Watchdog-controlled" device

Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Pin configuration:
Bus terminal cover with terminal box (Connection 1)

Direction	OUT					IN				
Signal:	CAN Ground	CAN_Low (-)	CAN_High (+)	Common (0 V) power supply	+V power supply	Common (0 V) power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground
Abbrv:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG

Pin configuration:
Cable connection (Connection A)

Direction	IN				
Signal:	Common (0 V) power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground
Abbrv:	0 V	+V	CL	CH	CG
Color:	BK	RD	BL	WH	GY

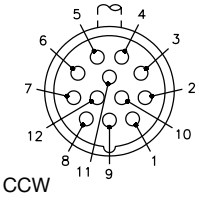
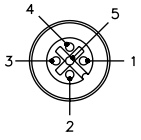
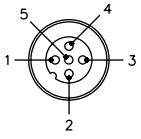
Pin configuration:
M23 connector or M12 connector (Connection I) (Connection E)

Direction	IN					Pinout
Signal:	Common (0 V) power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground	
Abbrv:	0 V	+V	CL	CH	CG	
M23 pin:	10	12	2	7	3	A
M12 pin:	3	2	5	4	1	C

Pin configuration:
Bus terminal cover with 2 - M12, 2 - M12, 2 - M23 (Connection 2) (Connection F) (Connection J)

Direction	OUT					Pinout	IN					Pinout
Signal:	CAN Ground	CAN_Low (-)	CAN_High (+)	0 V power supply	+V power supply		0 V power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground	
Abbrv:	CG	CL	CH	0 V	+V		0 V	+V	CL	CH	CG	
M23 pin:	3	2	7	10	12	A	10	12	2	7	3	A
M12 pin:	1	5	4	3	2	B	3	2	5	4	1	C

Wiring Diagrams:

A	B	C
Male encoder view	**Female encoder view**	**Male encoder view**
		
Bus In and Out M23 ***multifast*** ® pinout	**Bus Out** M12 ***eurofast*** ® pinout	**Bus In** M12 ***eurofast*** pinout
Mating cordset: [1] consult factory	Mating cordset: [1][2] **E-RKC 4.5T-1695-*/A**	Mating cordset: [1] **E-RKC 4.5T-1695-*/A**

[1] See cable section for additional options.
[2] "S" denotes shield tied to coupling nut.
* Length in meters. Available in 0.1 meters increments ≥0.2 meters.

TURCK Industrial Automation

Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Part number key: 5858 shaft version

T8.5858.XXXX.XX1X

Type

Flange

1 = clamping flange Ø 58 mm, IP65
2 = servo flange Ø 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
6 = servo flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67
8 = servo flange 2.5" / 63.5 mm, IP67

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Output circuit and power supply

2 = 10-30 VDC, CANopen DS 301 V4.02

Options

2 = no option
3 = SET

Fieldbus profile [1)]

21 = CANopen Encoder-Profile DS 406 V3.1

Type of connection

1 = removable bus terminal cover with radial screwed cable passage
2 = removable bus terminal cover with 2 x M12 ***eurofast***® connector
A = fixed connection without bus terminal cover, with radial cable (2 m PVC)
E = fixed connection without bus terminal cover, with 1 x M12 ***eurofast*** radial connector
F = fixed connection without bus terminal cover, with 2 x M12 ***eurofast*** radial connector
I = fixed connection without bus terminal cover, with 1 x M23 ***multifast***® radial connector
J = fixed connection without bus terminal cover, with 2 x M23 ***multifast*** radial connector

[1)] CAN parameters can also be factory-preset

Part number key: 5878 blind hollow shaft version

T8.5878.XXXX.XX1X

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Blind hollow shaft (30 mm depth)

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm
8 = Ø 9.52 mm(3/8")
9 = Ø 12.7 mm (1/2")

Output circuit and power supply

2 = 10-30 VDC, CANopen DS 301 V4.02

Options (service)

2 = no option
3 = SET

Fieldbus profile [1)]

21 = CANopen encoder-profile DS 406 V3.1
22 = CANlift DS 417 V1.01

Type of connection

1 = removable bus terminal cover with radial screwed cable passage
2 = removable bus terminal cover with 2 x M12 ***eurofast*** connector
A = fixed connection without bus terminal cover, with radial cable (2 m PVC)
E = fixed connection without bus terminal cover, with 1 x M12 ***eurofast*** radial connector
F = fixed connection without bus terminal cover, with 2 x M12 ***eurofast*** radial connector
I = fixed connection without bus terminal cover, with 1 x M23 ***multifast*** radial connector
J = fixed connection without bus terminal cover, with 2 x M23 ***multifast*** radial connector

[1)] CAN parameters can also be factory-preset

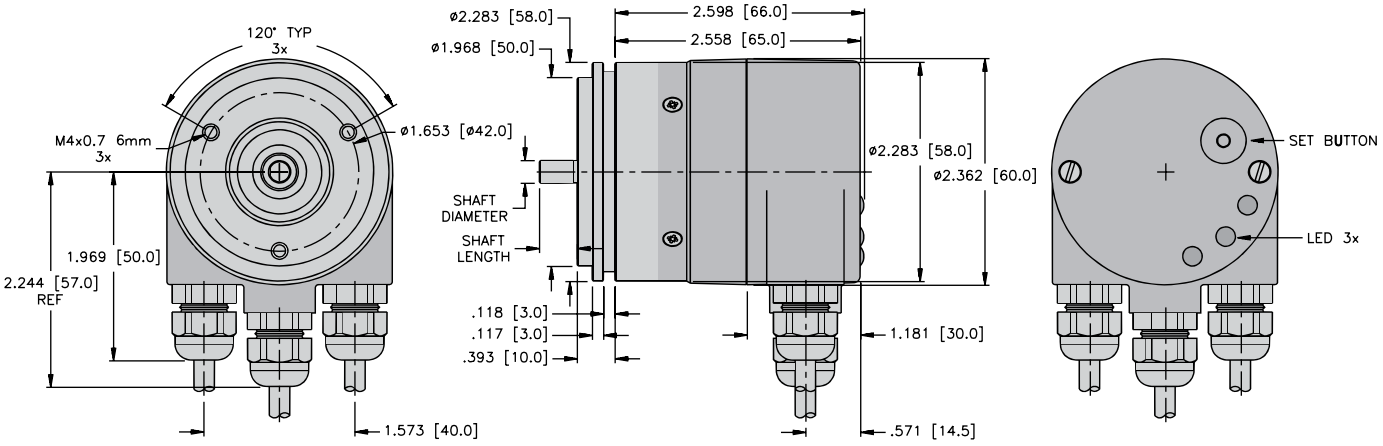
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

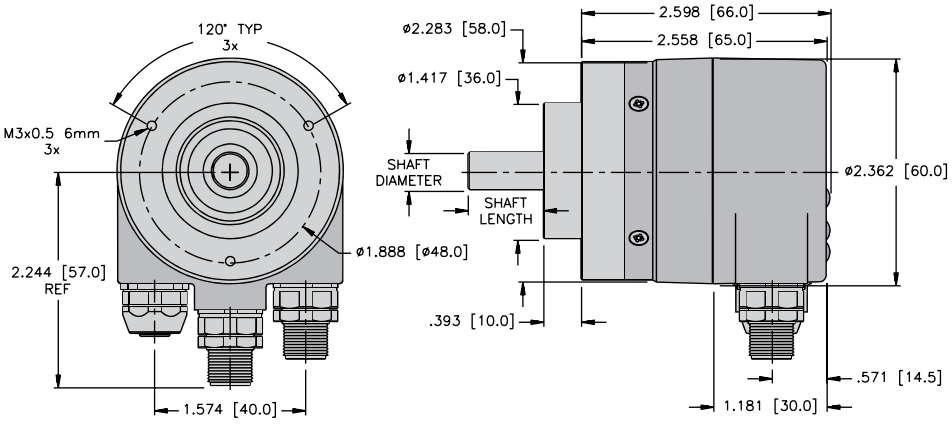
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Dimensions: 5858 shaft version

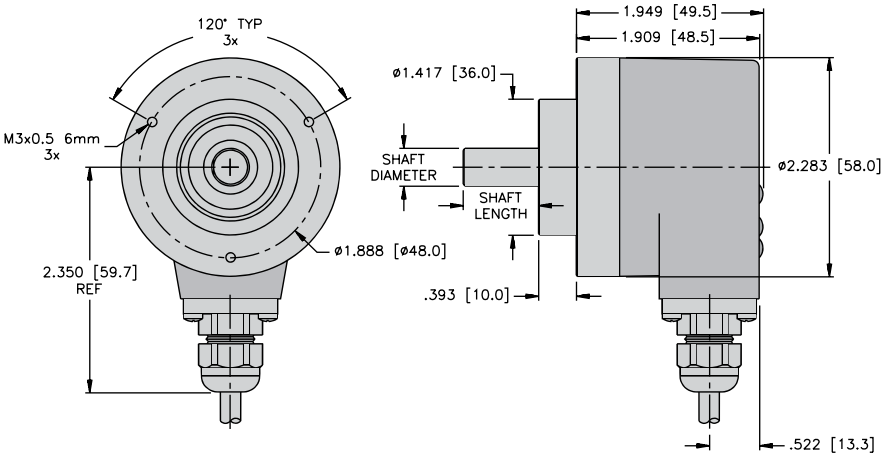
5858 flanges 2 & 4
Cable connection 1



5858 flanges 1 & 3
M12 *eurofast*® connection 2



5858 flanges 1 & 3
Cable connection A



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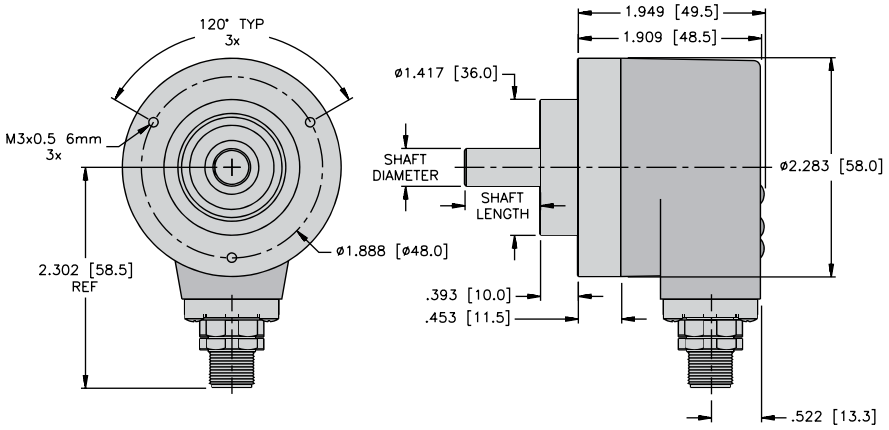
Industrial Automation

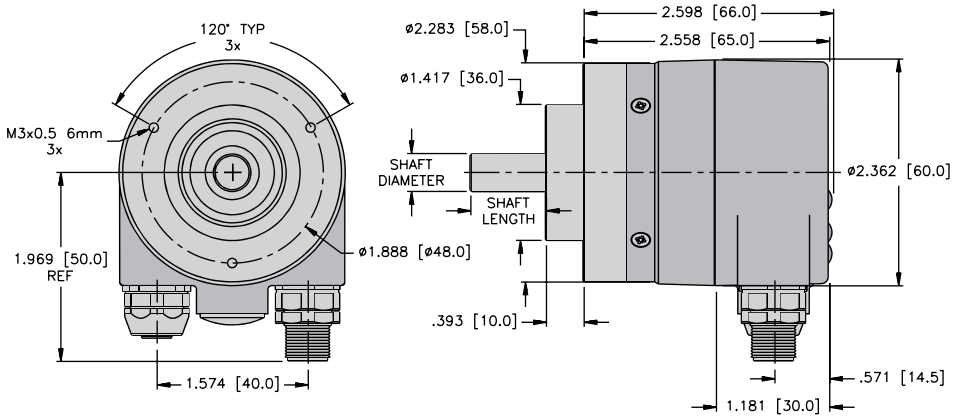
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Dimensions: 5858 shaft version

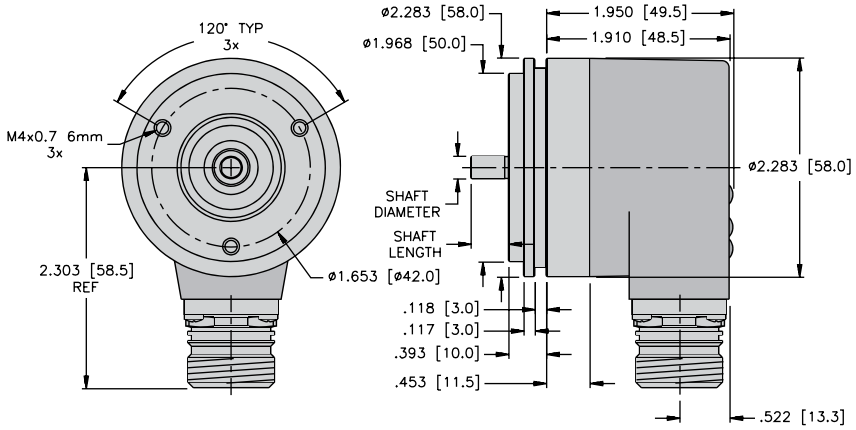
5858 flanges 1 & 3
M12 *eurofast*® connection E



5858 flanges 1 & 3
M12 *eurofast*® connection F



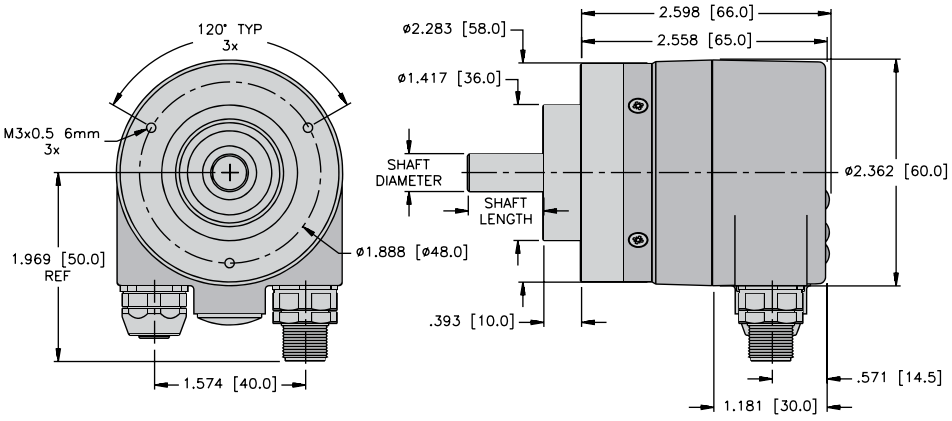
5858 flanges 2 & 4
M23 *multifast*® connection I



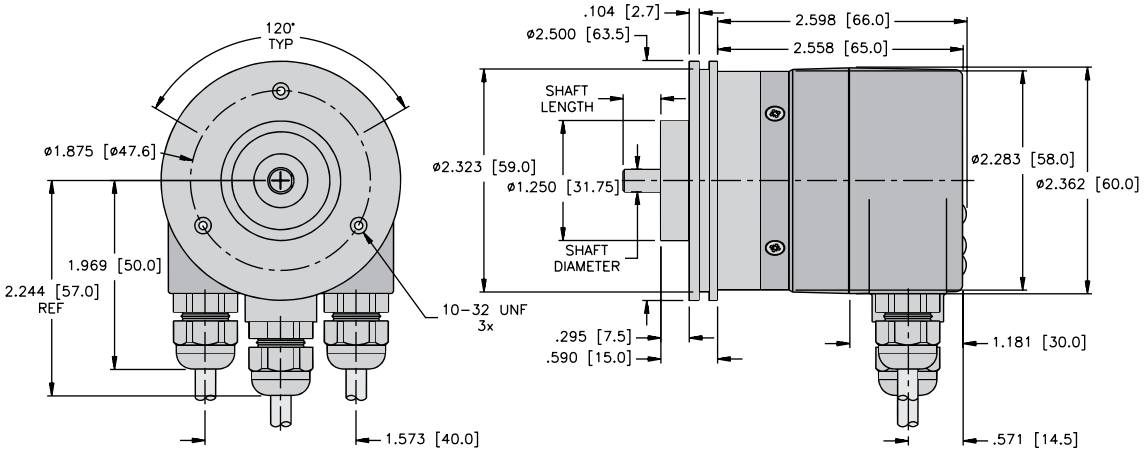
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Dimensions: 5858 shaft version

5858 flanges 5 & 7
M23 *multifast*® connection J



5858 6 & 8
Cable connection 1

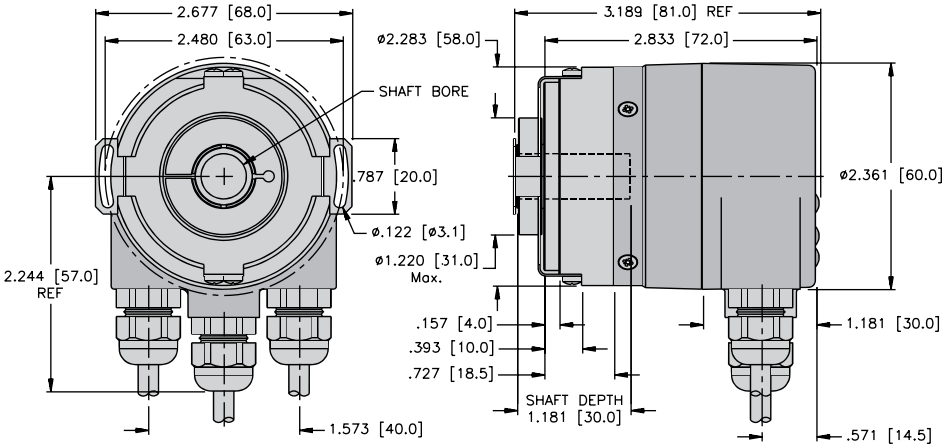


TURCK
Industrial Automation

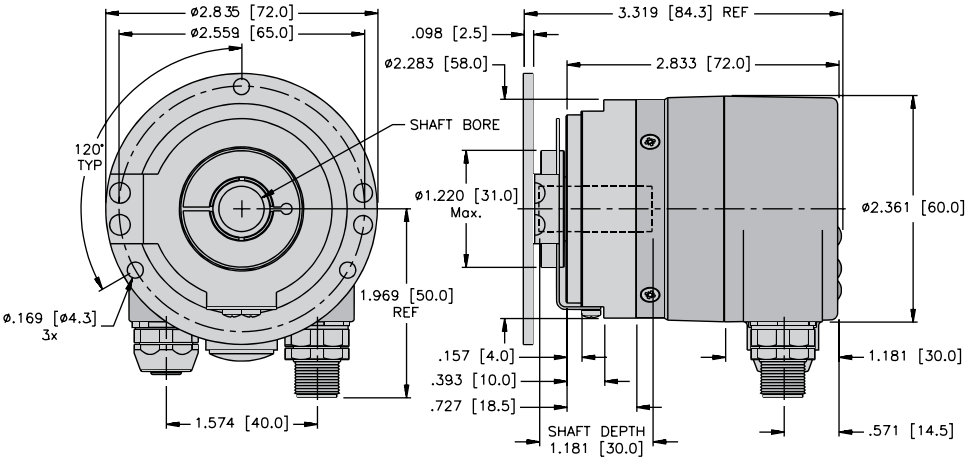
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Dimensions: 5878 blind hollow shaft version

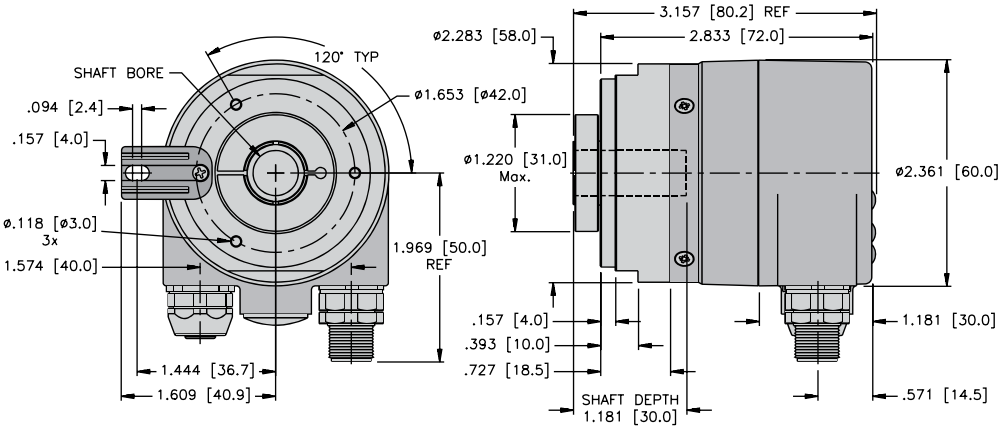
5878 flanges 5 & 6
Cable connection 1



5878 flanges 3 & 4
M12 *eurofast*® connection 2



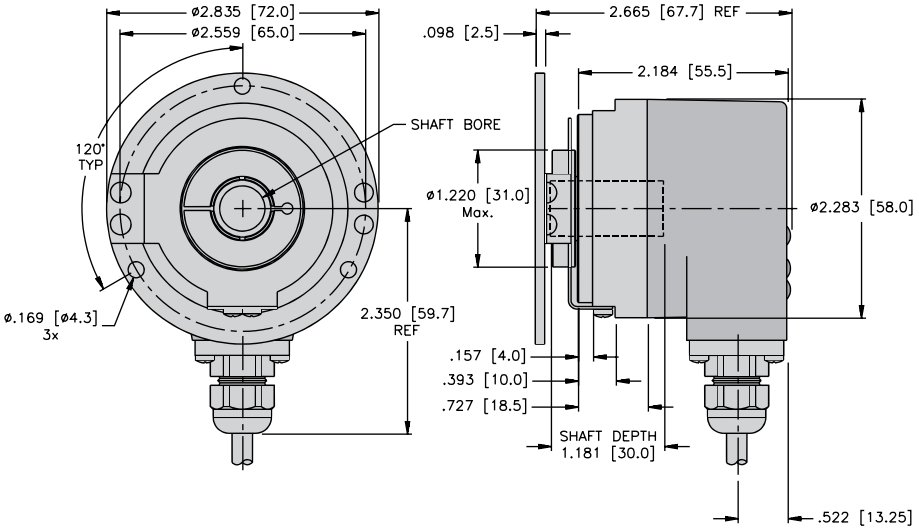
5878 flanges 1 & 2
M12 *eurofast*® connection 2



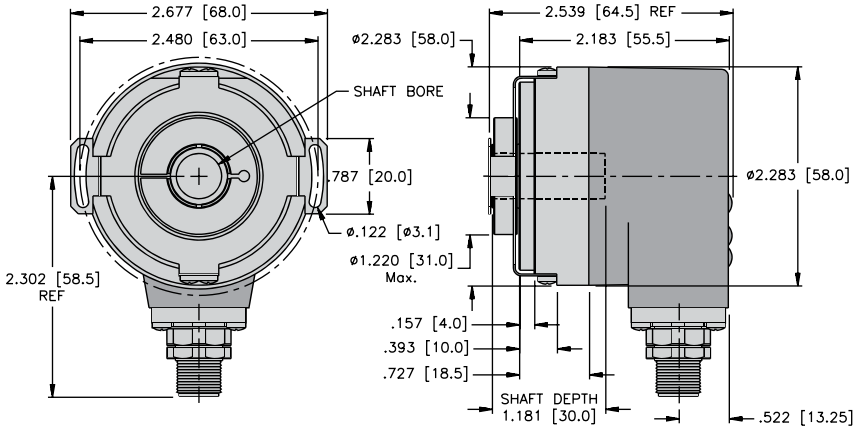
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Dimensions: 5878 blind hollow shaft version

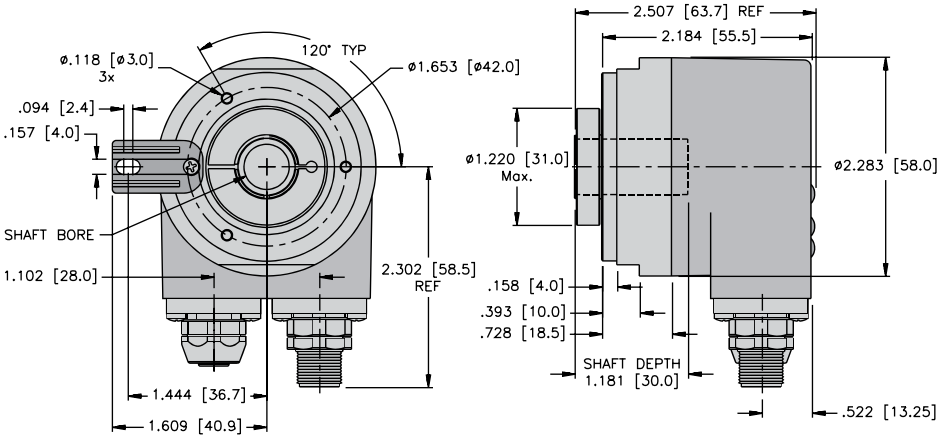
5878 flanges 3 & 4
Cable connection A



5878 flanges 5 & 6
M12 *eurofast*® connection E



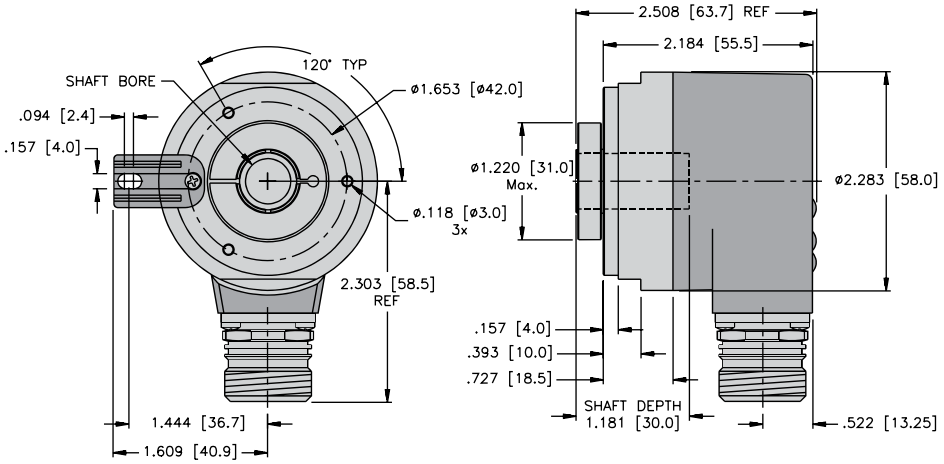
5878 flanges 1 & 2
M12 *eurofast* connection F



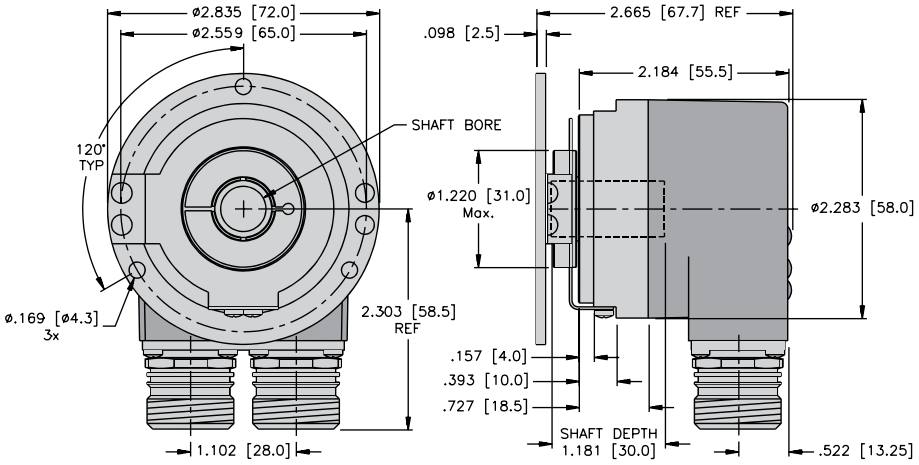
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) CANopen

Dimensions: 5878 blind hollow shaft version

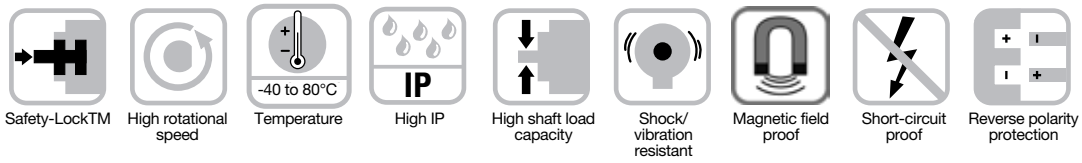
5878 flanges 1 & 2
M23 *multifast*® connection I



5878 flanges 3 & 4
M23 *multifast* connection J



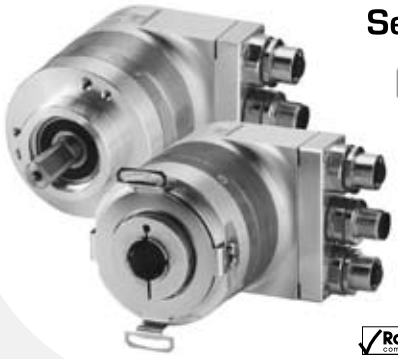
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) EtherCAT



Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability.** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range of:** -40 to +176 °F (-40 to +80 °C).



Sendix® absolute

EtherCAT.

RoHS compliant

2/22

Fast

- **Genuine time-servo position detection of several axes:** Distributed clock for real-time position detection.
- **Fast data availability with reduced loading on the bus and controller:** Intelligent functions such as transmission of speed/velocity, acceleration or leaving a working area.
- **Fast, simple, error-free connection:** Bus terminal cover with 3 x M12 connectors.

Versatile

- **Up-to-the minute fieldbus performance in the CoE application.**
- **Real-time data access including position, speed/velocity, acceleration or working area:** PDO mapping in the memory.
- **Fast, error-free start-up without setting switches.** All parameters can be programmed via the bus.
- **Numerous special functions:** Temperature monitoring, operating time, customer data (i.e. installation location)

Mechanical characteristics:

Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 7,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	7,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 6,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Starting torque without shaft sealing (IP65):	< 1.4 oz-in (< 0.01 Nm)
Starting torque with shaft sealing (IP67):	Shaft version: < 7 oz-in (< 0.05 Nm) Hollow shaft version: < 4.25 oz-in (<0.03 Nm)
Moment of inertia:	Shaft version: 0.16 oz-in^2 (3.0 x 10^{-6} kgm^2) Hollow shaft version: 0.328 oz-in^2 (6.0 x 10^{-6} kgm^2)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 1.10 lbs (0.50 kg)
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +176 °F (-40 to +80°C)
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc
Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (> 100 m/s^2), 55-2,000 Hz

TURCK Industrial Automation

Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) EtherCAT

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (without output load):	24 VDC, max. 60 mA
Reverse polarity protection at power supply (+V):	Yes
UL certified:	File 224618

Conforms to CE requirements according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3

RoHS compliant according to EU guideline 2002/95/EG

Device characteristics:

Singleturn resolution:	1-65535 (16 bit), (scalable: 1-65535))
Default value:	8192 (13 bit)
Total resolution:	scalable from 1 to 65535 (13 Bit)
Interface:	EtherNet Frame binary
Protocol:	EtherNet/EtherCAT

Diagnostic LED (Red):

LED is ON with the following fault conditions:
Sensor error (internal code or LED error), low voltage, over-temperature

Run LED (Green):

LED is ON with the following conditions:
Init-, Preop-, Safeop and Op-State

2 x Link LED (Yellow):

LED is ON with the following conditions (Port A and B)
Link detected

Modes:

Freerun, Distributed Clock (cycle time for Sync 0 pulse min. 125 µs or 62.5 µs with restrictions), Sync-Mode

General information about CoE (CAN over EtherCAT)

The 58X8 series of EtherCAT encoders support the CANopen communication profile according to DS 301. In addition, device-specific profiles are available.

Scaling, preset values, limit switch values and many other parameters can be programmed via the EtherCAT bus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again.

Position, speed, acceleration and status output values may be combined in a freely variable way as PDO mapping.

CANopen Encoder Profile CoE (CAN over EtherCAT)

The following parameters are programmable:

- Units for speed selectable (Steps/Sec or RPM)
- Factor for speed calculation (e.g. circumference of measuring wheel)
- Integration time for the speed value from 1 to 32
- Two working area with two upper and lower limits and the corresponding output states
- PDO mapping of position, speed/velocity, acceleration and working area
- Extended error management for position sensing with integrated temperature control
- User interface with visual display of bus and fault status – 4 LEDs
- Alarm and warning messages

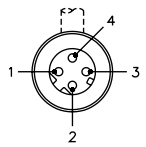
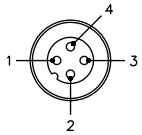
Pin configuration Bus:
(Type of connection 2, D-coded)

Direction:	Port A				Port B			
Signal:	Transmit data+	Receive data+	Transmit data-	Receive data-	Transmit data+	Receive data+	Transmit data-	Receive data-
Abbrv:	TxD+	RxD+	TxD-	RxD-	TxD+	RxD+	TxD-	RxD-
M12 pin:	1	2	3	4	1	2	3	4

Pin configuration power supply:
M12 *eurofast*® connector

Signal:	Power supply	N/C	Common	N/C
Abbrv:	+V	-	0 V	-
M12 pin:	1	2	3	4

Wiring Diagrams:

Bus	Power supply
Male encoder view	Female encoder view
	
Mating cordset: RSSD 441-*	Mating cordset: RK 4.4T-*

Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) EtherCAT

Part number key: 5858 shaft version

T8.5858.XXXX.XX12

Type

Flange

1 = clamping flange Ø 58 IP65
2 = servo flange Ø 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Fieldbus profile

B1 = EtherCAT with CoE (CAN over EtherNet™)

Type of connection

2 = removable bus terminal cover with 3 x M12 ***eurofast*** ® connector

Output circuit and power supply

B = EtherCAT

Part number key: 5878 blind hollow shaft version

T8.5878.XXXX.XX12

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Blind hollow shaft (30 mm depth)

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm
8 = Ø 9.52 mm (3/8“)
9 = Ø 12.7 mm (1/2“)

Fieldbus profile

B1 = EtherCAT with CoE (CAN over EtherNet)

Type of connection

2 = removable bus terminal cover with 3 x M12 ***eurofast*** connector

Output circuit and power supply

B = EtherCAT

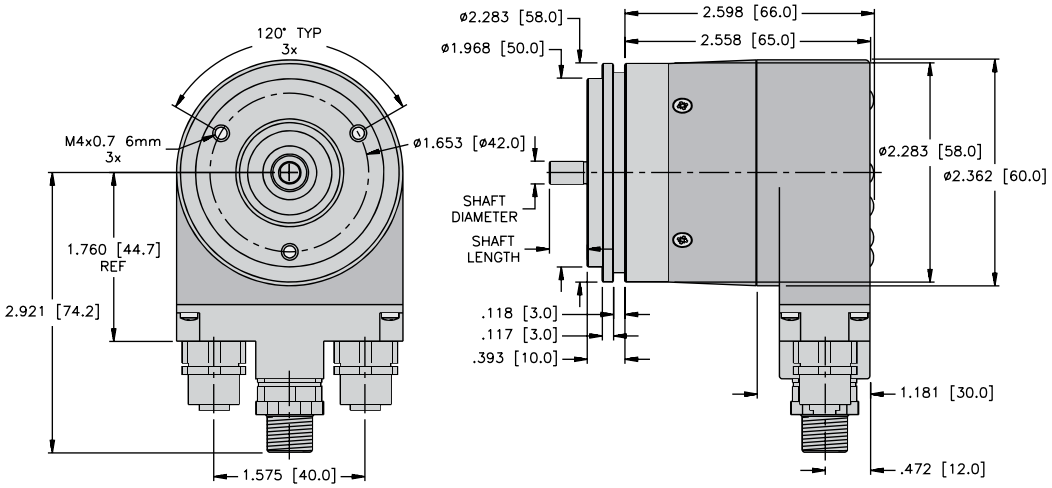
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

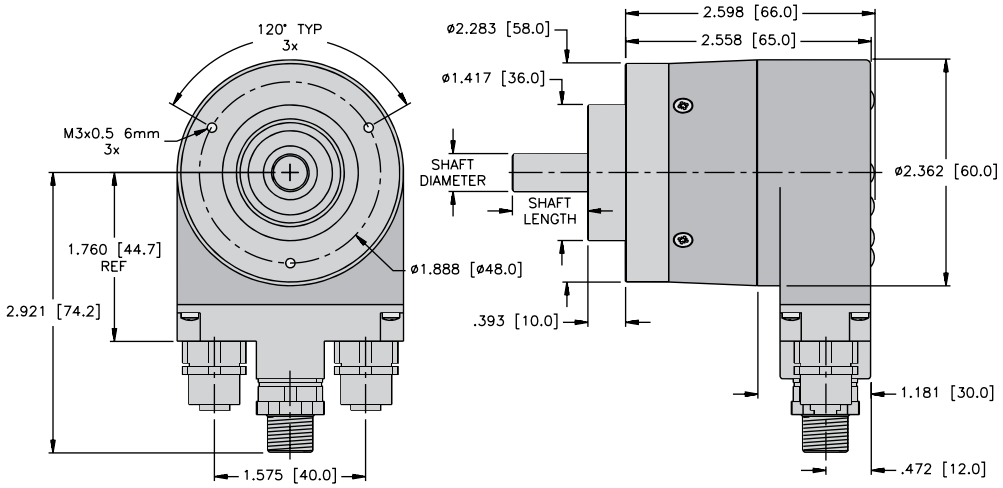
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) EtherCAT

Dimensions: 5858 shaft version

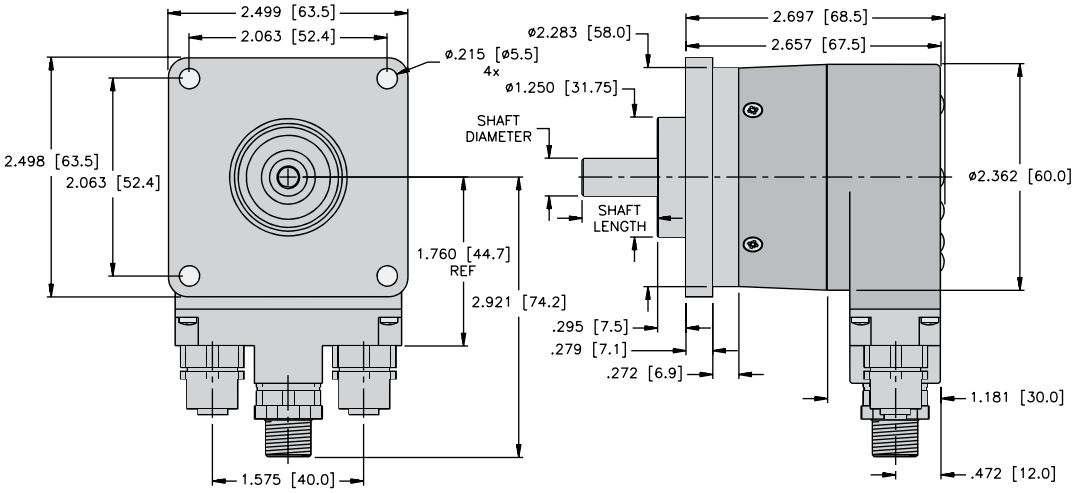
5858 flanges 2 & 4
M12 *eurofast*® connection 2



5858 flanges 1 & 3
M12 *eurofast* connection 2



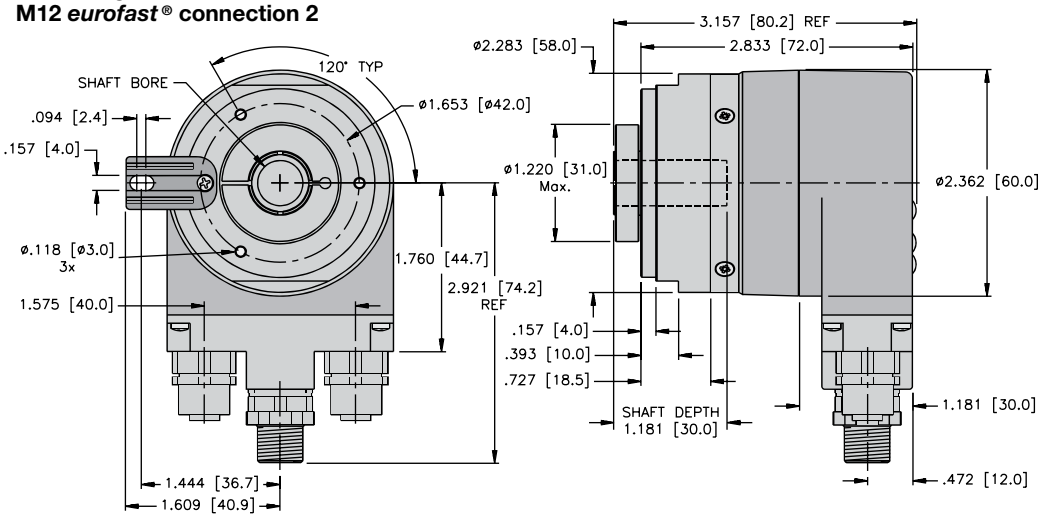
5858 flanges 5 & 7
M12 *eurofast* connection 2



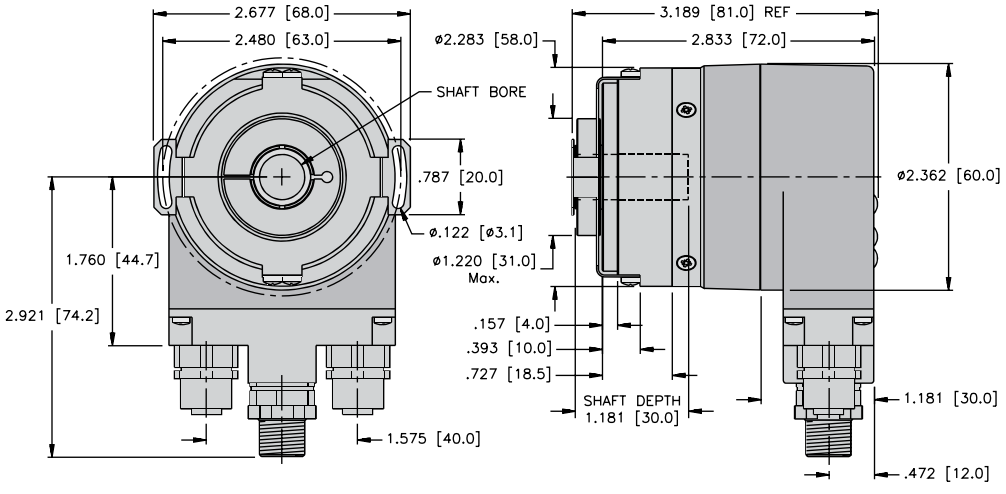
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) EtherCAT

Dimensions: 5878 blind hollow shaft version

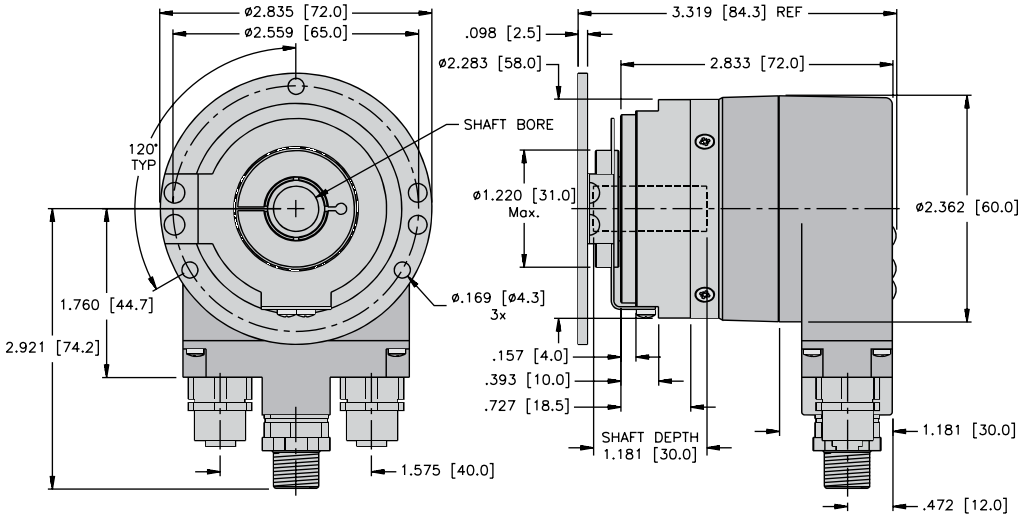
5878 flanges 1 & 2
M12 *eurofast*® connection 2



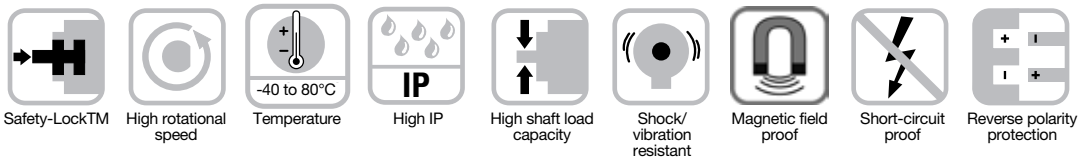
5878 flanges 5 & 6
M12 *eurofast* connection 2



5878 flanges 3 & 4
M12 *eurofast* connection 2



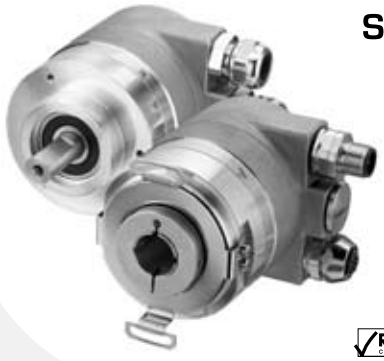
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) PROFIBUS®-DP



Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability.** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range.**



Sendix® absolute

PROFIBUS

RoHS compliant | cULus | Ex | 2/22

Fast

- **Fast data availability with reduced loading on the bus and controller:** Intelligent functions such as transmission of speed/velocity, acceleration or leaving a working area.
- **Fast, simple, error-free connection.**

Versatile

- **Up-to-the minute fieldbus performance:** PROFIBUS-DP V0 with the current encoder profile supports Class I and Class II.
- **Connection options:** Bus cover with M12 connector or cable connection.
- **Fast start-up:** with pre-defined GSD file. A variety of scaling options for the most diverse applications: 16 bit singleturn resolution; comprehensive diagnostics, programmable to Class II.

Mechanical characteristics:

Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 7,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	7,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 6,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Starting torque without shaft sealing (IP65):	< 1.4 oz-in (< 0.01 Nm)
Starting torque with shaft sealing (IP67):	Shaft version: < 7 oz-in (0.05 Nm) Hollow shaft version: < 4.25 oz-in (< 0.03 Nm)
Moment of inertia:	Shaft version: 0.16 oz-in² (3.0 x 10^{-6} kgm²) Hollow shaft version: 0.328 oz-in² (6.0 x 10^{-6} kgm²)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 1.17 lbs (0.53 kg) with bus terminal cover approx. 1.10 lbs (0.50 kg) with fixed connection
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +176°F (-40 to +80°C)
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc
Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (> 100 m/s²), 55-2,000 Hz

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (without output load):	24 VDC, max.90 mA
Reverse polarity protection at power supply (+V):	Yes
UL certified:	File 224618
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
RoHS compliant acc. to EU guideline 2002/95/EG	

Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) PROFIBUS®-DP

Interface characteristics PROFIBUS-DP:

Singleturn resolution (max, scalable):	1-65536 (16 bits), default scale value is set to 8192 (13 bits)
Code:	Binary
Interface:	Specification according to PROFIBUS-DP 2.0 Standard (DIN 19245 part 3)
Protocol:	PROFIBUS Encoder Profile V1.1 Class I and Class II with manufacturer-specific enhancements
Baud rate:	12 Mbits/s
Node address:	1-127 (set by rotary switches)
Termination switchable:	Set by DIP switches

SET control button (zero or defined value, option):

Protected against accidental activation, can only be pushed in with the tip of a ballpoint pen or similar.

Diagnostic LED (yellow):

LED on with:
Sensor error: PROFIBUS error

PROFIBUS Encoder-Profile V1.1

The PROFIBUS-DP device profile describes the functionality of the communication and the user-specific component within the PROFIBUS fieldbus system. For encoders, the encoder profile is definitive. Here the individual objects are defined independent of the manufacturer. Furthermore, the profiles offer space for additional manufacturer-specific functions; this means that PROFIBUS-compliant device systems may be used with the guarantee that they are ready for the future.

The following parameters can be programmed:

- Direction of rotation
- Scaling/number of steps per revolution
- Preset value
- Diagnostics mode

The following functionality is integrated:

- Galvanic isolation of the bus stage with DC/DC converter
- Line driver according to RS485; max. 12 MB
- Address programmable via DIP switches
- Diagnostics LED
- Full Class I and Class II functionality

Pin configuration with terminal box (Connection 1):

Signal:	BUS IN				BUS OUT			
	B	A	Common (0 V)	+V	Common (0 V)	+V	B	A
Pin:	1	2	3	4	5	6	7	8

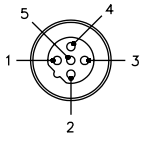
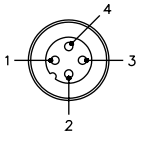
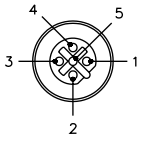
Pin configuration M12 *eurofast*® - 3 connector version (Connection 2):

Bus In	**Signal:**	**-**	**BUS-A**	**-**	**BUS-B**	**Shield**
	Pin:	1	2	3	4	5

Power Supply	**Signal:**	**+V**	**-**	**Common (0 V)**	**-**
	Pin:	1	2	3	4

Bus Out	**Signal:**	**BUS-VDC** [1]	**BUS-A**	**BUS_GND** [1]	**BUS-B**	**Shield**
	Pin:	1	2	3	4	5

Wiring Diagrams:

Bus In	Power Supply	Bus Out
Male encoder view	**Male encoder view**	**Female encoder view**
		
M12 ***eurofast*** pinout	M12 ***eurofast*** pinout	M12 ***eurofast*** pinout
Mating cordset: [2] [3] **RKSW-455-*M**	Mating cordset: [2] **RK 4.4T-***	Mating cordset: [2] [3] **RSSW-455-*M**

[1] For powering an external PROFIBUS-DP terminating resistor.
[2] See cable section for additional options.
[3] "S" denotes shield tied to coupling nut.
* Length in meters. Available in 0.1 meter increments ≥ 0.2 meters.

TURCK
Industrial Automation

Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) PROFIBUS®-DP

Part number key: 5858 shaft version

T8.5858.XXXX.XX1X

Type

Flange

1 = clamping flange Ø 58 IP65
2 = servo flange Ø 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
6 = servo flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67
8 = servo flange 2.5" / 63.5 mm, IP67

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Output circuit and power supply

3 = 10-30 VDC, PROFIBUS-DP V0 Encoder Profile V 1

Options

2 = no option
3 = SET button

Fieldbus profile

31 = PROFIBUS-DP-V0, encoder profile Class 2

Type of connection

1 = with removable bus terminal cover, with radial screwed cable passage
2 = removable bus terminal cover with 3 x M12 ***euofast*** ® connector

Part number key: 5878 blind hollow shaft version

T8.5878.XXXX.XX1X

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Blind hollow shaft (30 mm depth)

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm
8 = Ø 9.52 mm (3/8“)
9 = Ø 12.7 mm (1/2“)

Output circuit and power supply

3 = 10-30 VDC, PROFIBUS-DP V0 Encoder Profile V 1

Options

2 = no option
3 = SET

Fieldbus profile

31 = PROFIBUS-DP-V0, encoder profile Class 2

Type of connection

1 = with removable bus terminal cover, with radial screwed cable passage
2 = removable bus terminal cover with 3 x M12 ***eurofast*** connector

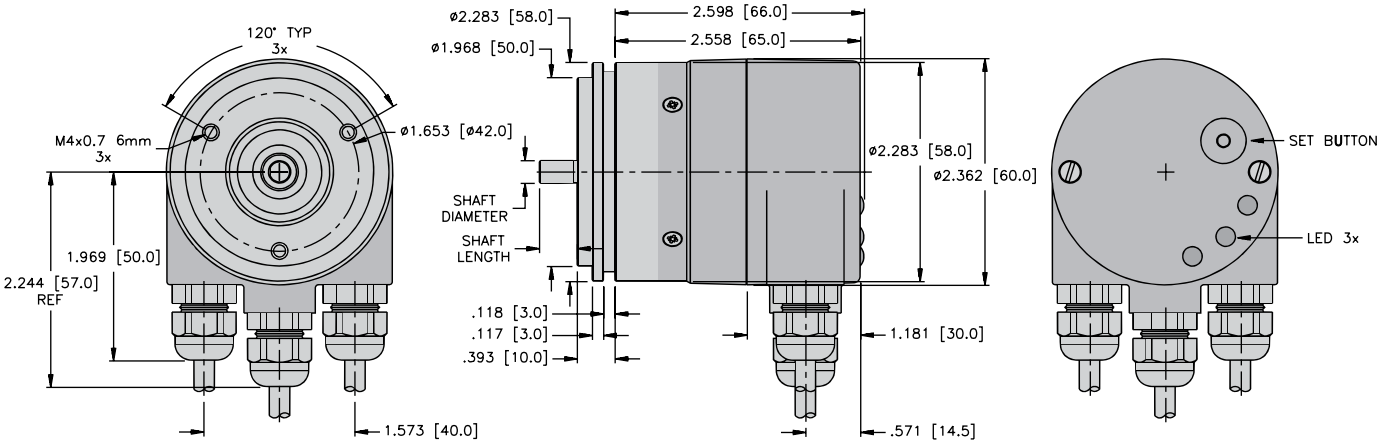
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

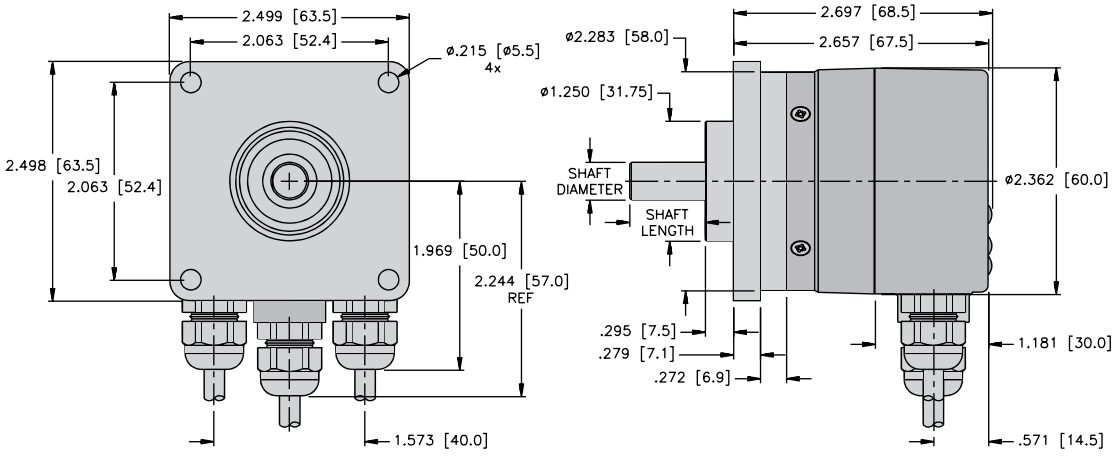
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) PROFIBUS®-DP

Dimensions: 5858 shaft version

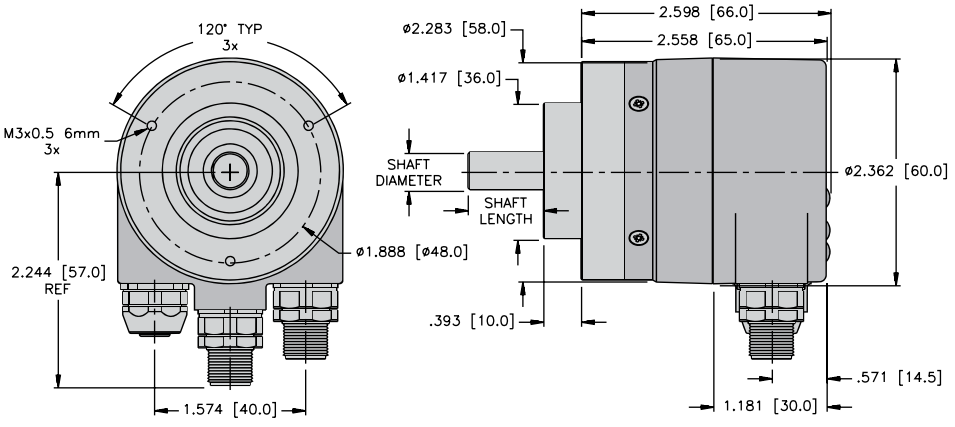
5858 flanges 2 & 4
Cable connection 1



5858 flanges 5 & 7
Cable connection 1



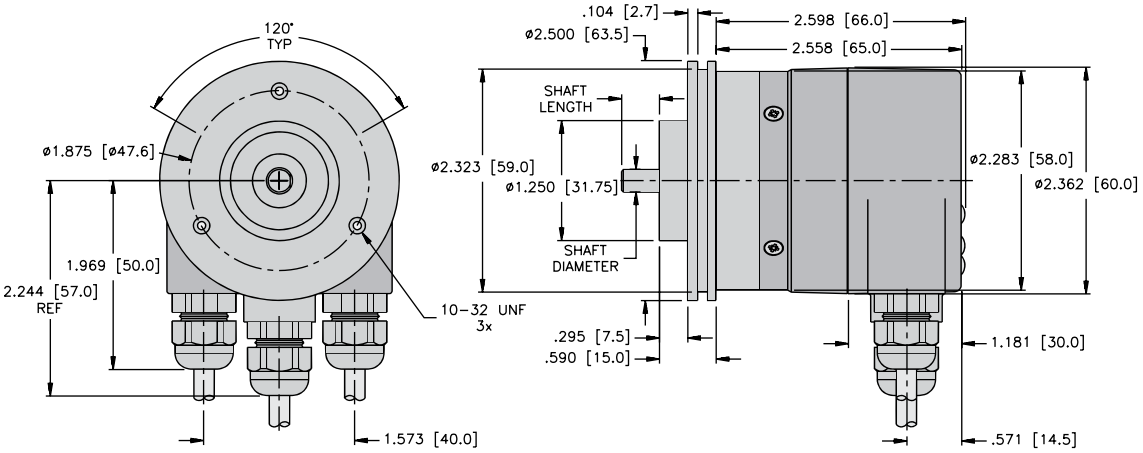
5858 flanges 1 & 3
M12 *eurofast*® connection 2



Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) PROFIBUS®-DP

Dimensions: 5858 shaft version

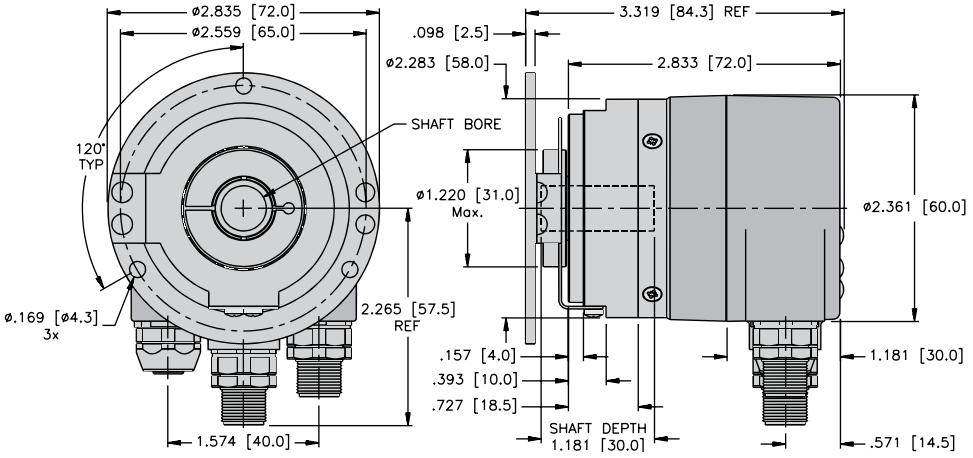
5858 flanges 6 & 8
Cable connection 1



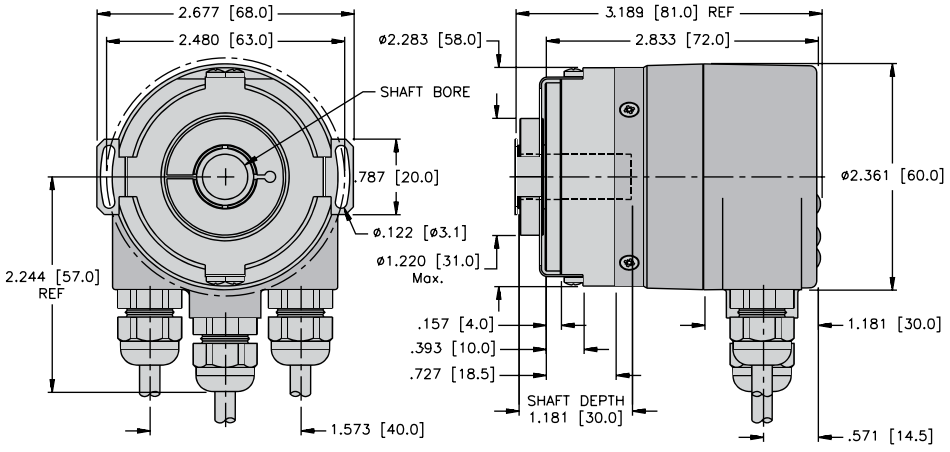
Sendix absolute, singleturn type 5858 (shaft) / 5878 (blind hollow shaft) PROFIBUS®-DP

Dimensions: 5878 blind hollow shaft version

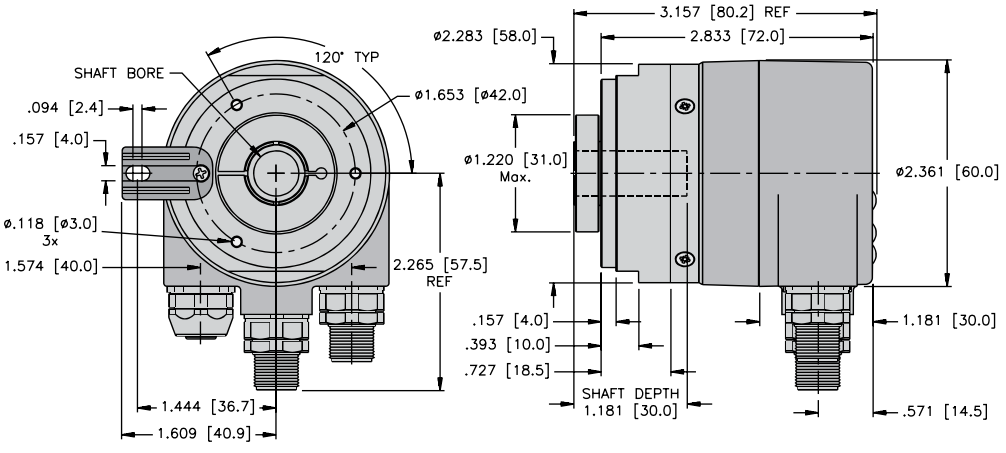
5878 flanges 3 & 4
M12 *eurofast*® connection 2



5878 flanges 5 & 6
Cable connection 1



5878 flanges 1 & 2
M12 *eurofast* connection 2



Stainless steel type 5876 (hollow shaft) — SSI, parallel

High rotational speed | Temperature | High IP | Shock/ vibration resistant | Short-circuit proof | Reverse polarity protection

Rugged
- Patented construction integrates all components; opto-asic and multilayer technology on a single PCB.
- Improved EMC and the highest shock resistance on the market: > 250 g (> 2,500 m/s²), 6 ms according to DIN IEC 68-2-27).
- IP67 protection.
- Temperature and aging compensation.
- Short-circuit proof outputs.

RoHS compliant | cULus | Ex | 2/22

Compact
- Ø 58 mm.
- Hollow shaft up to Ø 12 mm.

Versatile
- Resolution up to 14 bits, singleturn.
- Gray, Binary or BCD code.
- SSI or parallel interface.
- Various options.

Mechanical characteristics:

Speed with seal [1]:	max. 6,000 RPM
Rotor moment of inertia:	approx. 0.328 oz-in² (6 x 10⁻⁶ kgm²)
Starting torque:	< 7 oz-in (< 0.05 Nm)
Weight:	approx. 1.32 lbs (0.6 kg)
Protection acc. to EN 60 529 with seal:	IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature with seal:	-4 to +176°F (-20 to +80°C) [2] [3]
Shaft/body:	stainless steel H7
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] For continuous operation max. 1,500 RPM

[2] Non-condensing
[3] 158°F (70°C) with cable

Electrical characteristics:

Interface type:		Synchronous Serial (SSI)	Synchronous Serial (SSI)	Parallel	Parallel
Supply voltage (+V):		5 VDC (± 5 %)	10-30 V DC	5 VDC (± 5 %)	10-30 V DC
Output driver:		RS485	RS485	Push-pull	Push-pull
Current consumption typ.: (no load) max.:		89 mA 138 mA	89 mA 138 mA	109 mA 169 mA	109 mA 169 mA
Permissible load/channel:		max. +/- 20 mA	max. +/- 20 mA	max. +/- 10 mA	max. +/- 10 mA
Word change frequency:		max. 15.000/s	max. 15.000/s	40.000/s	40.000/s
SSI pulse rate min./max.:		100 kHz/500 kHz	100 kHz/500 kHz	-	-
Signal level high:		type. 3.8 V	type. 3.8 V	type. 3.4 V	min. +V - 2.8 V
Signal level low:	(I_{Load} = 20 mA): (I_{Load} = 10 mA): (I_{Load} = 1 mA):	typ. 1.3 V - -	typ. 1.3 V - -	- max. 1.5 V max. 0.3 V	- max. 1.8 V -
Rise time t_r (without cable):		max. 100 ns	max. 100 ns	max. 0.2 µs	max. 1 µs
Fall time t_f (without cable):		max. 100 ns	max. 100 ns	max. 0.2 µs	max. 1 µs
Short-circuit proof outputs [1]:		yes	yes [2]	yes	yes
Reverse connection protection at +V:		no	yes	no	yes
UL certified:		File 224618			
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3					
RoHS compliant acc. to EU guideline 2002/95/EG					

[1] If supply voltage correctly applied

[2] Only one channel allowed to be shorted-out: (If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted.)
(If +V = 5-30 V, short-circuit to channel or 0 V is permitted.)

Stainless steel type 5876 (hollow shaft) — SSI, parallel

Control Inputs:

UP/DOWN input to switch the counting direction. By default, absolute encoders deliver increasing code values when the shaft rotates clockwise. If the shaft rotates counter-clockwise, the output delivers decreasing code values. If the up/down input receives the corresponding signal (high), this feature is reversed. Clockwise rotation delivers decreasing code values, while counter-clockwise rotation delivers increasing code values.

The response time is:
- 0.4 ms for 5 VDC supply voltage
- 2 ms for 10-30 VDC supply voltage

Switching level of the control inputs:

Supply voltage:	5 VDC	10-30 VDC
Low:	≤ 1.7 V	≤ 4.5 V
High:	≥ 3.4 V	≥ 8.7 V

SET input

This input is used to reset (to zero) the encoder. A control pulse (high) sent to this input allows storing the current position value as new zero position in the encoder.

Note: Before activating the SET input after supplying the encoder with the supply voltage, a counting direction clockwise or counter-clockwise must be defined univocally on the up/down input.

The response time is :
- 0.4 ms for 5 VDC supply voltage
- 2 ms for 10-30 VDC supply voltage

LATCH input

This input is used to “freeze” the current position value. The position value will be statically available on the parallel output as long as this input will remain active (high).

The response time is:
- 140 µs for 5 VDC supply voltage
- 200 µs for 10-30 VDC supply voltage

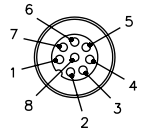
Pin configuration: SSi interface with 8-pin plug

Signal:	0 V	+V	+T	-T	+D	-D	ST	V/R
Pin:	1	2	3	4	5	6	7	8
Color:	WH	BN	GN	YE	GY	PK	BU	RD

T = Clock signal
D = Data signal
ST = SET input. The current positon value is stored as new zero position.
VR = Up/down input. As long as this input is active, decreasing code values are transmitted when the shaft is turning clockwise.
Isolate unused outputs before initial start-up.

Wiring diagrams:

Male encoder view



M12 ***eurofast***® pinout

Mating cordset:
E-RKC 8T-264-*

* Length in meters.

Pin configuration: Parallel interface, 14 bits and max. 2 options, cable version

Signal:	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	SET V/R	V/R Latch	14
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU	WH GN	BN GN	WH YE	YE BN	WH GY	BY BN

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Stainless steel type 5876 (hollow shaft) SSI, parallel

Part number key: 5876 hollow shaft version

T8.5876.XXXX.XXXX

Type

Flange

1 = flange with through shaft
2 = flange with blind hollow shaft

Hollow shaft

6 = Ø 10 mm
8 = Ø 12 mm

Interface and supply voltage

1 = 5 VDC, SSI
2 = 10-30 VDC, SS
3 = 5 VDC, parallel
4 = 10-30 VDC, parallel

Options

2 = SET [1] and V/R
3 [2] = SET and Latch [1]
4 [2] = V/R [1] and Latch
Alarm output on request

Type of code and division

Gray/Binary
250, 360 [3], 500, 720 [3], 900, 1000 [3], 1024 (10 Bit) [3], 1250, 1440, 1800, 2000, 2500, 2880, 3600 [3], 4000, 4096 (12 Bit) [3], 5000, 7200, 8192 (13 Bit) [3], 16384 (14 Bit) [3]

BCD
250, 360 [3], 500, 720 [3], 900, 1000 [3], 1024 (10 Bit) [3], 1250, 1440, 1800, 2000
Others on request

Type of connection

1 [a] = radial cable (1 m PVC-cable)
2 [b] = radial 8-pin M12 ***eurofast*** ® connector

[1] With 14 bits parallel output
[2] Not with SSI or current interface
[3] Preferred divisions use corresponding table

[a] In connection with parallel- or SSI- output
[b] In connection with SSI-output

Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

Code type and division with parallel output

Interface and supply voltage, version 3 or 4 (Parallel):

Division	Part number key Gray/Gray-Excess	Part number key Binary	Part number key BCD
250	E02	B02	D02
360	E03	B03	D03
500	E05	B05	D05
720	E07	B07	D07
900	E09	B09	D09
1000	E01	B01	D01
1024 (10 Bit)	G10	B10	D10
1250	E12	BA2	DA2
1440	E14	BA1	DA1
1800	E18	B18	D18
2000	E20	B20	D20
2500	E25	B25	
2880	E28	B28	
3600	E36	B36	
4000	E40	B40	
4096 (12 Bit)	G12	B12	
5000	E50	B50	
7200	E72	B72	
8192 (13 Bit)	G13	B13	
16384 (14 Bit)	G14	B14	

Code type and division for encoder with SSI-Output

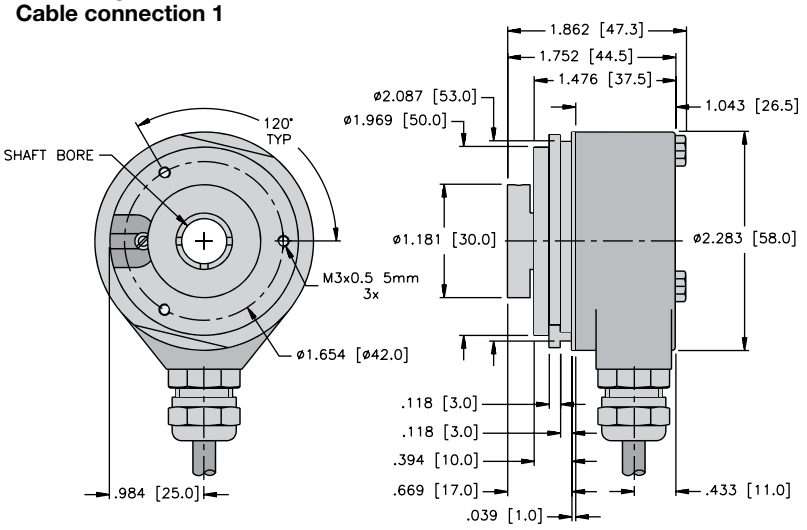
Interface and supply voltage, version 1 or 2 (SSI):

Division	Part number key Gray	Part number key Binary
1024 (10 Bit)	G10	B10
4096 (12 Bit)	G12	B12
8192 (13 Bit)	G13	B13
16384 (14 Bit)	G14	B14

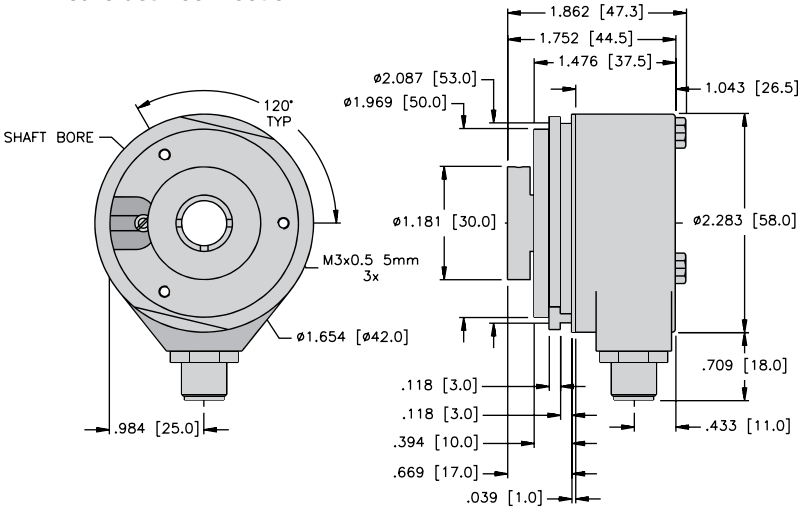
Stainless steel type 5876 (hollow shaft) **SSI, parallel**

Dimensions: 5876 hollow shaft version

5876 flanges 1 & 2
Cable connection 1



5876 flanges 1 & 2
M12 *eurofast*® connection 2



Mounting advice:

The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time.

When mounting a hollow shaft encoder, we recommend using a torque stop pin or a flex bracket (see page E1, Accessories).

Sendix absolute, multiturn type F3663 (shaft) / F3683 (blind / hollow shaft) SSI/BiSS

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN/COS

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability:** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range of -22 to +194°F (-30 to +90°C).**
- **Easy diagnosis in case of fault condition.** Status indication by means of LED, sensor, voltage and temperature monitoring.

Sendix absolute

SSI

BiSS INTERFACE

pending 2/22

Fast

- **High accuracy:** Update rate of the whole position value above 100 kHz for a max. jitter of 1 µs (real-time).
- **High productivity due to very short regulation cycles:** Clock rate with SSI up to 2 MHz, with BiSS up to 10 MHz.
- **High-resolution feedback system achievable in real-time:** SinCos incremental outputs.

Versatile

- **Connections for every application:** Tangential cable.
- **Open interfaces ensure flexibility and independence:** SSI or BISS with Sine-Cosine-Option incremental track RS422.
- Multiple mounting brackets for easy installation.
- **Compact design.**
- **Fast and easy start-up on site:** Preset and reversal of rotation direction by control inputs.
- **Direct mounting on standard diameter shafts up to 10 mm through hollow shaft up to 8 mm.**

Mechanical characteristics:

Max. speed, shaft or blind hollow shaft version without shaft sealing (IP65):	12,000 RPM, continuous operation 10,000 RPM
Max. speed, shaft version (IP67) or blind hollow shaft (IP65) with shaft sealing:	10,000 RPM, continuous operation 8,000 RPM
Starting torque without shaft sealing:	< 1 oz-in (< 0.007 Nm)
Starting torque with shaft sealing:	< 1.4 oz-in (< 0.01 Nm)
Radial load capacity of shaft:	9 lbs (40 N)
Axial load capacity of shaft:	7 lbs (31 N)
Weight:	approx. 0.44 lbs (0.2 kg)

Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	fixed installation: -22 to +194°F (-30 to +90°C) flexible installation: -4 to +194°F (-20 to +90°C)
Materials:	Shaft/Hollow shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:	> 250g (> 2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (>100 m/s²), 55-2,000 Hz

General electrical characteristics:

Supply voltage:	5 VDC ± 5 % or 10-30 VDC
Current consumption (without output load):	5 VDC: max. 70 mA, 24 VDC: max. 20 mA
Reverse polarity protection at power supply (+V):	yes
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	

RoHS compliant acc. to EU guideline 2002/95/EG	
Output driver:	RS485 transceiver type
Permissible load/channel:	max. ± 20 mA
Signal level high:	typ. 3.8 V
Signal level low at I_{load} = 20 mA:	typ. 1.3 V
Short-circuit proof outputs:	yes [1]

Interface characteristics SSi:

Singleturn resolution:	10-17 bit [2]
Number of revolutions:	4096 (12 bit), 65535 (16 bit)
Code:	Binary or Gray
SSI clock rate:	< 14 bit: 50 kHz-2 MHz / < 15 bit: 50 kHz-125 kHz
Monoflop time:	> 15 µs [2]

Time jitter (data request to position latch):	< 1 µs up to 14 bits, < 4 µs at 15-17 bits
Status and Parity bit:	optional on request

Note: If clock starts cycling within monoflop time, a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. Max. update rate is dependent on clock speed, data length and monoflop time.

[1] Short-circuit to 0 V or to output, one channel at a time, supply voltage correctly applied
[2] Other options upon request

Sendix absolute, multiturn type F3663 (shaft) / F3683 (blind / hollow shaft) SSI/BiSS

Interface characteristics BiSS:

Singleturn resolution:	10-17 bit, customer programmable [3]
Number or revolutions:	4096 (12 bit)
Code:	Binary
Clock rate:	up to 10 MHz
Max. update rate:	< 10 µs, depending on clock speed and data length
Time jitter (data request to position latch):	< 1 µs

Note: Bidirectional, programmable parameters are: resolution, code, direction, alarms and warnings; Multicycle data output, e.g. for temperature; CRC data verification

Incremental output (A/B). 2048 ppr:

	Sin/Cos
Max. -3dB frequency:	400 kHz
Signal level:	1 Vpp (± 20%)
Short-circuit proof:	yes [2]

[2] Short-circuit to 0 V or to output, one channel at a time, supply voltage correctly applied
[3] Other options upon request

Status output and LED:

Output driver:	open collector, internal pull up resistor 22 kOhm
Permissible load:	-20 mA
Signal level high:	+V
Signal level low:	< 1 V
Active at:	Low

The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation, the LED is OFF and the status output is HIGH (open-collector with int. pull-up 22k).

If the LED is ON (status output LOW) this indicates: Sensor error, singleturn or multiturn (soiling, glass breakage etc.); LED error, failure or aging; Over or under temperature; Under voltage.
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

SET input:

Input characteristics:	active HIGH
Input type:	comparator
Signal level high:	min. 60 % of V+ (supply voltage), max: V+
Signal level low:	max. 30 % of V+ (supply voltage)
Input current:	< 0.5 mA
Min. pulse duration (SET):	10 ms
Timeout after SET input:	14 ms

The encoder may be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET key. Other preset values may be factory programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. During this time the LED is ON and the status output is at LOW.

DIR input:

A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.

Power-on delay:

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

Pin configuration:

Interface 1 and 2 (SSI or BiSS, SET, DIR, Status) (Connection 1, 2)

Output:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	SET	DIR	Status	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	Shield

Interface 3 and 4 (SSI or BiSS, SET, DIR, 2048 Sin/Cos) (Connection 1, 2)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Interface 5 (SSI or BiSS, SET, DIR, voltage sense outputs) (Connection 1, 2)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	SET	DIR	0 V sens	+V sens	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	RD/BU	VT	Shield

Interface 6 (SSI or BiSS, SET, DIR, 2048 Sin/Cos, voltage sense outputs) (Connection 1, 2)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	0 V sens	+V sens	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Interface 7 and 8 (SSI or BiSS, SET, DIR, 2048 Sin/Cos) (Connection 1, 2)

Output:	GND	+V	+Clock	-Clock	+Data	-Data	A	A inv	B	B inv	PE
Color:	WH	BN	GN	YE	GY	PK	BK	VT	RD	RD/BU	Shield

TURCK
Industrial Automation

Sendix absolute, multiturn type F3663 (shaft) / F3683 (blind / hollow shaft) SSI/BiSS

Part number key: F3663 shaft version

T8.F3663.XXXX.XXXX

Type

Flange

1 = clamping flange Ø 36 mm, IP67
2 = servo flange Ø 36 mm, IP67
3 = clamping flange Ø 36 mm, IP65
4 = servo flange Ø 36 mm, IP65

Shaft (Ø x L)

1 = Ø 6 mm x 12.5 mm
2 = Ø 6.35 mm (1/4")x 12.5 mm
3 = Ø 8 mm x 15 mm
4 = Ø 9.525 mm (3/8") x 15.875 mm (5/8")
5 = Ø 10 mm x 20 mm

Output and voltage supply

1 = 5 VDC, SSI or BiSS
2 = 10-30 VDC, SSI or BiSS
3= 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422
8 = 10-30 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422

Inputs/outputs

2 = SET, DIR input

Resolution Multiturn

2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

Resolution Singleturn

A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

Code

B = SSI, binary
C = BiSS, binary
G = SSI, gray

Type of connection

1 = tangential cable outlet (1 m PUR)
3 = tangential cable outlet (5 m PUR)

Part number key: F3683 hollow shaft version

T8.F3683.XXXX.XXXX

Type

Flange

1 = Ø 36 mm, with torque stop, IP65
2 = Ø 36 mm, with slotted flex mount, IP65

Hollow shaft

1 = Ø 6 mm
2 = Ø 6.35 mm
3 = Ø 8 mm
4 = Ø 10 mm (blind hollow shaft)

Output and voltage supply

1 = 5 VDC, SSI or BiSS
2 = 10-30 VDC, SSI or BiSS
3= 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422
8 = 10-30 VDC, SSI or BiSS and 2048 ppr. incr. signals RS422

Inputs/outputs

2 = SET, DIR input (additional status output)

Resolution Multiturn

2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

Resolution Singleturn

A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

Code

B = SSI, binary
C = BiSS, binary
G = SSI, gray

Type of connection

1 = tangential cable outlet (1 m PUR)
3 = tangential cable outlet (5 m PUR)

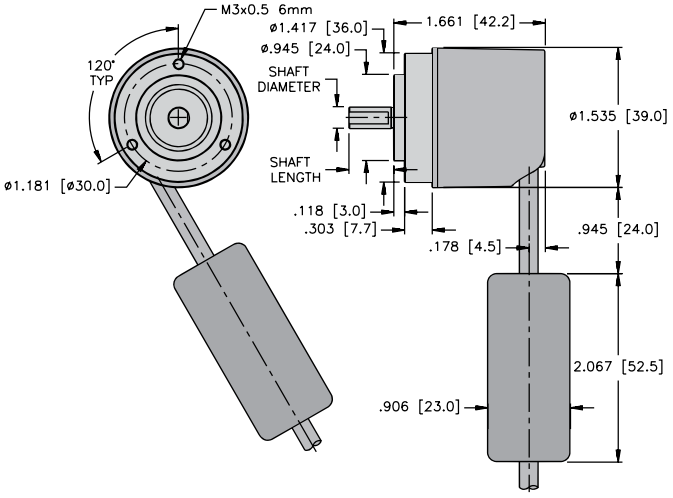
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

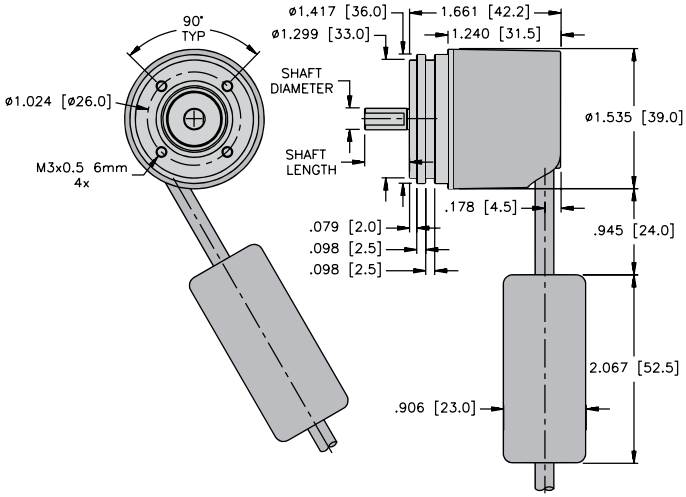
Sendix absolute, multiturn type F3663 (shaft) / F3683 (blind / hollow shaft) SSI/BiSS

Dimensions: F3663 shaft version

F3663 flanges 1 & 3
Cable connection 1 & 2

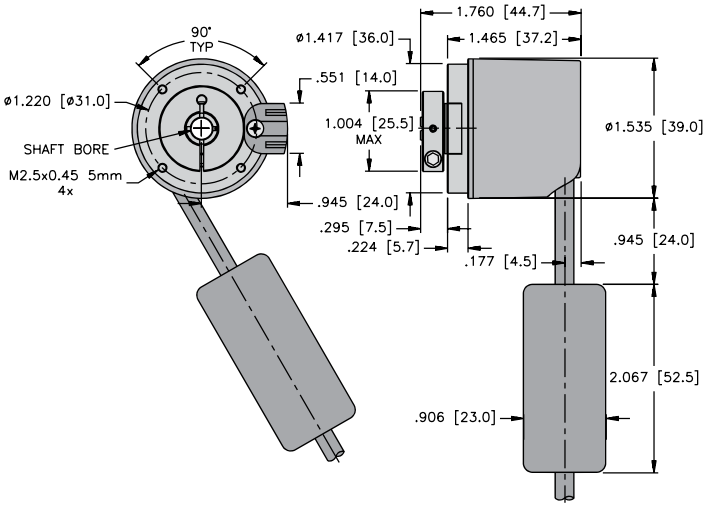


F3663 flanges 2 & 4
Cable connection 1 & 3

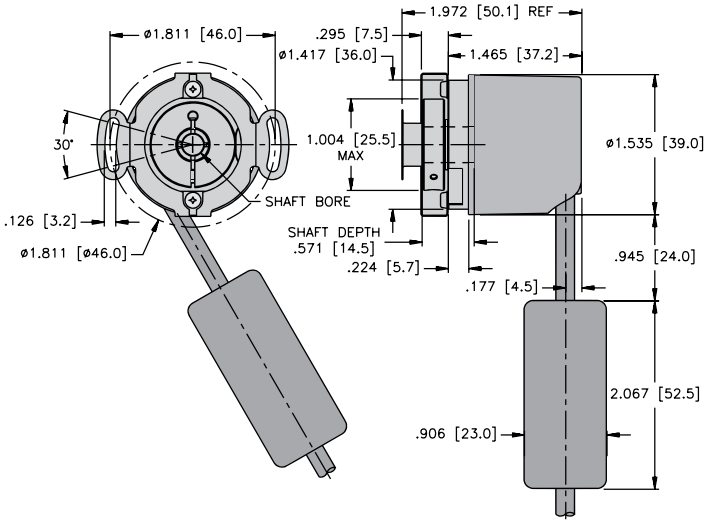


Dimensions: F3683 hollow shaft version

F3683 flange 1
Cable connection 1 & 3



F3683 flanges 2 (blind hollow shaft)
Cable connection 1 & 3



Sendix absolute, multiturn type F3668 (shaft) / F3688 (blind / hollow shaft) CANopen

Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN/COS

Rugged
- Electronic multiturn is 100% magnetic-field resistant.
- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors.
- Wide temperature range: -22 to +194°F (-30 to +90°C).

Sendix absolute CANopen

RoHS compliant | pending | 2/22

Compact
- **Overall size of 36 x 42 mm:** Hollow shaft of up to 8 mm, blind hollow shaft of up to 10 mm.

Versatile
- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.

Mechanical characteristics:

Max. speed: Shaft or blind hollow shaft version without shaft sealing (IP65): Shaft version (IP67) or blind hollow shaft (IP65) with shaft sealing:		12,000 RPM, continuous operation 10,000 RPM 10,000 RPM, continuous operation 8,000 RPM
Starting torque without shaft sealing:		< 1 oz-in (< 0.007 Nm)
Starting torque with shaft sealing:		< 1.4 oz-in (< 0.01 Nm)
Radial load capacity of shaft:		9 lbs (40 N)
Axial load capacity of shaft:		7 lbs (31 N)
Weight:		approx. 0.44 lbs (0.2 kg)
Protection acc. to EN 60 529:		Housing: IP67 Shaft: IP65, opt. IP67
EX approval for hazardous areas:		optional zone 2 and 22
Working temperature: (Cable type)	fixed: flexible:	-22 to +185°F (-30 to +85°C) -4 to +185°F (-20 to +185°C)
Materials:		Shaft/Hollow shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PUR
Shock resistance acc. to DIN-IEC 68-2-27:		> 250g (> 2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:		> 10 g (>100 m/s²), 55-2,000 Hz

Diagnostic LED (two-color, red/green):

LED ON or blinking	red: green:	error display status display

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (no load):	24 V DC max. 60 mA
Reverse connection of the supply voltage (+V):	yes
RoHS compliant acc. to EG-guideline 2002/95/EG	
CE compliant acc. to EN 61000-6-2, EN 61000-6-4 and EN 61000-6-3	

Interface characteristics CANopen:

Resolution Singleturn:	1-65536 (16 bit), scaleable: 1-65536
Default value Singleturn:	8192 (13 bit)
Total resolution:	1-4.294.967.296 (32 bit); Default: 25 bit
Code:	Binary
Interface:	CAN High-Speed according to ISO 11898, Basic- and Full-CAN , CAN Specification 2.0 B
Protocol:	CANopen profil DS 406 V3.1 with manufacturer specific add-ons LSS-Service DS305 V2.0
Baud rate:	10-1000 kbit/s (software configurable)
Node address:	1-127 (software configurable)
Termination switchable:	software configurable
LSS Protocol	CIA LSS protocol DS305 Global command support for node address and baud rate. Selective commands via attributes of the identity object

Sendix absolute, multiturn type F3668 (shaft) / F3688 (blind / hollow shaft) CANopen

General information about CANopen

The M3658 and M3678 CANopen encoder series support the latest CANopen communication profile according to DS 301 V4.02 . In addition, device specific profiles, like the DS 406 V3.1, are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters, which have been saved on a flash memory to protect them against power failure, are loaded again. Position, speed and status of the working area output values may be combined in a freely variable way as PDO mapping.

The encoders are available with a connector or a cable connection. The device address and baud rate may be set/modified by means of the software. A two-color LED indicates the operating or fault status of the CANbus, as well as the status of the internal diagnostics. Node address, baud rate and CANbus termination are programmable.

CANopen Communication Profile DS301 V4.02

The following functionality is integrated. Class C2 functionality:

- NMT Slave
- Heartbeat Protocol
- Identity Object
- Error Behavior Object
- Variable PDO Mapping self-start programmable (Power on to operational), 3 sending PDO's
- Node address, baud rate and CANbus/programmable termination

CANopen Encoder Profile DS406 V3.1

The following parameters may be programmed:

- Event mode
- One work area with upper and lower limit and the corresponding output states
- Variable PDO mapping for position, speed, work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status: 1 LED, two-color
- Customer-specific memory - 16 Bytes
- "Watchdog controlled" device

LSS Layer Setting Services DS305 V2.0

- Global support of Node-ID and baud rate
- Selective protocol via identity object (1018h)

Pin configuration:

Signal:	+V	0 V	CAN GND	CAN High	CAN Low
Color:	BN	WH	GY	GN	YE

Part number key: F3668 shaft version

T8.F3668.XX2X.2112

Type

Flange

1 = clamping flange Ø 36 mm, IP67
2 = servo flange Ø 36 mm, IP67
3 = clamping flange Ø 36 mm, IP65
4 = servo flange Ø 36 mm, IP65

Shaft (Ø x L)

1 = Ø 6 mm x 12.5 mm
2 = Ø 6.35 mm (1/4") x 12.5 mm
3 = Ø 8 mm x 15 mm
4 = Ø 9.525 mm (3/8") x 15.875 mm (5/8")
5 = Ø 10 mm x 20 mm

Fieldbus profile

21 = CANopen encoder profile DS406 V3.1

Type of connection

1 = tangential cable (1 m PUR cable)
3 = tangential cable (5 m PUR cable)

Output and voltage supply

2 = 10-30 VDC, CANopen DS301 V4.0

Part number key: F3668 blind hollow shaft version

T8.F3688.XX2X.2112

Type

Flange

1 = Ø 36 mm, with torque stop, IP65
2 = Ø 36 mm, with slotted flex mount, IP65

Hollow shaft

4 = Ø 10 mm (blind hollow shaft)
5 = Ø 6 mm
6 = Ø 6.35 mm (1/4")
7 = Ø 8 mm

Fieldbus profile

21 = CANopen encoder profile DS406 V3.1

Type of connection

1 = tangential cable (1 m PUR cable)
3 = tangential cable (5 m PUR cable)

Output and voltage supply

2 = 10-30 VDC, CANopen DS301 V4.0

Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

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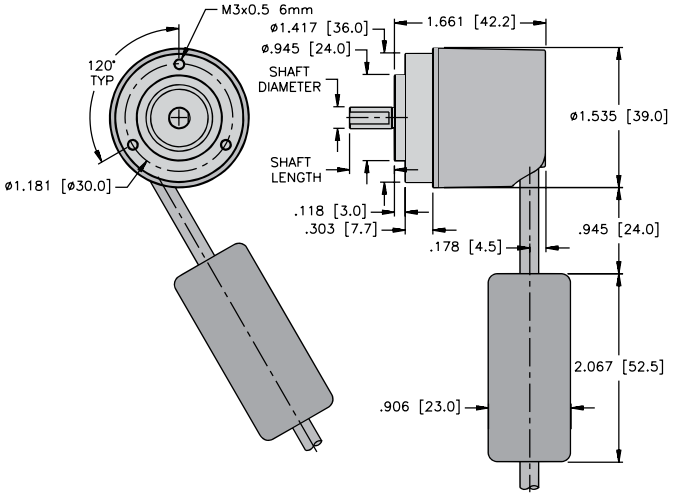
Industrial Automation

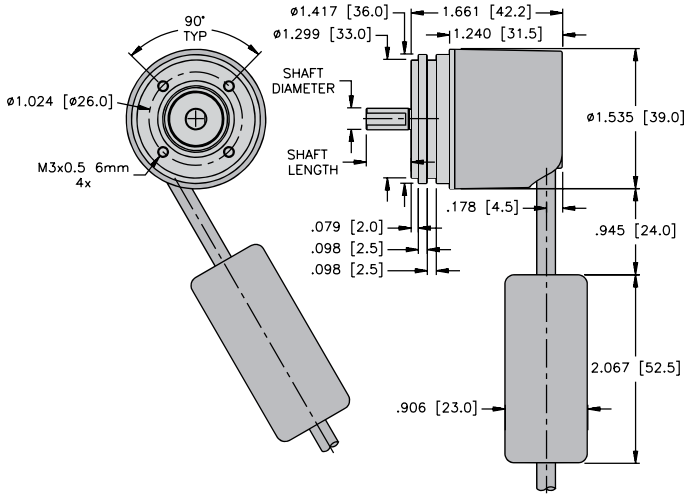
Sendix absolute, multiturn type F3668 (shaft) / F3688 (blind / hollow shaft) CANopen

Dimensions: F3668 shaft version

F3668 flanges 1 & 3
Cable connection 1 & 3

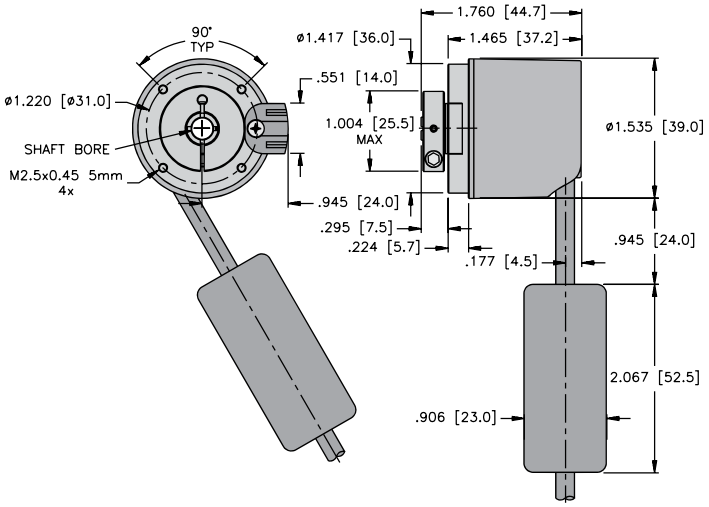


F3668 flanges 2 & 4
Cable connection 1 & 3

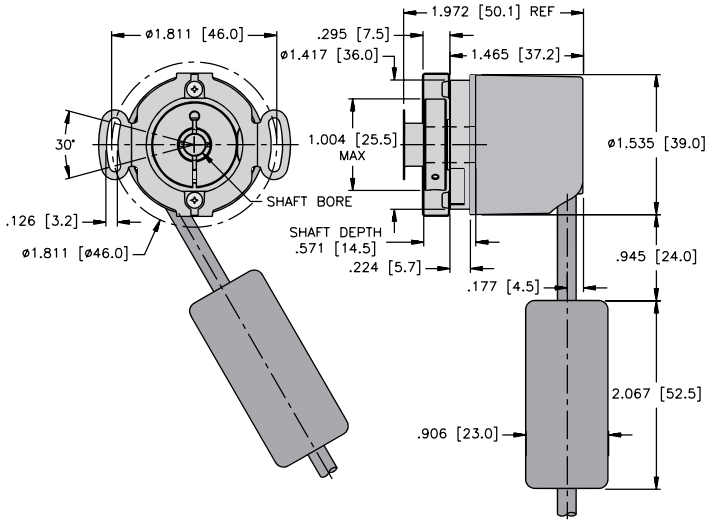


Dimensions: F3688 hollow shaft version

F3688 flange 1
Cable connection 1 & 3



F3688 flanges 2 (blind hollow shaft)
Cable connection 1 & 3



Sendix absolute, multiturn type 5863 (shaft) / 5883 (hollow shaft) SSI/BiSS

Mechanical drive | Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SIN/COS

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability:** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range.**
- **Easy diagnosis in case of fault condition.** Status indication by means of LED, sensor, voltage and temperature monitoring.

Sendix absolute

SSI

BiSS INTERFACE

RoHS compliant

2/22

Fast

- **High accuracy:** Update rate of the whole position value above 100 kHz.
- **High productivity due to very short regulation cycles:** Clock rate with SSI up to 2 MHz, with BiSS up to 10 MHz.
- **High-resolution feedback system achievable in real-time:** SinCos incremental outputs.

Versatile

- **Connections for every application:** Cable, M23 and M12 connector.
- **Open interfaces ensure flexibility and independence:** SSI or BISS with Sine-Cosine-Option incremental track RS422.
- Multiple mounting brackets for easy installation.
- **Status LED and set key available.**
- **Quick, simple on site start-up:** Set key or preset by means of a control input.

Mechanical characteristics:

Shaft version:	
Max. speed without shaft sealing (IP65) up to 158°F (70°C):	12,000 RPM, continuous 10,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	8,000 RPM, continuous 5,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	11,000 RPM, continuous 9,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	8,000 RPM, continuous 5,000 RPM
Hollow shaft version:	
Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 6,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	4,000 RPM, continuous 2,000 RPM
Starting torque without shaft seal (IP65):	Shaft version: < 1.4 oz-in (< 0.01 Nm) Hollow shaft version: < 4.25 oz-in (< 0.03 Nm)
Starting torque with shaft seal (IP67):	< 7 oz-in (< 0.05 Nm)
Moment of inertia:	Shaft version: 0.219 oz-in^2 (4.0 x 10^{-6} kgm^2) Hollow shaft version: 0.383 oz-in^2 (7.0 x 10^{-6} kgm^2)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 1 lb (0.45 kg)
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +194°F (-40 to +90°C)
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PVC
Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (> 100 m/s^2), 55-2,000 Hz

[1] Cable versions: -22 to +167°F (-30 to +75°C)

TURCK Industrial Automation

Sendix absolute, multiturn type 5863 (shaft) / 5883 (hollow shaft) SSI/BiSS

General electrical characteristics:

Supply voltage:	5 VDC + 5% or 10-30 VDC
Current consumption (without output load):	5 VDC: max. 75 mA, 24 VDC: max. 25 mA
Reverse polarity protection at power supply (+V):	Yes (only 10-30 VDC)
UL certified:	File 224618

Conforms to CE requirements according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3

RoHS compliant according to EU guideline 2002/95/EG

General interface characteristics:

Output driver:	RS485 Transceiver type
Permissible load/channel:	max. + 20 mA
Signal level high:	typ. 3.8 V
Signal level low at	typ. 1.3 V, I_{load} = 20 mA:
Short-circuit proof outputs:	Yes [1]

Interface characteristics SSI:

Singleturn resolution:	10-14 bits and 17 bits [2]
Number of revolutions:	4096 (12 bits)
Code:	Binary or Gray
SSI clock rate:	< 14 bits: 50 kHz-2 MHz
Monoflop time:	> 15 µs [2]

Note:
If clock starts cycling within monoflop time, a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. Max. update rate is dependent on clock speed, data length and monoflop time.

Time jitter (data request to position latch):	< 1 µs up to 14 bits, < 4 µs at 15-17 bits
Status and Parity bit:	optional on request

Interface characteristics BiSS:

Singleturn resolution:	10-14 bits and 17 bits, customer programmable [2]
Number of revolutions:	4096 (12 bits)
Code:	Binary
Clock rate:	up to 10 MHz
Max. update rate:	< 10 µs, depending on clock speed and data length
Time jitter (data request to position latch):	< 1 µs

Note:
- Bidirectional, programmable parameters are: resolution, code, direction, alarms and warnings
- Multicycle data output, e.g. for temperature
- CRC data verification

[1] Short-circuit to 0 V or to output, one channel at a time, supply voltage correctly applied
[2] Other options upon request

SET (zero or defined value) and Direction (CW/CCW) control inputs

Input characteristics:	High active
Receiver type:	Comparator
Signal level high:	min. 60 % of V+ (Supply voltage), max: V+
Signal level low:	max. 25% of V+ (Supply voltage)
Input current:	< 0.5 mA
Min. pulse duration (SET):	10 ms
Timeout after SET input:	14 ms
Reaction Time (DIR input):	1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET key. Other preset values may be factory programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. During this time the LED is ON and the status output is at LOW.

Status output and LED

Output driver:	Open collector, internal pull up resistor 22 kOhm
Permissible load:	-20 mA
Signal level high:	+V
Signal level low:	< 1 V
Active at:	Low

The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open-collector with int. pull-up 22k).

If the LED is ON (status output LOW) this indicates:
- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or aging
- Over- or under-temperature
- Undervoltage

In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

DIR input

A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory-programmed. If direction is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.

Power-on delay

-3dB frequency:	400 kHz
Signal level:	1 Vpp (+ 20%)
Short-circuit proof:	Yes [1]

Option incremental output (A/B), 2048 ppr:

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

Sendix absolute, multiturn type 5863 (shaft) / 5883 (hollow shaft) SSI/BiSS

Pin configuration:
Output circuit 1 or 2 and 2 control inputs, 1 status output (Connection 1, 2, 3 or 4)

Output	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Status	NC	NC	NC	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	Shield

Pin configuration:
Output circuit 5 and 2 control inputs, 1 status output, voltage monitor outputs (Connection 1, 2, 3 or 4)

Output	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Status	NC	0 V Sens	+V Sens	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY/PK	RD/BU	Shield

Pin configuration:
Output circuit 3, 4, 7 or 8 and 2 control inputs or incremental track, sine/cosine (Connection 1, 2, 3 or 4)

Output	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Sin A	Sin inv A-	Cos B	Cos inv B-	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

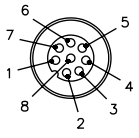
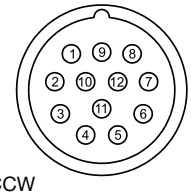
Pin configuration:
Output circuit 6 or 9 and sine/cosine or incremental monitor, voltage outputs (Connection 1, 2, 3 or 4)

Output	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	Sin A	Sin inv A-	Cos B	Cos inv B-	0 V Sens	+V Sens	PE
M23 pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Pin configuration:
Output circuit 1 or 2 and 2 control inputs (Connection 5 or 6)

Output	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	PE
M12 pin:	1	2	3	4	5	6	7	8	PH

Wiring diagrams:

Male encoder view	
	 CCW
M12 ***eurofast*** ® pinout	M23 ***multifast*** ® pinout
Mating cordset: **E-RKC 8T-264-***	Mating cordset: **E-CKM 12-1687-*/A**

* Length in meters.

Encoder with tangential cable outlet

- Safe operation in strong magnetic fields
- Special gears with specific toothing

TURCK
Industrial Automation

Sendix absolute, multiturn type 5863 (shaft) / 5883 (hollow shaft) SSI/BiSS

Part number key: 5863 shaft version

T8.5863.XXXX.XXXX

Type

Flange

1 = clamping flange Ø 58 IP65
2 = servo flange 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
6 = servo flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67
8 = servo flange 2.5" / 63.5 mm, IP67

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Output circuit and supply voltage

1 = 5 VDC, SSI or BiSS interface
2 = 10-30 VDC, SSI or BiSS
3 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS, with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC,SSI or BiSS, and 2048 ppr SinCos, with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
8 = 10-30 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
9 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.), with sensor outputs for monitoring the supply voltage on the encoder

Options (service)

1 = no option
2 = status LED
3 = SET button and status LED

Input/output [1]

2 = SET, DIR inputs additional status output

Resolution [3]

A = 10 bits ST + 12 bits MT
1 = 11 bits ST + 12 bits MT
2 = 12 bits ST + 12 bits MT
3 = 13 bits ST + 12 bits MT
4 = 14 bits ST + 12 bits MT
7 = 17 bits ST + 12 bits MY

Code

B = SSI, binary
C = BiSS, binary
G = SSI, gray

Type of connection

1 = axial cable (1 m PVC)
2 = radial cable (1 m PVC)
3 = axial 12-pin M23 ***multifast*** ® connector
4 = radial 12-pin M23 ***multifast*** connector
5 = axial 8-pin M12 ***eurofast*** ® connector
6 = radial 8-pin M12 ***eurofast*** connector

[1] Resolution, preset value and counting direction factory-programmable

Part number key: 5883 hollow shaft version

T8.5883.XXXX.XXXX

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Hollow shaft

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm (blind hollow shaft, 30 mm depth)
8 = Ø 9.52 mm (3/8“)
9 = Ø 12.7 mm (1/2“)

Output circuit and supply voltage

1 = 5 VDC, SSI or BiSS interface
2 = 10-30 VDC, SSI or BiSS
3 = 5 VDC, SSI or BiSS, and 2048 ppr SinCos
4 = 10-30 VDC, SSI or BiSS, and 2048 ppr SinCos
5 = 5 VDC, SSI or BiSS, with sensor outputs for monitoring the supply voltage on the encoder
6 = 5 VDC,SSI or BiSS, and 2048 ppr SinCos, with sensor outputs for monitoring the supply voltage on the encoder
7 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
8 = 10-30 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.)
9 = 5 VDC, SSI or BiSS and 2048 ppr-incremental track RS422 (TTL-comp.), with sensor outputs for monitoring the supply voltage on the encoder

Options (service)

1 = no option
2 = status LED
3 = SET button and status LED

Input/output [1]

2 = SET, DIR inputs additional status output

Resolution [1]

A = 10 bits ST + 12 bits MT
1 = 11 bits ST + 12 bits MT
2 = 12 bits ST + 12 bits MT
3 = 13 bits ST + 12 bits MT
4 = 14 bits ST + 12 bits MT
7 = 17 bits ST + 12 bits MY

Code

B = SSI, binary
C = BiSS, binary
G = SSI, gray

Type of connection

2 = radial cable (1 m PVC)
4 = radial 12-pin M23 ***multifast*** connector
6 = radial 8-pin M12 ***eurofast*** connector
E = tangential cable outlet (1 m PVC cable)

[1] Resolution, preset value and counting direction factory-programmable

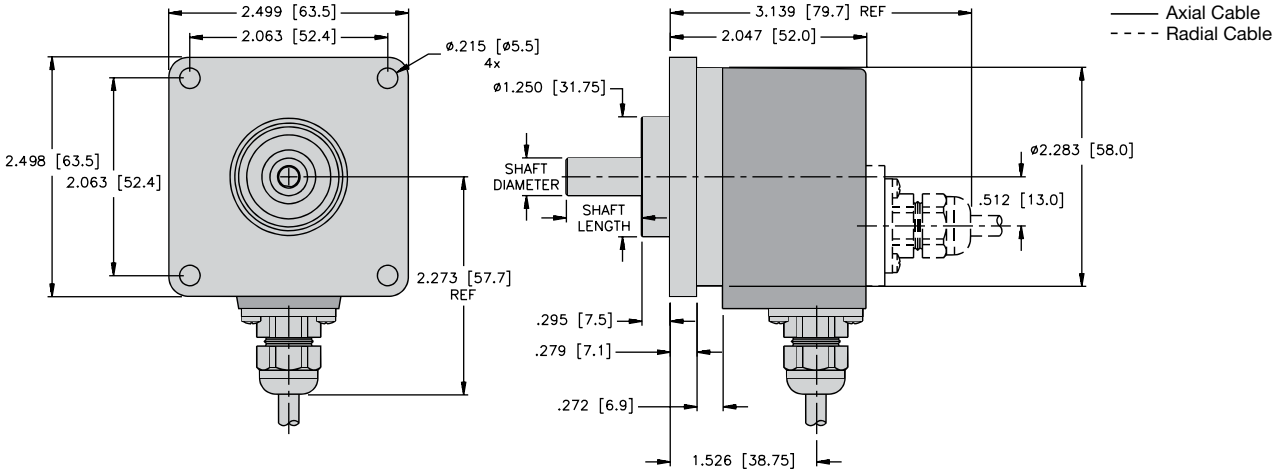
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

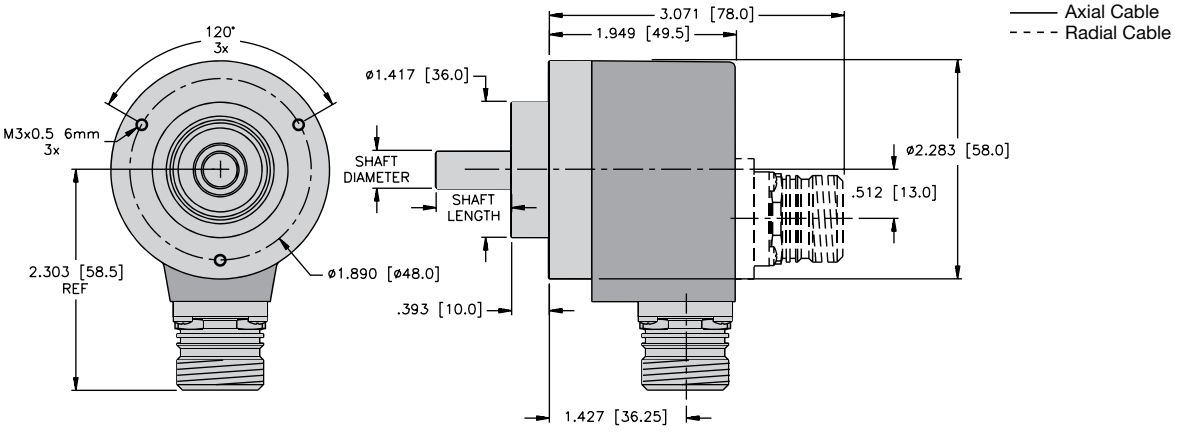
Sendix absolute, multiturn type 5863 (shaft) / 5883 (hollow shaft) SSI/BiSS

Dimensions: 5863 shaft version

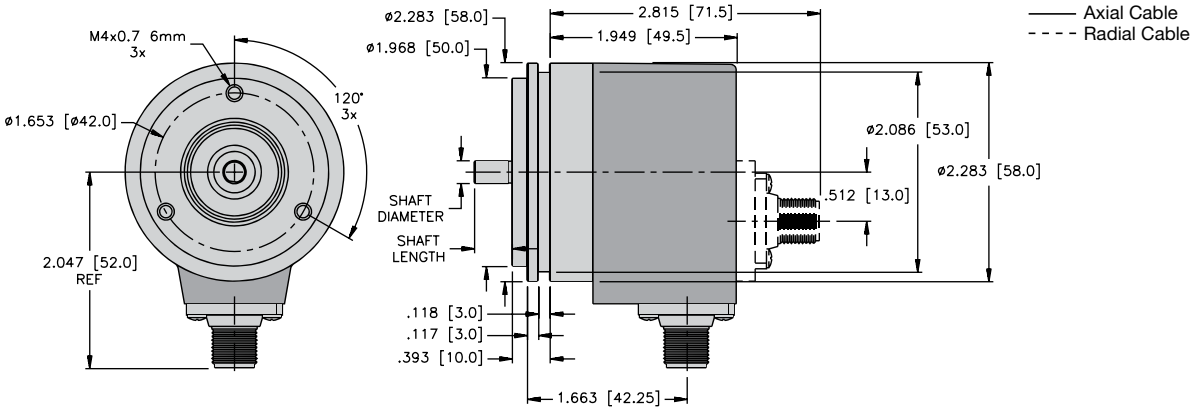
5863 flanges 5 & 7
Cable connection 1 & 2



5863 flanges 1 & 3
M23 *multifast*® connection 3 & 4



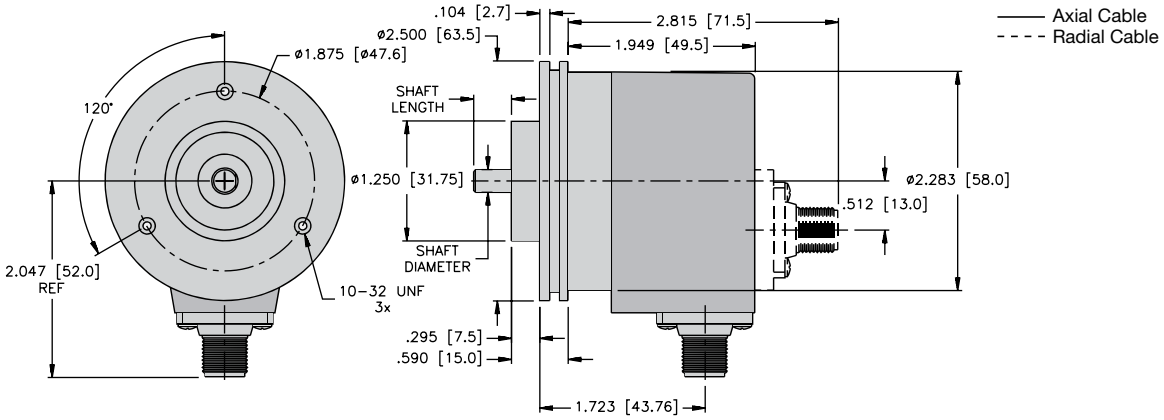
5863 flanges 2 & 4
M12 *eurofast*® connection 5 & 6



Sendix absolute, multiturn type 5863 (shaft) / 5883 (hollow shaft) SSI/BiSS

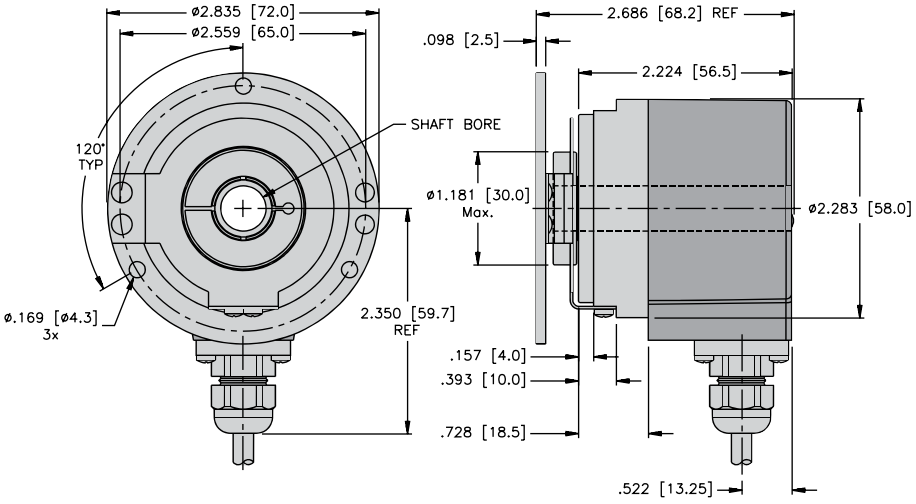
Dimensions: 5863 shaft version

5863 flanges 6 & 8
M12 *eurofast*® connection 5 & 6

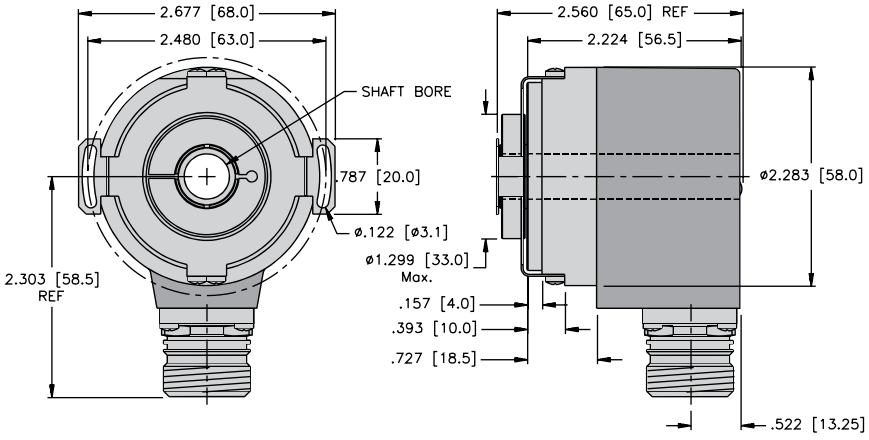


Dimensions: 5883 hollow shaft version

5883 flanges 3 & 4
Cable connection 2



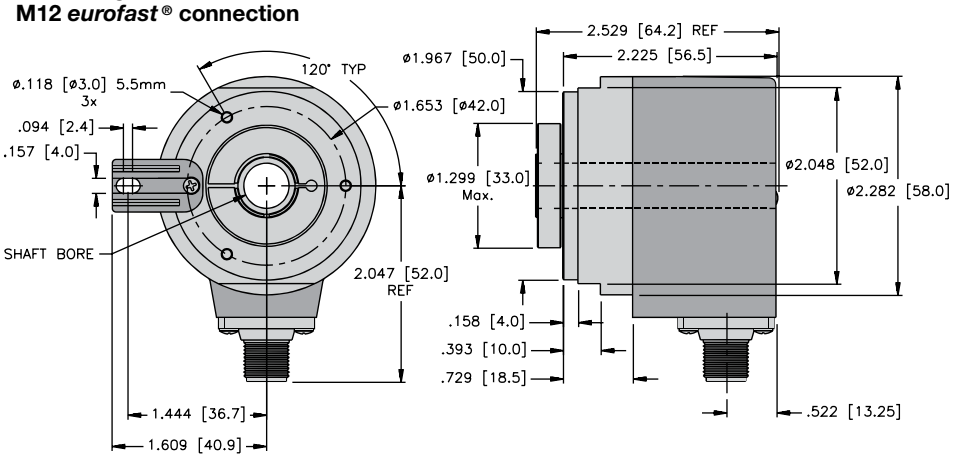
5883 flanges 5 & 6
M23 *multifast*® connection 4



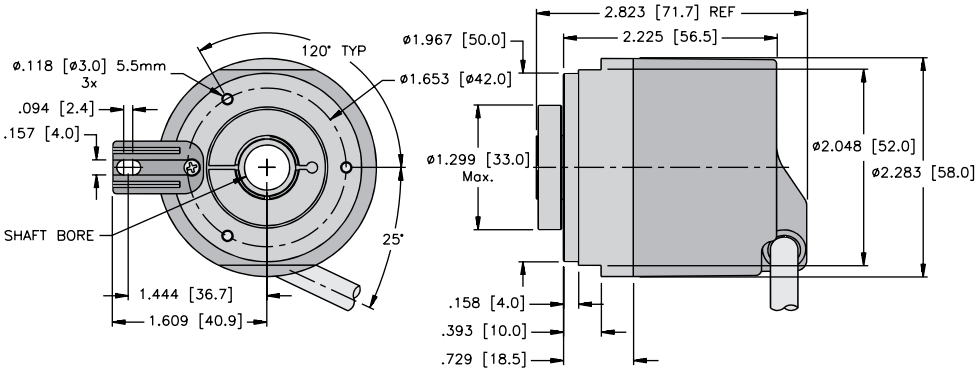
Sendix absolute, multiturn type 5863 (shaft) / 5883 (hollow shaft) SSI/BiSS

Dimensions: 5883 hollow shaft version

5883 flanges 1 & 2
M12 *eurofast*® connection



5883 flanges 1 & 2
Cable connection E



TURCK
Industrial Automation

Multiturn type 5862 (shaft) / 5882 (hollow shaft) **SSI or RS485, programmable**


Programmable


High rotational speed


Shock/ vibration resistant


Short-circuit proof


Reverse polarity protection

Rugged
- IP65 protection.
- Short-circuit proof at 5 VDC.

RoHS compliant · cULus · Ex 2/22

Compact
- Only 40.5 mm clearance needed for hollow shaft version.

Versatile
- Optional incremental track: 2048 ppr.
- Gearless electronic multiturn.
- Maximum of 4 programmable outputs* for the SSI version.
- Programmable parameters include*: code type, resolution per revolution, total resolution, direction of rotation and zero point.
- Resolution: up to 8192 (13 bits) per revolution, 4096 (12 bits) revolutions.

* With optional programming kit (Ezturn®) see accessories.

Mechanical characteristics:

Speed: [1]	max. 6,000 RPM
Rotor moment of inertia:	Shaft version: approx. 0.098 oz-in² (1.8 x 10⁻⁶ kgm²) Hollow shaft version: approx. 0.328 oz-in² (6 x 10⁻⁶ kgm²)
Starting torque	Shaft version: < 1.4 oz-in (< 0.01 Nm) Hollow shaft version: < 7 oz-in (<0.05 Nm)
Radial load capacity of shaft: [2]	40 lbs (178 N)
Axial load capacity of shaft: [2]	40 lbs (178 N)
Weight:	approx. 0.88 lbs (0.4 kg)
Protection acc. to EN 60 529:	IP65
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-4 to +158°F (-20 to +70°C) [3]
Shaft:	stainless steel
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] Hollow shaft version: continuous operation 3,000 RPM
[2] For shaft version only
[3] Non-condensing

The programmable SSI outputs are available in 3 versions:

Part number key, output 2:
- Version with 4 programmable outputs

Part number key, output 5:
- Version with incremental outputs A, $\overline{A}$, B, $\overline{B}$ (no programmable outputs)

Part number key, output 9:
- Version with 2 programmable outputs and 2 sensor outputs for 0 V and +V for controlling the supply voltage on the encoder

Multiturn type 5862 (shaft) / 5882 (hollow shaft) SSI or RS485, programmable

Electrical characteristics:

Interface type:	Synchronous Serial (SSI) with outputs
General information	
Supply voltage (+V):	5.0-30 VDC [3]
Current consumption type (no load).: max (no load):	89 mA 138 mA
Short-circuit proof outputs: [1]	yes [2]
Reverse connection protection at +V:	yes
SSI-Interface:	
Output driver:	RS485
Permissible load/channel:	max. +/-20 mA
Update rate for position data:	approx. 1600/s
SSI pulse rate min./max./pulse frequency:	100 kHz/500 kHz
Signal level high:	typ. 3.8 V
Signal level low (I_{Last} = 20 mA):	typ. 1.3 V
Rise time tr (without cable):	max. 100 ns
Fall time tf (without cable):	max. 100 ns

[1] If +V supply voltage correctly applied +V
[2] Only one channel at a time: If +V = 5 VDC, short-circuit to output, 0 V and +V is permitted. If +V < 5 VDC short-circuit to output and 0 V is permitted.
[3] The supply voltage at the encoder input must not be less than 4.75 V (5 V - 5%)

Control inputs: (V/R, SET)	Voltage: Response time: Signal level: low Signal level: high Max. current input	5-30 VDC = +V 10 ms max. 25% +V min. 60% +V, max. +V ≤ 0.5 mA
Status outputs:	Output driver: max. permissible load: Signal level high: Signal level low: Rise time: Fall time:	Push-Pull ±9.0 mA min. +V - 3.0 V max. 1.5 V max. 240 µs max. 300 µs
Incremental outputs (A/B):	Output driver: Pulse frequency (max.): Signal level high: Signal level low (I_{Last} = 20 mA): Rise time (without cable): Fall time (without cable):	RS422 compatible 200 kHz 4.5 V 0.5 V max. 200 ns max. 200 ns
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3 Performance against magnetic influence acc. to EN61000-4, 5		
UL certified		File 224618
RoHS compliant acc. to EU guideline 2002/95/EG		

Control inputs:

F/R input for change of direction:
The encoder can output increasing code values when the shaft is rotated either clockwise or counter-clockwise (when looking from the shaft side).

There are two methods for selecting the appropriate option:

1. Via a hardware configuration of the F/R input BEFORE powering up the encoder.
2. By programming the device using the TURCK ***Ezturn*** programming tool.

Control inputs notes:
- Any hardware configuration of the F/R input must take place BEFORE powering up the encoder.
- If the F/R input is not configured, then a 0 V configuration will apply (default condition).
- If the direction of rotation is changed due to the F/R configuration without activating the SET function and the encoder is powered up again, a new position value may be outputted, even if the physical shaft position of the encoder has not moved. This is due to internal conversion processes.

The start-up procedure for the encoder should follow this sequence:
1. Determine the count direction of the encoder either via the F/R input or via programming.
2. Apply power to the encoder.
3. Activate the SET function, if desired (see SET input below).

- If using a cable wire to configure the F/R input, then for EMC reasons the wire should not remain open but should be tied either to 0 V or +V.
- The response time of the F/R input with +V = 5-30 VDC power supply is 10 ms.

The following table shows the function selection dependent on hardware and software settings:

Hardware configuration of F/R input	Programmed selection [1]	Function [2]
"low" (0 V) on F/R input (=cw)	cw	cw
"high" (+V) on F/R input (= ccw)	cw	ccw
"low" (0 V) on F/R input (=cw)	ccw	ccw
"high" (+V) on F/R input (= ccw)	ccw	ccw

[1] Using the ***Ezturn*** programming tool
[2] Increasing code value when the shaft is in the direction specified.

SET input:

This input is used for a one-time alignment (zeroing) of the encoder immediately after installation. A high control pulse (+V) applied to this input for a minimum of 10 ms will reset the current encoder position to the pre-programmed setpoint value. Programming the setpoint may be carried out with TURCK's ***Ezturn*** programming software or in advance at the factory, upon request. The default value is zero. However, any value within the encoder's measuring range can be defined.

SET input notes:
- The SET function should only be implemented when the encoder shaft is at rest.
- For the duration of the SET pulse the SSI interface does not function and therefore does not output any valid position values. In order to avoid malfunctions, no SSI clock pulse should occur during the SET pulse.
- If a cable wire is used to configure the SET input, then for EMC reasons the wire should not remain open but should if at all possible be tied to 0 V, provided no SET pulse is triggered.
- The response time of the SET input with +V = 5-30 VDC power supply is 10 ms.

Multiturn type 5862 (shaft) / 5882 (hollow shaft) SSI or RS485, programmable

Encoder outputs [1]

Output	Default-function:
A1:	battery control [2]
A2:	not activated [2]
A3:	not activated [2] [3]
A4:	not activated [2] [3]

The outputs are not activated in the factory setting (default). They may be activated and defined with the optional ***Ezturn*** ® programming software.

[1] Not available for versions with incremental track.
[2] Programmable with the optional ***Ezturn*** programming software.
[3] With the part number key Interface 9 assigned to the sense outputs.

Functionality of the *Ezturn* software

- Setting communication parameters
- RS232 encoder/PC interface
- Setting a drive factor by means of the modification of the resolution per revolution, the number of revolutions and the total resolution
- Programming the direction of rotation and code type
- Setting a preset/electronic zero point
- Setting diagnostic functions
- Setting the outputs A1-A4
  - Limit switch values, max. 2
  - Alarm and status information
  - Battery monitoring
- Limiting maximum number of bits to interface with PLCs
- Diagnostics and information for the set-up operation
- Data transmission from the PC to the encoder and inversely, also during operation
- rint-out of the current data and set parameters
- Convenient position output with the current set data
- Terminal operation for direct instructions via the keyboard
- Diagnostics of the encoder connected

Pin configuration SSI (Synchronous Serial interface) with 12-pin M23 *multifast* ® plug:

Signal:	0 V	+V	+T	-T	+D	-D	ST	VR	A1	A2	A3 [1]	A4 [1]	Coupling Nut
Interface 9:										0 V sense	+V sense		
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	Case Ground
Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU	

T = Clock signal
D = Data signal
ST = SET input. The current position value is stored as new zero position (or the actual value is set to the preset value when using the programmable version).
VR = Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning clockwise.
Isolate unused outputs before initial start-up

Interface 9
A1, A2, A3, A4: outputs, can be modified using ***Ezturn*** ®

[1] With the Part number key Interface 9 these outputs are assigned to the sense outputs. The sensor circuits are internally tied to the power supply. Special power supply units control the voltage drop in long cable runs via the voltage feedback. If the circuits are not being used, then they should be individually isolated and not connected.

Pin configuration (RS485 interface 12-pin M23 *multifast*, 8-pin M12 *eurofast* ® connector):

Signal:	0 V	+V	T/R-	T/R+	Term [2]	Term [2]		VR					Coupling Nut
Pin:	1	2	3	4	5	6	7 [1]	8	9	10	11	12	Case Ground
Color:	WH	BN	GN	YE				RD					

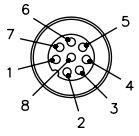
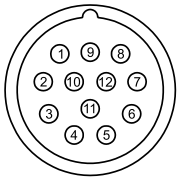
R = Receive-channel
T = Transmit-channel
VR = Up/down input. As long as this input (High-Level = + V) is active, decreasing code values are transmitted when shaft turning clockwise.

[1] There is no SET input for the P3001 version but it can likewise be implemented using the command "<ESC> QP" (Write preset).
[2] For the version with external termination: if the termination is desired (terminating resistor 120 Ohm), then both connections are to be tied together by means of a jumper (0 Ohm).

Pin configuration SSI interface with incremental track (A/B):

Signal:	0 V	+V	+T	-T	+D	-D	ST	VR	$\overline{B}$	B	$\overline{A}$	A	⏚
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Wiring diagrams:

Male encoder view	
	
M12 ***eurofast*** pinout	M23 ***multifast*** pinout
Mating cordset: **E-RKC 8T-264-***	Mating cordset: **E-CKM 12-1687-*/A**

* Length in meters.

Multiturn type 5862 (shaft) / 5882 (hollow shaft) SSI or RS485, programmable

Part number key: 5862 shaft version

T8.5862.XXXX.XXXX

Type

Flange

1 = clamping flange Ø 58 mm
2 = servo flange Ø 58 mm
4 = square flange 63.5 mm (2.5")
5 = servo flange Ø 63.5 mm (2.5")
6 = square flange 63.5 mm (2.5") w/shaft seal

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Output and voltage supply

2 = 5-30 VDC, SSI
3 = 5-30 VDC, RS485, half-duplex
5 = 5-30 VDC, SSI, 2048 ppr. incremental output (A, $\overline{A}$, B, $\overline{B}$)
7 = 5-30 VDC, RS485, half duplex, external termination
9 = 4.75-30 VDC,SSI with 2 status outputs and 2 sensor outputs for monitoring the supply voltage on the encoder

Fieldbus profile

1001 = RS 422, full duplex protocol, ESC code
2001 = SSI, 4096 x 4096 (24-Bit), binary
2002 = SSI, 8192 x 4096 (25-Bit), binary
2003 = SSI, 4096 x 4096 (24-Bit), gray
2004 = SSI, 8192 x 4096 (25-Bit), gray
3001 = ESC RS 485, half duplex protocol, (max. 19200 baud)

Type of connection

1 = axial cable (1 m PVC-cable)
2 = radial cable (1 m PVC-cable)
3 = axial 12-pin M23 ***multifast*** ® connector
4 = radial 12-pin M23 ***multifast*** connector
7 = axial cable (3 m PVC-cable)
8 = radial cable (3 m PVC-cable)
L = axial 8-pin M12 ***eurofast*** ® connector
M =radial 8-pin M12 ***eurofast*** connector

Part number key: 5882 hollow shaft version

T8.5882.XXXX.XXXX

Type

Flange

1 = torque stop
3 = slotted flex mount

Hollow shaft

6 = hollow shaft Ø 10 mm
8 = hollow shaft Ø 12 mm

Output and voltage supply

2 = 5-30 VDC, SSI with 4 status outputs
3 = 5-30 VDC, RS485, half-duplex, internal termination
5 = 5-30 VDC, SSI, 2048 ppr. incremental output (A, $\overline{A}$, B, $\overline{B}$)
7 = 5-30 VDC, RS485, half duplex 5-30 VDC, external termination
9 = 4.75-30 VDC,SSI with 2 status outputs and 2 sensor outputs for monitoring the supply voltage on the encoder

Fieldbus profile

1001 = RS 422, full duplex protocol, ESC code
2001 = SSI, 4096 x 4096 (24-Bit), binary
2002 = SSI, 8192 x 4096 (25-Bit), binary
2003 = SSI, 4096 x 4096 (24-Bit), gray
2004 = SSI, 8192 x 4096 (25-Bit), gray
3001 = ESC RS 485, half duplex protocol, (max. 19200 baud)

Type of connection

1 = radial cable (1 m PVC cable)
2 = radial 12-pin M23 ***multifast*** connector
4 = radial cable (3 m PVC cable)
5 = radial cable (5 m PVC cable)
B = radial 8-pin M12 ***eurofast*** connector

Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

Patented
Intelligent-Sensing-Technology® (IST)

An innovative principle of operation based on a non-contact electronic multiturn stage overcomes system disadvantages previously associated with encoders that had mechanical gears or with traditional electronic gear technology.

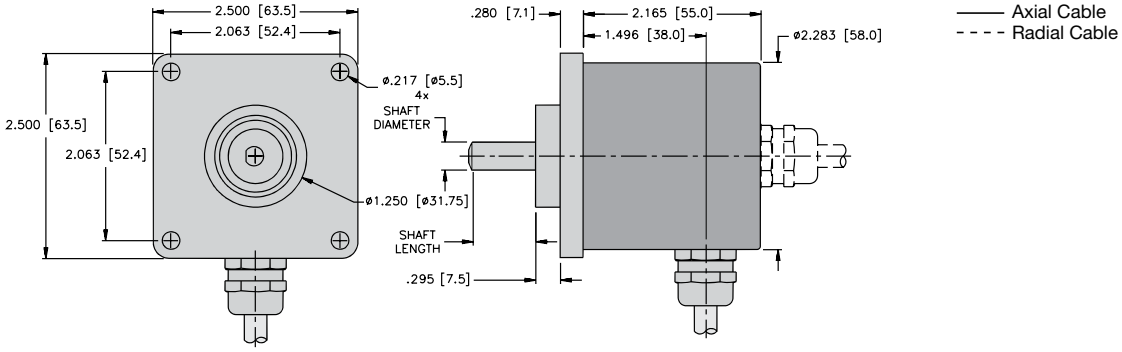
Advantages:

- High operational reliability
- Logic filter and innovative principle of operation compensate for high EMC interference
- Free from wear

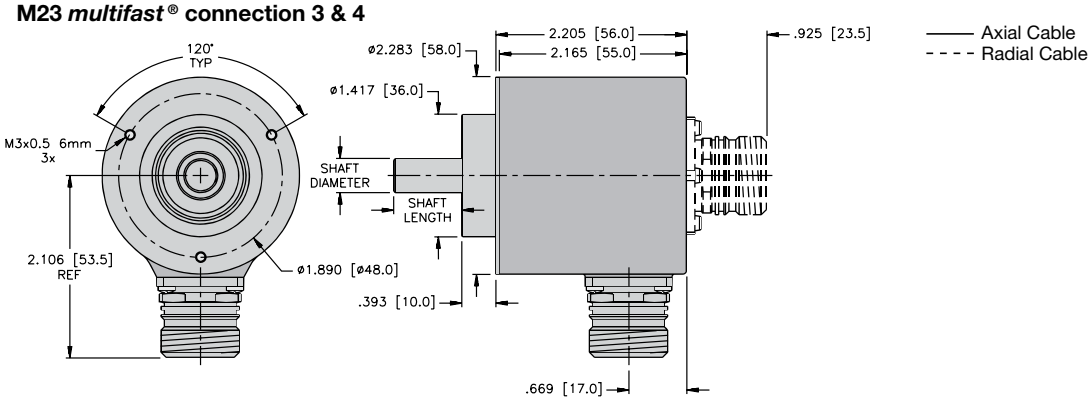
Multiturn type 5862 (shaft) / 5882 (hollow shaft) **SSI or RS485, programmable**

Dimensions: 5862 shaft version

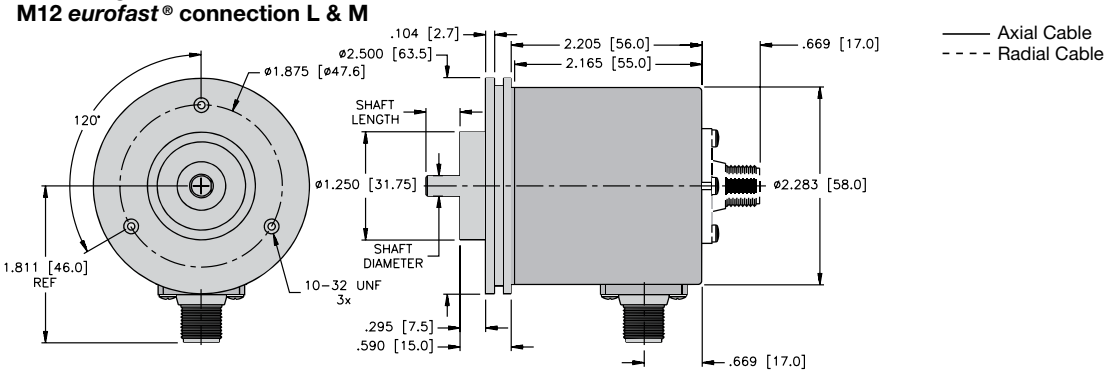
5862 flanges 4 & 6
Cable connection 1, 2, 7 & 8



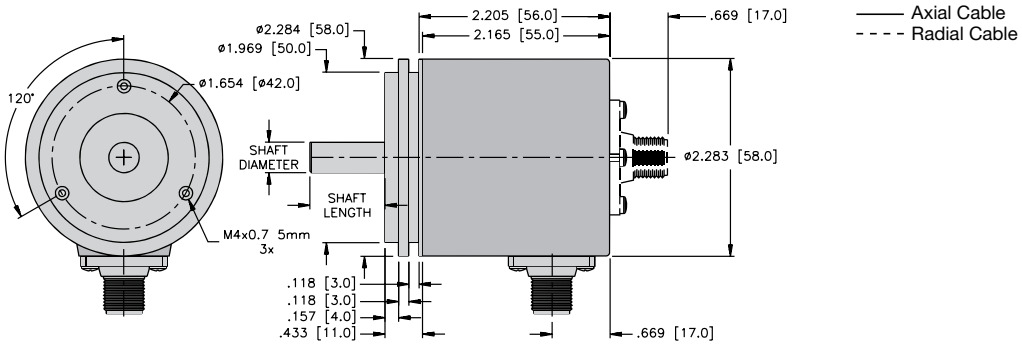
5862 flange 1
M23 *multifast*® connection 3 & 4



5862 flange 2
M12 *eurofast*® connection L & M



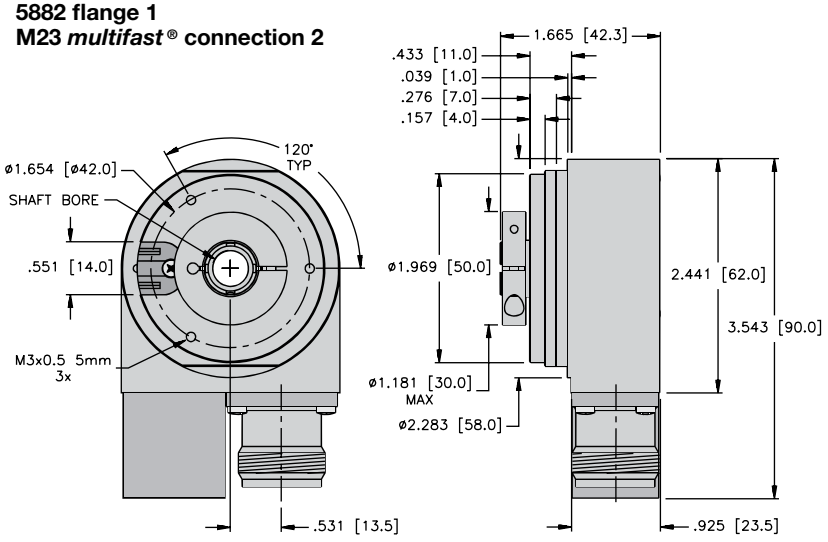
5862 flange 5
M12 *eurofast* connection L & M



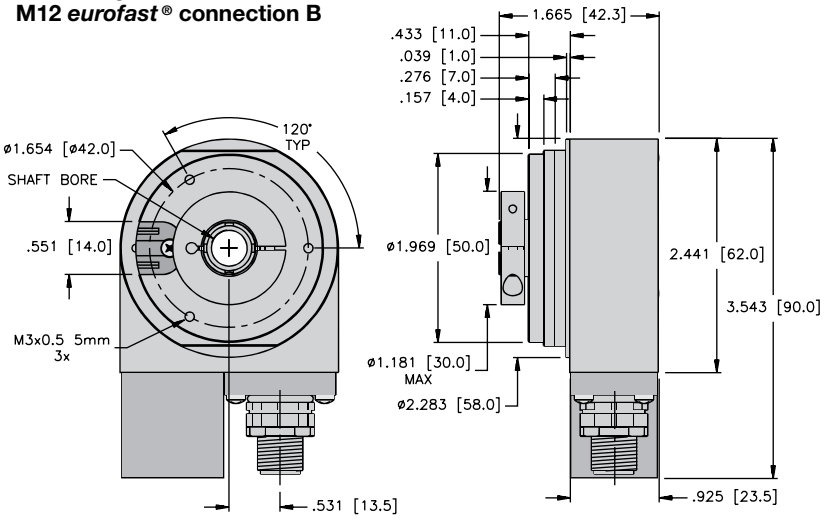
Multiturn type 5862 (shaft) / 5882 (hollow shaft) **SSI or RS485, programmable**

Dimensions: 5882 hollow shaft version

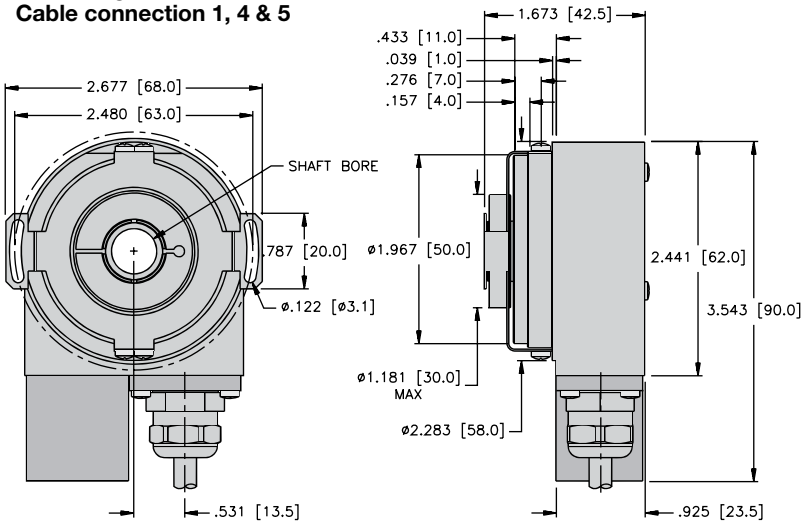
5882 flange 1
M23 *multifast*® connection 2



5882 flange 1
M12 *eurofast*® connection B



5882 flange 3
Cable connection 1, 4 & 5



TURCK
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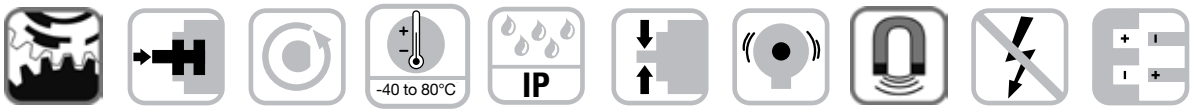
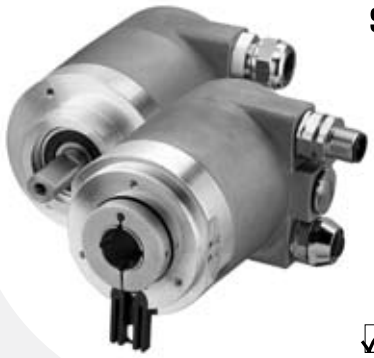
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift



Mechanical drive | Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability:** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range.**



Sendix absolute
CANopen
CANopen LIFT

RoHS compliant | UL | Ex | 2/22

Fast

- **Genuine time-servo position detection of several axes:** Extended CAN Sync Mode with realtime position acquisition.
- **Fast data availability, while reducing the load on the bus and the controller:** Intelligent functions like the transmission of speed, acceleration or exiting a working area.

Versatile

- **CANopen, CANlift fieldbus with the latest profiles.**
- **Connections for every application:** Bus terminal cover with M12 connector or fixed connection with M12, M23 or D-Sub connector.Point-to-point connections also available.
- **Real-time data:** Position, speed or working area. Variable PDO mapping in the memory.
- **Fast, error-free start-up, without setting any switches.** Node address, baud rate and termination can be programmed via the bus.
- **Direct mounting of hollow shaft on large diameter standard shafts;** up to 15 mm for blind hollow shaft.

Mechanical characteristics:

Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 7,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	7,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 6,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Starting torque without shaft seal (IP65):	1.4 oz-in (< 0.01 Nm)
Starting torque with shaft seal (IP67):	4.25 oz-in (< 0.03 Nm)
Moment of inertia:	Shaft version: 0.219 oz-in^2 (4.0 x 10^{-6} kgm^2) Hollow shaft version: 0.41 oz-in^2 (7.5 x 10^{-6} kgm^2)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 1.26 lbs (0.57 kg) with bus terminal cover approx. 1.15 lbs (0.52 kg) with fixed connection
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +176°F (-40 to +80°C)
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PVC
Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (> 100 m/s^2), 55-2,000 Hz

[1] Cable versions: -22 to +167°F (-30 to +75°C)

- Safe operation in strong magnetic fields
- Special gears with specific toothing

Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (w/o output load):	24 VDC, max. 65 mA
Reverse polarity protection	Yes
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
UL certified	File 224618
RoHS compliant acc. to EU guideline 2002/95/EG	

SET control button (zero or defined value, option)

Protected against accidental activation, can only be depressed with the tip of a ballpoint pen or similar.

Diagnostic LED (yellow)

LED on with: optical sensor path faulty (code error, LED error), low voltage and over-temperature

Interface characteristics CANopen/CANlift:

Singleturn resolution (max, scalable):	1-65536 (16 bits), default scale value is set to 8192 (13 bits)
Total resolution:	1-268 435 456 (28 Bit) Default: 25 Bit
Code:	Binary
Interface:	CAN High-Speed according ISO 11898, Basic- and Full-CAN CAN Specification 2.0 B

Protocol:	CANopen profile DS 406 V3.1 with manufacturer-specific add-on's or CANlift profile DS 417 V1.1
Baud rate:	10-1000 kbits/s (set by DIP switches/software configurable)
Node address:	1-127 (set by rotary switches / software configurable)
Termination switchable:	Set by DIP switches (software configurable)

General information about CAN/CANlift

The 5868 series of encoders support the latest CANopen communication profile according to DS 301 V4.02. In addition, device-specific profiles, like the DS 406 V3.1 and DS 417 V1.1 (for lift applications), are available. The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters may be programmed via the CANopen fieldbus. When switching the device on, all parameters, which have been saved on an EEPROM to protect them against power failure, are loaded again.

Position, speed, acceleration and status output values may be combined in a freely variable way as PDO mapping.

Encoders with a connector or a cable connection are available. Models with bus terminal cover and integrated T-shaped coupler allow a particularly easy installation via M12 connectors. The device address is set by means of two hexadecimal rotary switches. Furthermore, another DIP switch allows setting the baud rate and switching on a termination resistor. Three LEDs indicate the operating or fault status of the CANopen fieldbus, as well as the status of an internal diagnostics.

CANopen Communication Profile V4.02

The following functionality is integrated: Class C2 Functionality • NMT Slave • Heartbeat Protocol • High Resolution Sync Protocol • Identity Object • Error Behavior Object • Variable PDO Mapping • Self-start programmable (power on to operational) • Three Sending PDO's • One Receiving PDO for servo preset operation with minimal jitter • Node address, baud rate and CANbus • Programmable termination

CANopen Encoder Profile V3.1

The following parameters may be programmed:

- Event mode
- Units for speed selectable (Steps/Sec or RPM)
- Factor for speed calculation (e.g. measuring wheel periphery)
- Integration time for speed value of 1 to 32
- Two work areas with 2 upper and lower limits and the corresponding output states
- Variable PDO mapping for position, speed, acceleration and work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status – 3 LED's
- Optional – 32 CAM's programmable
- Customer-specific memory – 16 Bytes

CANopen Lift Profile DS 417 V1.1

The following functionality is integrated:

- Car position unit
- Two virtual devices
- One virtual device delivers the position in absolute measuring steps (steps)
- One virtual device delivers the position as an absolute travel information in mm
- Lift number programmable
- Independent setting of the node address in relation with the CAN identifier
- Factor for speed calculation (e.g. measuring wheel periphery)
- Integration time for speed value of 1 to 32
- Two work areas with 2 upper and lower limits and the corresponding output states
- Variable PDO mapping for position, speed, acceleration, work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status – 3 LEDs

Key features:

The object 6003h "Preset" is assigned to an integrated key, accessible from the outside "Watchdog-controlled" device.

Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Pin configuration:
Bus terminal cover with terminal box (Connection 1)

Direction	OUT					IN				
Signal:	CAN Ground	CAN_Low (-)	CAN_High (+)	Common (0 V) power supply	+V power supply	Common (0 V) power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground
Abbrv:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG

Pin configuration:
Cable connection (Connection A)

Direction	IN				
Signal:	Common (0 V) power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground
Abbrv:	0 V	+V	CL	CH	CG
Color:	WH	BN	YE	GN	GY

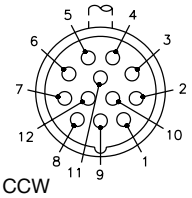
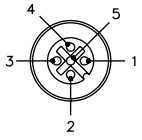
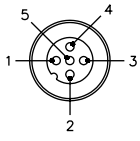
Pin configuration:
M23 connector or M12 connector or D-Sub 9 (Connection I) (Connection E) (Connection K)

Direction	IN					Pinout
Signal:	Common (0 V) power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground	
Abbrv:	0 V	+V	CL	CH	CG	
M23 pin:	10	12	2	7	3	A
M12 pin:	3	2	5	4	1	C
D-Sub 9:	6	9	2	7	3	-

Pin configuration:
Bus terminal cover with 2 - M12, 2 - M12, 2 - M23 (Connection 2) (Connection F) (Connection J)

Direction	OUT					Pinout	IN					Pinout
Signal:	CAN Ground	CAN_Low (-)	CAN_High (+)	0 V power supply	+V power supply		0 V power supply	+V power supply	CAN_Low (-)	CAN_High (+)	CAN Ground	
Abbrv:	CG	CL	CH	0 V	+V		0 V	+V	CL	CH	CG	
M23 pin:	3	2	7	10	12	A	10	12	2	7	3	A
M12 pin:	1	5	4	3	2	B	3	2	5	4	1	C

Wiring Diagrams:

A	B	C
Male encoder view	**Female encoder view**	**Male encoder view**
 CCW		
Bus In and Out M23 ***multifast*** ® pinout	**Bus Out** M12 ***eurofast*** ® pinout	**Bus In** M12 ***eurofast*** pinout
Mating cordset: [1] consult factory	Mating cordset: [1][2] **RSC 4.5T-1695-*/A**	Mating cordset: [1] **RKC 4.5T-1695-*/A**

[1] See cable section for additional options.
[2] "S" denotes shield tied to coupling nut.
* Length in meters. Available in 0.1 meter increments ≥0.2 meters.

Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Part number key: 5868 shaft version

T8.5868.XXXX.XX1X

Type

Flange

1 = clamping flange Ø 58 IP65
2 = servo flange Ø 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
6 = servo flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67
8 = servo flange 2.5" / 63.5 mm, IP67

Shaft (Ø x L)

1 = 6 mm x 10 mm
2 = 10 mm x 20 mm
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

Output circuit and power supply [2]

2 = 10-30 VDC, CANopen DS 301 V4.0

Options (service)

2 = no option
3 = SET button

Fieldbus profile [1]

21 = CANopen encoder-profile, DS 406 V3.1
22 = CANlift DS 417 V1.01

Type of connection

1 = with removable bus terminal cover, with radial screwed cable passage
2 = removable bus terminal cover with 2 x M12 connector
A = fixed connection without bus terminal cover, with radial cable (2 m PVC)
E = fixed connection without bus terminal cover, with 1 x M12 ***eurofast*** ® radial connector
F = fixed connection without bus terminal cover, with 2 x M12 ***eurofast*** radial connector
I = fixed connection without bus terminal cover, with 1 x M23 ***multifast*** ® radial connector
J = fixed connection without bus terminal cover, with 2 x M23 ***multifast*** radial connector
K = fixed connection without bus terminal cover, with 1 x D-Sub 9-pin connector

[1] CAN parameters can also be factory-preset
[2] Incremental tracks are available upon request. Contact factory for more information.

Part number key: 5888 blind hollow shaft version

T8.5888.XXXX.XX1X

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Blind hollow shaft

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm
8 = Ø 9.52 mm (3/8“)
9 = Ø 12.7 mm (1/2“)

Output circuit and power supply [2]

2 = 10-30 VDC, CANopen DS 301 V4.0

Options (service)

2 = no option
3 = SET button

Fieldbus profile [1]

21 = CANopen encoder-profile, DS 406 V3.1
22 = CANlift DS 417 V1.01

Type of connection

1 = with removable bus terminal cover, with radial screwed cable passage
2 = removable bus terminal cover with 2 x M12 connector
A = fixed connection without bus terminal cover, with radial cable (2 m PVC)
E = fixed connection without bus terminal cover, with 1 x M12 ***eurofast*** radial connector
F = fixed connection without bus terminal cover, with 2 x M12 ***eurofast*** radial connector
I = fixed connection without bus terminal cover, with 1 x M23 ***multifast*** radial connector
J = fixed connection without bus terminal cover, with 2 x M23 ***multifast*** radial connector
K = fixed connection without bus terminal cover, with 1 x D-SUB 9-pin connector

[1] CAN parameters can also be factory-preset
[2] Incremental tracks are available upon request. Contact factory for more information.

Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

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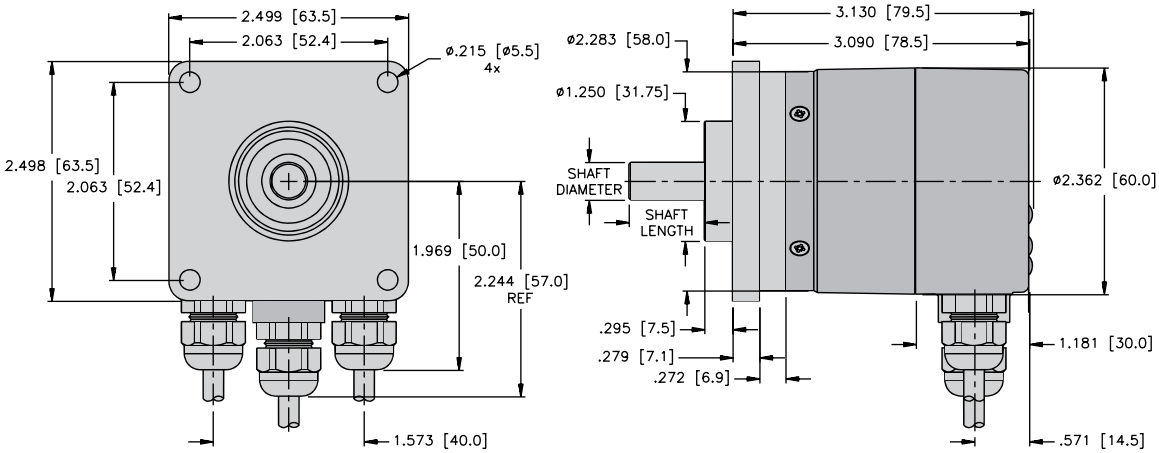
Industrial Automation

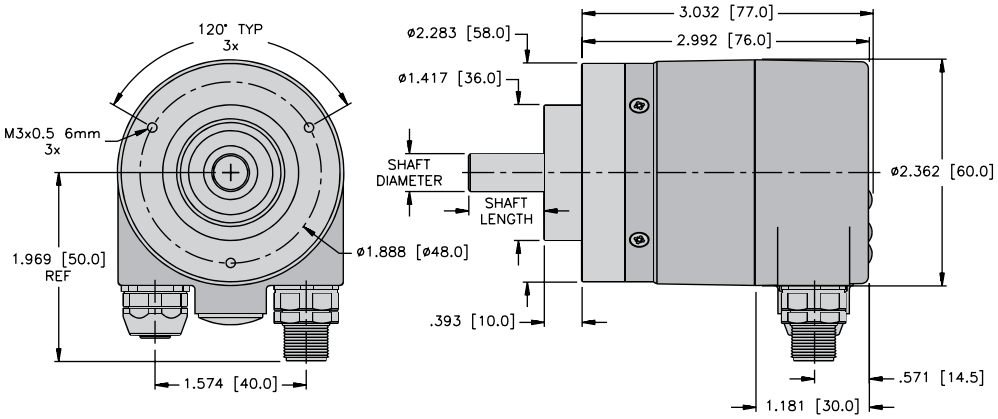
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Dimensions: 5868 shaft version

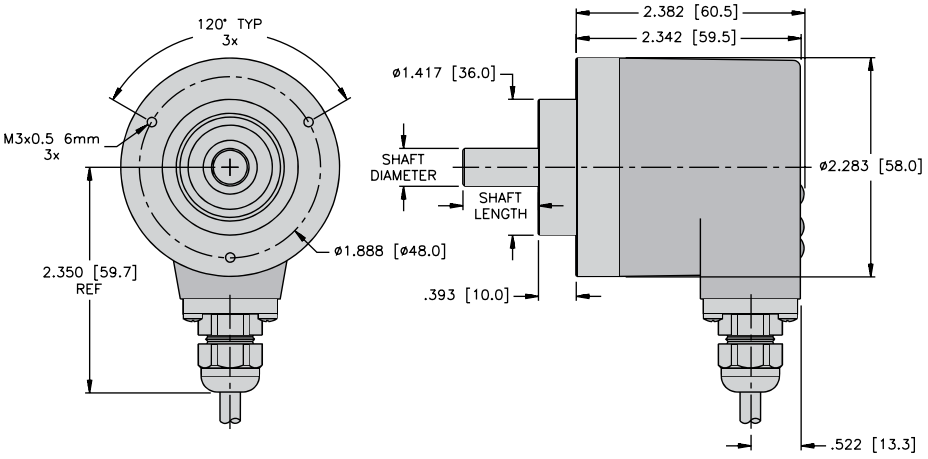
5868 flanges 5 & 7
Cable connection 1



5868 flanges 1 & 3
M12 *eurofast*® connection 2



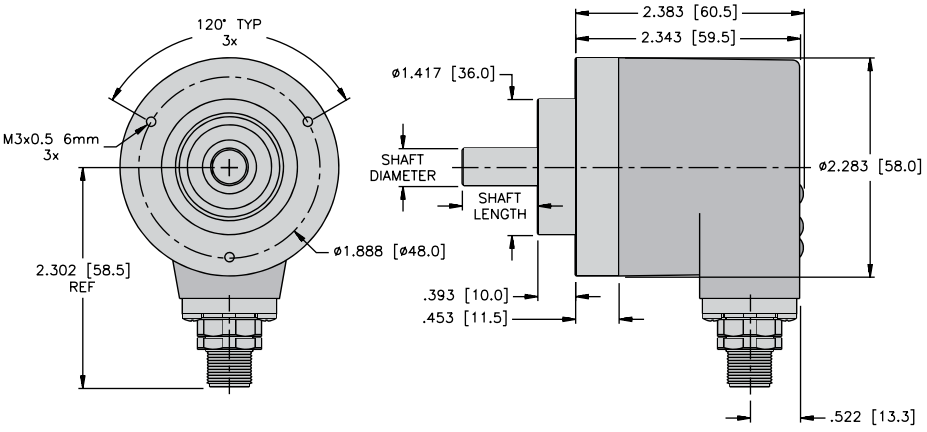
5868 flanges 1 & 3
Cable connection A



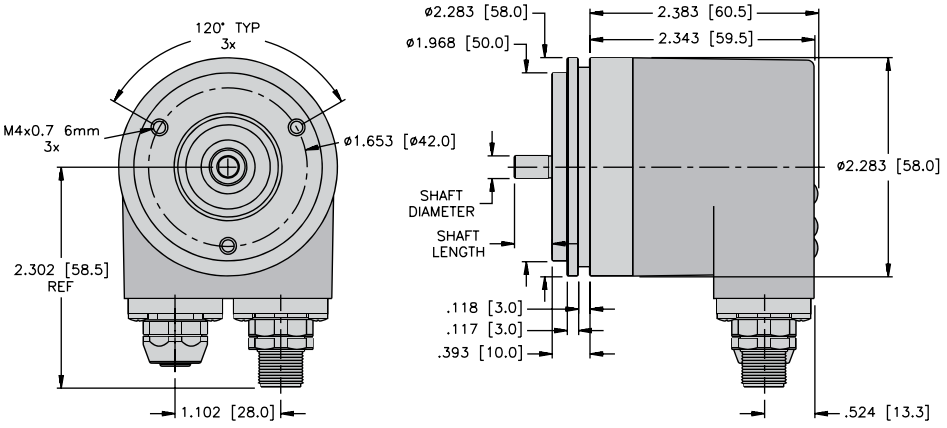
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Dimensions: 5868 shaft version

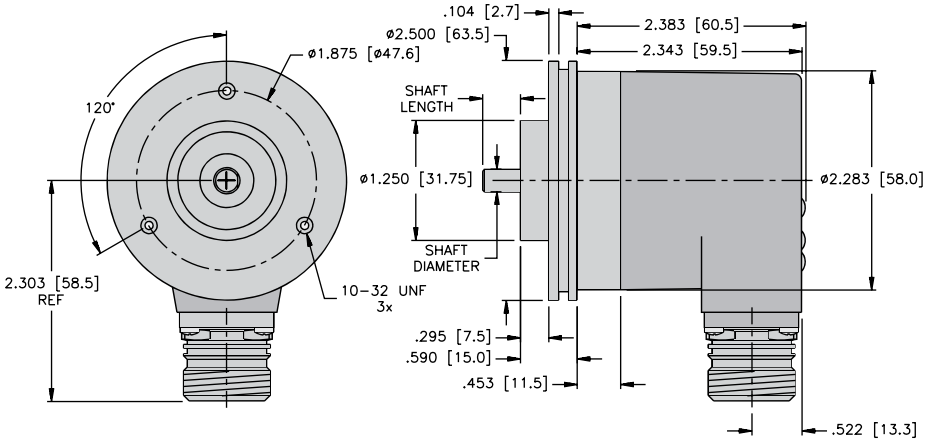
5868 flanges 1 & 3
M12 *eurofast*® connection E



5868 flanges 2 & 4
M12 *eurofast* connection F



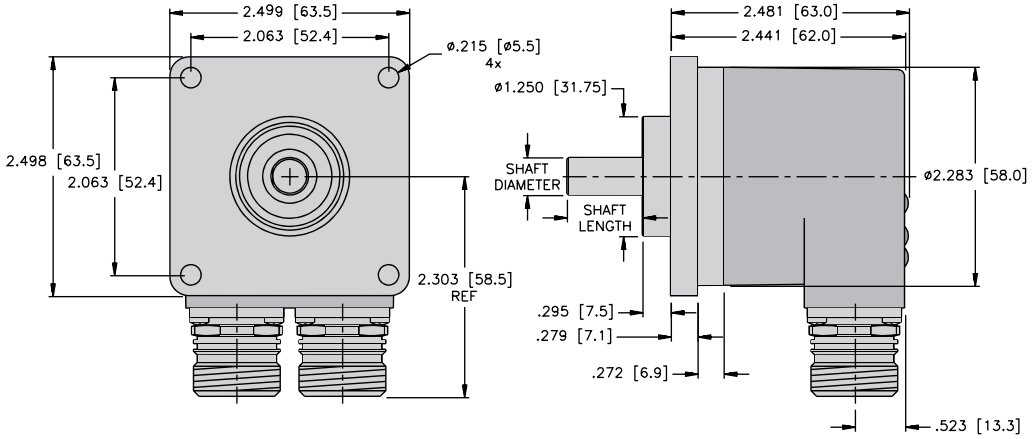
5868 flanges 6 & 8
M23 *multifast*® connection I



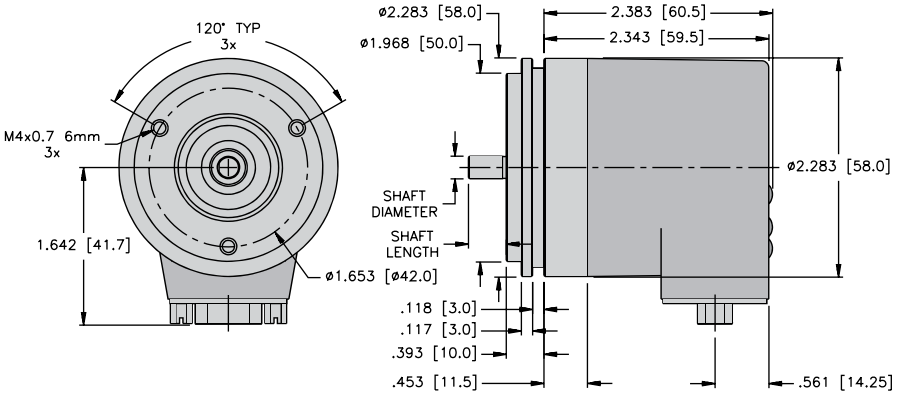
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Dimensions: 5868 shaft version

5868 flanges 5 & 7
M23 *multifast*® connection J



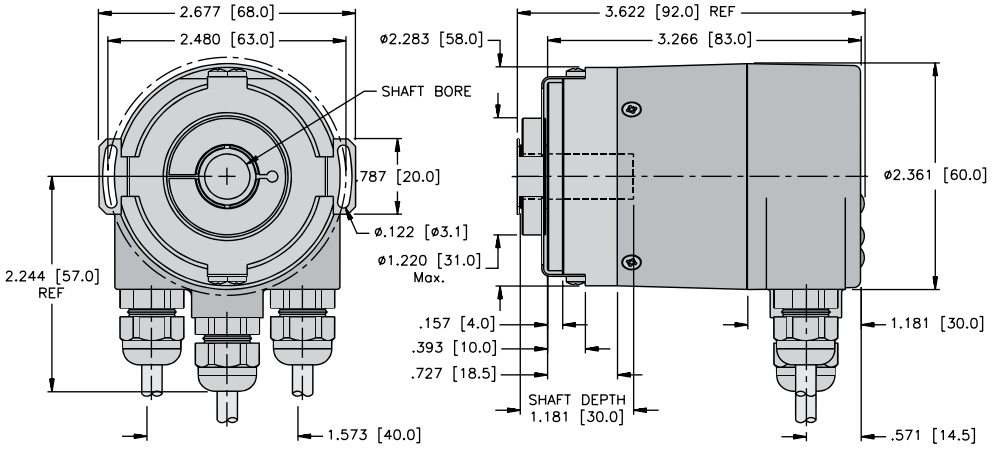
5868 flanges 2 & 4
D-Sub connection K



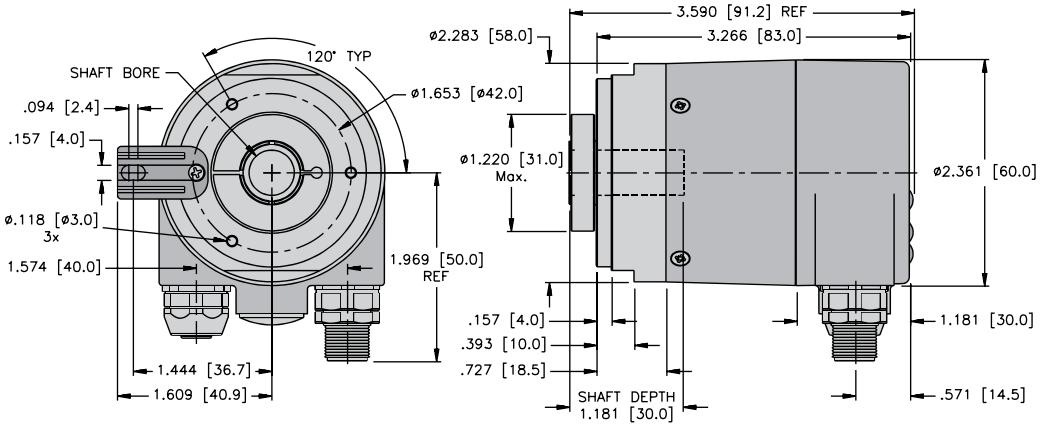
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Dimensions: 5888 blind hollow shaft version

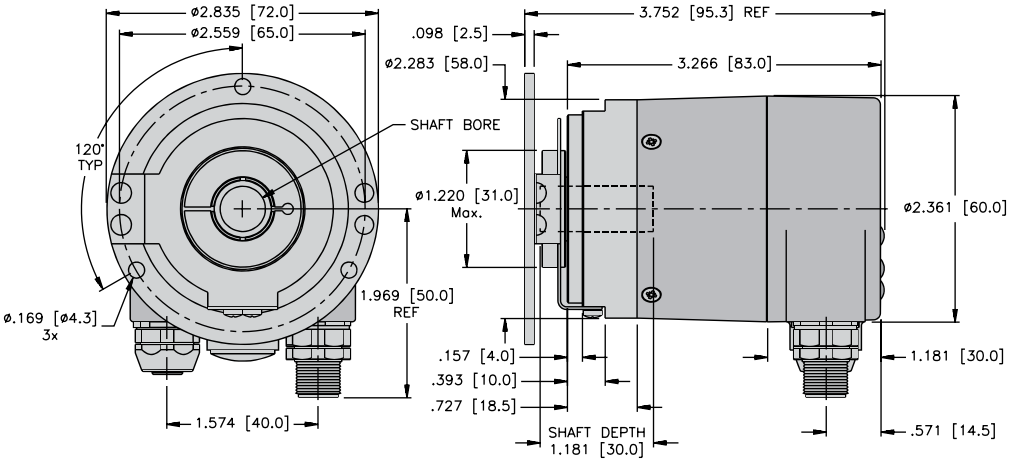
5888 flanges 5 & 6
Cable connection 1



5888 flanges 1 & 2
M12 *eurofast*® connection 2



5888 flanges 3 & 4
M12 *eurofast* connection 2

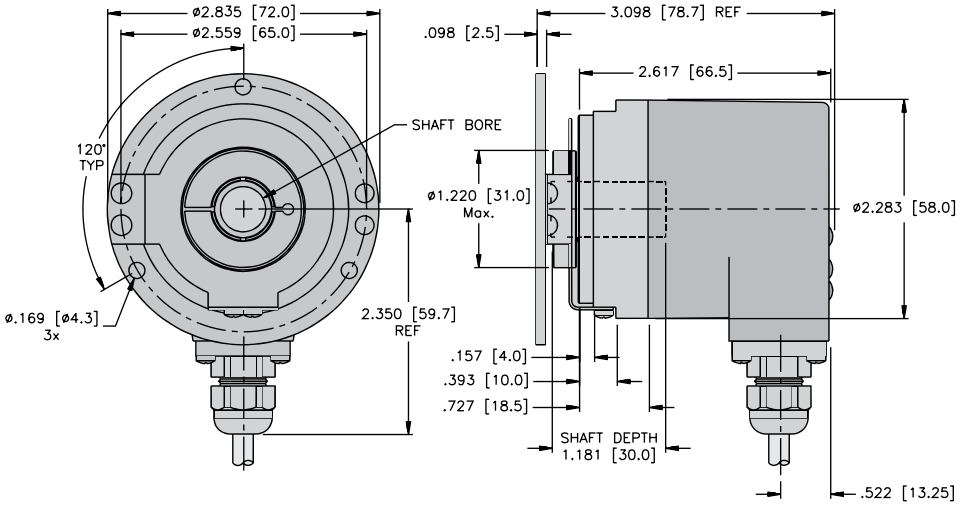


TURCK Industrial Automation

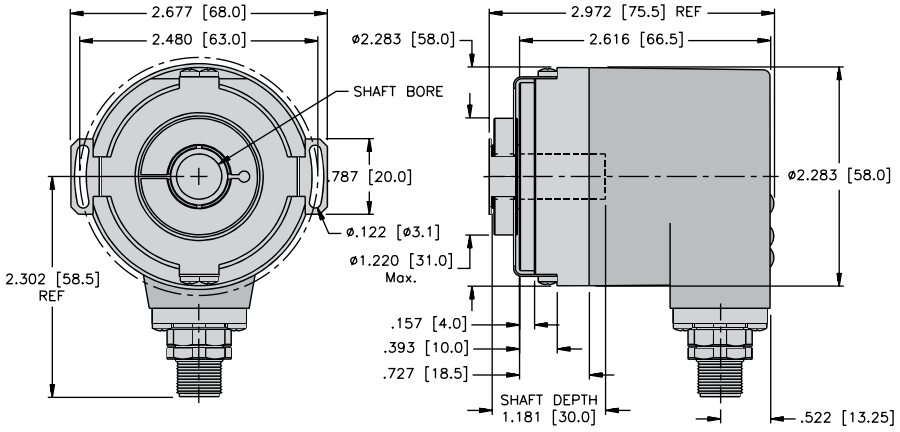
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Dimensions: 5888 blind hollow shaft version

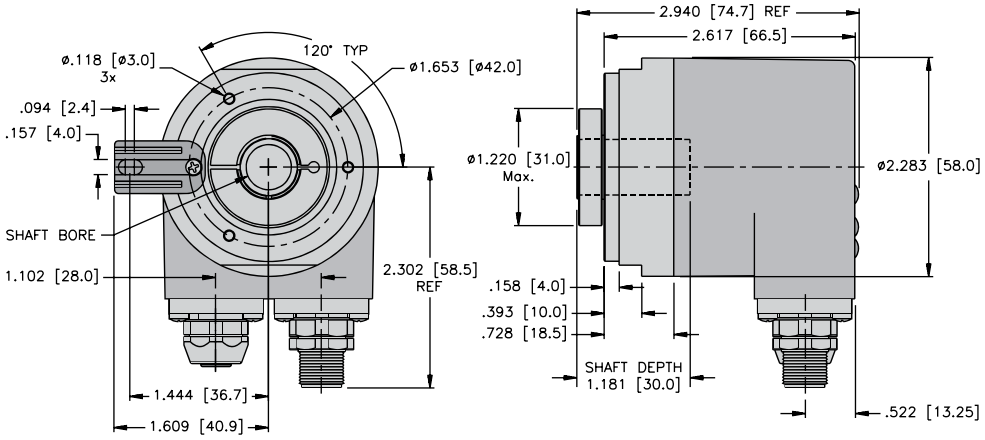
5888 flanges 3 & 4
Cable connection A



5888 flanges 5 & 6
M12 *eurofast*® connection E



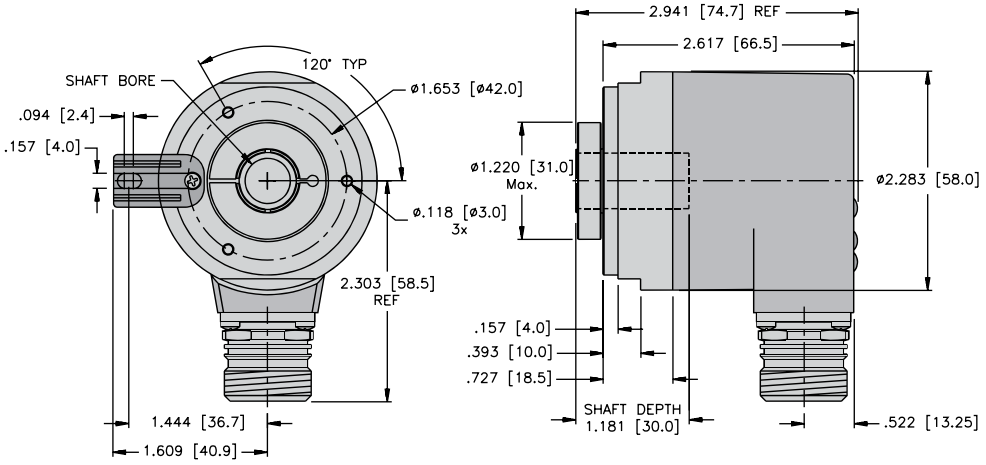
5888 flanges 1 & 2
M12 *eurofast* connection F



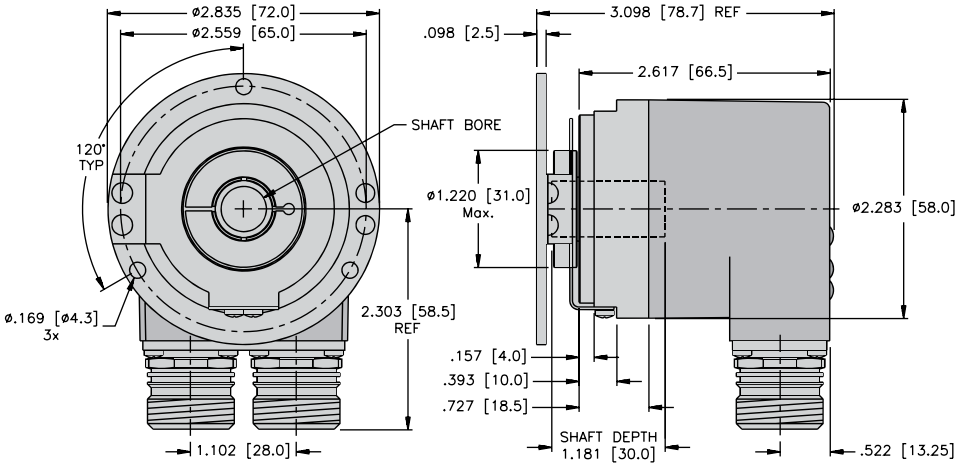
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) CANopen/CANlift

Dimensions: 5888 blind hollow shaft version

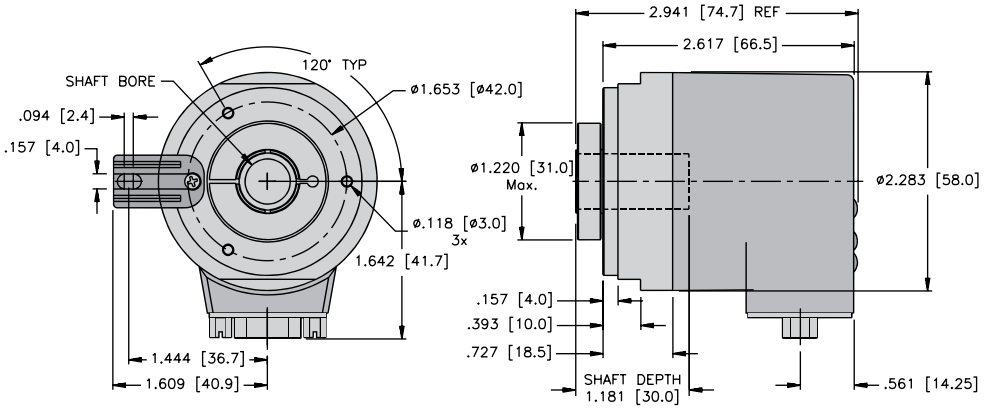
5888 flanges 1 & 2
M23 *multifast*® connection I



5888 flanges 3 & 4
M23 *multifast* connection J



5888 flanges 1 & 2
D-Sub connection K



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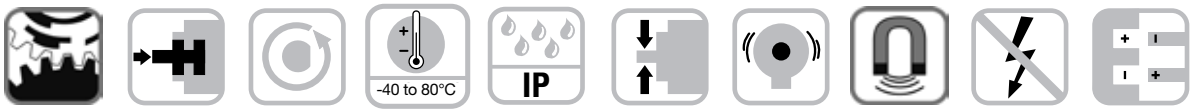
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) EtherCAT



Mechanical drive | Safety-LockTM | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/ vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability:** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range:** -40 to +176°F (-40 to +80°C).

RoHS compliant 2/22

Fast

- **Genuine time-servo position detection of several axes:** Distributed clock for real-time position detection.
- **Fast data availability with reduced loading on the bus and controller:** Intelligent functions such as transmission of speed/velocity, acceleration or leaving a working area.
- **Fast, simple, error-free connection:** Bus terminal cover with 3 x M12 connectors.

Versatile

- **Up-to-the minute fieldbus performance:** CAN over Ethernet.
- **Real-time data:** Position, speed or working area. Variable PDO mapping in the memory.
- **Fast, error-free start-up, without setting any switches:** All parameters can be programmed via the bus.
- **Numerous special functions:** Temperature monitoring, operating time, customer data.

Mechanical characteristics:

Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 7,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	7,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 6,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Starting torque without shaft seal (IP65):	1.4 oz-in (< 0.01 Nm)
Starting torque with shaft seal (IP67):	Shaft version: 7 oz-in (< 0.05 Nm) Hollow shaft version: 4.25 oz-in (< 0.03 Nm)
Moment of inertia:	Shaft version: 0.16 oz-in^2 (3.0 x 10^{-6} kgm^2) Hollow shaft version: 0.41 oz-in^2 (7.5 x 10^{-6} kgm^2)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 1.19 lbs (0.54 kg)
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +176°F (-40 to +80°C)
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc,
Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (> 100 m/s^2), 55-2,000 Hz

- Safe operation in strong magnetic fields
- Special gears with specific toothing

Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) EtherCAT

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (without output load):	24 VDC, max. 90 mA
Reverse polarity protection at power supply (+V):	Yes
Conforms to CE requirements according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
UL certified	File 224618
RoHS compliant according to EU guideline 2002/95/EG	

Device characteristics:

Singleturn resolution Default value:	1-65535 (16 bit), (scalable: 1-65535) 8192 (13 bit)
Total resolution:	scalable from 1 to 268435456 (28 Bit) 12 Bit Multiturn
Code:	EtherNet Frame binary
Interface:	EtherNet/EtherCAT

Diagnostic LED (Red)

LED is ON with the following fault conditions:
Sensor error (internal code or LED error), low voltage, over-temperature

Run LED (Green)

LED is ON with the following conditions:
Init-, Preop-, Safeop and Op-State

2 x Link LED (Yellow)

LED is ON with the following conditions (Port A and B):
Link detected

Modes

Freerun, Distributed Clock (cycle time for Sync 0
pulse min. 125 µs or 62.5 µs with restrictions), Sync-Mode

General information about CoE (CAN over EtherCAT)

The 58X8 series of EtherCAT encoders support the CANopen communication profile according to DS 301. In addition, device-specific profiles are available.

Scaling, preset values, limit switch values and many other parameters may be programmed via the EtherCAT bus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved to protect them against power failure.

Position, speed, acceleration, temperature and working area status output may be combined as PDO mapping).

CANopen Encoder Profile CoE (CAN over EtherCAT)

The following parameters are programmable:
- Units for speed selectable (Steps/Sec or RPM)
- Factor for speed calculation (e.g. circumference of measuring wheel)
- Integration time for the speed value from 1 to 32
- Two working area with 2 upper and lower limits and the corresponding output states
- PDO mapping of position, speed/velocity, acceleration and working area
- Extended error management for position sensing with integrated temperature control
- User interface with visual display of bus and fault status – 4 LEDs
- Alarm and warning messages

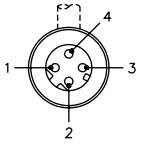
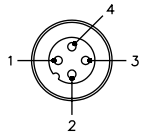
Pin configuration Bus:
(Type of connection 2, D-coded)

Direction:	Port A				Port B			
Signal:	Transmit data+	Receive data+	Transmit data-	Receive data-	Transmit data+	Receive data+	Transmit data-	Receive data-
Abbrv:	TxD+	RxD+	TxD-	RxD-	TxD+	RxD+	TxD-	RxD-
M12 pin:	1	2	3	4	1	2	3	4

Pin configuration power supply:
M12 *eurofast*® connector

Signal:	Power supply	N/C	Common	N/C
Abbrv:	+V	-	0 V	-
M12 pin:	1	2	3	4

Wiring Diagrams:

Bus	Power supply
Female encoder view	Male encoder view
	
Mating cordset: RSSD 441-*	Mating cordset: RK 4.4T-*

TURCK
Industrial Automation

Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) EtherCAT

Part number key: 5868 shaft version

T8.5868.XXXX.XX12

Type

Flange

1 = clamping flange Ø 58 IP65
2 = servo flange Ø 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67

Shaft (ØxL)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Fieldbus profile

B1 = EtherCAT with CoE (CAN over EtherNet™)

Type of connection

2 = removable bus terminal cover with 3 x M12 ***eurofast***® connector

Output circuit and power supply

B = EtherCAT

Part number key: 5888 hollow shaft version

T8.5888.XXXX.XX12

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Blind hollow shaft

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm
8 = Ø 9.52 mm (3/8")
9 = Ø 12.7 mm (1/2")

Fieldbus profile

B1 = EtherCAT with CoE (CAN over EtherNet)

Type of connection

2 = removable bus terminal cover with 3 x M12 ***eurofast*** connector

Output circuit and power supply

B = EtherCAT
Ex-proof zone 2, 22 on request

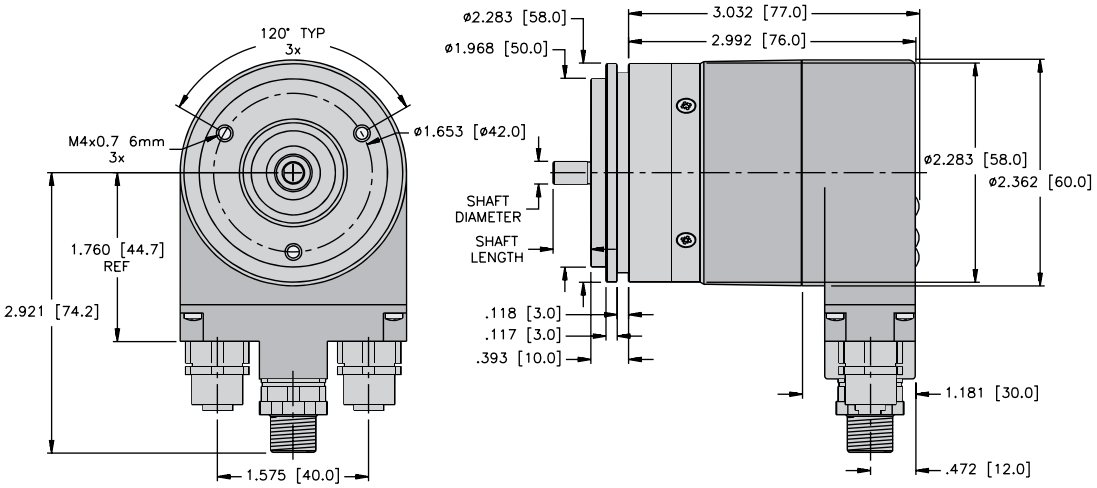
Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

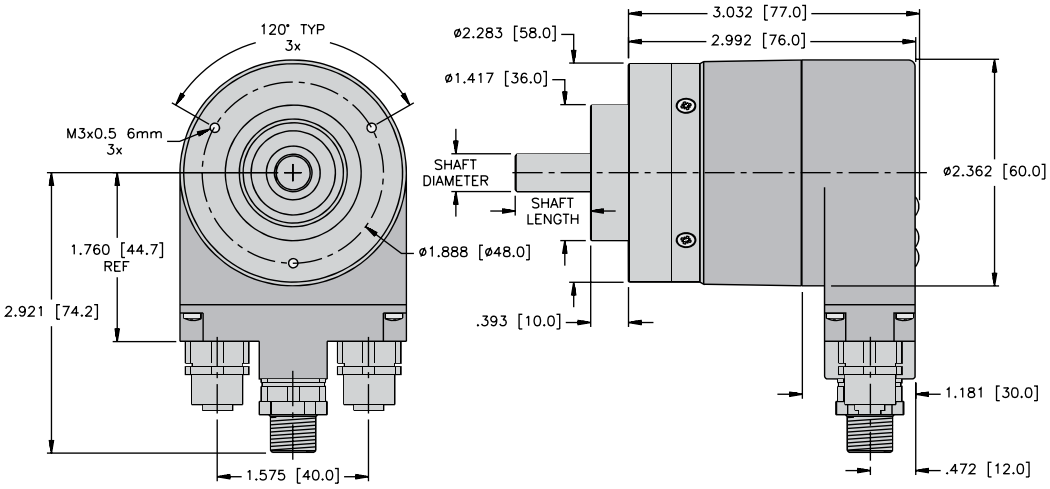
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) EtherCAT

Dimensions: 5868 shaft version

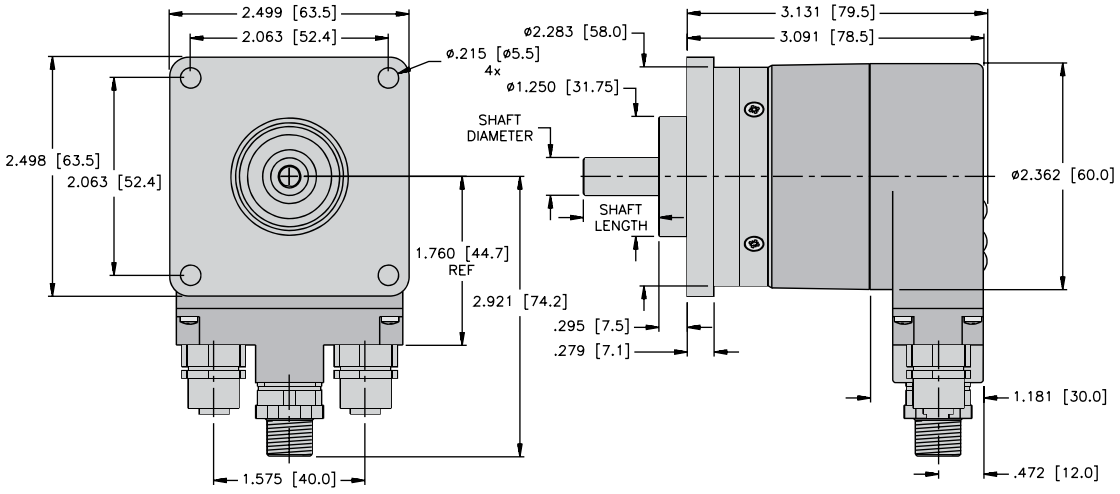
5868 flanges 2 & 4
M12 *eurofast*® connection 2



5868 flanges 1 & 3
M12 *eurofast* connection 2



5868 flanges 5 & 7
M12 *eurofast* connection 2



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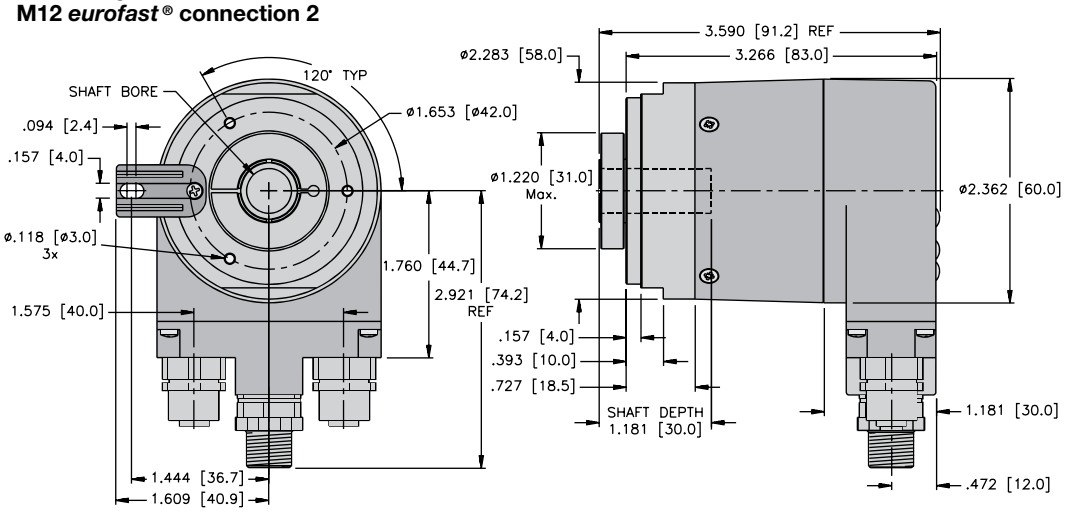
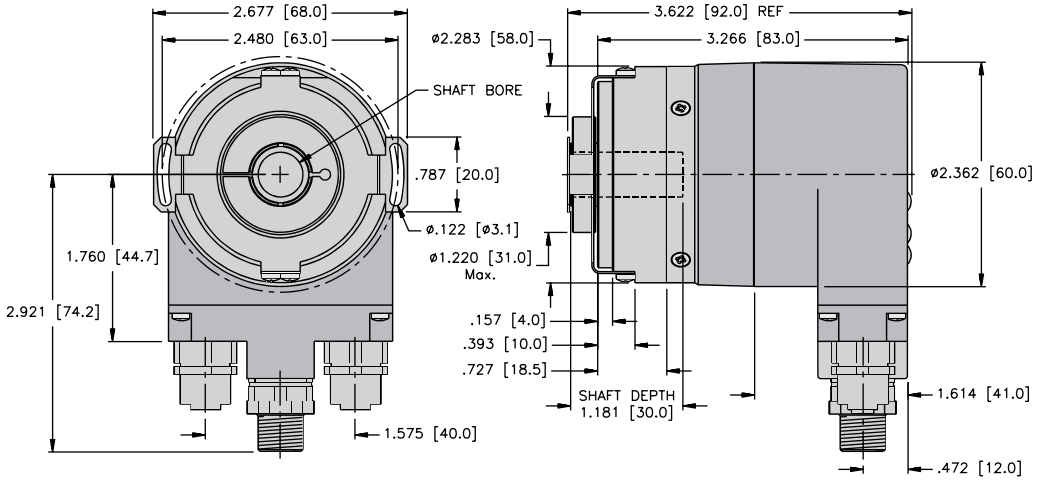
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) EtherCAT

Dimensions: 5888 blind hollow shaft version

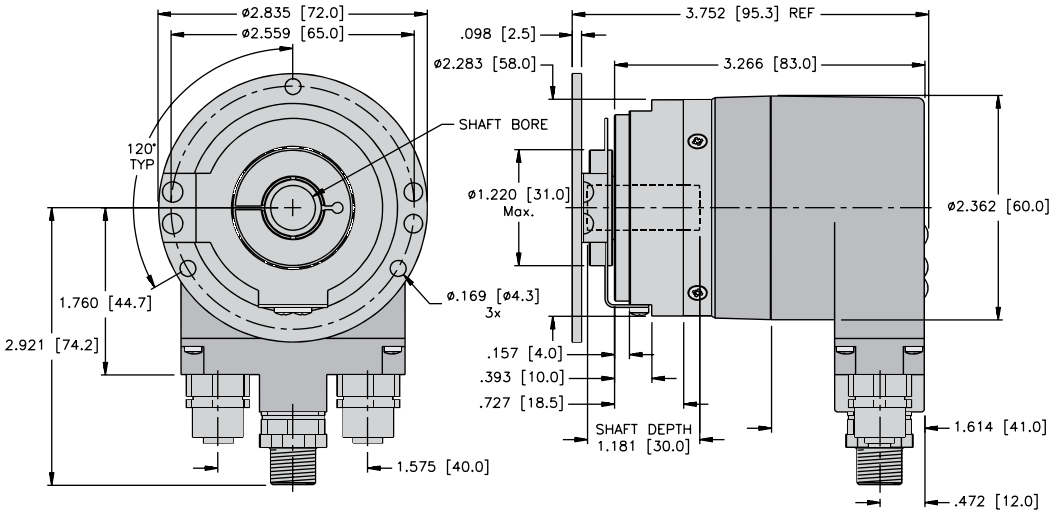
5888 flanges 1 & 2
M12 *eurofast*® connection 2



5888 flanges 5 & 6
M12 *eurofast* connection 2



5888 flanges 3 & 4
M12 *eurofast* connection 2

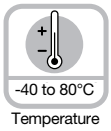


Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) PROFIBUS®-DP


Mechanical drive


Safety-LockTM


High rotational speed



Temperature

High IP


High shaft load capacity


Shock/ vibration resistant

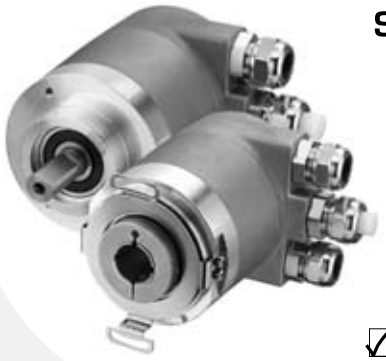

Magnetic field proof


Short-circuit proof


Reverse polarity protection

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Safety-Lock™ Design bearing structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability:** TURCK OptoASIC technology with highest integration density (Chip-on-Board).
- **Die cast housing and protection up to IP67:** Remains sealed even when subjected to harsh everyday use.
- **Wide temperature range.**
- **Immediate recognition of bus operation.**



Sendix® absolute

PROFIBUS

RoHS compliant · UL · Ex · 2/22

Fast

- **Fast data availability with reduced loading on the bus and controller:** Intelligent functions like the transmission of speed, acceleration or exiting a working area.
- **Fast, simple, error-free connection.**

Versatile

- **Up-to-the minute fieldbus performance:** PROFIBUS-DPV0 supports Class I and II.
- **Connection options:** Bus cover with M12 connector or cable connection.
- **Fast start-up with pre-defined GSD file:** A variety of scaling options, 16 bit singleturn resolution, 12 bit multiturn resolution.
- **Comprehensive diagnostics,** programmable to Class II.

Mechanical characteristics:

Max. speed without shaft sealing (IP65) up to 158°F (70°C):	9,000 RPM, continuous 7,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	7,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to 158°F (70°C):	8,000 RPM, continuous 6,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Starting torque without shaft seal (IP65):	1.4 oz-in (< 0.01 Nm)
Starting torque with shaft seal (IP67):	7 oz-in (< 0.05 Nm)
Moment of inertia:	Shaft version: 0.219 oz-in^2 (4.0 x 10^{-6} kgm^2) Hollow shaft version: 0.41 oz-in^2 (7.5 x 10^{-6} kgm^2)
Radial load capacity of shaft:	40 lbs (178 N)
Axial load capacity of shaft:	40 lbs (178 N)
Weight:	approx. 1.26 lbs (0.57 kg) with bus terminal cover approx. 1.15 lbs (0.52 kg) with fixed connection
Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-40 to +176°F (-40 to +80°C)
Materials:	Shaft: stainless steel, Flange: aluminum, Housing: die cast zinc
Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s^2), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (> 100 m/s^2), 55-2,000 Hz

- Safe operation in strong magnetic fields
- Special gears with specific toothing

TURCK Industrial Automation

Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) PROFIBUS®-DP

General electrical characteristics:

Supply voltage:	10-30 VDC
Current consumption (w/o output load):	24 VDC, max. 90 mA
Reverse polarity protection	Yes at power supply (+V)
Conforms to CE requirements according to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
UL certified	File 224618
RoHS compliant according to EU guideline 2002/95/EG	

SET control button (zero or defined value, option):

Protected against accidental activation, can only be depressed with the tip of a ballpoint pen or similar.

Diagnostic LED (yellow):

LED on with: optical sensor path faulty (code error, LED error), low voltage and over-temperature

Interface characteristics PROFIBUS-DP:

Singleturn resolution (max, scalable):	1-65536 (16 bits), default scale value is set to 8192 (13 bits)
Total resolution:	28 Bit (scalable 1-228 steps)
Number of Revolutions:	4096 (12 bits), (scalable 1-4096)
Code:	Binary
Interface:	Specification according to PROFIBUS-DP 2.0 Standard (DIN 19245 Part 3) RS485 driver galvanically isolated.

Protocol:	PROFIBUS Encoder Profile V1.1 Class 1 and Class 2 with manufacturer-specific enhancements
Baud rate:	12 Mbits/s
Node address:	1-127 (set by rotary switches / software configurable)
Termination switchable:	Set by DIP switches

PROFIBUS Encoder-Profile V1.1

The PROFIBUS-DP device profile describes the functionality of the communication and the user-specific component within the PROFIBUS fieldbus system. The encoder profile is definitive. Here the individual objects are defined independent of the manufacturer. Furthermore, the profiles offer space for additional manufacturer-specific functions.

The following parameters may be programmed:
- Direction of rotation
- Scaling
- Number of steps per revolution
- Number of revolutions
- Total resolution over Singleturn/Multiturn
- Preset value
- Diagnostics mode

The following parameters may be configured:
- Position 16/32 Bit
- Speed UPM or Unit/s (16/32) Bit

The following functionality is integrated:
- Galvanic isolation of the bus stage with DC/DC converter
- Line driver according to RS485; max. 12 MB
- Address programmable via DIP switches
- Diagnostics LED
- Full Class I and Class II functionality

Pin configuration with terminal box (Connection 1):

Signal:	BUS IN				BUS OUT			
	B	A	Common (0 V)	+V	Common (0 V)	+V	B	A
Pin:	1	2	3	4	5	6	7	8

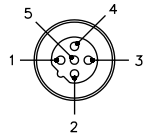
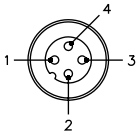
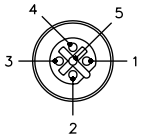
Pin configuration M12 - 3 connector version (Connection 2):

Bus In	**Signal:**	**-**	**BUS-A**	**-**	**BUS-B**	**Shield**
	Pin:	1	2	3	4	5

Power Supply	**Signal:**	**+V**	**-**	**Common (0 V)**	**-**
	Pin:	1	2	3	4

Bus Out	**Signal:**	**BUS-VDC** [1]	**BUS-A**	**BUS_GND** [1]	**BUS-B**	**Shield**
	Pin:	1	2	3	4	5

Wiring Diagrams:

Bus In	Power Supply	Bus Out
Male encoder view	**Male encoder view**	**Female encoder view**
		
M12 ***eurofast*®** pinout	M12 ***eurofast*** pinout	M12 ***eurofast*** pinout
Mating cordset: [2] [3] **RKSW-455-*M**	Mating cordset: [2] **RK 4.4T-***	Mating cordset: [2] [3] **RSSW-455-*M**

[1] For powering an external PROFIBUS-DP terminating resistor.
[2] See cable section for additional options.
[3] "S" denotes shield tied to coupling nut.
* Length in meters. Available in 0.1 meter increments ≥ 0.2 meters.

Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) PROFIBUS®-DP

Part number key shaft version:

T8.5868.XXXX.XX1X

Type

Flange

1 = clamping flange Ø 58 IP65
2 = servo flange Ø 58 mm, IP65
3 = clamping flange Ø 58 mm, IP67
4 = servo flange Ø 58 mm, IP67
5 = square flange 2.5" / 63.5 mm, IP65
6 = servo flange 2.5" / 63.5 mm, IP65
7 = square flange 2.5" / 63.5 mm, IP67
8 = servo flange 2.5" / 63.5 mm, IP67

Shaft (Ø x L)

1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4" x 7/8"
4 = Ø 3/8" x 7/8"

Output circuit and power supply

3 = 10-30 VDC, PROFIBUS-DP V0 encoder Profile V 1.1

Options (service)

2 = no option
3 = SET button

Fieldbus profile

31 = PROFIBUS-DP-V0 encoder profile Class 2

Type of connection

1 = with removable bus terminal cover, with radial screwed cable passage
2 = removable bus terminal cover with 3 x M12 ***eurofast***® connector

---

Part number key: 5888 blind hollow shaft version

T8.5888.XXXX.XX1X

Type

Flange

1 = flange with torque stop IP65
2 = flange with torque stop IP67
3 = flange with flex mount pitch circle Ø 65, IP65
4 = flange with flex mount pitch circle Ø 65, IP67
5 = flange with slotted flex mount pitch circle Ø 63, IP65
6 = flange with slotted flex mount pitch circle Ø 63, IP67

Blind hollow shaft

3 = Ø 10 mm
4 = Ø 12 mm
5 = Ø 14 mm
6 = Ø 15 mm
8 = Ø 9.52 mm (3/8“)
9 = Ø 12.7 mm (1/2“)

Output circuit and power supply

3 = 10-30 VDC, PROFIBUS-DP V0 encoder Profile V 1.1

Options (service)

2 = no option
3 = SET button

Fieldbus profile

31 = PROFIBUS-DP-V0 encoder profile Class 2

Type of connection

1 = with removable bus terminal cover, with radial screwed cable passage
2 = removable bus terminal cover with 3 x M12 ***eurofast*** connector

Accessories:

- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

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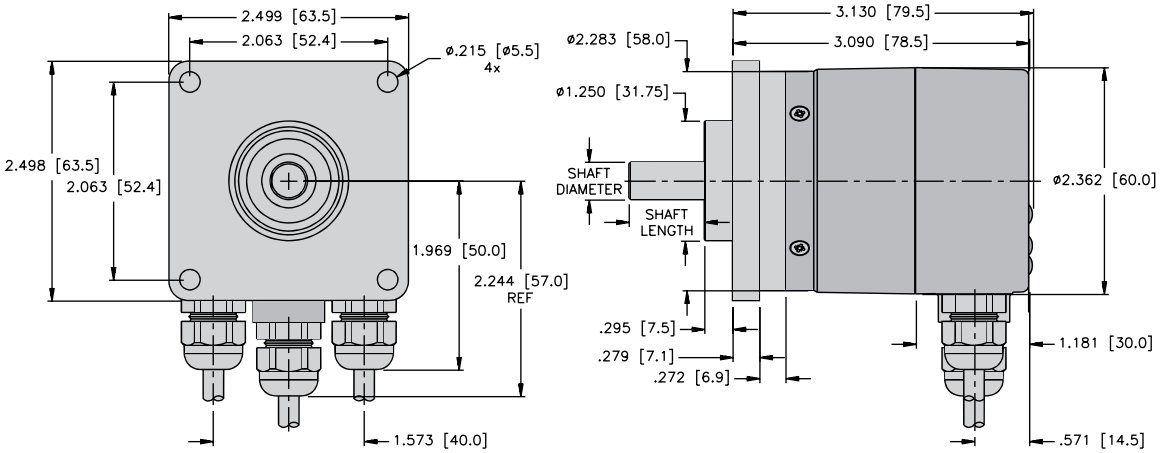
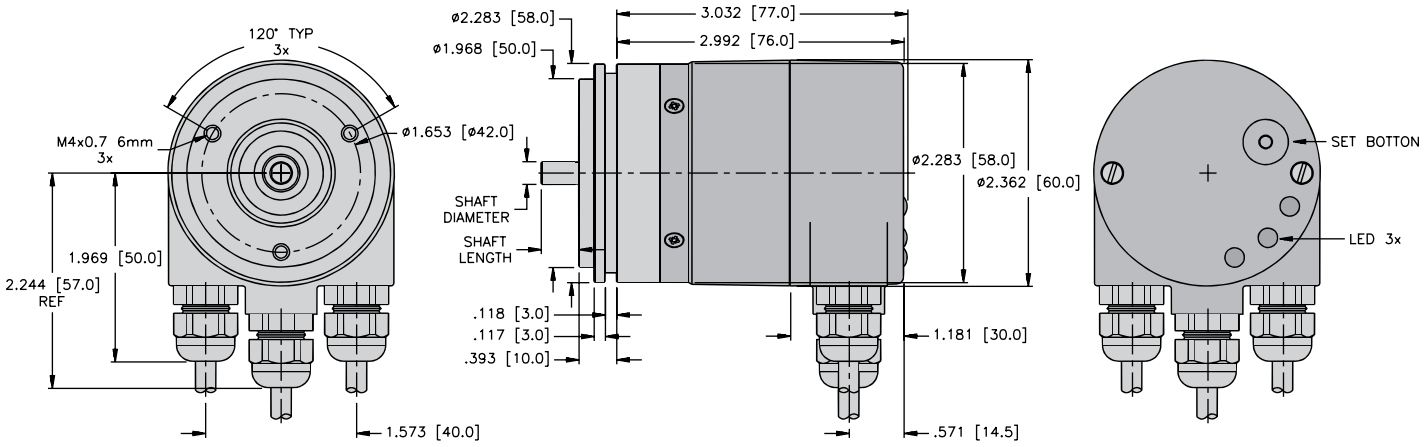
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) PROFIBUS®-DP

Dimensions: 5868 shaft version

5868 flanges 5 & 7
Cable connection 1



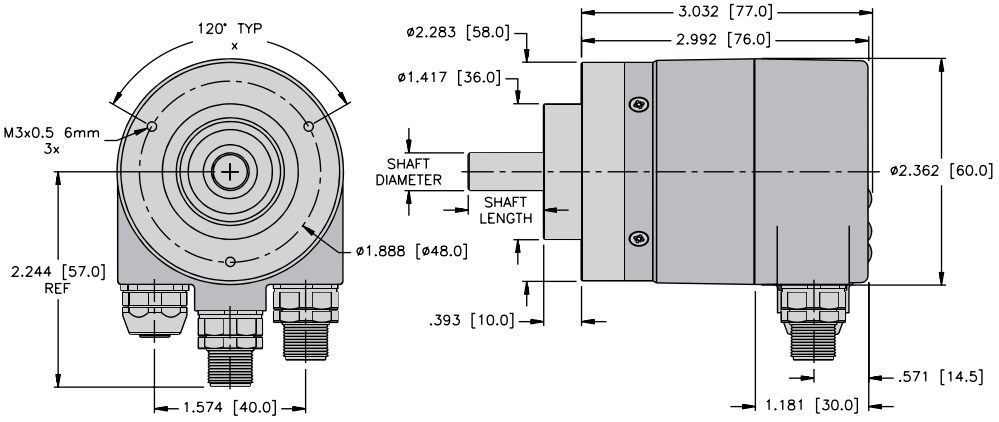
5868 flanges 2 & 4
Cable connection 1



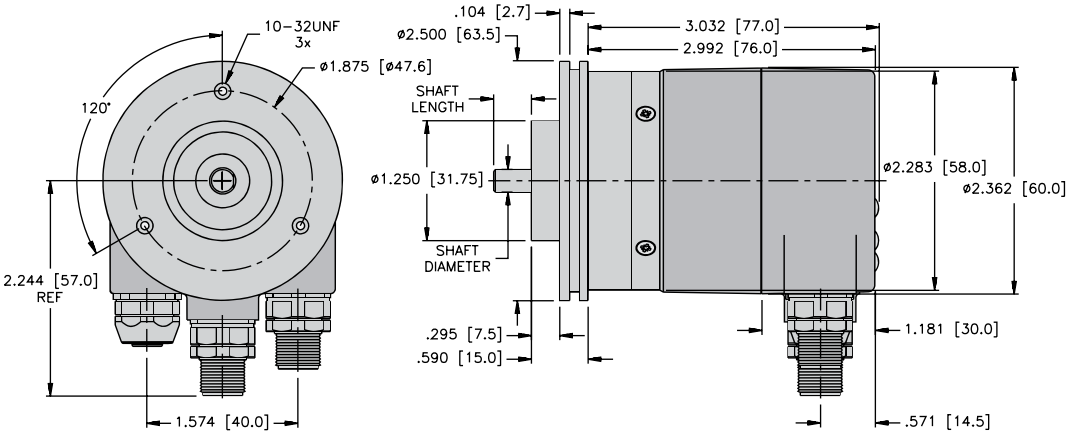
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) PROFIBUS®-DP

Dimensions: 5868 shaft version

5868 flanges 1 & 3
M12 *eurofast*® connection 2



5868 flanges 6 & 8
M12 *eurofast* connection 2



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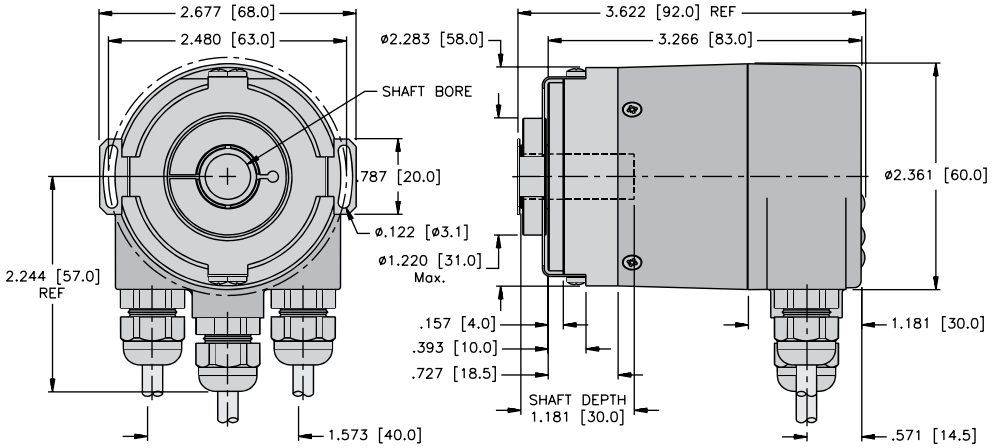
Industrial Automation

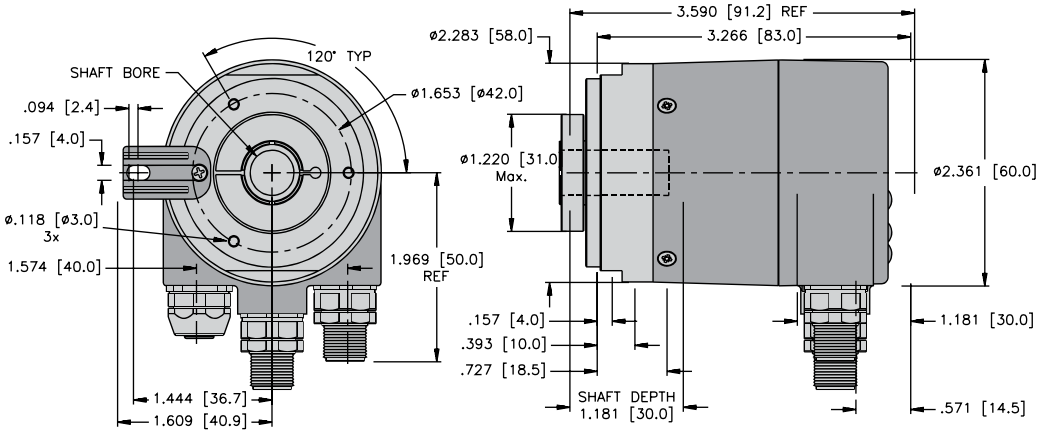
Sendix absolute, multiturn type 5868 (shaft) / 5888 (blind hollow shaft) PROFIBUS®-DP

Dimensions: 5888 blind hollow shaft version

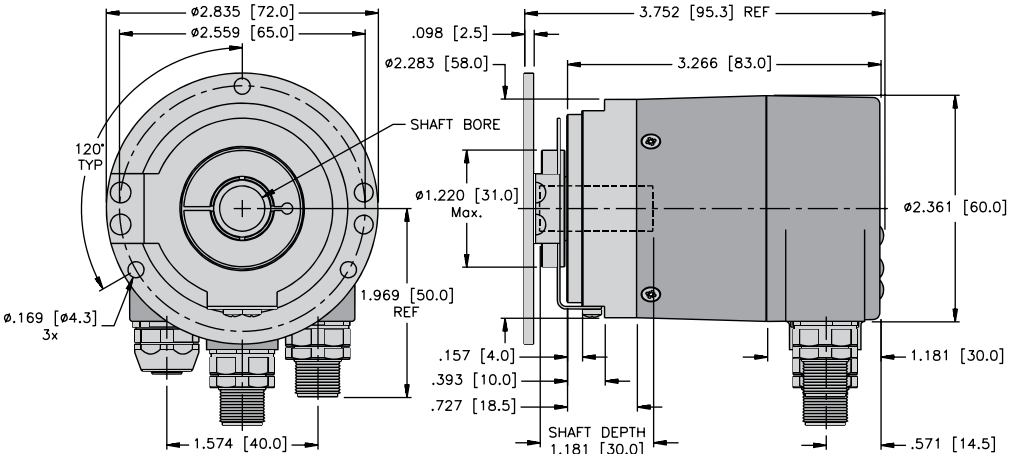
5888 flanges 5 & 6
Cable connection 1



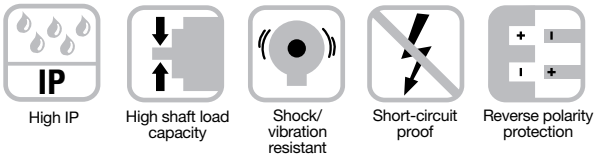
5888 flanges 1 & 2
M12 *eurofast*® connection 2



5888 flanges 3 & 4
M12 *eurofast* connection 2



Multiturn type 5860 (shaft / blind hollow shaft) DeviceNet™



High IP | High shaft load capacity | Shock/ vibration resistant | Short-circuit proof | Reverse polarity protection

Rugged
- **High shock and vibration values.**

DeviceNet.

RoHS compliant

Versatile
- **Connection options: Plug and Play cable assemblies.**
- **Diagnostics and alarm functions.**
- **Ex also available as explosion proof Zones 2 and 22.**
- **Many options** (no need for adaper sleeves).
- **Fully programmable.**
- **Integrated Fieldbus node with T-Coupler.**

Compact
- **Minimal installation depth.**
- **Very compact (only 87.8 mm installation depth).**

Mechanical characteristics:

Speed: [1]	max. 6000 RPM
Rotor moment of inertia:	approx. 0.098 oz-in² (1.8 x 10^{-6} kgm²)
Starting torque:	< 1.4 oz-in (< 0.01 Nm)
Load capacity of shaft at shaft extension: [3]	radial: 40 lbs (178 N), axial: 40 lbs (178 N)
Weight:	approx. 1.54 lbs (0.7 kg)
Protection acc. to EN 60529:	IP65
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-4 to +176°F (-20 to +80°C) [2]
Shaft:	stainless steel
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] For continuous operation 3000 RPM at the max. temperature [2] Non-condensing [3] Solid shaft version

Electrical characteristics:

Supply voltage (+V):	10-30 VDC
Current consumption:	max. 0.29 A
Recommended fuse:	T 0,315 A
Divisions:	up to 8192 (13 bits) per revolution, 4096 (12 bits) revolutions
Linearity:	± 1/2 LSB (±1 LSB at resolution 13, 14, 25 Bit)
Code:	Binary
Interface:	CAN HIGH-Speed to ISO/DIS 11898, Basic and Full-CAN; CAN specification 2.0 B (11 and 29 Bit Identifier)
Protocols:	**DeviceNet™ Profile for Encoder Release V 2.0**
Baud rate:	programmable via DIP switches 10-1000 Kbits/s CAN DNET 125/250/500 kBit/s
Basic identifier/node number:	programmable via DIP switches
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
Performance against magnetic influence acc. to EN61000-4, 8, severity of inspection 5	
UL certified	File 224618
RoHS compliant acc. to EU guideline 2002/95/EG	

TURCK Industrial Automation

Multiturn type 5860 (shaft / blind hollow shaft) DeviceNet™

DeviceNet Encoder Profile:

General description:
The DeviceNet profile defines the functionality of the communication and of that part of the DeviceNet fieldbus system specific to the manufacturer. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer.

The following parameters may be programmed:
- Direction of rotation
- Scaling factor
  - Number of pulses/rotation 1 to 8192
  - Total resolution
- Number of revolutions 1 to 4096
- Preset value
- Diagnostics mode

The following functionality is integrated:
- Galvanic isolation of the Fieldbus-stage with DC/DC converter
- Addressing via DIP switches or software
- Diagnostics LED network and mode
- Baud rate 125, 250 and 500 kbit/s programmable via DIP switches
- Node address 0 to 63 and baud rate programmable via DIP switches
- Polled mode
- Cyclic mode
- Change of state mode (COS)
- Combination of Polled mode and Cyclic mode
- Combination of Polled mode and COS mode
- Offline connection set
- Device heartbeat

"Out of box" Configuration
- MAC-ID and Baud rate preset value
  MAC-ID = 63
- Baud rate = 125 kBit/s
- Two I/O Assembly
  Position value
  Position value and status

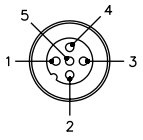
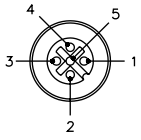
Fieldbus encoders can be used in the following applications:
- Elevators, construction machines, cranes, agricultural vehicles, special-purposes vehicles, industrial automation

Pin configuration:
DeviceNet M12 *eurofast*®

Bus In (Male) (3)	**Output**	**Drain**	**+VDC**	**-VDC**	**CAN_H**	**CAN_L**
	Pin:	1	2	3	4	5

Bus Out (Female) (3)	**Output**	**Drain**	**+VDC**	**-VDC**	**CAN_H**	**CAN_L**
	Pin:	1	2	3	4	5

Wiring Diagrams:

BUS IN	BUS OUT
Male encoder view	**Female encoder view**
DeviceNet  M12 ***eurofast***® pinout	**DeviceNet**  M12 ***eurofast*** pinout
Mating cordset: **RKC 572-*M**	Mating cordset: **RSC 572-*M**

* Length in meters.

Multiturn type 5860 (shaft / blind hollow shaft) DeviceNet™

The basics of TURCK encoders include two patented technologies:

Integrative Technology®:

Integrative Technology, developed and patented by TURCK, is a package of measures that ensures compact construction, high signal quality, high shock resistance – up to 2,500 m/s² – high reliability and high immunity to EMC.

This is achieved by using an Opto ASIC: a multilayer board and an especially shock resistant and space-saving method of mounting the sensor unit. ASIC ensures the integration of several hundred individual components that had previously been required to balance the system.

Intelligent Sensing Technology®

An innovative principle of operation based on a non-contact electronic multiturn stage. This overcomes system disadvantages previously associated with encoders that had mechanical gears or with traditional electronic gear technology.

Advantages:
- High operational reliability
- Logic filter and innovative principle of operation compensate for high EMC interference
- Free from wear

Part number key: 5860 version

T8.5860.XXXX.X001

Type

Flange for shaft
1 = clamping flange
2 = servo flange
4 = 2.5” square flange (63.5 mm)
5 = 2.5” servo flange (Ø 63.5 mm)
6 = 2.5” servo flange (Ø 63.5 mm) with shaft seal

Flange for blind hollow shaft
A = with spring element
B = with slotted flex mount

Shaft (Ø x L)
1 = Ø 6 mm x 10 mm
2 = Ø 10 mm x 20 mm
3 = Ø 1/4” x 7/8”
4 = Ø 3/8” x 7/8”

Blind hollow shaft
A = Ø 10 mm
B = Ø 12 mm
C = Ø 14 mm
D = Ø 15 mm
E = Ø 9.525 mm (3/8”)
F = Ø 12.7 mm (1/2”)

Fieldbus profile
1001 = DeviceNet 2.0

Type of connection
2 = 8-pin M12 ***eurofast***® connector

Interface and supply voltage
1 = 10-30 VDC, DeviceNet

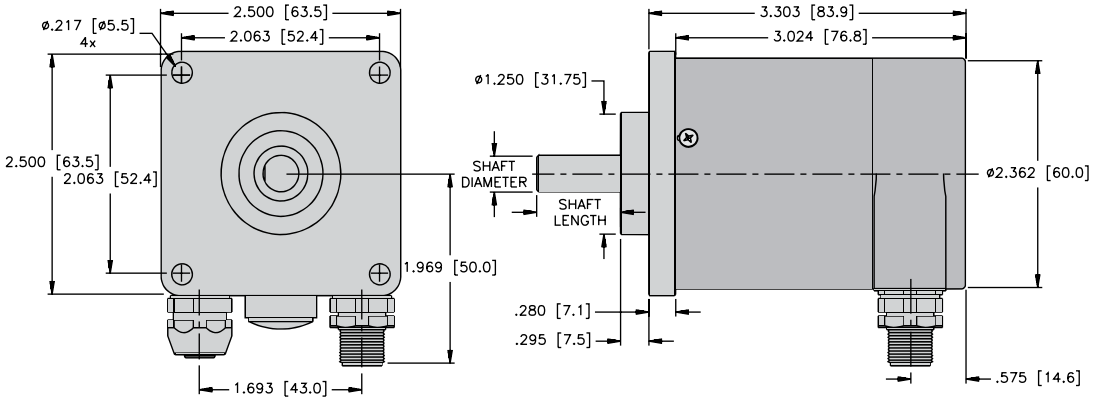
Note: Numbers and letters can not be combined for vaild part number.

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

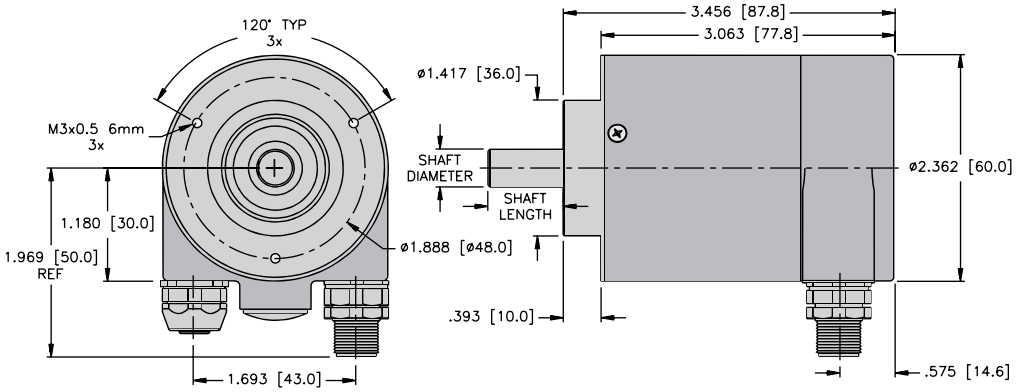
Multiturn type 5860 (shaft / blind hollow shaft) DeviceNet™

Dimensions: 5860 shaft version

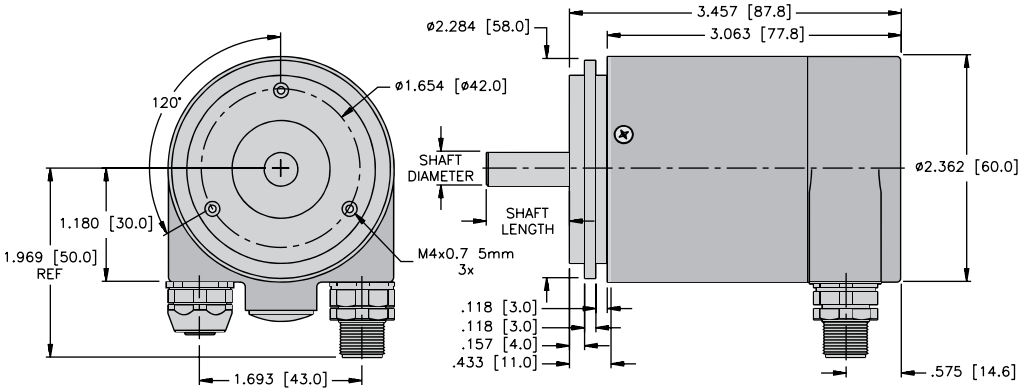
5860 flange 4
M12 *eurofast*® connection 2



5860 flange 1
M12 *eurofast* connection 2



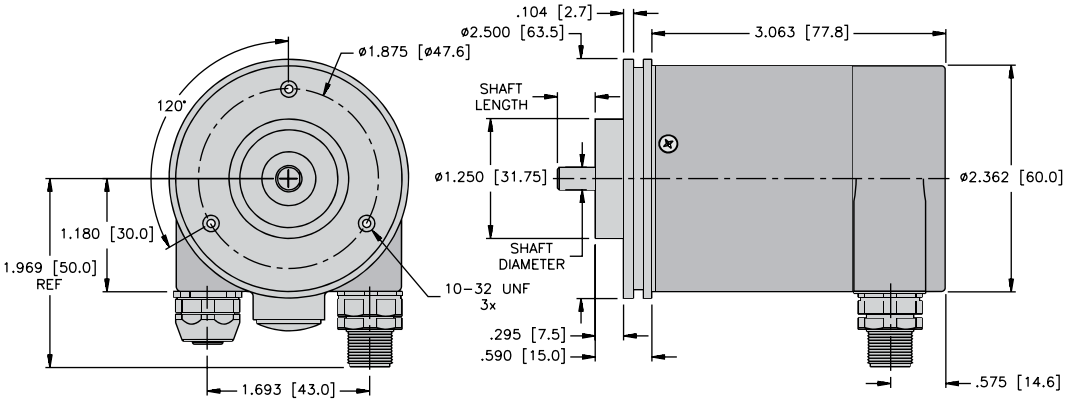
5860 flange 2
M12 *eurofast* connection 2



Multiturn Type 5860 (shaft / blind hollow shaft) DeviceNet™

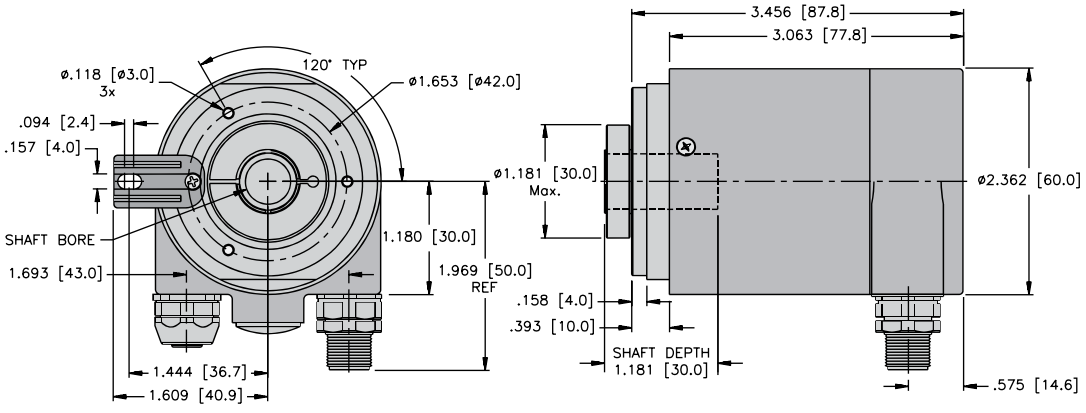
Dimensions: 5860 shaft version

5860 flange 5 & 6
M12 *eurofast*® connection 2

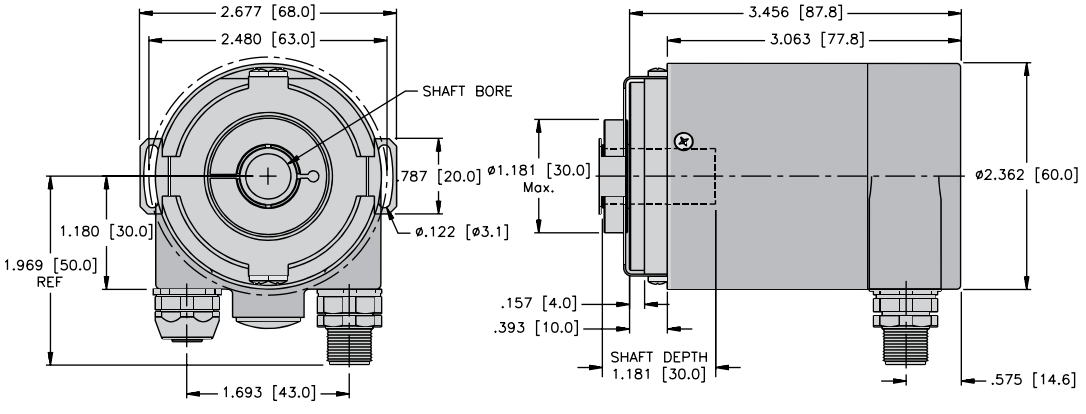


Dimensions: 5860 blind hollow shaft version

5860 flange A
M12 *eurofast* connection 2



5860 flange B
M12 *eurofast* connection 2



TURCK
Industrial Automation

Multiturn type 9080 (shaft / hollow shaft) CANopen/DeviceNet™

Rugged
- Patented integrative technology.
- IP65 protection.

DeviceNet.
CANopen

RoHS compliant · cULus · Ex 2/22

Versatile
- CANopen fieldbus according to DSP 406; DeviceNet 2.0 protocol.
- Patent pending connecting system with removable socket box.
- Up to 8192 (13 bits) per revolution, 4096 (12 bits) revolutions.
- Non-contact multiturn gear with new Intelligent Sensing Technology.
- Extensive M12 accessories.

Compact
- Only 60 mm clearance needed.
- The encoder is mounted directly on the drive shaft without coupling. This saves up to 30% cost and 50% clearance compared to shaft versions.

Mechanical characteristics:

Speed: [1]	max. 6,000 RPM
Rotor moment of inertia:	approx. 3.94 oz-in² (72 x 10⁻⁶ kgm²)
Starting torque:	Hollow shaft version: < 28.3 oz-in (< 0.2 Nm) Shaft version: < 7oz-in (< 0.05 Nm)
Radial load capacity of shaft: [2]	40 lbs (178 N)
Axial load capacity of shaft: [2]	40 lbs (178 N)
Weight:	approx. 1.98 lbs (0.9 kg)
Protection acc. to EN 60529:	IP65
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	+14 to +158°F (-10 to +70°C) [3]
Shaft:	stainless steel, hollow shaft: H7
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] For continuous operation 3,000 RPM [2] At shaft version only [3] Non-condensing

Electrical characteristics:

Supply voltage (+V):	10-30 VDC
Current consumption:	max. 0.29 A
Recommended fuse:	T 0.315 A
Linearity:	±1/2 LSB (±1 LSB at 13, 14, 25 bit)
Code:	Binary
Interface:	CAN HIGH-Speed to ISO/DIS 11898, Basic and Full-CAN; CAN-specification 2.0 B (11 and 29 Bit Identifier)
Protocols:	CANopen to Profile DSP 406 DeviceNet Profile for Encoder Release V 2.0
Baud rate:	programmable via DIP switches 10-1000 Kbits/s
Basic identifier/node:	programmable via DIP switches
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
Performance against magnetic influence acc. to EN61000-4, 5	
UL certified	File 224618 (version with terminal box)
RoHS compliant acc. to EU guideline 2002/95/EG	

Fieldbus encoders can be used in following applications:
- Elevators
- Construction
- Mobile plant
- Cranes
- Agricultural vehicles
- Special-purposes vehicles

Multiturn type 9080 (shaft / hollow shaft) CANopen/DeviceNet™

CANopen - Device Profile:

General description:
The CANopen profiles defines the functionality of the communication and of that part of the CANopen fieldbus system specific to the manufacturer. Device profile 406 applies to encoders and defines the individual objects independently of the manufacturer. In addition the profile makes provision for additional extended functions specific to the manufacturer; using devices that interface with CANopen offers the advantage of acquiring systems today that are prepared for the needs of the future.

The following functionality is integrated:
- Class C2 functionality
- NMT Slave
- Diagnostics (internal) 2 Bit
- CAN-LED for bus status
- CAN-LED for operating mode

The following parameters may be programmed:
- Polling mode or auto mode with adjustable time
- Direction
- Number of pulses/rotation: 1 to 8192
- Number of revolutions: 1 to 4096
- Total resolution
- Preset
- Offset

DeviceNet Encoder Profile:

General description:
The DeviceNet profile describes the functionality of the communication and of that part of the DeviceNet fieldbus system specific to the manufacturer. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer.

The following parameters may be programmed:
- Direction of rotation
- Scaling factor
  - Number of pulses/rotation
  - Total resolution
- Number of revolutions
- Preset value
- Diagnostics mode
- Resolution

The following functionality is integrated:
- Galvanic isolation of the Fieldbus-stage with DC/DC converter
- Addressing via DIP switches or software
- Diagnostic LED for network and mode
- Baud rate 125, 250 and 500 kbit/s programmable via DIP switches
- Node address 0 to 63 and baud rate programmable via DIP switches
- Polled mode
- Cyclic mode
- Change of state mode (COS)
- Combination of Polled mode and Cyclic mode
- Combination of Polled mode and COS mode
- Offline connection set
- Device heartbeat
- “Out of box” Configuration
- MAC-ID and Baud rate preset value MAC-ID = 63
- Baud rate = 125 kBits/s
- Two I/O Assembly
  Position value
  Position value and status

Multiturn type 9080 (shaft / hollow shaft) — CANopen/DeviceNet™

Pin configuration:
CANopen with terminal box, Connection 1

Output	ENC		BUS IN			BUS OUT			ENC	
	+VDC	GND	GND	CAN_H	CAN_L	CAN_L	CAN_H	GND	GND	+VDC
Pin:	1	2	3	4	5	6	7	8	9	10

Pin configuration:
DeviceNet with M12, Connection 2

Bus IN (Male)	Output	Drain	+VDC	-VDC	CAN_H	CAN_L
	Pin:	1	2	3	4	5

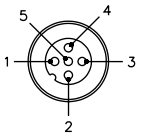
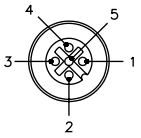
Bus OUT (Female)	Output	Drain	+VDC	-VDC	CAN_H	CAN_L
	Pin:	1	2	3	4	5

Pin configuration:
CANopen with M12, Connection 2

Bus IN (Male)	Output	CAN GND	+VDC	-VDC	CAN_H	CAN_L
	Pin:	1	2	3	4	5

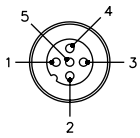
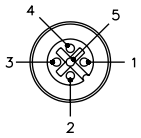
Bus OUT (Female)	Output	CAN GND	+VDC	-VDC	CAN_H	CAN_L
	Pin:	1	2	3	4	5

Wiring Diagrams: DeviceNet

BUS IN	BUS OUT
Male encoder view	Female encoder view
	
M12 ***eurofast*** ® pinout	M12 ***eurofast*** ® pinout
Mating cordset: **RKC 572-*M**	Mating cordset: **RSC 572-*M**

* Length in meters.

Wiring Diagrams: CANopen

BUS IN	BUS OUT
Male encoder view	Female encoder view
	
M12 ***eurofast*** ® pinout	M12 ***eurofast*** ® pinout
Mating cordset: **E-RKC 4.5T-1695-*/A**	Mating cordset: **E-RSC 4.5T-1695-*/A**

* Length in meters.

Part number key: 9080 version

T8.9080.XXXX.X001

Type

Flange
1 = without mounting aid
2 = with short spring device
3 = with long spring device
4 = with mounting flange
5 = with tether arm

Shaft / hollow shaft
1 = hollow shaft Ø 12 mm
2 = hollow shaft Ø 15 mm
3 = hollow shaft Ø 20 mm
4 = hollow shaft Ø 24 mm
5 = hollow shaft Ø 28 mm
6 = hollow shaft Ø 5/8”
7 = hollow shaft Ø 1”
8 = shaft Ø 12 mm x 30 mm
9 = hollow shaft Ø 16 mm
A = hollow shaft Ø 3/4”
B = hollow shaft Ø 1/2”

Fieldbus profile
1001 = DeviceNet
2001 = CANopen encoder profile DSP 406

Type of connection
1 = terminal box with cable connection M16 [1)]
2 = M12 ***eurofast*** ® connector

Output and voltage supply
1 = 10-30 VDC, DeviceNet
2 = 10-30 VDC, CANopen

[1)] only in conjunction with CANopen

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

Multiturn type 9080 (shaft / hollow shaft) CANopen/DeviceNet™

Patented Integrated Technology®
uses single board construction, deliberate assembly techniques and two ASIC design:

- Shock up to 250gs
- Higher vibration and thermal shock performance
- Lower parts count, elimination of potentiometers
- Higher resistance to EMI

Electronic multiturn increases performance and eliminates gears:

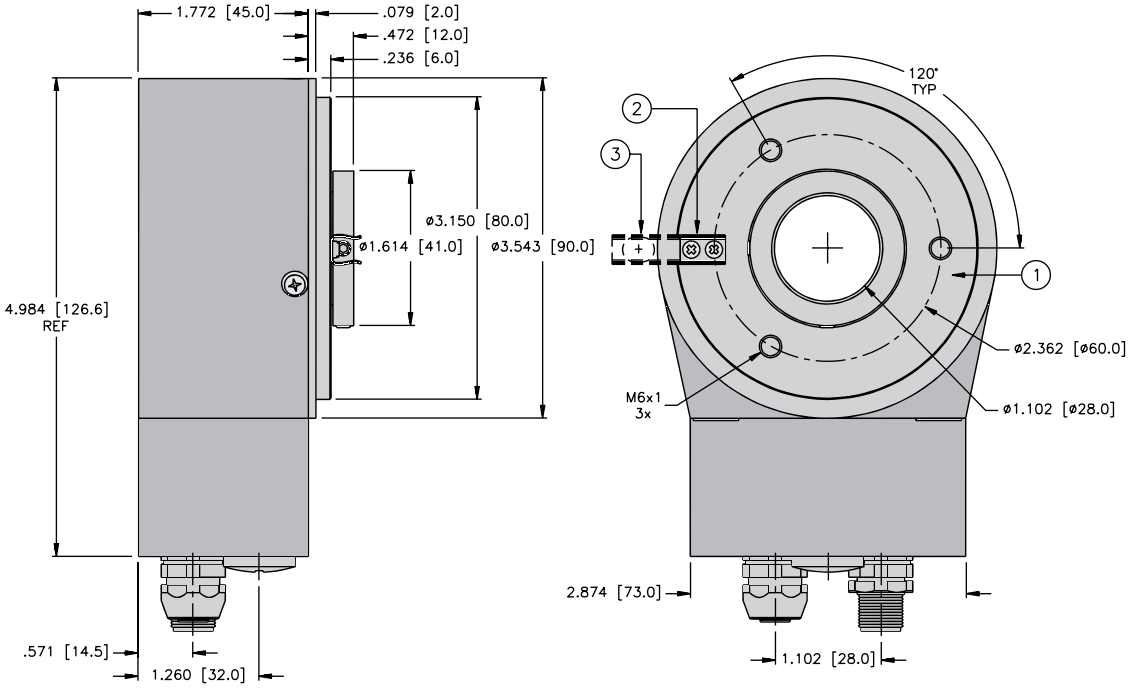
- Reliability - No backlash errors, resistant to EMI, lower parts count
- Higher life - No mechanical wear, lower internal temperature
- Higher performance - Higher operating speeds
- Lower profile - Compact size, hollow shaft
- Economical - Lower cost

Patented Intelligent Sensing Technology®

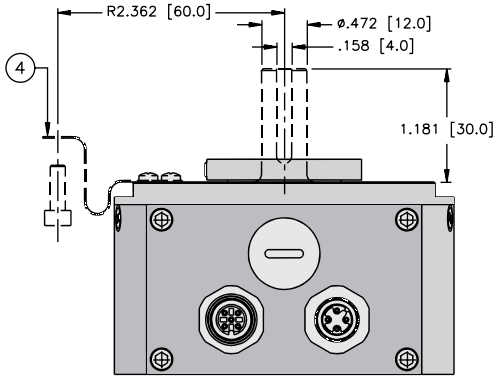
- The battery outlasts both application requirements and system components (LEDs and bearings)
- Redundant multiturn sensors and counters increase reliability and life
- Active system output monitoring using digital filters to compare data to logical and target bits.

Dimensions: 9080 hollow shaft version

M12 *eurofast*® connection 2



1 = face mount
2 = short anti-rotational spring
3 = long anti-rotational spring
4 = tether arm (short)



Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time.

TURCK
Industrial Automation

Multiturn Type 9080 (shaft / hollow shaft) PROFIBUS®-DP

Rugged
- IP65 protection.
- Shock resistant up to 250 g.

PROFIBUS
Specification to PROFIBUS-DP 2.0 standard (DIN 19245 Part 3)

RoHS compliant · cULus · Ex · 2/22

Compact
- Only 60 mm clearance needed.
- The encoder is mounted directly on the drive shaft without coupling. This saves up to 30% cost and 50% clearance compared to shaft versions.

Versatile
- PROFIBUS-DP fieldbus interface.
- Hollow shaft up to Ø 28 or shaft Ø 12 mm.
- Up to 8192 (13 bits) per revolution, 4096 (12 bits) revolutions.
- Non-contact multiturn gear with new Intelligent Sensing Technology®.
- Patent pending connecting system with removable socket box.
- Integrated T-coupler.
- Patented Integrative Technology®.

Mechanical characteristics:

Speed: [1]	max. 6,000 RPM
Rotor moment of inertia:	approx. 3.94 oz-in² (72 x 10⁻⁶ kgm²)
Starting torque:	Hollow shaft version: < 28.3 oz-in (< 0.2 Nm) Shaft version: < 7oz-in (< 0.05 Nm)
Radial load capacity of shaft: [2]	40 lbs (178 N)
Axial load capacity of shaft: [2]	40 lbs (178 N)
Weight:	approx. 1.98 lbs (0.9 kg)
Protection acc. to EN 60529:	IP65
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	+14 to +158°F (-10 to +70°C) [3]
Shaft:	stainless steel, hollow shaft: H7
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] For continuous operation 3,000 RPM
[2] At shaft version only
[3] Non-condensing

Electrical characteristics:

Supply voltage (+V):	10-30 VDC
Current consumption:	max. 0.29 A
Recommended fuse:	T 0.315 A
Linearity:	±1/2 LSB (± 1 LSB at 13, 14, 25 bit resolution)
Code:	Binary
Interface:	RS485
Protocols:	PROFIBUS-DP, encoder profile class 2
Baud rate:	max. 12 Mbit/s
Address:	adjustable with DIP-switches
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
Performance against magnetic influence acc. to EN61000-4, 5	
UL certified:	File 224618 (version with terminal box)
RoHS compliant acc. to EU guideline 2002/95/EG	

PROFIBUS Encoder Profile:
The basic functions of the PROFIBUS-DP are not fully described in this text. For additional information, please refer to DIN 19245-3 and EN 50170.

The following parameters may be programmed:
- Direction of rotation
- Scaling factor
  - number of pulse/rotation
  - total resolution
- Preset value
- Diagnostics mode

The following functionality is integrated:
- Galvanic isolation of the fieldbus stage with DC/DC converter
- Line driver according to RS485; max. 12 MB
- Addressing by means of rotary switches
- Diagnostics LED
- Full Class I and Class II functionality

Multiturn Type 9080 (shaft / hollow shaft) — PROFIBUS®-DP

Pin configuration:
PROFIBUS with terminal box

Output	ENC		BUS IN			BUS OUT			ENC	
	+VDC	GND	GND	B	A	A	B	GND	GND	+VDC
Pin:	1	2	3	4	5	6	7	8	9	10

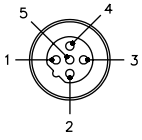
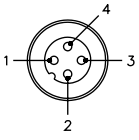
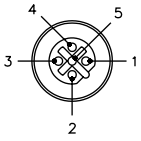
Pin configuration:
PROFIBUS M12

Bus In (3)	Output	-	BUS-A	-	BUS-B	-
	Pin:	1	2	3	4	5

Supply Voltage (2)	Output	+V	-	-	Common (0 V)
	Pin:	1	2	3	4

Bus Out (1)	Output	BUS VDC	BUS-A	BUS GND	BUS-B	Shield
	Pin:	1	2	3	4	5

Wiring Diagrams:

Bus In	Power Supply	Bus Out
Male encoder view	Male encoder view	Female encoder view
		
M12 ***eurofast*®** pinout	M12 ***eurofast*** pinout	M12 ***eurofast*** pinout
Mating cordset: [2] [3] **RKSW-455-*M**	Mating cordset: [2] **RK 4.4T-***	Mating cordset: [2] [3] **RSSW-455-*M**

[1] For powering an external PROFIBUS-DP terminating resistor.
[2] See cable section for additional options.
[3] "S" denotes shield tied to coupling nut.
* Length in meters. Available in 0.1 meter increments ≥ 0.2 meters.

Part number key: 9080 version

T8.9080.XXXX.XXXX

Type

Flange
1 = without mounting aid
2 = with short spring device
3 = with long spring device
4 = with mounting flange

Shaft / hollow shaft
1 = hollow shaft Ø 12 mm
2 = hollow shaft Ø 15 mm
3 = hollow shaft Ø 20 mm
4 = hollow shaft Ø 24 mm
5 = hollow shaft Ø 28 mm
6 = hollow shaft Ø 5/8"
7 = hollow shaft Ø 1"
8 = shaft Ø 12 mm x 30 mm
9 = hollow shaft Ø 16 mm
A = hollow shaft Ø 3/4"
B = hollow shaft Ø 1/2"
C = hollow shaft Ø 25 mm

PROFIBUS-DP
3001 = PROFIBUS Class II

Type of connection
1 = socket box with PG7 screwed connections and integrated T-coupler
2 = 8-pin M12 ***eurofast*®** connector

Interface and supply voltage
3 = 10-30 VDC, PROFIBUS-DP

Accessories:
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

TURCK
Industrial Automation

Multiturn Type 9080 (shaft / hollow shaft) PROFIBUS®-DP

Integrative Technology®

Compact construction, higher resistance to shock and EMI coupled with greater reliability due to:

- Integration of all components on one PCB instead of a sandwich structure
- Innovative assembly techniques
- Use of self-balancing Opto ASICs instead of potentiometers

Intelligent Sensing Technology

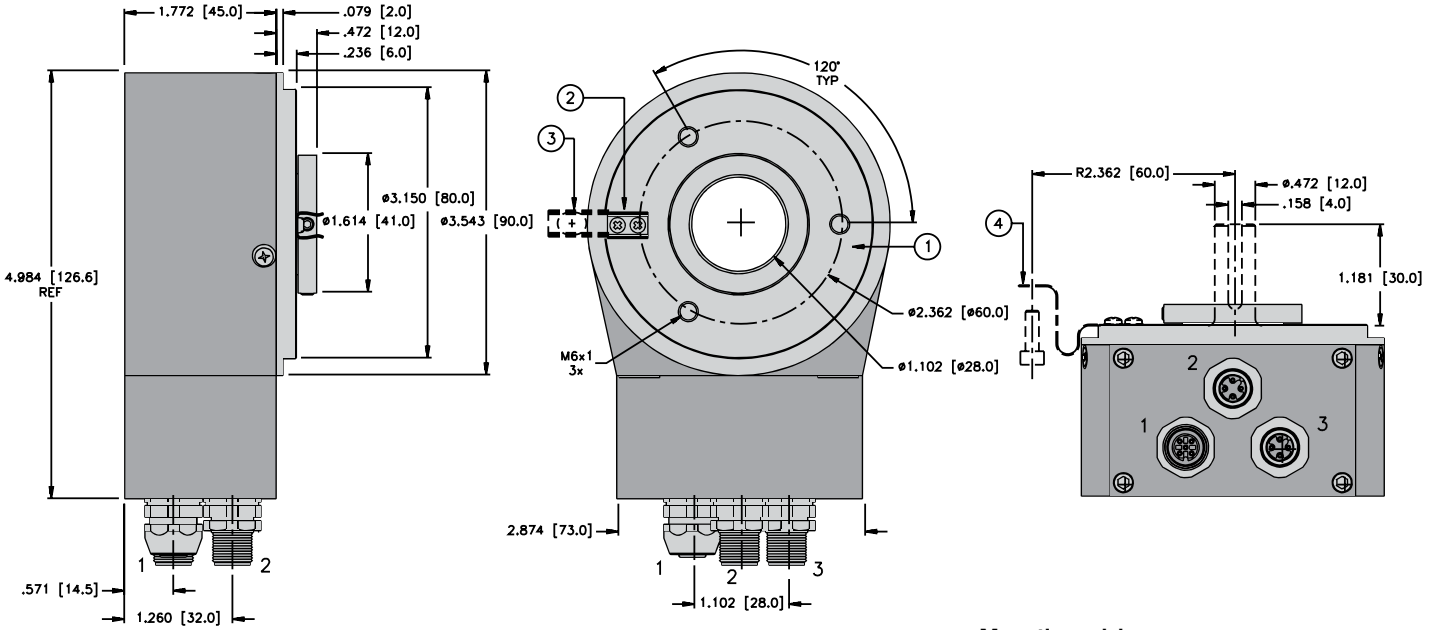
An innovative principle of operation based on a non-contact electronic multiturn stage. This overcomes system disadvantages previously associated with encoders that had mechanical gears or with traditional electronic gear technology.

Advantages

- High operational reliability
- Logic filter and innovative principle of operation compensate for high EMC interference
- Free from wear

Dimensions: 9080 hollow shaft version

M12 *eurofast*® connection 2



1 = face mount
2 = short anti-rotational spring
3 = long anti-rotational spring
4 = tether arm (short)

Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time.

Multiturn Type 9081 (shaft / hollow shaft) SSI or RS485, programmable

Rugged
- Electronic multiturn gear with patented intelligent sensing technology.
- Shock resistant up to 250 g.

2/22

Compact
- Only 50 mm clearance needed
- The encoder is mounted directly on the drive shaft without couplings. This saves up to 30% cost and 50% clearance compared to shaft versions

Versatile
- Maximum of 4 programmable outputs* for the SSI version.
- Up to 8192 (13 bits) per revolution, 4096 (12 bits) revolutions.
- Optional incremental track; 2048 ppr.
- Hollow shaft up to Ø 28 mm, shaft up to Ø 12 mm.
- Programming parameters include*: code type, resolution per revolution, total resolution, direction of rotation (cw or ccw), zero point.

* With optional programming kit (***Ezturn***®) see accessories.

Mechanical characteristics:

Speed: [1]	max. 6,000 RPM
Rotor moment of inertia:	approx. 3.55 oz-in² (65 x 10^{-6} kgm²)
Starting torque:	Hollow shaft version: < 28.3 oz-in (< 0.2 Nm) Shaft version: < 7 oz-in (< 0.05 Nm)
Radial load capacity of shaft (hollow shaft): [2]	40 lbs (178 N)
Axial load capacity of shaft: (shaft): [2]	40 lbs (178 N)
Weight:	approx. 1.54 lbs (0.7 kg)
Protection acc. to EN 60529:	IP65
EX approval for hazardous areas:	optional zone 2 and 22
Working temperature:	-4 to +158°F (-20 to +70°C) [3]
Shaft:	stainless steel H7
Shock resistance acc. to DIN-IEC 68-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] For continuous operation 3,000 RPM
[2] At shaft version only
[3] Non-condensing

The programmable SSI versions are available in 3 variants:

Part number key Interface 2:
- Version with 4 programmable outputs

Part number key Interface 5:
- Version with incremental outputs A, $\overline{A}$, B, $\overline{B}$ (no programmable outputs)

Part number key Interface 9:
- Version with 2 programmable outputs and 2 sensor outputs for 0 V and +V for controlling the supply voltage on the encoder

Multiturn Type 9081 (shaft / hollow shaft) SSI or RS485, programmable

Electrical characteristics:	Servo-Serial (SSI) with outputs
Interface type	
General:	
Supply voltage (+V):	5.0-30 VDC [3]
Current consumption type (no load).: max (no load):	89 mA 138 mA
Short-circuit proof outputs: [1]	yes [2]
Reverse connection protection at +V:	yes
SSI-Interface:	
Output driver:	RS485
Permissible load/channel:	max. +/-20 mA
Update rate for position data:	approx. 1600/s
SSI pulse rate min./max./pulse frequency:	100 kHz/500 kHz
Signal level high:	typ. 3.8 V
Signal level low (I_{Last} = 20 mA):	typ. 1.3 V
Rise time t_r (without cable):	max. 100 ns
Fall time t_f (without cable):	max. 100 ns

Control inputs: (V/R, SET)	Voltage:	5-30 VDC = +V
	Response time:	10 ms
	Signal level: low	max. 25% +V
	Signal level: high	min. 60% +V, max. +V
	Max. current load	≤0.5 mA
Status outputs:	Output driver:	Push-Pull
	max. permissible load:	±9.0 mA
	Signal level high:	min. +V -2.8 V
	Signal level low:	max. 1.5 V
	Rise time:	max. 1 µs
	Fall time:	max. 1 µs
Incremental outputs (A/B):	Output driver:	RS422 compatible
	Pulse frequency (max.):	200 kHz
	Signal level high:	4.5 V
	Signal level low (I_{Last} = 20 mA):	0.5 V
	Rise time (without cable):	max. 200 ns
	Fall time (without cable):	max. 200 ns

Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
Performance against magnetic influence acc. to EN61000-4, 5	
UL certified	File 224618
RoHS compliant acc. to EU guideline 2002/95/EG	

[1] If +V supply voltage correctly applied +V
[2] Only one channel allowed to be shorted-out: If +V = 5 VDC, short-circuit to output, 0 V and + +V is permitted. If +V < 5 VDC, short-circuit to output and 0 V is permitted.
[3] The supply voltage at the encoder input must not be less than 4.75 V (5 V - 5%)

Control inputs:

F/R input for change of direction:
The encoder can output increasing code values when the shaft is rotated either clockwise or counter-clockwise (when looking from the shaft side).

There are two methods for selecting the appropriate option:

1. Via a hardware configuration of the F/R input BEFORE powering up the encoder.
2. By programming the device using the TURCK ***Ezturn*** ® programming tool.

The following table shows the function selection dependent on hardware and software settings.

Hardware configuration of the F/R input:	Programmed selection using the ***Ezturn*** programming tool:	Function: increasing code value when the shaft is in the following direction:
"low" (0 V) on the F/R input (=cw)	cw	cw
"high" (+V) on the F/R input (= ccw)	cw	ccw
"low" (0 V) on the F/R input (=cw)	ccw	ccw
"high" (+V) on the F/R input (= ccw)	ccw	ccw

Notes:
- Any hardware configuration of the F/R input must take place BEFORE powering up the encoder.
- If the F/R input is not configured, then a 0V configuration will apply (default condition).
- If the direction of rotation is changed due to the F/R configuration without activating the SET function and the encoder is powered up again, a new position value may be outputted – even if the physical shaft position of the encoder has not moved. This is due to internal conversion processes.

The start-up procedure for the encoder should follow this sequence:
1. Determine the count direction of the encoder either via the F/R input or via programming.
2. Apply power to the encoder.
3. Activate the SET function, if desired (see SET input below).

- If using a cable wire to configure the F/R input, then for EMC reasons the wire should not remain open, but should be tied either to 0V or +V.
- The response time of the F/R input with +V = 5-30 VDC; power supply is 10 ms.

SET input:

This input is used for a one-time alignment (zeroing) of the encoder immediately after installation. A high control pulse (+V) applied to this input for a minimum of 10 ms will reset the current encoder position to the preprogrammed setpoint value. The programming of the setpoint can be carried out with TURCK's ***Ezturn*** programming software or done in advance at the factory, upon request. The default value is zero, however, any value within the encoder's measuring range may be defined.

Notes:
- The SET function should only be implemented when the encoder shaft is at rest.

- For the duration of the SET pulse, the SSI interface does not function and therefore does not output any valid position values. In order to avoid malfunctions, no SSI clock pulse should occur during the SET pulse.

- If using a cable wire to configure the SET input, then for EMC reasons the wire should not remain open, but should be tied to 0 V, provided no SET pulse is triggered.
- The response time of the SET input with +V = 5-30 VDC power supply is 10 ms.

Multiturn Type 9081 (shaft / hollow shaft) SSI or RS485, programmable

Encoder outputs [1]

Output	Default-function:
A1:	battery control [2]
A2:	not activated [2]
A3:	not activated [2] [3]
A4:	not activated [2] [3]

The outputs are not activated in the factory setting (default). They may be activated and defined with the optional ***Ezturn***® programming software.

[1] Not available for versions with incremental track.
[2] Programmable with the optional ***Ezturn*** programming software.
[3] With the part number key Interface 9 assigned to the sense outputs.

Functionality of the *Ezturn* software:

- Setting communication parameters
- RS232 encoder/PC interface
- Setting a drive factor by means of the modification of the resolution per revolution, the number of revolutions and the total resolution
- Programming the direction of rotation and code type
- Setting a preset/electronic zero point
- Setting diagnostic functions
- Setting the outputs A1-A4
  - Limit switch values, max. 2
  - Alarm and status information
  - Battery monitoring
- Limiting the maximum number of bits to interface with PLCs
- Diagnostics and information for the set-up operation
- Data transmission from the PC to the encoder and inversely, also during operation
- Print-out of the current data and set parameters
- Convenient position output with the current set data
- Terminal operation for direct instructions via the keyboard
- Diagnostics of the encoder connected

Pin configuration:
SSi interface with incremental track (A,B): M23 (12-pin)

Output	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	VR	$\overline{B}$	B	$\overline{A}$	A	Case ground
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	Coupling nut

Pin configuration:
SSi interface with M23 (12-pin) or cable

Output	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	VR	A1	A2	A3	A4	Case ground
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	Coupling nut

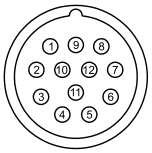
Pin configuration:
RS 485 with M23 (12-pin)

Output	Common (0 V)	+V	+R/T	-R/T	NC	NC	ST*	VR	NC	NC	NC	NC	Case ground
Pin:	1	2	3	4	5	6	7	8	9	10	11	12	Coupling nut

* Data channels +5 VDC

Wiring diagrams:

Male Encoder View



M23 ***multifast***® pinout

Mating cordset:
E-CKM 12-1687-*/A

* Length in meters.

TURCK
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Multiturn Type 9081 (shaft / hollow shaft) SSI or RS485, programmable

Part number key: 9081 version

T8.9081.XXXX.XXXX

Type

Flange

1 = without mounting aid
2 = with short spring device
3 = with long spring device
4 = with mounting flange
5 = with tether arm large

Shaft/hollow shaft

1 = hollow shaft Ø 12 mm
2 = hollow shaft Ø 15 mm
3 = hollow shaft Ø 20 mm
4 = hollow shaft Ø 24 mm
5 = hollow shaft Ø 28 mm
6 = hollow shaft Ø 5/8”
7 = hollow shaft Ø 1”
8 = shaft Ø 12 mm x 30 mm

SSI-Interface*

2001 = 4096 x 4096 (24-Bit), binary
2002 = 8192 x 4096 (25-Bit), binary
2003 = 4096 x 4096 (24-Bit), gray
2004 = 8192 x 4096 (25-Bit), gray

RS485-Interface, half-duplex mode

3001 = ESC-protocol max. 38400 baud

Type of connection

2 = 12-pin M23 ***multifast***® plug without mating connector

Interface and supply voltage

2 = 5-30 VDC, SSI with 4 status outputs
3 = 5-30 VDC, RS485, half-duplex, internal termination
5 = 5-30 VDC, SSI with incremental track 2048 ppr (A, B)
7 = 5-30 VDC, RS485 half-duplex, external termination
9 = 4.75-30 VDC, SSI with 2 status outputs and 2 sensor outputs for monitoring the supply voltage on the encoder

* This factory set (default) resolution can be re-programmed by using the ***Ezturn***® software.

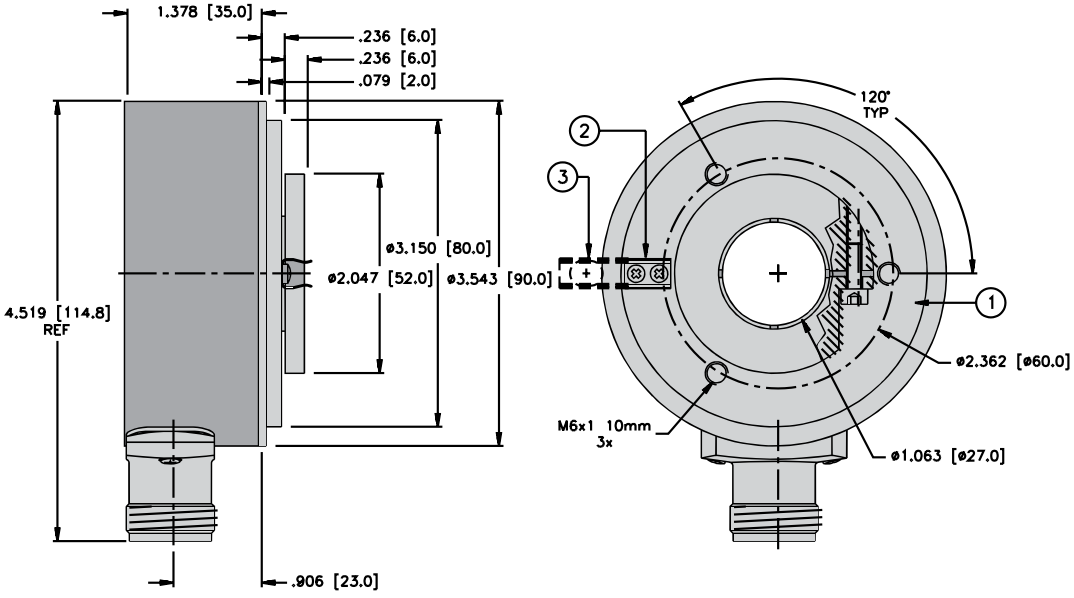
Accessories:

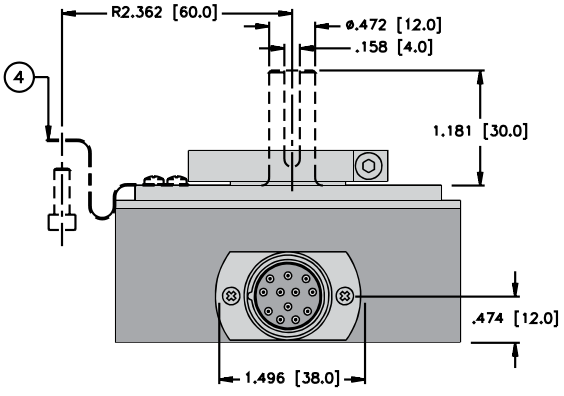
- See page J1, Connectivity, for cables and connectors
- See page E1, Accessories, for mounting attachments and couplings

Multiturn Type 9081 (shaft / hollow shaft) SSI or RS485, programmable

Dimensions: 9081 hollow shaft version

M23 *multifast*® connection 2





1 = face mount
2 = short anti-rotational spring
3 = long anti-rotational spring
4 = tether arm (short)

Also available with the following tethers:
8.0010.4E00.0000
8.0010.4L00.0000
8.0010.4T00.0000

See page E1, Accessories.

Mounting advice:
1) The flanges and shafts of the enoder and drive should not both be rigidly coupled together at the same time! We recommend the use of suitable couplings (see Accessories section).
2) Delivery includes a corresponding cylindric pin (see drawing), when the encoder is ordered with flange type 2 (short spring device) or type 3 (long spring device).

TURCK
Industrial Automation

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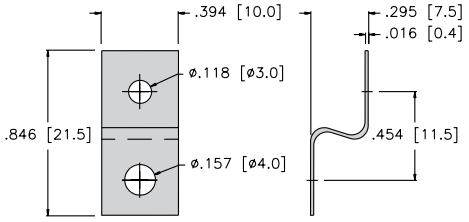
Flex brackets

Part Number:
8.0010.4F00.0000

Description:
Flex bracket for Hollow Shaft
582X, 587X or 3720

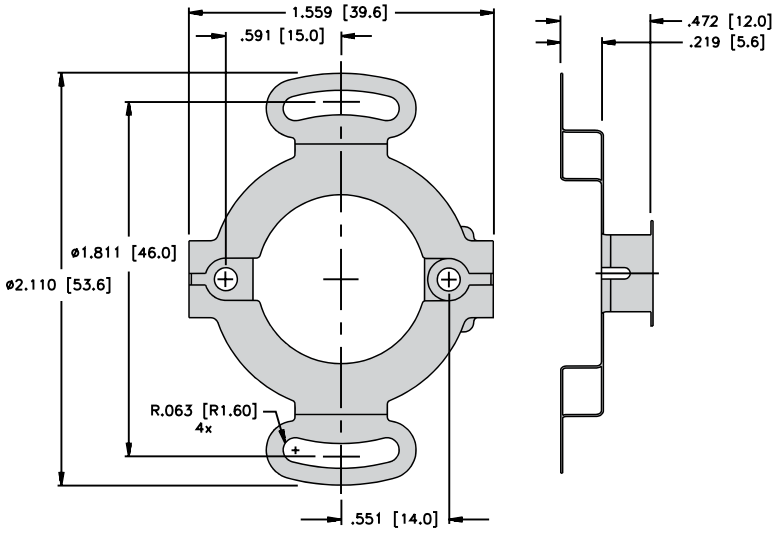
Screws included: (2) M2.5x6 mm



Part Number:
8.0010.4C00.0000

Description:
Slotted flex mount for hollow shaft series 3720/3620

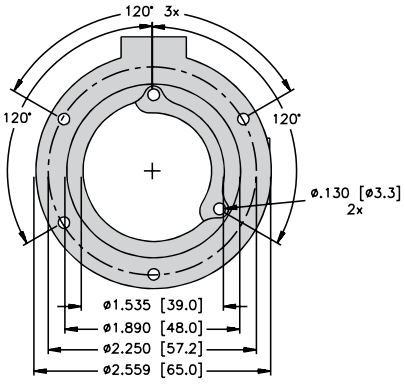
Screws included: (2) M2.5x6 mm

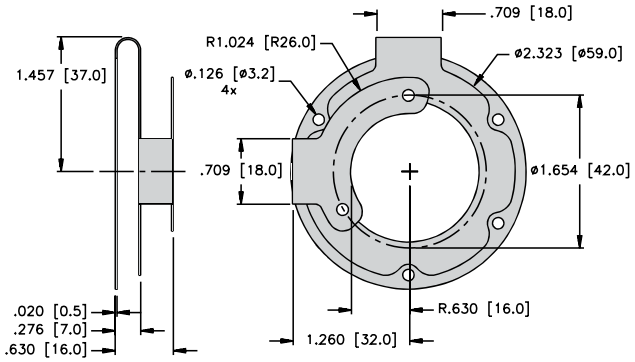


Part Number:
8.0010.40G0.0000

Description:
Flex mount for hollow
shaft series 5020

Included:
(3) M3x6 mm screws,
(3) lock washers



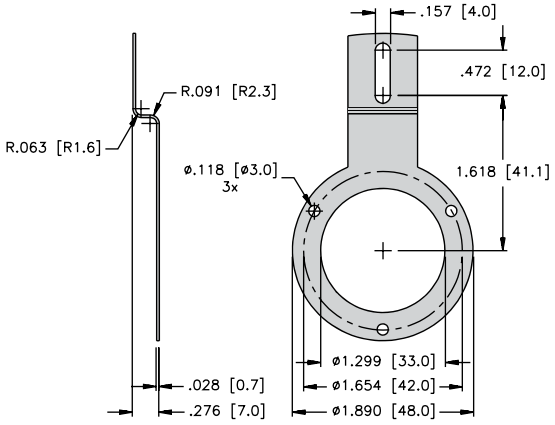


Flex brackets

Part Number:
8.0010.4800.0000

Description:
Single point tether arm for hollow shaft series 5020, 582X and 5870

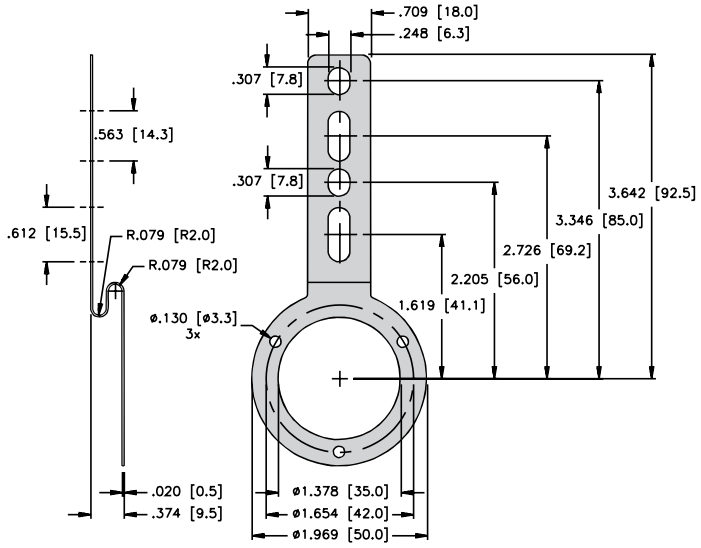
Screws included: (3) M3x6 mm



Part Number:
8.0010.4R00.0000

Description:
Single point tether arm for hollow shaft series 5020, 582X, 5870

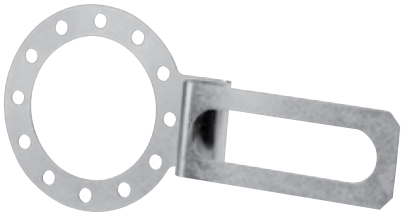
Screws included: (3) M3x6 mm

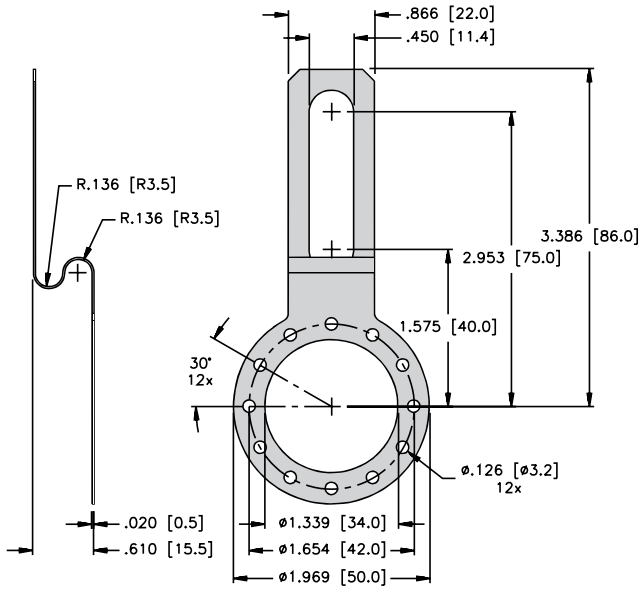


Part Number:
8.0010.40H0.0000

Description:
Standard single point tether arm for hollow shaft
series 5020, 582X, 5870

Included: (1) phenolic step washer (10 mm inside diameter),
(4) M3x6 screws,
(4) lock washers



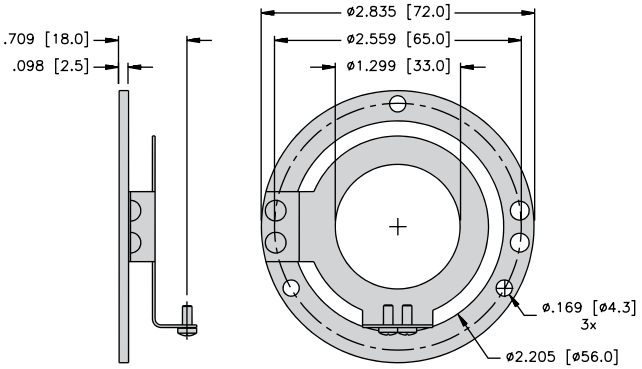


Flex brackets

Part Number:
8.0010.1602.0000

Description:
Flex mount for hollow shaft series 582X or 587X

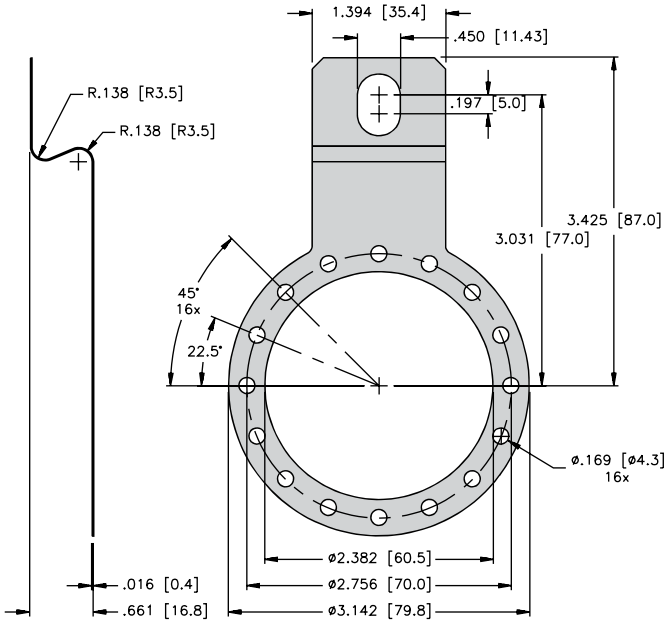
Screws included: (2) M2.5x6 mm



Part Number:
8.0010.4T00.0000

Description:
4.5" C-face tether for A02H

Included: (3) M4x5 mm screws,
(1) 3/8-16 x 1/0" bolt,
(3) 3/8-16 nuts, (1) Nylon step washer, (1) Nylon mating washer



Flex brackets

Part Number:
8.0010.4E00.0000

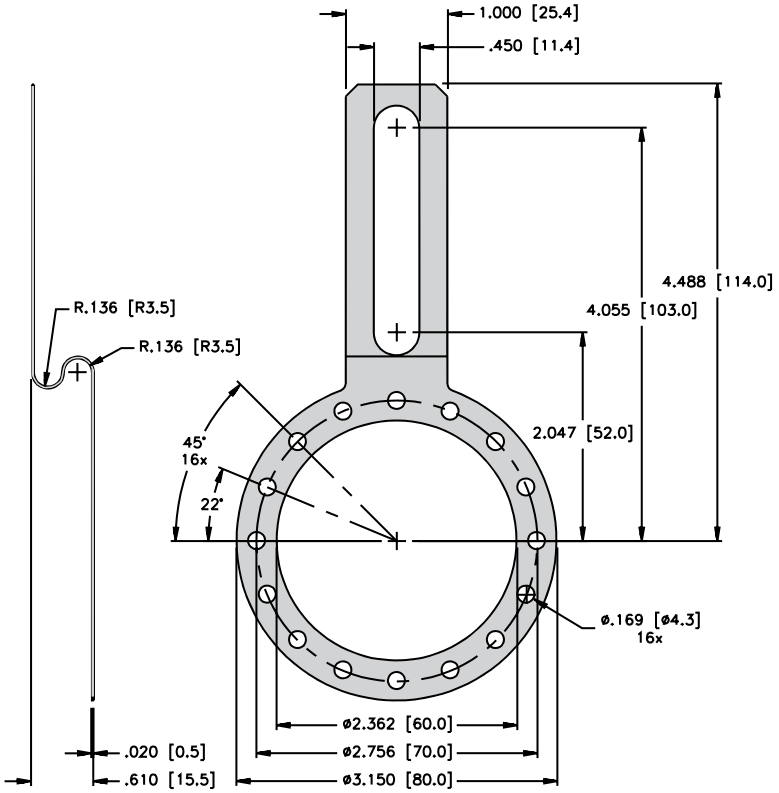
Description:
Tether arm (long) for A02H

Included: (3) M4x5 mm screws

Part Number:
8.0010.4L00.0000

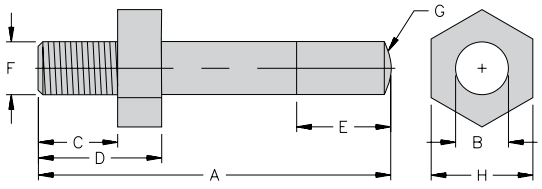
Description:
Tether arm (long) for A02H

Included: (3) M4x5 mm screws,
(1) 1/4-20 x 1/0" bolt,
(3) 1/4-20 nuts, (1) Nylon step washer,
(1) Nylon mating washer



Torque pins (standard and metric)

Part Number	Description	A	B	C	D	E	F	G (Radius)	H
N.615.683	2420 3 mm, smooth	0.472 (12.0 mm)	0.118 (3.0 mm)	----	----	----	----	0.276 (7.0 mm)	N/A
N.615.692	3720 4 mm, smooth	0.630 (16.0 mm)	0.157 (4.0 mm)	----	----	----	----	0.276 (7.0 mm)	N/A
8.0010.4700.0000	5820 4 mm, M4 thread	1.181 (30.0 mm)	0.157 (4.0 mm)	0.197 (5.0 mm)	0.315 (8.0 mm)	----	M4x0.7	0.276 (7.0 mm)	0.276 (7.0 mm)
8.0010.4700.0005	5820 4 mm, 8-32 thread	1.181 (30.0 mm)	0.157 (4.0 mm)	0.250 (6.35 mm)	0.374(9.5 mm)	----	8-32	0.276 (7.0 mm)	1/4" (6.35 mm)
8.0010.4700.0003	A020 6 mm, M6 thread	1.575 (40.0 mm)	0.236 (6.0 mm)	0.354 (9.0 mm)	0.551 (14.0 mm)	0.394 (10.0 mm)	M6x1	0.276 (7.0 mm)	0.394 (10.0 mm)
8.0010.4700.0006	A020 6 mm, 10-32 thread	1.811 (46.0 mm)	0.236 (6.0 mm)	0.250 (6.35 mm)	0.433 (11.0 mm)	0.630 (16.0 mm)	10-32	0.276 (7.0 mm)	3/8" (9.52 mm)

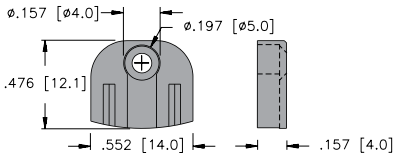


Torque stop

Part Number:
8.0010.4H00.0000 (short)

Description:
Torque stop for 3720 and 58XX encoders

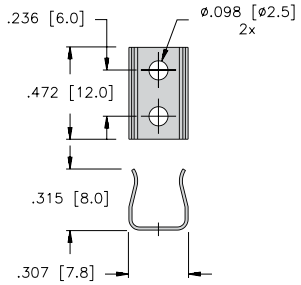
Included:
(1) M2.5x5 mm screw



Part Number:
8.0010.4J00.0000 (short)

Description:
Torque stop (short) for A02H and 9080 large bore series

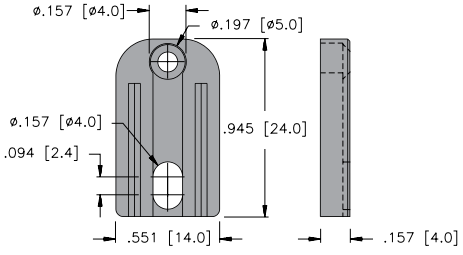
Included:
(2) M2.5x5 mm screws



Part Number:
8.0010.4I00.0000 (long)

Description:
Torque stop for 3720 and 58XX encoders

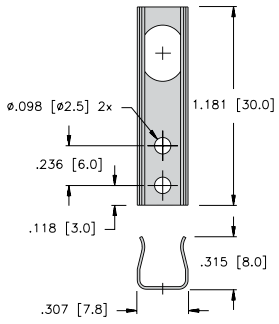
Included:
(1) M2.5x5 mm screw



Part Number:
8.0010.4K00.0000 (long)

Description:
Torque stop (long) for A02H and 9080 large bore series

Included:
(2) M2.5x5 mm screws



TURCK Industrial Automation

Couplings

TURCK precision flexible couplings are engineered for optimum performance with TURCK encoders. Designed to connect two misaligned shafts, our beam style couplings offer superior performance, reliability, long life and are easy to install.

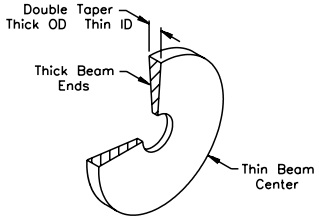
Performance: Designed with six overlapping double tapered beams to offer even load distribution, constant velocity and torsional rigidity.

Reliability: Our couplings have exceeded the U.S. military MIL-HDBK-SA specification for flexing beams. Accelerated life tests with excessive loads at 10,000 RPM and 50 million revolutions indicate no sign of fatigue.

Installation: Clean and degrease all shafts, check parallel alignment. Do not exceed misalignment and axial motion specifications. Clamp one end of the coupling to the drive shaft. Insert encoder into the other end. Tap lightly on the coupling hub to stabilize system. Tighten the second screw.

Note: Light should be visible through the beams.

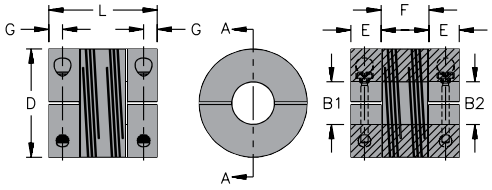
Two sets of three overlapping curved beams



Cross section of one beam

Coupling tabulation - in (mm)

Part Number	D	L	E	F	G	Parallel	Angular misalignment	Axial motion
TFC075-XXX-XXX	0.745 (19.0)	0.750 (19.0)	0.220 (5.6)	0.310 (7.8)	0.095 (2.4)	0.008 (0.20)	5°	±0.005 (0.13)
TFC100-XXX-XXX	0.995 (25.4)	1.000 (25.4)	0.280 (7.1)	0.440 (11.2)	0.125 (3.2)	0.010 (0.25)	5°	±0.010 (0.25)
TFC125-XXX-XXX	1.240 (31.5)	1.250	0.310 (7.87)	0.630 (16.0)	0.140 (3.55)	0.010 (0.25)	5°	±0.012 (0.30)



B1 = encoder shaft
B2 = drive shaft with G10 insert

Part Number	Coupling Diameter	Encoder Shaft	Drive Shaft
TFC075-250-M04	0.750 in	0.25 in	4 mm
TFC075-250-M05	0.750 in	0.25 in	5 mm
TFC075-250-M06	0.750 in	0.25 in	6 mm
TFC075-250-M08	0.750 in	0.25 in	8 mm
TFC075-250-125	0.750 in	0.25 in	0.125 in
TFC075-250-187	0.750 in	0.25 in	0.187 in
TFC075-250-250	0.750 in	0.25 in	0.25 in
TFC075-06M-M04	0.750 in	6 mm	4 mm
TFC075-06M-M05	0.750 in	6 mm	5 mm
TFC075-06M-M06	0.750 in	6 mm	6 mm
TFC075-06M-M08	0.750 in	6 mm	8 mm
TFC075-06M-125	0.750 in	6 mm	0.125 in
TFC075-06M-187	0.750 in	6 mm	0.187 in
TFC075-06M-250	0.750 in	6 mm	0.250 in
TFC100-375-125	1.000 in	0.375 in	0.125 in in
TFC100-375-187	1.000 in	0.375 in	0.187 in
TFC100-375-250	1.000 in	0.375 in	0.25 in
TFC100-375-375	1.000 in	0.375 in	0.375 in

Part Number	Coupling Diameter	Encoder Shaft	Drive Shaft
TFC100-375-M04	1.000 in	0.375 in	4 mm
TFC100-375-M05	1.000 in	0.375 in	5 mm
TFC100-375-M06	1.000 in	0.375 in	6 mm
TFC100-375-M08	1.000 in	0.375 in	8 mm
TFC100-375-M10	1.000 in	0.375 in	10 mm
TFC125-12M-125	1.250 in	12 mm	0.125 in
TFC125-12M-187	1.250 in	12 mm	0.187 in
TFC125-12M-250	1.250 in	12 mm	0.250 in
TFC125-12M-375	1.250 in	12 mm	0.375 in
TFC125-12M-500	1.250 in	12 mm	0.5 in
TFC125-12M-M06	1.250 in	12 mm	6 mm
TFC125-12M-M08	1.250 in	12 mm	8 mm
TFC125-12M-M10	1.250 in	12 mm	10 mm
TFC125-12M-M12	1.250 in	12 mm	12 mm
TFC125-375-M12	1.250 in	0.375 in	12 mm
TFC125-375-500	1.250 in	0.375 in	0.5 in

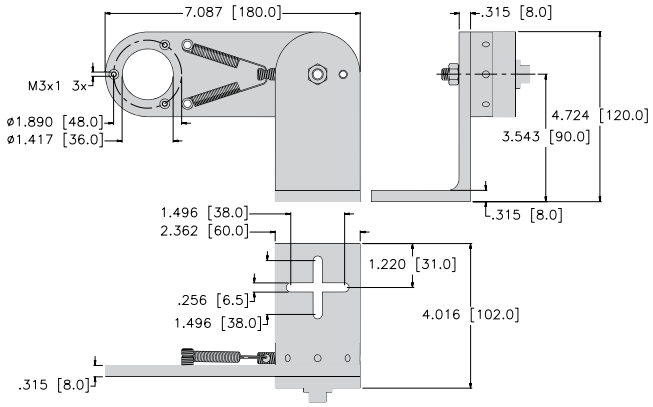
Other options available on request.

Incremental encoder bracket (T8.58XX)

Part Number:
8.0010.7000.0010

Description:
Spring loaded right angle bracket for measuring wheels and rack and pinion systems

Used with clamping flange 58 mm
face mount screws included



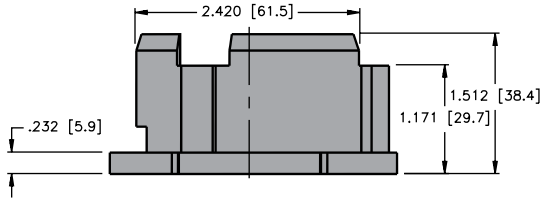
Incremental encoder assembly bell (T8.58XX)

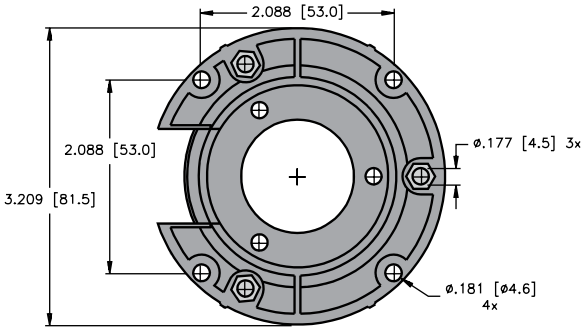
Part Number:
8.0000.4500.XXXX

Description:
Assembly bell

Kit includes:
- Coupling **8.0000.1401**
- Mounting screws

Purchase separately:
- Flex coupling **TCF075-XX-XX**
- Optional assembly with servo cleat **8.0010.4100.0000**
- Used with servo flange Ø 58 mm





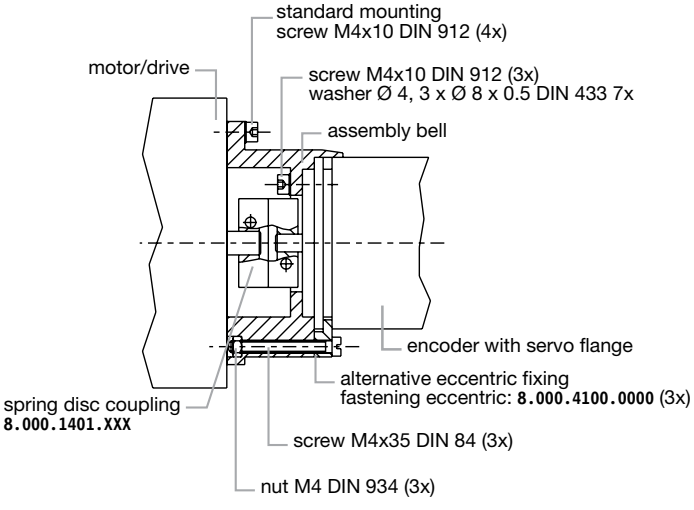
Part number key:

8.0000.4500.XXXX

Bore diameter of coupling
d_1 in mm

Bore diameter of coupling
d_2 in mm

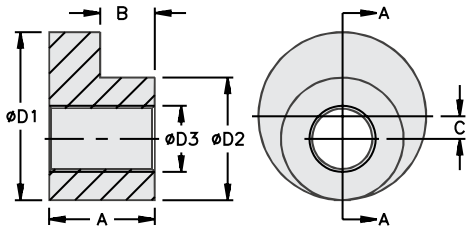
Mounting example:



Servo cleats

Part Number	For Encoder Type	D1	D2	D3	A	B	C
8.0010.4200.0000	T8.3600.1XXX.XXXX	0.267 [6.8]	0.197 [5.0]	0.110 [2.8]	0.138 [3.5]	0.089 [2.25]	0.35 [0.9]
8.0010.4100.0000	T8.58XX.2XXX.XXXX	0.350 [8.9]	0.256 [6.5]	0.126 [3.2]	0.220 [5.6]	0.114 [2.9]	0.047 [1.2]

- For use with rotary encoders with servo flange
- Kit includes 3 cleats and 3 screws
- Chrome plated steel
- Galvanized nickel finish

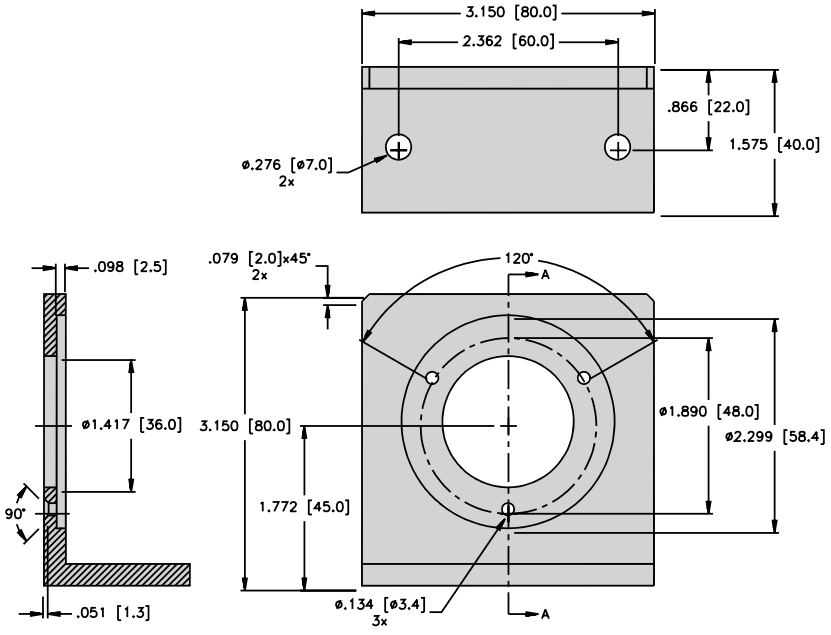


Brackets

Part Number:
8.0010.2300.0000

Description:
Right angle bracket

Used with clamping flange Ø 58 mm face mount
Screws Included



Rack and pinion

Part Number:
8.0010.7000.0001

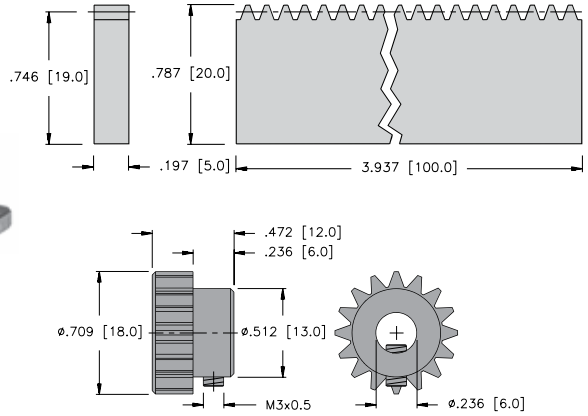
Description:
Rack

Part Number:
8.0010.7000.0002

Description:
Pinion

Part Number:
8.0010.7000.0003

Description:
Support



Wheels

Part Number:
8.0000.3751.0006

Description:
6 mm bore, diamond knurl aluminum wheel, 12” circumference

Part Number:
8.0000.3751.0010

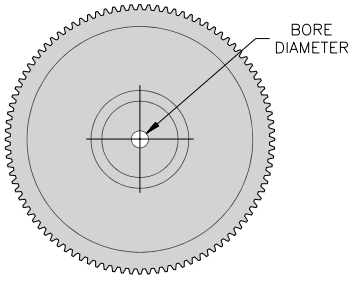
Description:
10 mm bore, diamond knurl aluminum wheel, 12” circumference

Part Number:
8.0000.3751.0006.35

Description:
1/4” bore, diamond knurl aluminum wheel, 12” circumference

Part Number:
8.0000.3751.0009.52

Description:
3/8” bore, diamond knurl aluminum wheel, 12” circumference



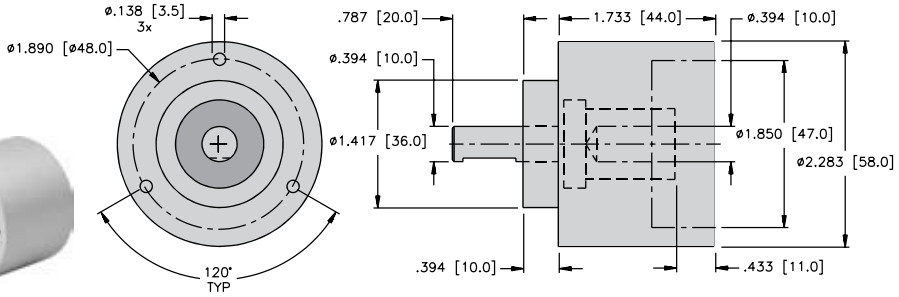
Bearing unit

Part Number:
8.0010.8200.0006

Description:
Bearing unit for 58XX shaft encoders with clamping flange and Ø 10x20 mm shaft

Speed: max 3,000 RPM
Load: Radial: 90 lbs (400 N),
Axial: 45 lbs (200 N)
Weight: 0.9 lbs (0.4 kg)

Included:
- Bearing unit with lock cover and sealing
- Coupling for Ø .394 (10.0) shaft
- Flange adapter 8.0010.2100.0000
- (3) M3x8 countersink screws
- (4) slotted head screws

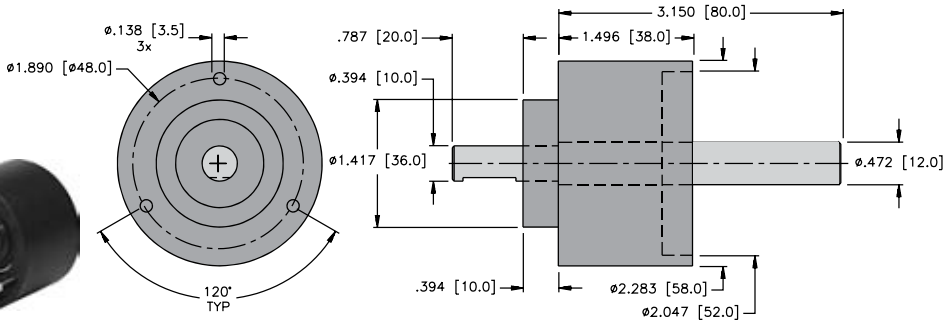


Part Number:
8.0010.8400.0007

Description:
Bearing box for 58XX hollow shaft encoders with Ø12 mm hollow shaft

Speed: max 6,000 RPM
Load: Radial: 67.5 lbs (300 N),
Axial: 33.7 lbs (150 N)
Weight: 0.9 lbs (0.4 kg)

Included:
- Bearing unit with lock cover and sealing
- Coupling for Ø .394 (10.0) shaft
- Flange adapter 8.0010.2100.0000
- (3) M3x8 countersink screws
- (4) slotted head screws

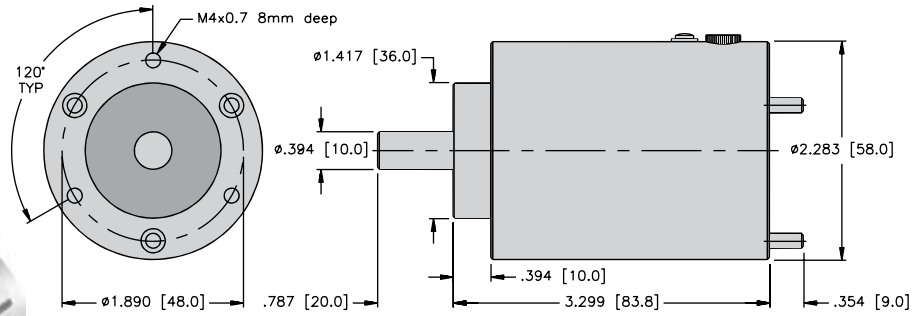


Part Number:
8.0010.8200.000B

Description:
Robust bearing unit for 58XX solid shaft encoders with clamping flange and shaft 6 mm

Speed: max 6,000 RPM
Load: Radial: 135 lbs (600 N),
Axial: 45 lbs (200 N)
Weight: 1.23 lbs (0.56 kg)
Protection: IP67 (when closure caps are used)

Included:
- Bearing box
- (3) M4x25 cylindrical pins
- (1) O-ring



Unit shown with optional encoder attached.
Consult factory for additional information.

Programming kits

Part Number:
T8.0010.9000.0007

Description:
EZturn programming kit with M12 (Rev 3.05)

Included:
E-RSS 8T
All hardware and software necessary to program T8.5862, T8.5882 and T8.9081 programmable absolute encoders with a PC.

Part Number:
T8.0010.9000.0006

Description:
EZturn programming kit with M23 (Rev 3.05)

Included:
All hardware and software necessary to program T8.5862, T8.5882 and T8.9081 programmable absolute encoders with a PC.

Display type 570 — SSI

Reliable
- AC and DC supply voltage in one unit.
- Plug-in screw terminals.
- SSI clock frequency from 100 Hz up to 1 MHz.
- Display and outputs may be adjusted using scale and offset features.
- Large, 6-digit, 15 mm high LED display with adjustable brightness.
- 48 x 96 mm DIN housing, IP65.

RoHS compliant

Versatile
- Suitable for SSI protocols up to 25 bits.
- Version with 2 optocoupler outputs to work as limit or preset values; also programmable with trail signal.
- Version with scalable analog output, resolution 14 bits, 0-10 V, 10 to +10 V, 0 to 20 mA or 4 to 20 mA.
- Gray or binary code.
- Master or slave mode.
- Versions with serial interface for read the data (RS232/RS485).

Technical data:

Supply voltage:	17-30 VDC, 115/230 VAC ± 12.5%
Display:	15 mm high LED display, 6 digits
Current consumption (DC):	17 V, 109 mA; 24 V, 150 mA; 30 V, 120 mA
Power consumption (AC):	7.5 VA
Sensor power supply:	24 VDC ± 15%, 120 mA
Inputs:	
SSI input frequency range:	100 Hz - 1 MHz
Input reset:	PNP or NPN, programmable 5.1 mA 24 VDC / R_i = 4.7 kOhm
Input level:	Low: 0-2 V, High: 9-35 V
Reset time:	min. 5 ms

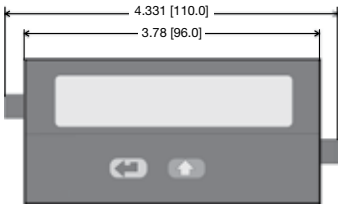
Outputs:	
Scalable analog output:	0-10 V, -10 - +10 V or 0-20 mA, 4-20 mA
Resolution:	14 bits + sign
Accuracy:	0.1%
Optocoupler output:	5-35 VDC
Interface:	RS232 and RS485 acc. to ISO 1745 Drivecom Protocol (0.570.012.E05)
Operating temperature:	32 to +113°F (0 to +45°C)
Storage temperature:	-13 to +158°F (-25 to +70°C)
Protection class:	IP65 (front)
EMC:	according to EC EMC directive 89/36/EC
Interface emissions:	EN 50 081-2/EN 55011 class B
Interface resistance:	EN 6100-6-2
Weight:	approx. 200 g

Part Numbers:

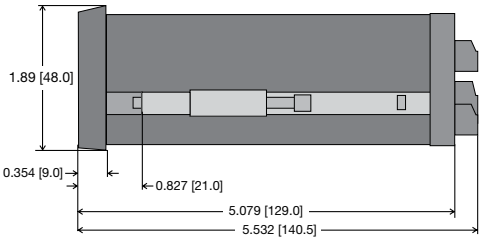
Display with 2 outputs:	**0.570.011.E00**
Display with analog outputs:	**0.570.012.E90**
Display with serial interface:	**0.570.012.E05**

Scope of delivery:
- Display 571
- Gasket
- Mounting kit
- Plug-in screw terminals
- Manual German/English

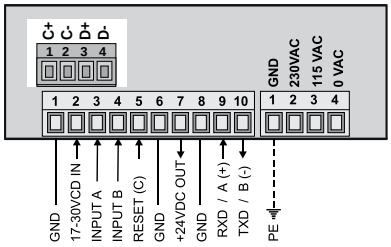
Dimensions:



Panel cut-out: 92 x 45mm

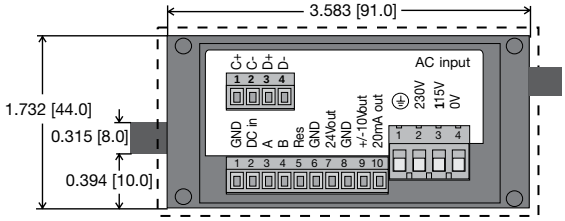


Display with serial interface (0.570.012.E05)

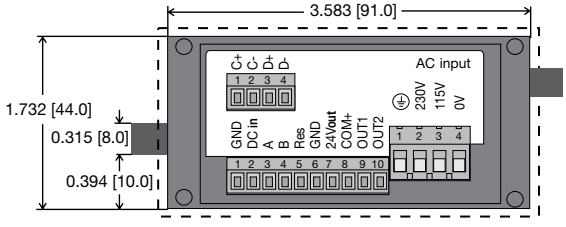


Wiring diagram:

Display with analog output (0.570.012.E90)



Display with 2 optocoupler outputs (0.570.011.E00)



Do not connect A, B; C+, C– = clock signal SSI; D+, D– = data signal SSI

Display type 571 — Incremental

Reliable
- AC and DC supply voltage in one unit.
- 48 x 96 mm DIN housing, IP65.
- Large, 6-digit, 15 mm high LED-display with adjustable brightness.
- Fast counting input, works with our linear measuring system (100KHz).

RoHS compliant

Versatile
- Version with 2 optocoupler outputs for alarms.
- Version with serial interface RS232/485 for importing and exporting data.
- Measuring function may be programmed for RPM, speed (from elapsed time), machine cycle time, throughput and baking time (time interval), as well as numerous count and stop-watch functions.
- Scaleable display, programmed via 2 keys.

Technical data:

Supply voltage:	16-35 VDC (Normal voltage: 24 VDC) 115/230 VAC ± 12.5%
Display:	15 mm high LED display, 6 digits
Current consumption (DC):	18 V, 120 mA; 24 V, 95 mA; 30 V, 80 mA
Power consumption (AC):	7.5 VA
Sensor power supply:	24 VDC ± 15%, 120 mA (AC and DC supply)
Inputs:	3 inputs (PNP, NPN and Namur) A, B = pulses, C = reset
Max. input frequency:	A, B = 25 kHz, C = 1 kHz
Accuracy:	±1 ppm, ±1 digital
Input level HTL:	Low: 0-3.5 V, High: 9-35 V

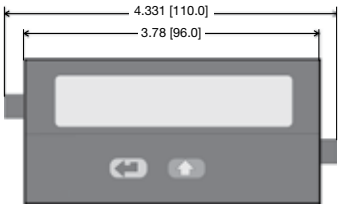
Outputs:	
Analog output: (0.571.012.E90)	0-10 V, -10 - +10 V or 0-20 mA, 4-20 mA
Resolution:	14 bits + sign
Accuracy:	0.1%
Optocoupler output:	5-35 VDC / 150 mA (0.571.012.E00)
Interface:	RS232 and RS485 acc. to ISO 1745 Drivecom Protocol (0.570.012.E05)
Operating temperature:	32 to +113°F (0 to +45°C)
Storage temperature:	-13 to +158°F (-25 to +70°C)
Protection class:	IP65 (front)
EMC:	according to EC EMC directive 89/36/EC
Interface emissions:	EN 50 081-2/EN 55011 class B
Interface resistance:	EN 6100-6-2
Weight:	approx. 200 g

Part Numbers:

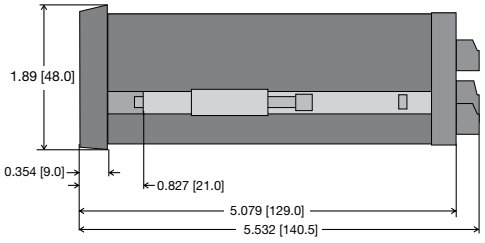
Display with 2 outputs:	**0.571.011.E00**
Display with analog outputs:	**0.571.012.E90**
Display with serial interface:	**0.571.012.E05**

Scope of delivery:
- Display 571
- Gasket
- Mounting kit
- Plug-in screw terminals
- Manual German/English

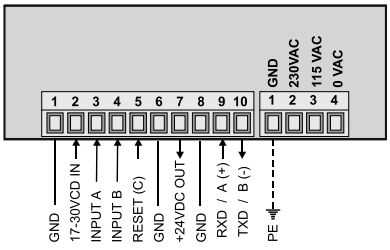
Dimensions:



Panel cut-out: 92 x 45mm

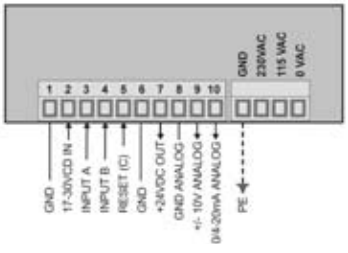


Display with serial interface (0.571.012.E05)

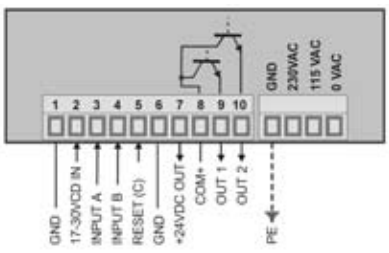


Wiring diagram:

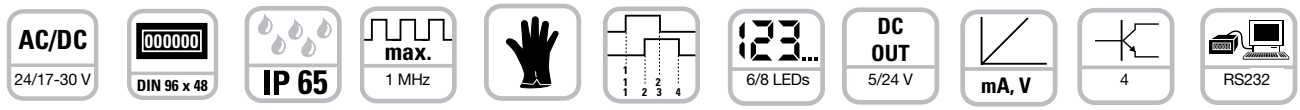
Display with analog output (0.571.012.E90)



Display with 2 optocoupler outputs (0.571.011.E00)



Display type 572, position and difference — Incremental



Supply voltage AC/DC | DIN front panel | High IP value | 2 Inputs | Operation with gloves | TTL, HTL and RS422-Input | 6/8 LEDs | 2 x Sensor supply | Output | Transistor-output | Interface

Reliable

- Two, separate, freely scalable count inputs – HTL or TTL; also with inverted inputs. Maximum input frequency 1 MHz/ channel.
- Very bright LED display: 15 mm high (6 digit) and 10 mm high (8 digit).
- Four, freely programmable solid-state outputs, each with 350 mA output current.
- Step or tracking preset.
- Simple programming with function codes, depending on the operating mode selected.
- Eight permanent count functions, such as simple count, difference count and total count of both inputs, batch counters, etc.

RoHS compliant

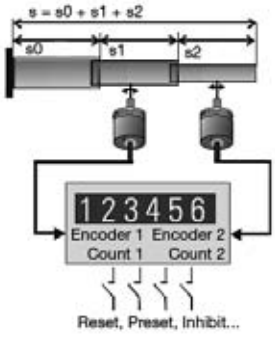
Fast

- Up to 3 display values in a single device: Display Counter 1 and Display Counter 2, as well as the display calculated from Counter 1 and 2.
- AC and DC supply voltages in one device.
- Four programmable inputs with various functions, such as reset, gate, display memory, reference input or switching between the display values.

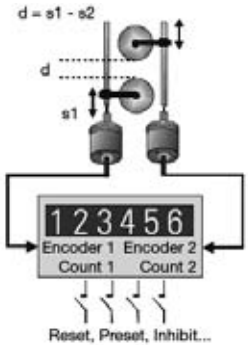
Versatile

- Can be used as a counter or position display with limit values.
- Monitoring function: where two values are monitored or calculated with respect to each other.
- Scalable analog output 0/4-20 mA, +/-10 V or 0-10 V
- Two auxiliary power supplies for sensors: 5.2 VDC and 24 VDC.
- Standard RS232 interface for parameter setting, reading the values to a PC or PLC or modifications during operation.

Application examples:



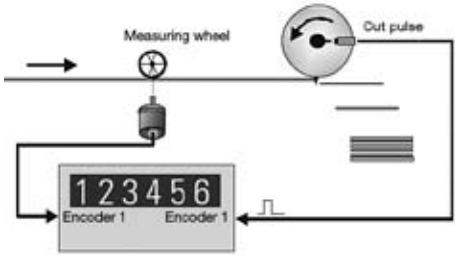
Total-Position display



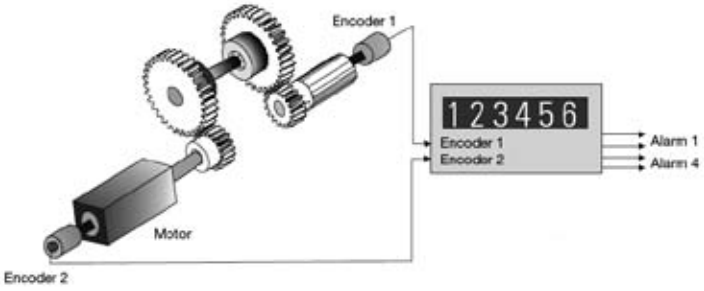
Difference-Position display

Counter series for demanding applications: two, individually scalable encoder inputs, in each case A $\overline{A}$, B $\overline{B}$,s for count frequencies up to 1 MHz per channel. Operating modes may be selected for position or event counter, total counter, difference counter, cut-to-length display, diameter calculator and more.

Counter mounting fixture for DIN cut-out 92x45xmm
Part number: G 300005



Measurement of the effective cut amount



Monitoring of torsion, shafts or gear breakage

Display type 572, position and difference — Incremental

Technical data:

Supply voltage:	24 VAC, ±10%; 24 (17-30) VDC
Current consumption (DC):	100 mA+ current consumption encoder
Connected load (AC):	15 VA
Auxiliary power supply output for sensors:	2 x 5.2 VDC, each 150 mA 2 x 24 VDC, each 120 mA
Inputs:	2 universal incremental encoder inputs
Count frequency:	RS422 and TTL with inv. 1 MHz HTL asymmetric 200 kHz TTL asymmetric 200 kHz (per encoder)
Control inputs:	4 control inputs HTL, Ri = 3.3 kOhm Low < 2.5 V; High > 10 V, min pulse duration 50 µs

Switch outputs:	4 fast power transistors 5-30 VDC 350 mA, reaction time < 1 ms*, inductive loads require a freewheeling diode
Serial interface:	RS232, 2400-38400 baud
Accuracy:	0/4-20 mA, load max. 270 Ohm 0 - ±10 V (max. 2 mA) Resolution 14 bit, precision 0.1% reaction time < 1 ms
Ambient temperature:	32 to +113°F (0 to +45°C)
Storage temperature:	-13 to +158°F (-25 to +70°C)
Housing:	Noryl UL94-V-0
Protection class:	IP65 (front side)
Conformity and norms:	EMV 89/336/EWG: EN 61 000-6-2, EN 61 000-6-3 NS73/23/EWG EN 61010-1
Weight:	approx. 200 g

* Intensive seal communication can temporarily prolong the reaction time.

Part number specifications:

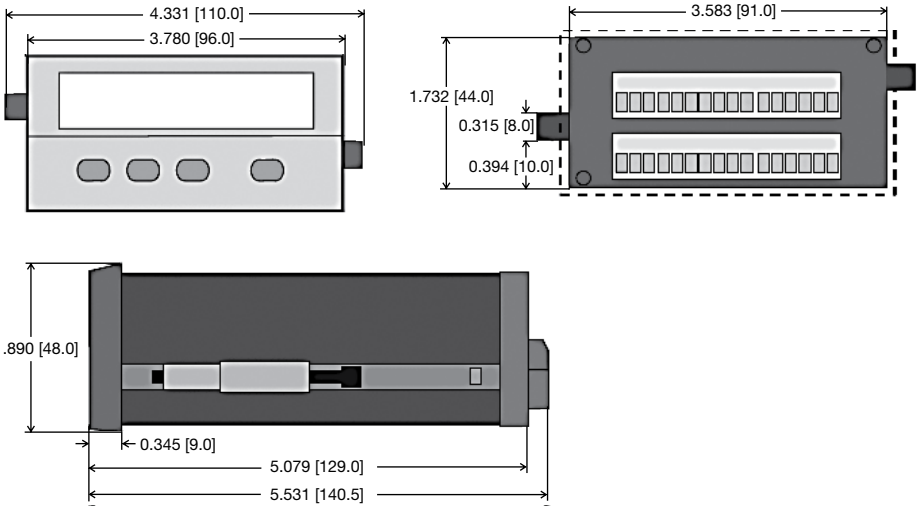
Position display, 6 digits, with 4 fast switch outputs and serial interface:
6.572.0116.D05

Position display, 6 digits, with 4 fast switch outputs and serial interface and scalable analog outputs:
6.572.0116.D95

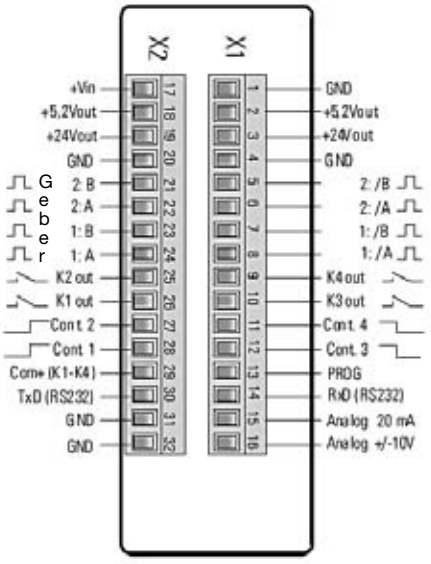
Position display, 8 digits, with 4 fast switch outputs and serial interface:
6.572.0118.D05

Position display, 8 digits, with 4 fast switch outputs and serial interface and scalable analog output:
6.572.0118.D95

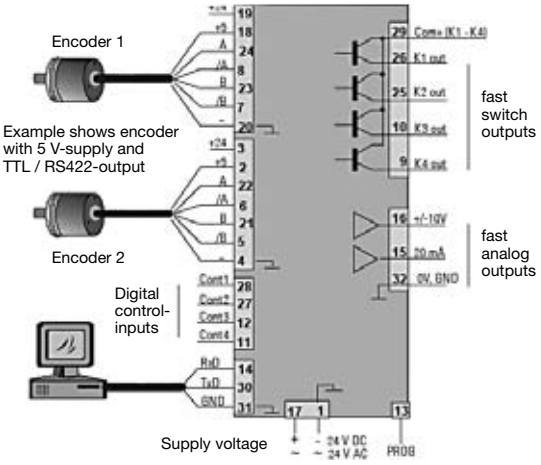
Dimensions:



Electrical connections:



Connection examples:



Delivery contents:

- Controller 572
- Gasket, fastening set
- Instruction manual German/English

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Industrial Automation

Fiber optic module — SSI

Optical fiber transmission system for SSI absolute encoders

The system consists of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals from a normal absolute encoder with Synchronous Serial Interface (SSI) into a light signal for transmission by means of an optical fiber. The receiving module converts the optical signal back into electrical signals. Absolute signals may be transmitted safely through one glass fiber over distances of up to 1500 m. The resolution may be defined by means of a DIP-switch on the front side of the module: 13 bit for a singleturn encoder or 25 bit for a multiturn encoder.

Reliable transmission

- Safe signal transmission up to 1500 m.
- Resists extremely strong electromagnetic fields.

Easy installation

- Signal transmission via a single glass fiber.
- Resolution of 13 bit or 25 bit may be set via DIP-switch.
- LED for monitoring power supply, clock and date.
- DIN-rail mounting requires minimum installation space – only 22 mm wide.

Application areas

- Process control and automation technology.
- Interference-sensitive applications.
- High voltage plant.
- Plant with long transmission distances.
- Potential separation.

Technical data:

Supply voltage:	10-30 V or 5 V ± 5%
Power consumption per module:	+V 10-30 VDC max 1.6 W +V 5 VDC max 0.8 W
Operating voltage reverse connection protection:	available
Encoder inputs - optical fiber transmitter:	-T, +T and -D, +D
SSI clock rate:	500 kHz fixed setting
Optical wavelength:	820 nm
Optical transmission rate:	120 Mbit/s
Optical fiber connection:	ST connector,13 mm, Ø 9 mm, on the bottom side of the housing

Glass fiber:	Multimode fiber, 50/125 µm, 62.5/125 µm
Max. optical fiber transmission distance:	1,500 m
Dimensions:	22.5 x 110.8 x 88.4 mm (B x L x H)
Protection:	IP 40, terminals IP 20
Terminals:	Protected against contact, max. conductor diameter: 2.5 mm²
Temperature range:	+14 to 140°F (-10 to +60°C)
Weight:	approx. 100 g
Standards:	EN 55 011 Class B1, EN 61 000-6-2: 2006

Part number:

Optical fiber transmitter:

+V = 10-30 VDC **LWLS.A1**
+V = 5 VDC **LWLS.A4**

Optical fiber receiver:

+V = 10-30 VDC **LWLE.A1**
+V = 5 VDC **LWLE.A4**

Dimensions: in [mm]

Height: 4.36 [110.8]
Width: 0.92 [22.5]
Depth: 2.95 [75]

Accessories:

Simplex Patch cable ST-ST – Multimode

Connector: 2 x ST/PC, Faser: 1 x 50/125
Standard lengths: 2 m, 5 m, 8 m, 10 m, 15 m, 20 m, ... (in 5 m steps)

Order code:
05.B09-B09-821-LXXX
Length in meters

ST Multimode coupling

Barrel: ceramic, slotted
Order code: **05.LWLK.001**

Connecting diagram of the optical fiber transmitter and receiver:

Optical fiber transmitter:

Pin	Signal
1	0 V (GND)
2	+V
3	+T
4	-T
5	+D
6	-D
7	0 V (GND)
8	+V

Optical fiber receiver:

Pin	Signal	Description
1	0 V (GND)	from power supply
2	+V	
3	+T	to controller
4	-T	
5	+D	from controller
6	-D	
7	0 V (GND)	optocoupler output alarm output
8	+V	

Fiber optic module — Incremental

Optical fiber transmission system for Incremental encoders

The system consists of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals of an incremental encoder into a light signal for transmission by means of an optical fiber.

The receiving module converts the optical signal back into electrical signals. Up to 4 channels may be transmitted safely.

Compact
- Only 22 mm wide.
- DIN rail mounting, small size.

Innovative
- Signal transmission via a simple glass fiber.
- Safe signal transmission up to 1000 m.
- Input frequency up to 400 kHz.
- Input level 10 to 30 V or RS 422.
- Inverted input signals.
- Resists extremely strong electromagnetic fields.

Versatile
- Process control and automation technology.
- Interference-sensitive applications.
- High voltage plants.
- Plants with long transmission distances.
- Potential separation.
- Explosive areas.

Technical data:

Supply voltage:	10-30 V or 5 V ± 5%
Power consumption per module:	< 2 W
Operating voltage reverse connection protection:	available
Encoder inputs - optical fiber transmitter:	Channels A, $\overline{A}$, B, $\overline{B}$, 0, $\overline{0}$
Max. input frequency - optical fiber transmitter:	400 kHz
Max. output frequency - optical fiber receiver:	400 kHz
Input level - optical fiber transmitter:	10-30 V or RS 422
Optical wavelength:	820 nm
Optical transmission rate:	120 Mbit/s
Optical fiber connection:	ST connector,13 mm, Ø 9 mm, on the bottom side of the housing
Input signals sampling rate:	10 MSample/s
Max. optical fiber transmission distance:	1,000 m
Dimensions:	22.5 x 110.8 x 88.4 mm (B x L x H)
Protection:	IP 40, terminals IP 20
Terminals:	Protected against contact, max. conductor diameter: 2.5 mm²
Temperature range:	+14 to 140°F (-10 to +60°C)
Standards:	EN 55 011 Class B1, EN 61 000-6-2: 2006

LED function:

Green LED ON when the supply voltage and the optical fiber cable are connected correctly.

The LED in the receiver module (LWLE) blinks when the optical fiber cable is not connected correctly or is broken.

Dimensions: in [mm]

Height: 4.36 [110.8]
Width: 0.92 [22.5]
Depth: 2.95 [75]

Accessories:

Simplex Patch cable ST-ST – Multimode
Connector: 2 x ST/PC, Faser: 1 x 50/125
Standard lengths: 2 m, 5 m, 8 m, 10 m, 15 m, 20 m, ... (in 5 m steps)
Order code:
05.B09-B09-821-LXXX
Length in meters

Part number:

Optical fiber transmitter:
+V = 10-30 VDC, input RS 422: **6.LWLS.1**
+V = 10-30 VDC, input HTL, without inversions: **6.LWLS.2**
+V = 5 VDC, input RS 422: **6.LWLS.4**
+V = 10-30 VDC, input HTL: **6.LWLS.5**

Optical fiber receiver:
+V = 10-30 VDC, output RS 422: **6.LWLE.1**
+V = 5 VDC, output RS 422: **6.LWLE.4**
+V = 10-30 VDC, output HTL: **6.LWLE.1**

Connecting diagram of the optical fiber transmitter and receiver:

Pin	Description
1	Channel $\overline{A}$
2	Channel $\overline{B}$
3	Channel $\overline{0}$ ($\overline{C}$)
4	Channel A
5	Channel B
6	Channel 0 (C)
7	Channel $\overline{D}$
8	+V
10	Channel D
9, 11, 12	0 V, GND, linked internally

ST Multimode coupling

Barrel: ceramic, slotted
Order code: **05.LWLK.001**

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Rotary Transmission Technology

Compact slip ring	Type SR060	F2
Configurable slip ring	Type SR085	F3

Compact slip ring, type SR060

Description
The SR060 is a compact, economical slip ring for up to three load and two signal transmissions from a stationary to a rotating platform. The transmission between the stator and rotor takes place via sliding contacts and is extremely reliable.

Advantages and benefits
- Various component configurations for the transmission paths.
- Fully encapsulated in high-grade glass reinforced plastic housing shells.
- Can be used as a pair starting from just 60 mm shaft distance of the sealing rollers.
- Economical due to advantages in mounting and component design.

Application areas for slip rings
Packaging and textile machines, robots and handling equipment, cranes, pipeline inspection systems, video surveillance (CCTV) equipment, amusement rides, bottling plants and rotary tables.

Technical Data (standard version):

Dimensions:	see drawing
Overall length:	dependent on the number of transmission paths
Bore diameter:	up to max. Ø 25 mm
Current loading:	max. 16 A (at 240 VAC)
Voltage/current loading:	240 VAC (dependent on current loading)
Contact resistance load channel:	≤ 1 Ohm
Contact resistance signal/data channel:	≤ 0.1 Ohm
Insulation resistance at 500 VDC:	10^3 M Ohm
Dielectric strength:	1,000 V eff. (60 sec.)
Speed:	max. 500 RPM
Operating temperature:	+32 to +167°F (0 to +75°C)
Protection rating:	IP50
Service life:	> 500 million revolutions
Maintenance cycles:	approx. 50 million revolutions

Part number key: SR060

T-SR060-XX-X-X-V01

Type
SR = slip ring

Size
060 = Ø 60 mm

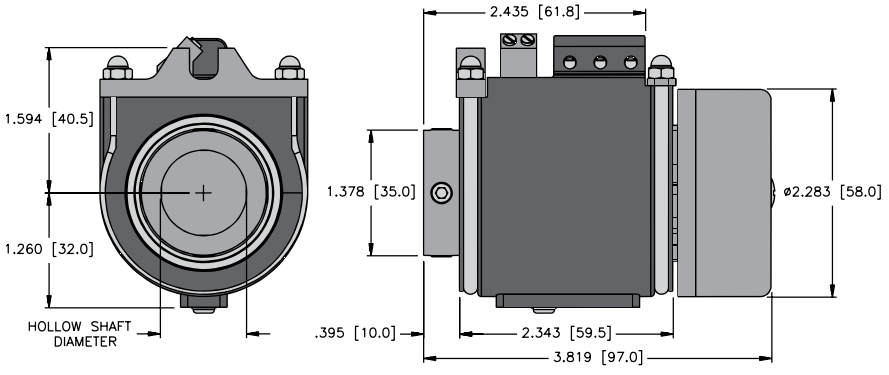
Hollow shaft diameter*
18 = Ø 18 mm
20 = Ø 20 mm
24 = Ø 24 mm
25 = Ø 25 mm
* other diameters on request

Version number V01 (standard)

Number of load transmission paths (max. 3)

Number of signal transmission paths (max. 2)

Dimensions: SR060



Fully encapsulated housing

Easily accessible connections

www.turck.us • 1-800-544-7769 • Fax: (763) 553-0708 • TURCK Inc. Minneapolis, MN 55441

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Industrial Automation

Configurable slip ring, type SR085

Description
Slip rings are used to transmit power, signals or data from a stationary to a rotating platform. The transmission between the stator and rotor takes place via sliding contacts and is extremely reliable. The construction is modular and offers the greatest flexibility in a variety of applications.

Application areas for slip rings
Packaging and textile machines, robots and handling equipment, cranes, pipeline inspection systems, video surveillance (CCTV) equipment, amusement rides, bottling plants and rotary tables.

Flexible
Modular construction system, load and signal/data channels may be combined as desired.

Rugged
- GFPC housing (glass-reinforced polycarbonate), 30% glass-fiber content for industrial usage.
- Long service life and long maintenance cycles.
- Individually replaceable brush rings.
- Customized versions easily available.

Reliable with Safety-Trans™-Design
- Two-cavity system for load and signal transmission.
- Labyrinth seal.
- High vibration resistance.
- Fieldbus signals such as PROFIBUS®, CANopen, etc. up to 12 MBit/s.

Technical Data (standard version):

Dimensions:	see drawing
Overall length:	dependent on the number of transmission paths
Bore diameter:	up to max. Ø 30 mm
Voltage/current loading:	max. 40 A (at 240 VAC/DC)
Contact resistance load channel:	≤ 1 Ohm
Contact resistance signal/data channel:	≤ 0.1 Ohm
Insulation resistance at 500 VDC:	10^3 M Ohm

Dielectric strength:	1,000 V eff. (60 sec.)
Speed:	max. 800 RPM
Operating temperature:	-22 to +176°F (-30 to +80°C)
Protection rating:	max. IP64
Service life:	> 500 million revolutions
Maintenance cycles:	approx. 50 million revolutions
Number of rings:	approx. 20 (> 20 on request)

Standards: EN61010-1 2001, VDE 0110 Part 1, VDE 0295/6.92, VDE 0100 Part 523

Modular construction system:

Stator ring with copper graphite pick-off spring for load currents, for a long service life

Insulator with slip ring for load currents

Stator ring with gold or copper alloy (90% gold content) pick-off spring for signal currents

Insulator with slip ring for signal currents, separate signal channels with contact guide

Technology in detail:

Easily accessible connections (standard)

Practical maintenance window (standard)

IP 64 version with rotor and stator protective cover (optional)

Hollow shaft mounting with pneumatic rotatable connector (optional)

Version with media lead-through (air, hydraulics) (optional)

Note: For custom options please consult factory.

Configurable slip ring, type SR085

Part number key: SR085

T-SR085-XX-XX-XX-XXXXX-VXXX

Type

Flange mounting

00 = Media lead-through

Hollow shaft mounting

20 = Ø 20 mm
24 = Ø 24 mm
25 = Ø 25 mm
30 = Ø 30 mm
IN = Ø 1 Inch
other options available on request

Number of signal/data channels [1]

(only in pairs e.g. 2, 4, 6)

Number of power (load) channels [1]

Max. load current

1 = 16 A, 240 VAC/DC
2 = 40 A, 240 VAC/DC
3 = 10 A, 400 VAC/DC
4 = 20 A, 400 VAC/DC

Options on request:

- > 20 channels
- other fixing options
- other types of connection e.g. plug connectors

Version number (options):

V 100 = Standard without options

Protection rating

1 = IP50
2 = IP64

Media lead-through

0 = none
1 = air, connection 1/4”
2 = air, connection 1/2”
3 = air, connection 3/8”
4 = hydraulics, connection 1/2”
5 = hydraulics, connection 3/8”

Hollow shaft mounting

6 = air, rotatable connector (up to 300 RPM) [2]

Contact material for data channels

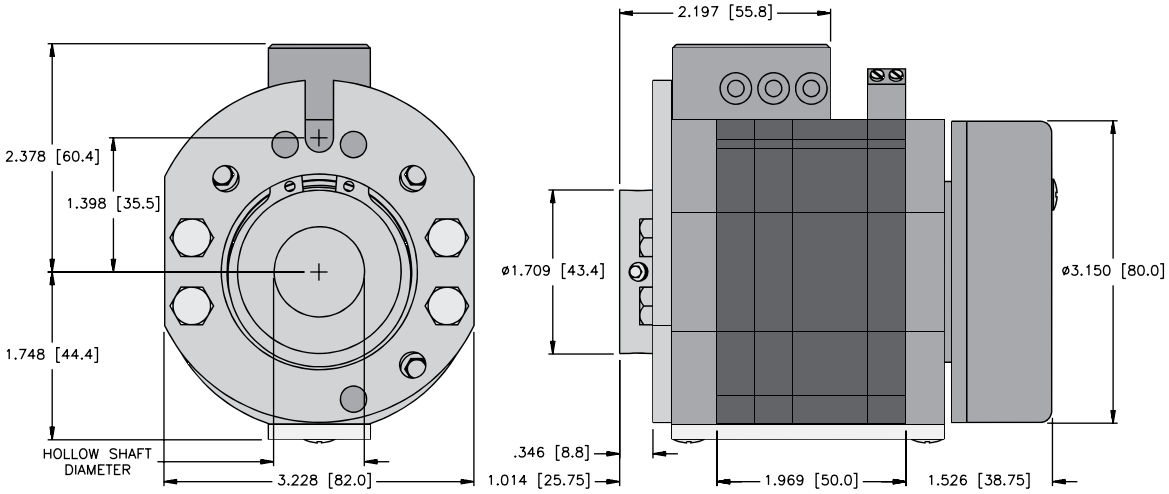
1 = gold
2 = copper alloy

Mounting position

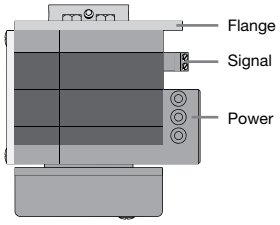
1 = standing and horizontal (flange down) [3]
2 = hanging and horizontal (flange up) [3]

[1] 20 combination max., for example 4 data channels and 16 power channels
[2] Not valid with flange mounting “00” media lead through
[3] Signal channels are always located above power channels

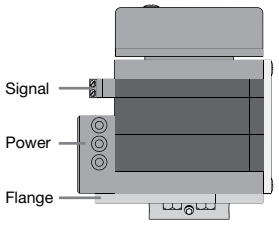
Dimensions: SR085



Mounting position: Flange up



Mounting position: Flange down



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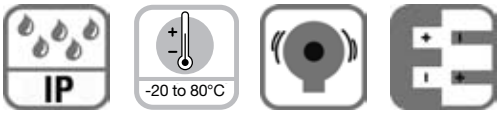
Linear Magnetic Measurement System LI20/B1



High IP | Temperature | Shock/vibration resistant | Reverse polarity protection

Robust

- **Fully potted diecast metal housing.**
- **Increased ability to withstand vibrations and rough installation**: Eliminates machine downtime and repairs. Non-contact technology results in high shock and vibration resistance.
- **Stays sealed even when subjected to harsh everyday use.** Die cast metal housing with up to IP67protection.

Compact

- **Installation depth only 10 mm, width of magnetic band 10 mm.**
- **Installation height only 28 mm.** May be used even where space is very tight.

Versatile

- **Fast start-up of the measuring system:** Easy attachment of the magnetic band and the sensor head.
- **Easy mounting with large tolerances possible**: Distance of sensor head to magnetic band from 0.1 to 1.0 mm; tolerates lateral misalignment + 1 mm; LED warning indicator when magnetic field is too weak.

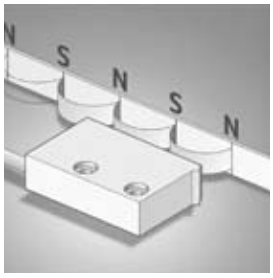
Technical data magnetic sensor LI20:

Output circuit:	Push-Pull	RS422
Supply voltage:	4.8 to 30 VDC	4.8 to 26 VDC
Load/channel, max cable length:	±20 mA, max. 30 m	120 Ohm, RS422 standard
Current consumption (without load):	typ. 25 mA, max. 60 mA	
Short circuit proof outputs: [1]	yes	yes [2]
Min. Pulse interval:	1 µs (edge interval) corresponds to 4 µs/cycle (see signal figures below)	
Output signal:	A, $\overline{A}$, B, $\overline{B}$, I, $\overline{I}$	
Reference signal:	Index periodical	
System Accuracy:	typ. 0.2 mm, max. ± (0.04 + 0.04 x L) mm, (L in [m], up to L = 50 m, at T = 20°C)	
Repeat accuracy:	±1 increment	
Resolution and speed: [3]	0.1 mm (quadruple), max. 25 m/s 0.025 mm(quadruple), max. 4 m/s 0.01 mm (quadruple), max. 6.5 m/s	
Permissible alignment tolerance:	see draft "Mounting tolerances"	
Gap sensor / magnetic band:	0.1-1.0 mm (0.4 mm recommended)	
Offset:	max. ±1 mm	
Tilting:	max. 3°	
Torsion:	max. 3°	
Working temperature:	-4 to +176°F (-20 to +80°C)	
Shock resistance:	500 g / 1 ms	
Vibration strength:	30 g / 10-2,000 Hz	
Protection class:	IP67 according to DIN 60 529 (housing)	
Humidity:	100%, condensation possible	
Housing:	Zinc die-cast	
Cable:	2 m, PUR 8 x 0.14 mm², shielded, may be used in trailing cable installations	
Status-LED:	Green: Pulse-index; Red: Error Speed too high or magnetic fields too weak (for sensors **T8.LI20.XXXX.X020** and **T8.LI20.XXXX.X050**)	

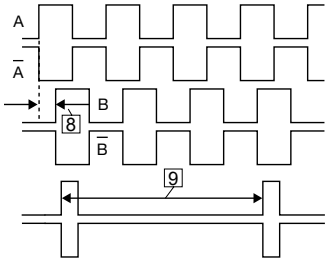
CE-compliant according to EN 61 000-6-1, EN 61 000-6-4, EN 61 000-6-3, EN 61 000-4-8 (magnetic field)

RoHS compliant acc. to EU guideline 2002/95/EG

Function principle:



Signal figures



9 periodic index signal (every 2 mm)
The logical assignment A, B and I-Signal can change
8 Min. Pulse interval: pay attention to the instructions in the technical data

[1] With supply voltage correctly applied
[2] A max. of one channel only may be short-circuited: (when +V = 5 V, a short circuit to another channel, 0 V, or +V is permissible.) (when +V = 5-30 V, a short circuit to another channel or to 0 V is permissible.)
[3] At the listed rotational speed the min. pulse interval is 1µs, this corresponds to 250 kHz. For the max. rotational speed range a counter with a count input frequency of not less then 250 kHz should be provided.

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Linear Magnetic Measurement System LI20/B1

Technical data magnetic band B1:

Pole gap:	2 mm from pole to pole
Dimensions:	Width: 10 mm, Thickness: 1.7 mm incl. masking tape
Temperature coefficient:	$(11\pm1)x10^{-6}/K$
Temperature ranges:	working temperature: -4 to +176°F (-20 to +80°C) storage temperature: -40 to +176°F (-40 to +80°C)
Mounting:	adhesive joint
Measuring:	0.1 m (to receive an optimal result of measurement, the magnetic band should be ca. 0.1 m longer than the desired measuring length)
Bending radius:	≤ 50 mm

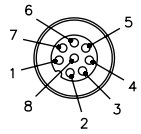
Pin configuration:

Pin	Signal	Color
1	0 V	WH
2	+V	BN
3	A	GN
4	$\overline{A}$	YE
5	B	GY
6	$\overline{B}$	PK
7	Z	BU
8	$\overline{Z}$	RD

Shield is on the housing

Wiring Diagram:

Male encoder view



M12 ***eurofast***® pinout
8-pin

Mating cordset:
E-RKC 8T-930-*

* Length in meters.

Part number key: Magnetic sensor LI20

T8.LI20.11X1.2XXX-XM-E-RSS 8T

Options for molded connection only.

Model

Design
1 = standard

Pulse interval
1 = standard

Interface and supply voltage
1 = 4.8-26, VDC RS422
2 = 4.8-30 VDC, push-pull

Type of connection
1 = cable (PUR), 2 m

* with quadruple evaluation

Connection (optional)
E-RSS 8T = 8-pin M12 ***eurofast***®

Mold on Length
Overall length in meters.
0.2M = 0.2 meters

Code (Resolution*)
005 = 100 µm
020 = 25 µm
050 = 10 µm

(only connected with magnetic band B1)

Reference signal
2 = index periodic

Part number key: Magnetic band B1

T8.B1.10.010.XXXX

Model

Width
10 = 10 mm

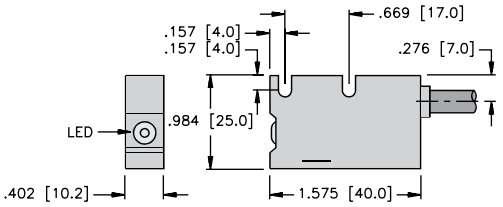
Length
0010 = 1 m
0050 = 5 m
0100 = 10 m
Other lengths up to 90 m on request

Accessories:

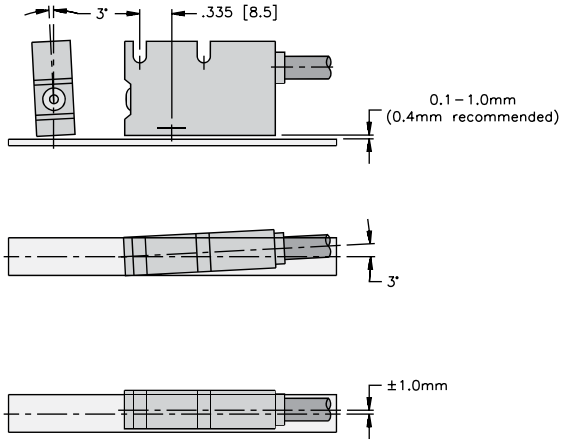
- See page J1, Connectivity, for cables and connectors

Linear Magnetic Measurement System LI20/B1

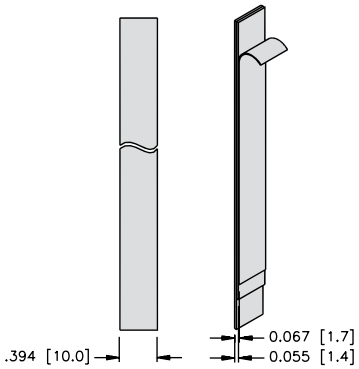
Dimensions: Magnetic sensor LI20



Permissible Mounting tolerances:



Dimensions: Magnetic band B1



Display Type 572 for LI20

Counter series with two individually scalable encoder inputs: HTL or TTL. In each case A $\overline{A}$, B $\overline{B}$, for count frequencies up to 1 MHz per channel. Operating modes may be selected for position or event counter, total counter, difference counter, cut-to-length display, diameter calculator, batch counter and more.

- Two separate freely scalable count inputs – HTL or TTL – also with inverted inputs.
- Max. input frequency 1 MHz/ channel.
- Four freely programmable solid-state outputs, each with 350 mA output current.
- Step or tracking preset.
- AC and DC supply voltage.
- May be used as a counter or position display with limit values.
- Monitoring function, where two values are monitored or calculated with respect to each other.
- Four programmable inputs with various functions, such as reset, gate, display memory, reference input or switching between the display values.
- Optional scalable analog output 0/4 to 20 mA, +/-10 V or 0 to10 V.
- Two auxiliary power supplies for sensors: 5.2 VDC and 24 VDC.
- Standard interface RS 232.

Part number key specification
Position display, 6 digits, with 4 fast switch outputs and serial interface: **6.572.0116.D05**

Position display, 6 digits, with 4 fast switch outputs and serial interface and scalable analog output: **6.572.0116.D95**

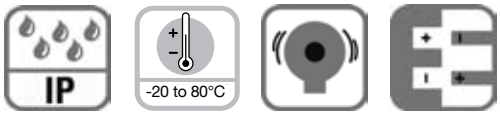
Position display, 8 digits, with 4 fast switch outputs and serial interface: **6.572.0118.D05**

Position display, 8 digits, with 4 fast switch outputs and serial interface and scalable analog output: **6.572.0118.D95**

For detailed product specifications, see page E15.

TURCK
Industrial Automation

Linear Magnetic Measurement System LI50/B2



High IP | Temperature | Shock/vibration resistant | Reverse polarity protection

Robust
- **Fully potted diecast metal housing.**
- **Increased ability to withstand vibrations and rough installation**: Eliminates machine downtime and repairs. Non-contact technology results in high shock and vibration resistance.
- **Stays sealed even when subjected to harsh everyday use.** Die cast metal housing with up to IP67protection.

Compact
- **Installation depth only 10 mm, width of magnetic band 10 mm.**
- **Installation height only 28 mm.** May be used even where space is very tight.

Simple installation
- **Fast start-up of the measuring system:** Easy attachment of the magnetic band and the sensor head.
- **Easy mounting with large tolerances possible**: Distance of sensor head to magnetic band from 0.1 to 2.0 mm; tolerates lateral misalignment +1 mm; LED warning indicator when magnetic field is too weak.

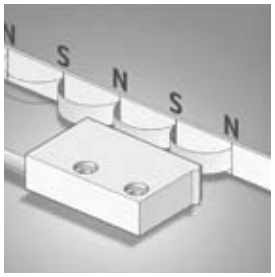
Technical data magnetic sensor LI50:

Output circuit:	Push-Pull	RS422
Supply voltage:	4.8 to 30 VDC	4.8 to 26 VDC
Load/channel, max cable length:	±20 mA, max. 30 m	120 Ohm, RS422 standard
Current consumption (without load):	typ. 25 mA, max. 60 mA	
Short circuit proof outputs: [1]	yes	yes [2]
Min. Pulse interval:	1 µs (edge interval) corresponds to 4 µs/cycle (see signal figures below)	
Output signal:	A, $\overline{A}$, B, $\overline{B}$, I, $\overline{I}$	
Reference signal:	Index periodical	
System Accuracy:	typ. 0.2 mm, max. ± (0.06 + 0.04 x L) mm, (L in [m], up to L = 50 m, at T = 20°C)	
Repeat accuracy:	±1 increment	
Resolution and speed: [3]	0.025 mm (quadruple), max. 16.25 m/s 0.005 mm (quadruple), max. 3.25 m/s	
Permissible alignment tolerance:	see draft "Mounting tolerances"	
Gap sensor / magnetic band:	0.1-2.0 mm (1.0 mm recommended)	
Offset:	max. ±1 mm	
Tilting:	max. 3°	
Torsion:	max. 3°	
Working temperature:	-4 to +176°F (-20 to +80°C)	
Shock resistance:	500g/1 ms	
Vibration strength:	30 g/10-2000 Hz	
Protection class:	IP67 according to DIN 60 529 (housing)	
Humidity:	100%, condensation possible	
Housing:	Zinc die-cast	
Cable:	2 m, PUR 8 x 0.14 mm², shielded, may be used in trailing cable installations	
Status-LED:	Green: Pulse-index; Red: Error Speed too high or magnetic fields too weak (for sensors **T8.LI50.XXXX.X050** and **T8.LI50.XXXX.X250**)	

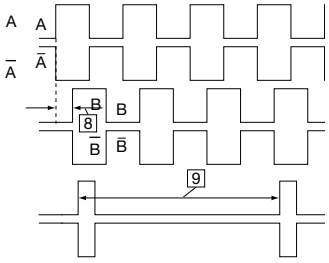
CE-compliant according to EN 61 000-6-1, EN 61 000-6-4, EN 61 000-6-3, EN 61 000-4-8 (magnetic field)

RoHS compliant acc. to EU guideline 2002/95/EG

Function principle:



Signal figures



9 periodic index signal (every 2 mm)
The logical assignment A, B and I-Signal can change
8 Min. Pulse interval: pay attention to the instructions in the technical data

[1] With supply voltage correctly applied
[2] A max. of one channel only may be short-circuited: (when +V = 5 V, a short circuit to another channel, 0 V, or +V is permissible.) (when +V = 5-30 V, a short circuit to another channel or to 0 V is permissible.)
[3] At the listed rotational speed the min. pulse interval is 1µs, this corresponds to 250 kHz. For the max. rotational speed range a counter with a count input frequency of not less then 250 kHz should be provided.

Linear Magnetic Measurement System LI50/B2

Technical data magnetic band B2:

Pole gap:	5 mm from pole to pole
Dimensions:	Width: 10 mm, Thickness: 1.7 mm incl. masking tape
Temperature coefficient:	$(11\pm1)x10^{-6}/K$
Temperature ranges:	working temperature: -4 to +176°F (-20 to +80°C) storage temperature: -40 to +176°F (-40 to +80°C)
Mounting:	adhesive joint
Measuring:	0.1 m (to receive an optimal result of measurement, the magnetic band should be ca. 0.1 m longer than the desired measuring length)
Bending radius:	≤ 50 mm

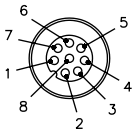
Pin configuration:

Pin	Signal	Color
1	0 V	WH
2	+V	BN
3	A	GN
4	$\overline{A}$	YE
5	B	GY
6	$\overline{B}$	PK
7	Z	BU
8	$\overline{Z}$	RD

Shield is on the housing

Wiring Diagram:

Male encoder view



M12 ***eurofast***® pinout
8-pin

Mating cordset:
E-RKC 8T-930-*

* Length in meters.

Part number key: Magnetic sensor LI50

T8.LI50.11X1.2XXX-XM-E-RSS 8T

Options for molded connection only.

Model

Design

1 = standard

Pulse interval

1 = standard

Interface and supply voltage

1 = 4.8-26 VDC, RS422
2 = 4.8-30 VDC, push-pull

Type of connection

1 = cable (PUR), 2 m

* with quadruple evaluation

Connection (optional)

E-RSS 8T = 8-pin M12 ***eurofast***®

Mold on Length

Overall length in meters.
0.2M = 0.2 meters

Code (Resolution*)

050 = 25 µm
250 = 5 µm
(only connected with magnetic band B2)

Reference signal

2 = index periodic

Part number key: Magnetic band B2

T8.B2.10.010.XXXX

Model

Width

10 = 10 mm

Length

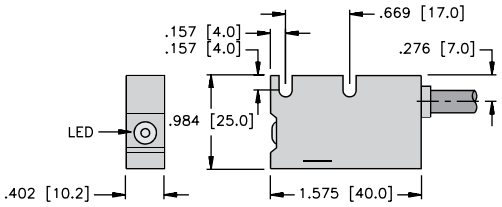
0010 = 1 m
0050 = 5 m
0100 = 10 m
Other lengths up to 90 m on request

Accessories:

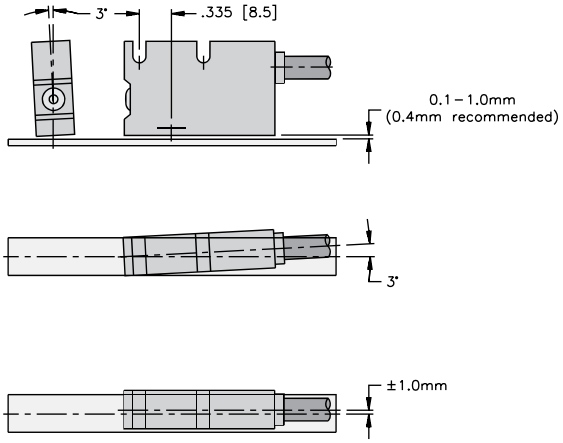
- See page J1, Connectivity, for cables and connectors

Linear Magnetic Measurement System LI50/B2

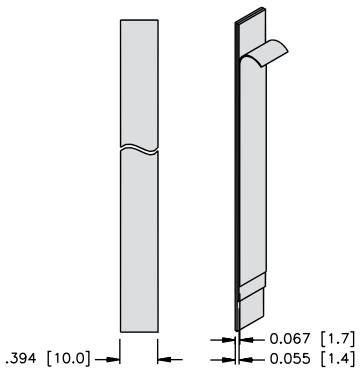
Dimensions: Magnetic sensor LI50



Permissible Mounting tolerances:



Dimensions: Magnetic band B2



Display Type 572 for LIXX

Counter series with two individually scalable encoder inputs: HTL or TTL. In each case, A $\overline{A}$, B $\overline{B}$ for count frequencies up to 1 MHz per channel. Operating modes may be selected for position or event counter, total counter, difference counter, cut-to-length display, diameter calculator, batch counter and more.

- Two, separate freely scalable count inputs – HTL or TTL – also with inverted inputs.
- Max. input frequency 1 MHz/ channel.
- Four freely programmable solid-state outputs, each with 350 mA output current.
- Step or tracking preset.
- AC and DC supply voltage.
- May be used as a counter or position display with limit values.
- Monitoring function, where two values are monitored or calculated with respect to each other.
- Four programmable inputs with various functions, such as reset, gate, display memory, reference input or switching between the display values.
- Optional scalable analog output 0/4 to 20 mA, +/-10 V or 0 to10 V.
- Two auxiliary power supplies for sensors: 5.2 VDC and 24 VDC.
- Standard interface RS 232.

Part number key specification:
Position display, 6 digits, with 4 fast switch outputs and serial interface: **6.572.0116.D05**

Position display, 6 digits, with 4 fast switch outputs and serial interface and scalable analog output: **6.572.0116.D95**

Position display, 8 digits, with 4 fast switch outputs and serial interface: **6.572.0118.D05**

Position display, 8 digits, with 4 fast switch outputs and serial interface and scalable analog output: **6.572.0118.D95**

For detailed product specifications, see page E15.

Draw wire encoder A50

High IP protection rating | Wide temperature range | Shock/vibration resistant | Reverse polarity protection

Robust
- **Corrosion resistant:** Titanium-anodized aluminium housing.
- **High-strength stainless steel draw wire.**
- **Low friction design or wire exit free from wear.** Diamond-polished ceramic guide.
- **Wide temperature range of** -4 to +185°F (-20 to +85°C).

RoHS compliant

Fast
- **High traverse speed.**
- **High acceleration:** Dynamic spring traction by means of a constant force spring, long service life of approx. 2 million complete cycles.

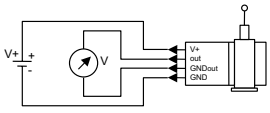
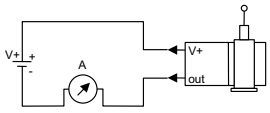
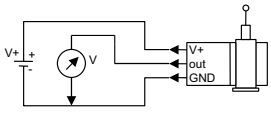
Versatile
- **Suitable for various sensors/ encoders:** Incremental and analog.
- **Quick mounting:** Fastening by means of 2 screws.
- **Flexible connection options:** Cable, M12 connector, radial, axial.
- **Linearity up to 0.05%.**

Mechanical characteristics (draw wire mechanics):

Measuring range:	**250 mm**	**500 mm**	**1250 mm**
Extension force Fmin:	1.17 lbs (5.2 N)	1.17 lbs (5.2 N)	0.85 lbs (3.8 N)
Fmax:	1.42 lbs (6.3 N)	1.64 lbs (7.3 N)	1.21 lbs (5.4 N)
Max. speed:	26.2 ft/s (8 m/s)	26.2 ft/s (8 m/s)	32.8 ft/s (10 m/s)
Max. acceleration:	8.7 g (85 m/s²)	8.7 g (85 m/s²)	10 g (100 m/s²)
Linearity:	analog output: 0.1% (of the measuring range) encoder: 0.05% (of the measuring range)		
Weight:	approx. 330 g (depending on the sensor/encoder used)		
Materials:	housing: titanium-anodized aluminium wire: stainless steel Ø 0.5 mm		
Protection (sensor):	IP65 (IP67 on request for encoders)		
Lifetime:	> 2 million full cycles		

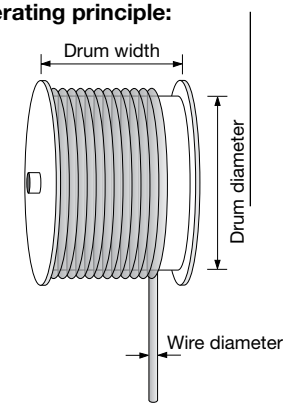
Electrical characteristics (digital output):
The electrical characteristics of the draw wire encoder assembly may be found in the data sheets of the encoder selected.

Electrical characteristics (analog output):

Analog output:	**0-10 V**	**4-20 mA**	**Potentiometer**
Output:	0-10 V galvanically isolated, 4 conductors	4-20 mA, 2 conductors	1 kOhm
Supply voltage:	12-30 VDC	12-30 VDC	max. 30 VDC
Recommended slider current:	-	-	-< 1 µA
Max. current consumption:	22.5 mA (no load)	50 mA	-
Reverse polarity protection:	yes	yes	-
Operating temperature:	-4 to +140°F (-20 to +60°C)	-4 to +140°F (-20 to +60°C)	-4 to +185°F (-20 to +85°C)
Connection diagrams:			
CE compliant according to:	EN 61000-6-1, EN 61000-6-4, EN 61000-6-3		

Draw wire encoder A50

Operating principle:



Construction:
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

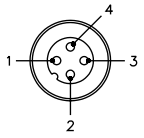
Note:
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.

Terminal assignment (analog output):

Pin	Color	0-10 V	4-20 mA	10 kOhm
1	BN	V+	V+	V+
2	WH	Signal	N/C	Slider
3	BU	GND	Signal	GND
4	BK	GND Sig.	N/C	N/C

Wiring Diagram (analog output):

Male encoder view



Mating cordset:
RK 4.4T-*/S618

* Length in meters.

Part number key: A50 with encoder

TD8.6A1.XXXX.XXXX.XXXX

Draw wire mechanics

Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm
*other measuring ranges on request

Available resolution, drum circumference 125 mm

Pulses/revolution	125	1250	2500
Pulses/mm	1	10	20
Resolution [mm]	1	0.1	0.05

Number of pulses
(e.g. 500 pulses => 0500)

Type of connection:
1 = axial cable (2 m PVC cable)
2 = radial cable (2 m PVC cable)

Output:
4 = 8-30 VDC, push-pull with inverted signals, supply voltage

Encoder used
36 = encoder type 3610

Part number key: A50 with analog sensor

TD8.3A1.XXXX.XXXX.0000

Draw wire mechanics

Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm
*other measuring ranges on request

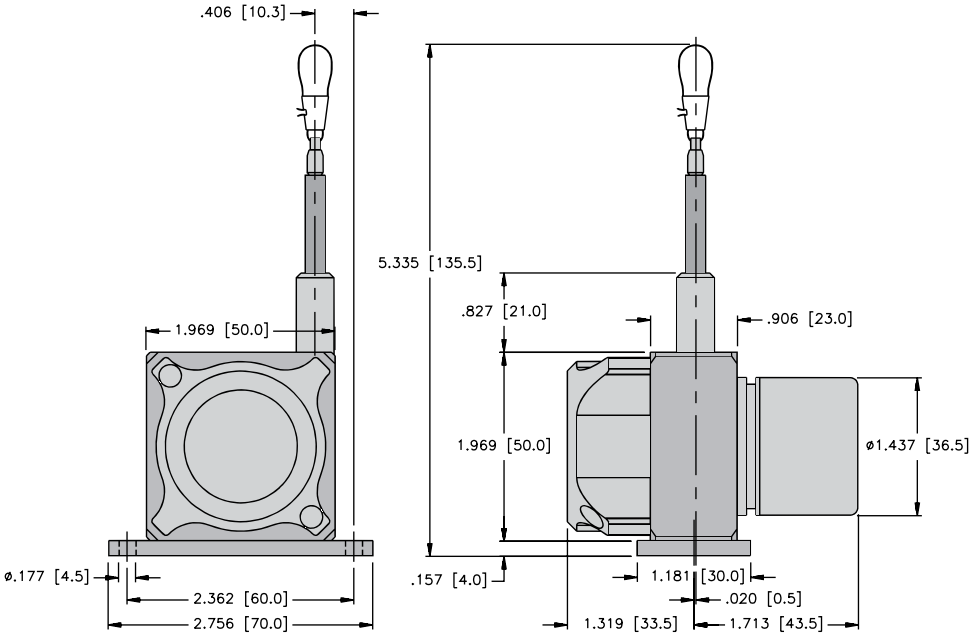
Type of connection:
1 = axial cable, length 2 m
3 = M12 ***eurofast***® 4-pin connector

Analog sensor output
A11 = 12-30 VDC, 4-20 mA
A22 = 12-30 VDC, 0-10 V
A33 = 30 VDC, potentiometer 1 kOhm

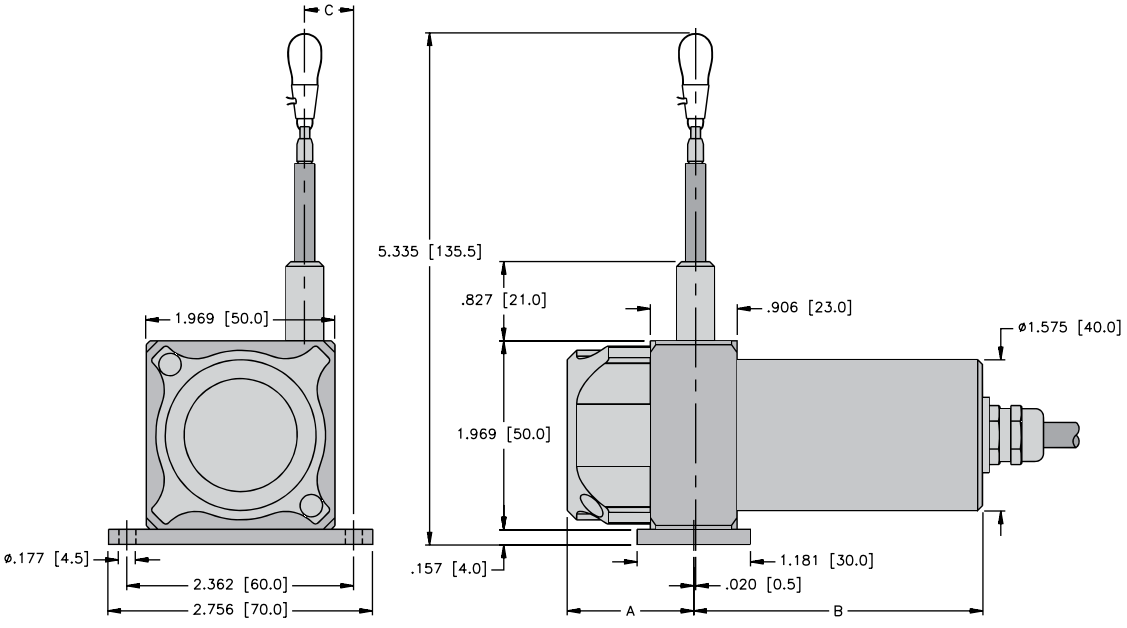
Accessories:
- See page J1, Connectivity, for cables and connectors

Draw wire encoder A50

Dimensions: A50 with encoder



Dimensions: A50 with analog sensor



Sensor type	Measuring length [mm]	A in [mm]	B in [mm]	C in [mm]
Potentiometer	250	1.043 [26.5]	2.559 [65]	0.850 [21.6]
	500	1.043 [26.5]	2.559 [65]	0.850 [21.6]
	1,250	1.319 [33.5]	2.559 [65]	0.406 [10.3]
0-10 V 4-20 mA	250	1.043 [26.5]	3.091 [78.5]	0.850 [21.6]
	500	1.043 [26.5]	3.091 [78.5]	0.850 [21.6]
	1,250	1.319 [33.5]	3.091 [78.5]	0.406 [10.3]

TURCK Industrial Automation

Draw wire encoder B80

High IP protection rating | Wide temperature range | Shock/vibration resistant | Reverse polarity protection

RoHS compliant

Robust
- **Corrosion resistant:** Titanium-anodized aluminium housing.
- **High-strength stainless steel draw wire.**
- **Low friction design or wire exit free from wear.** Diamond-polished ceramic guide.
- **Wide temperature range of** -40 to +194°F (-40 to +90°C).

Fast
- **High traverse speed.**
- **High acceleration:** Dynamic spring traction by means of a constant force spring, long service life of approx. 2 million complete cycles.

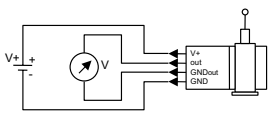
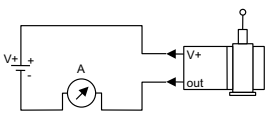
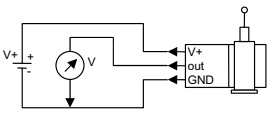
Versatile
- **Suitable for various sensors/ encoders:** Absolute, fieldbus, incremental and analog.
- **Quick mounting:** Fastening by means of 2 screws.
- **Flexible connection options:** Cable, connector, radial, axial.
- **Linearity up to 0.05 %.**

Mechanical characteristics (draw wire mechanics):

Measuring range:	**250 mm**	**500 mm**	**1250 mm**
Extension force Fmin:	1.21 lbs (5.4 N)	1.21 lbs (5.4 N	1.21 lbs (5.4 N
Fmax:	1.5 lbs (6.6 N)	1.75 lbs (7.8 N	2.05 lbs (9.1 N)
Max. speed:	32.8 ft/s (10 m/s)	32.8 ft/s (10 m/s)	32.8 ft/s (10 m/s)
Max. acceleration:	14 g (140 m/s²)	14 g (140 m/s²)	14 g (140 m/s²)
Linearity:	analog output: 0.1% (of the measuring range) encoder: 0.05% (of the measuring range)		
Weight:	approx. 750 g (depending on the sensor/encoder used)		
Materials:	housing: titanium-anodized aluminium wire: stainless steel Ø 0.5 mm		
Protection (sensor):	IP65 (IP67 on request for encoders)		
Lifetime:	> 2 million full cycles		

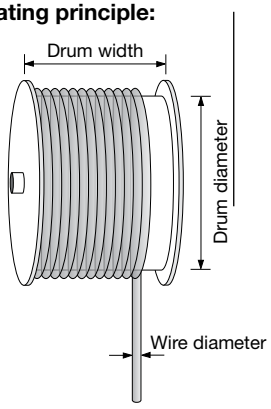
Electrical characteristics (digital output):
The electrical characteristics of the draw wire encoder assembly may be found in the data sheets of the encoder selected.

Electrical characteristics (analog output):

Analog output:	**0-10 V**	**4-20 mA**	**Potentiometer**
Output:	0-10 V galvanically isolated, 4 conductors	4-20 mA, 2 conductors	1 kOhm
Supply voltage:	12-30 VDC	12-30 VDC	max. 30 VDC
Recommended slider current:	-	-	-< 1 µA
Max. current consumption:	22.5 mA (no load)	50 mA	-
Reverse polarity protection:	yes	yes	-
Operating temperature:	-4 to +140°F (-20 to +60°C)	-4 to +140°F (-20 to +60°C)	-4 to +185°F (-20 to +85°C)
Connection diagrams:			
CE compliant according to:	EN 61000-6-1, EN 61000-6-4, EN 61000-6-3		

Draw wire encoder B80

Operating principle:



Construction:
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

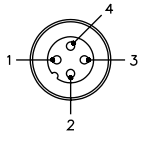
Note:
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.

Terminal assignment (analog output):

Pin	Color	0-10 V	4-20 mA	10 kOhm
1	BN	V+	V+	V+
2	WH	Signal	N/C	Slider
3	BU	GND	Signal	GND
4	BK	GND Sig.	N/C	N/C

Wiring Diagram (analog output):

Male encoder view



Mating cordset:
RK 4.4T-*/S618

* Length in meters.

Draw wire encoder B80

Part number key: B80 with encoder

TD8.4B1.XXXX.XXXX.XXXX

Draw wire mechanics

Measuring range

0100 = 1,000 mm
0200 = 2,000 mm
0300 = 3,000 mm
Other measuring ranges available upon request

Encoder used:*

00 = Sendix incremental 5000
63 = Sendix absolute 5863
68 = Sendix absolute 5868

Resolution/protocol/options

depending on the encoder used

Type of connection:*

depending on the encoder used

Output:*

depending on the encoder used

*Recommended encoders listed below

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 200 mm

Pulses/revolution	200	2000	4000
Pulses/mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix 5863 or 5868, drum circumference 200 mm

Absolute encoder	5863	5868
Pulses/revolution	2048/11 bits	4096, programmable via the bus/ 12 bits
Pulses/mm	10.24	20.48
Resolution [mm]	~0.1	~0.05

Example part number key:
Standard device with incremental encoder, Sendix 5000

TD8.4B1.XXXX.0053.2000

The standard device is supplied mounted. The mounted encoder is the Sendix incremental **5000** encoder, connector axial 8-pin M12 ***eurofast***®, push-pull with inverted signals, supply voltage 10-30 VDC (**T8.5000.8353.2000**)

Example part number key:
Standard device with absolute encoder, Sendix 5863 or 5868

TD8.4B1.XXXX.6324.G123

Sendix absolute **5863** encoder with SSI interface (gray code), 2048 pulses/rev., set key, 10-30 VDC, radial 12-pin M23 ***multifast***® connector (**T8.5863.1224.G123**)

TD8.4B1.XXXX.6822.2113

Sendix absolute **5868** encoder with CANopen interface, 4096 pulses/rev. programmable via the bus, set key, 10-30 VDC, M12 ***eurofast*** connector (**T8.5868.1222.2113**)

TD8.4B1.XXXX.6832.3113

Sendix absolute **5868** encoder with PROFIBUS® connection, 4096 pulses/rev. programmable via the bus, set key, 10-30 VDC, M12 ***eurofast*** connector (**T8.5868.1232.3113**)

Part number key: B80 with analog sensor:

TD8.3B1.XXXX.XXXX.0000

Draw wire mechanics

Measuring range*

0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm
*other measuring ranges on request

Type of connection:

1 = axial cable, length 2 m
3 = M12 ***eurofast***® 4-pin connector

Analog sensor output

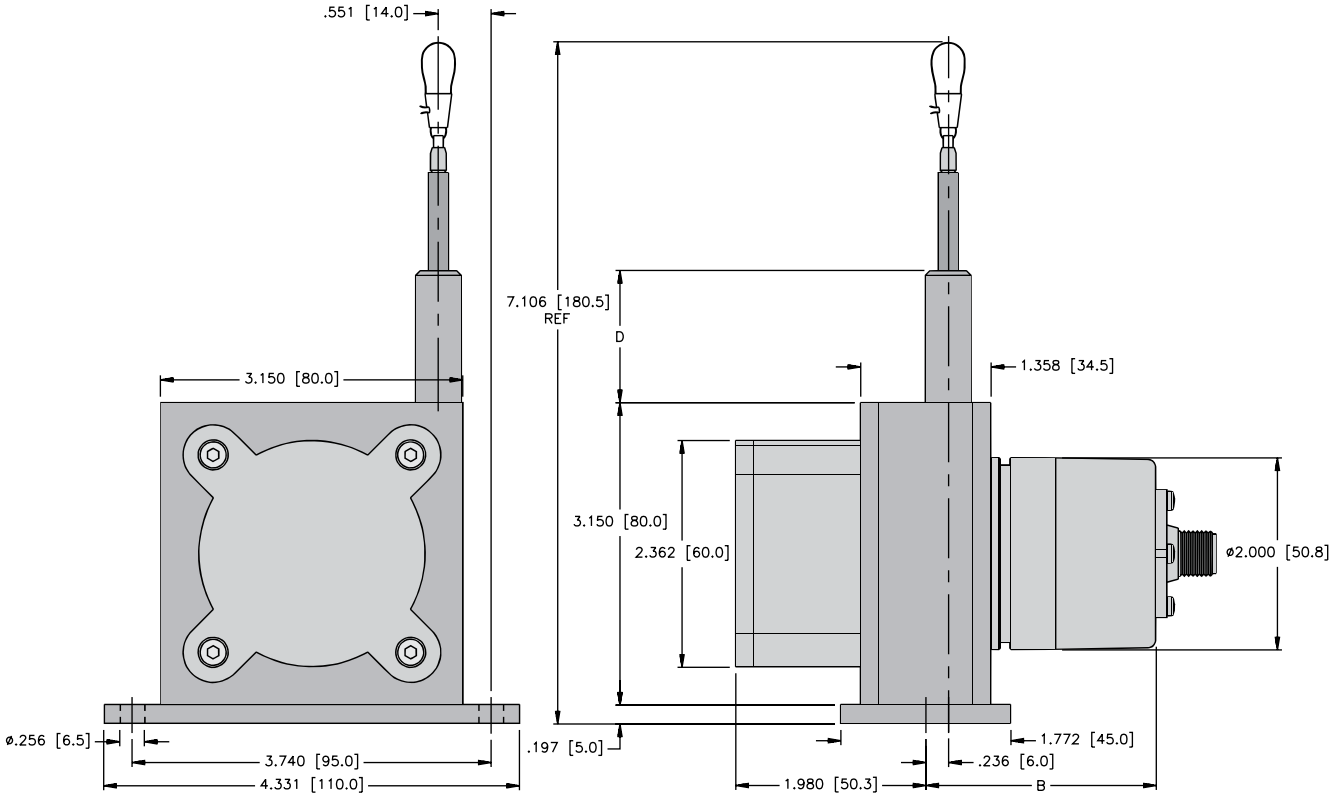
A11 = 4-20 mA, supply voltage 12-30 VDC
A22 = 0-10 V, supply voltage 12-30 VDC
A33 = potentiometer 1 kOhm, max. supply voltage 30 VDC

Accessories:

- See page J1, Connectivity, for cables and connectors

Draw wire encoder B80

Dimensions: B80 with encoder



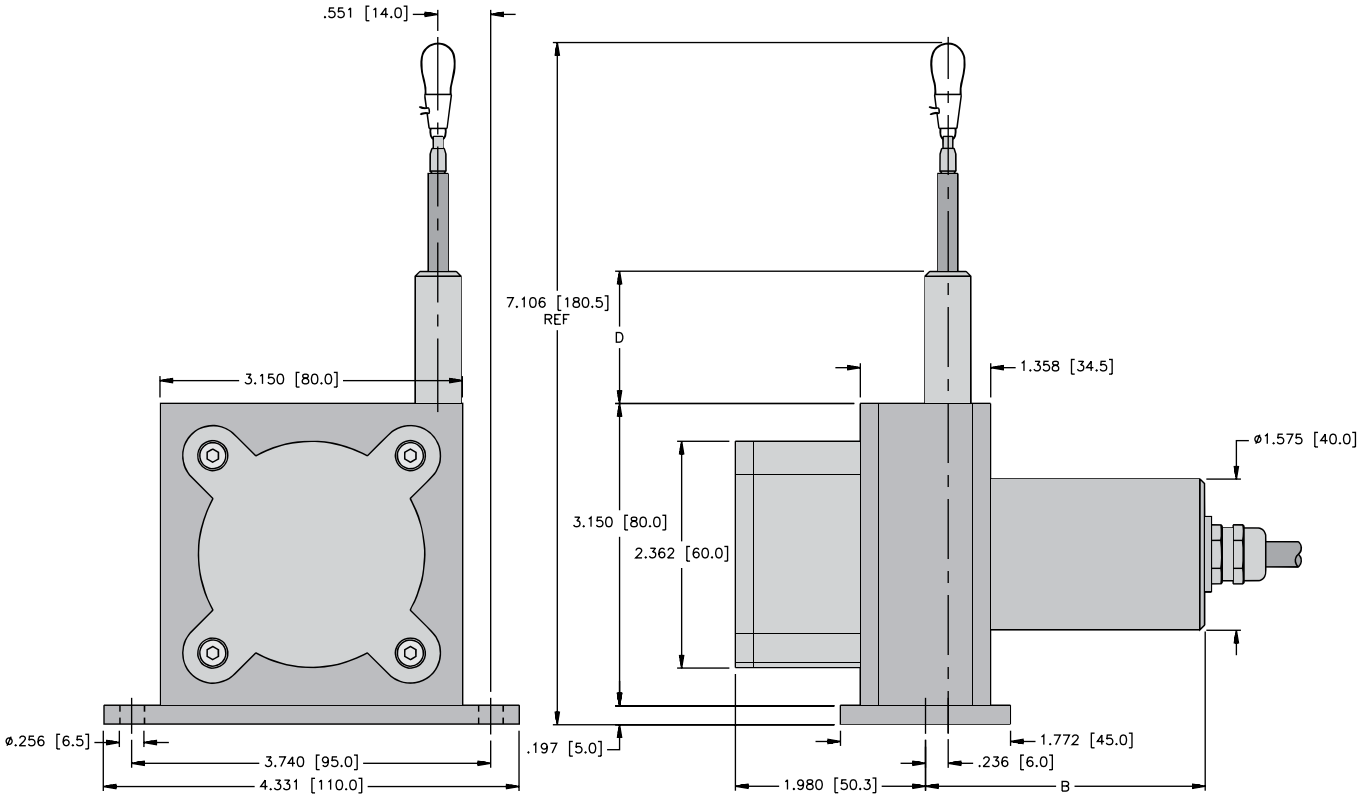
Measuring range [mm]	**D** in [mm]
1,000	0.827 [21]
2,000	1.378 [35]
3,000	1.378 [35]

Dimension B depends on the encoder used

Encoder	**B** in [mm]
Sendix incremental (5000) D8.4B1.XXXX.**00**XX.XXXX	2.136 [54.25]
Sendix absolute (5863) D8.4B1.XXXX.**63**XX.XXXX	2.628 [66.75]
Sendix absolute (5868) D8.4B1.XXXX.**68**XX.XXXX	3.671 [93.25]

Draw wire encoder B80

Dimensions: B80 with analog sensor



Sensor type	Measuring length [mm]	B in [mm]	C in [mm]
Potentiometer	1,000	2.913 [74]	0.827 [21]
	2,000	2.913 [74]	0.827 [21]
	3,000	4.026 [102.25]	1.378 [35]
0-10 V 4-20 mA	1,000	3.445 [87.5]	0.827 [21]
	2,000	3.445 [87.5]	0.827 [21]
	3,000	4.026 [102.25]	1.378 [35]

Draw wire encoder accessories

Part Number:
8.0000.7000.0033

Description:
2 meter steel wire extension

Part Number:
8.0000.7000.0034

Description:
5 meter steel wire extension

Part Number:
8.0000.7000.0032

Description:
2 meter para wire extension

Part Number:
8.0000.7000.0035

Description:
10 meter steel wire extension

Part Number:
8.0000.7000.0031

Description:
Guide pulley

Accessories:

- See page J1, Connectivity, for cables and connectors

Draw wire encoder C120

High IP protection rating | Wide temperature range | Shock/vibration resistant | Reverse polarity protection

Robust
- **Corrosion resistant:** Titanium-anodized aluminium housing.
- **High-strength stainless steel draw wire.**
- **Low friction design or wire exit free from wear.** Diamond-polished ceramic guide.
- **Wide temperature range of** -40 to +194°F (-40 to +90°C).

Fast
- **High traverse speed.**
- **High acceleration:** Dynamic spring traction by means of a constant force spring, long service life of approx. 2 million complete cycles.

Versatile
- **Suitable for various sensors/ encoders:** Absolute, fieldbus, incremental and analog.
- **Quick mounting:** Fastening by means of 2 screws.
- **Flexible connection options:** Cable, connector, radial, axial.
- **Linearity up to 0.05 %.**

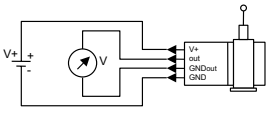
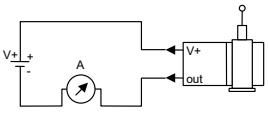
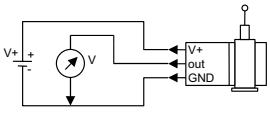
Mechanical characteristics (draw wire mechanics):

Measuring range:	6,000 mm (6 meter)
Extension force Fmin:	1.21 lbs (5.4 N)
Fmax:	1.75 lbs (7.8 N)
Max. speed:	32.8 ft/s (10 m/s)
Max. acceleration:	14 g (140 m/s²)
Linearity:	analog output: 0.1% (of the measuring range) encoder: 0.05% (of the measuring range)
Weight:	approx. 3.5 lbs (1,600 g) (depending on the sensor/encoder used)
Materials:	housing: titanium-anodized aluminium wire: stainless steel Ø 0.5 mm
Protection (sensor):	IP65 (IP67 on request for encoders)
Lifetime:	> 2 million full cycles

Electrical characteristics (digital output):

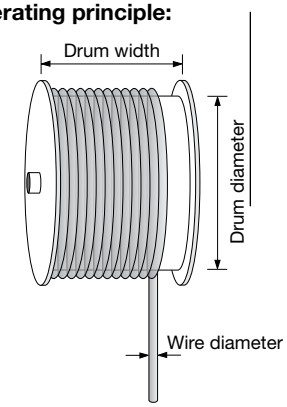
The electrical characteristics of the draw wire encoder assembly may be found in the data sheets of the encoder selected.

Electrical characteristics (analog output):

Analog output:	**0-10 V**	**4-20 mA**	**Potentiometer**
Output:	0-10 V galvanically isolated, 4 conductors	4-20 mA, 2 conductors	1 kOhm
Supply voltage:	12-30 VDC	12-30 VDC	max. 30 VDC
Recommended slider current:	-	-	-< 1 µA
Max. current consumption:	22.5 mA (no load)	50 mA	-
Reverse polarity protection:	yes	yes	-
Operating temperature:	-4 to +140°F (-20 to +60°C)	-4 to +140°F (-20 to +60°C)	-4 to +185°F (-20 to +85°C)
Connection diagrams:			
CE compliant according to:	EN 61000-6-1, EN 61000-6-4, EN 61000-6-3		

Draw wire encoder C120

Operating principle:



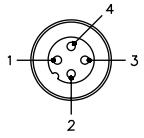
Construction:
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note:
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.

Terminal assignment (analog output):

Pin	Color	0-10 V	4-20 mA	10 kOhm
1	BN	V+	V+	V+
2	WH	Signal	N/C	Slider
3	BU	GND	Signal	GND
4	BK	GND Sig.	N/C	N/C

Wiring Diagram (analog output):

Male encoder view

Mating cordset: **RK 4.4T-*/S618**

* Length in meters.

Draw wire encoder C120

Part number key: C120 with encoder

TD8.4C1.XXXX.XXXX.XXXX

Draw wire mechanics

Measuring range

0600 = 6000 mm
Other measuring ranges available upon request

Encoder used:*

00 = Sendix incremental 5000
63 = Sendix absolute 5863
68 = Sendix absolute 5868

Resolution/protocol/options

depending on the encoder used

Type of connection:*

depending on the encoder used

Output:*

depending on the encoder used

*Recommended encoders listed below

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 317.68 mm

Pulses/revolution	500	2000
Pulses/mm	1.6	6.3
Resolution [mm]	~0.63	~0.16

Standard resolutions for draw wire with absolute encoder Sendix 5863 or 5868, drum circumference 200 mm

Absolute encoder	5863	5868
Pulses/revolution	2048/11 bits	4096, programmable via the bus/ 12 bits
Pulses/mm	6.4	12.9
Resolution [mm]	~0.16	~0.08

Example part number key: Standard device with incremental encoder, Sendix 5000

TD8.4C1.XXXX.0053.2000

The standard device is supplied mounted. The mounted encoder is the Sendix incremental **5000** encoder, connector axial 8 pin M12, push-pull with inverted signals, supply voltage 10-30 VDC (**T8.5000.8353.2000**)

Example part number key: Standard device with absolute encoder, Sendix 5863 or 5868

TD8.4C1.XXXX.6324.G123

Sendix absolute **5863** encoder with SSI interface (Gray code), 2048 pulses/rev., set key, 10-30 VDC, radial 12 pole M23 connector (**T8.5863.1224.G123**)

TD8.4C1.XXXX.6822.2113

Sendix absolute **5868** encoder with CANopen interface, 4096 pulses/rev. programmable via the bus, Set key, 10-30 VDC, M12 connector (**T8.5868.1222.2113**)

TD8.4C1.XXXX.6832.3113

Sendix absolute **5868** encoder with PROFIBUS® connection, 4096 pulses/rev. programmable via the bus, set key, 10-30 VDC, M12 connector (**T8.5868.1232.3113**)

Part number key: C120 with analog sensor

TD8.3C1.XXXX.XXXX.0000

Draw wire mechanics

Measuring range*

0600 = 6000 mm
*other measuring ranges on request

Type of connection:

1 = axial cable, length 2 m
3 = M12 ***eurofast***® 4-pin connector

Analog sensor output

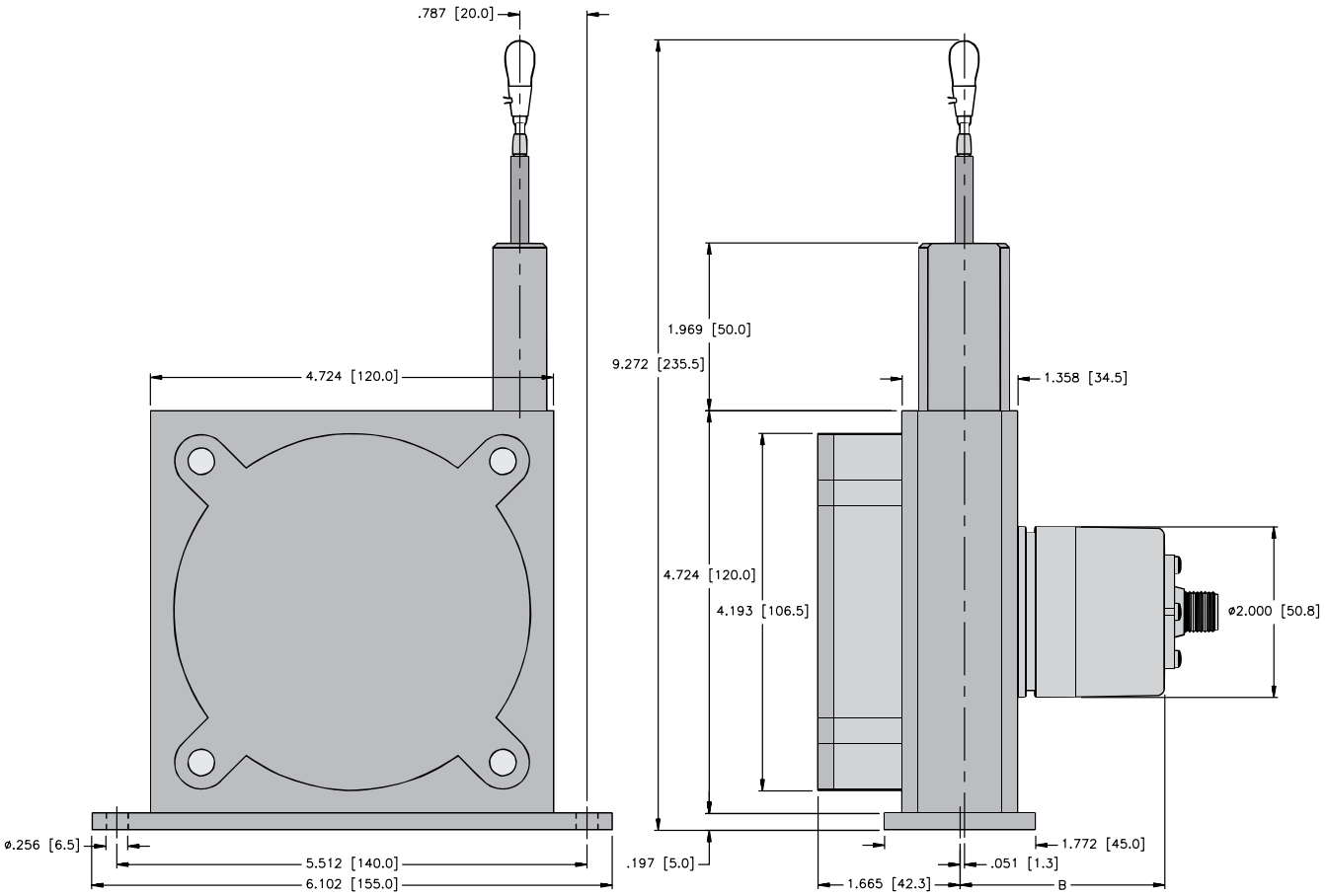
A11 = 12-30 VDC, 4-20 mA
A22 = 12-30 VDC, 0-10 V
A33 = 30 VDC, potentiometer 1 kOhm

Accessories:

- See page J1, Connectivity, for cables and connectors

Draw wire encoder C120

Dimensions: C120 with encoder

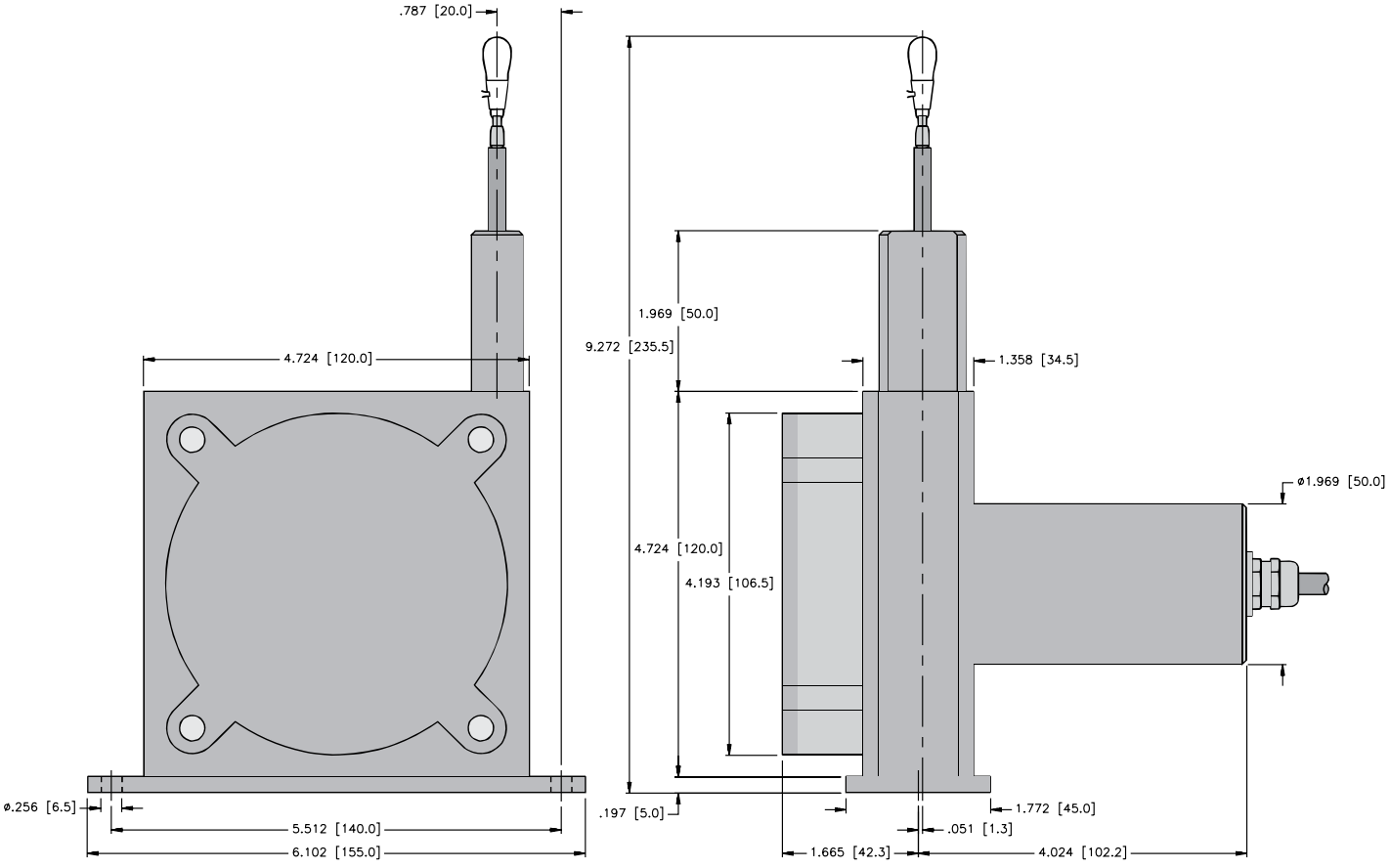


Dimension B depends on the encoder used

Encoder	**B** in [mm]
Sendix incremental (5000) **D8.4B1.XXXX.00XX.XXXX**	2.136 [54.25]
Sendix absolute (5863) **D8.4B1.XXXX.63XX.XXXX**	2.628 [66.75]
Sendix absolute (5868) **D8.4B1.XXXX.68XX.XXXX**	3.671 [93.25]

Draw wire encoder C120

Dimensions: C120 with analog sensor



Draw wire encoder accessories

Part Number:
8.0000.7000.0033

Description:
2 meter steel wire extension

Part Number:
8.0000.7000.0034

Description:
5 meter steel wire extension

Part Number:
8.0000.7000.0032

Description:
2 meter para wire extension

Part Number:
8.0000.7000.0035

Description:
10 meter steel wire extension

Part Number:
8.0000.7000.0031

Description:
Guide pulley

Accessories:

- See page J1, Connectivity, for cables and connectors

Draw wire encoder D135

High IP protection rating | Wide temperature range | Shock/vibration resistant | Reverse polarity protection

Robust
- **Corrosion resistant:** Titanium-anodized aluminium housing.
- **High-strength stainless steel draw wire.**
- **Low friction design or wire exit free from wear.** Diamond-polished ceramic guide.
- **Wide temperature range of** -40 to +194°F (-40 to +90°C).

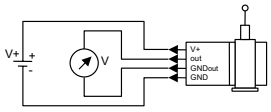
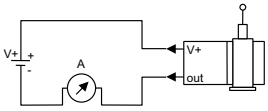
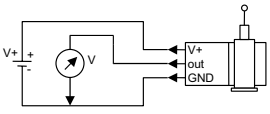
Dynamic
- **High traverse speed.**
- **High acceleration:** Dynamic spring traction by means of a constant force spring, long service life of approx. 2 million complete cycles.

Versatile
- **Suitable for various sensors/ encoders:** Absolute, fieldbus, incremental and analog.
- **Quick mounting:** Fastening by means of 2 screws.
- **Flexible connection options:** Cable, connector, radial, axial.
- **Linearity up to 0.05%.**

Mechanical characteristics (draw wire mechanics):

Measuring range:	8,000 mm	10,000/15,000 mm	20,000 mm	25,000/30,000 mm	35,000/40,000 mm
Extension force Fmin:	1.62 lbs (7.2 N)	1.96 lbs (8.7 N)	1.57 lbs (7.0 N)	1.64 lbs (7.3 N)	1.57 lbs (7.0 N)
Fmax:	3.60 lbs (16.0 N)	3.80 lbs (16.9 N)	2.79 lbs (12.4 N)	3.53 lbs (15.7 N)	3.17 lbs (14.1 N)
Max. speed:	32.8 ft/s (10 m/s)	19.7 ft/s (6 m/s)	16.4 ft/s (5 m/s)	16.4 ft/s (5 m/s)	16.4 ft/s (5 m/s)
Max. acceleration:	14 g (140 m/s²)	8 g (80 m/s²)	6 g (60 m/s²)	6 g (60 m/s²)	6 g (60 m/s²)
Linearity:	analog output: 0.1% (of the measuring range) encoder: 0.05% (of the measuring range)				
Weight:	approx. 1.65 lbs (750 g) (depending on the sensor/encoder used)				
Materials:	housing: titanium-anodized aluminium wire: stainless steel Ø 0.5 mm				
Protection (sensor):	IP65 (IP67 on request for encoders)				
Lifetime:	> 2 million full cycles				

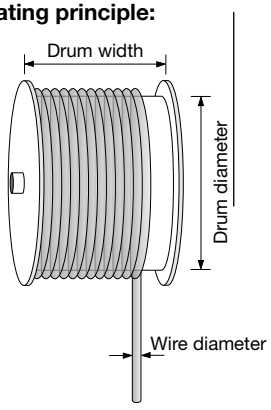
Electrical characteristics (analog output):

Analog output:	0-10 V	4-20 mA	Potentiometer
Output:	0-10 V galvanically isolated, 4 conductors	4-20 mA, 2 conductors	1 kOhm
Supply voltage:	12-30 VDC	12-30 VDC	max. 30 VDC
Recommended slider current:	-	-	-< 1 µA
Max. current consumption:	22.5 mA (no load)	50 mA	-
Reverse polarity protection:	yes	yes	-
Operating temperature:	-4 to +140°F (-20 to +60°C)	-4 to +140°F (-20 to +60°C	-4 to +185°F (-20 to +85°C
Connection diagrams:			
CE compliant according to:	EN 61000-6-1, EN 61000-6-4, EN 61000-6-3		

Draw wire encoder D135

Electrical characteristics (digital output):
The electrical characteristics of the draw wire encoder assembly may be found in the data sheets of the encoder selected.

Operating principle:



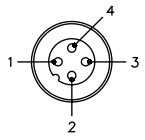
Construction:
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note:
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.

Terminal assignment (analog output):

Pin	Color	0-10 V	4-20 mA	10 kOhm
1	BN	V+	V+	V+
2	WH	Signal	N/C	Slider
3	BU	GND	Signal	GND
4	BK	GND Sig.	N/C	N/C

Wiring Diagram (analog output):

Male encoder view

Mating cordset: **RK 4.4T-*/S618**

* Length in meters.

Draw wire encoder D135

Part number key: D135 with encoder

TD8.4D1.XXXX.XXXX.XXXX

Draw wire mechanics

Measuring range

0800 = 8,000 mm
1000 = 10,000 mm
1500 = 15,000 mm
2000 =20,000 mm
2500 = 25,000 mm
3000 = 30,000 mm
3500 = 35,000 mm
4000 = 40,000 mm
Other measuring ranges on request

Encoder used:*

00 = Sendix incremental 5000
63 = Sendix absolute 5863
68 = Sendix absolute 5868

Resolution/protocol/options

depending on the encoder used

Type of connection:*

depending on the encoder used

Output:*

depending on the encoder used

*Recommended encoders listed below

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 333.33 mm (357.14 mm for the 8,000 mm measuring range)

Pulses/revolution	500	2000
Pulses/mm	1.5 (1.4)	6 (5.6)
Resolution [mm]	0.66 (0.71)	0.17 (0.18)

Standard resolutions for draw wire with absolute encoder Sendix 5863 or 5868, drum circumference 333.33 mm (357.14 mm for the 8,000 mm measuring range)

Absolute encoder	5863	5868
Pulses/revolution	2048/11 bits	4096, programmable via the bus/ 12 bits
Pulses/mm	6.4 (5.73)	12.9 (11.47)
Resolution [mm]	~0.16 (0.17)	~0.08 (0.09)

Example part number key: Standard device with incremental encoder, Sendix 5000

TD8.4D1.XXXX.0053.2000

The standard device is supplied mounted. The mounted encoder is the Sendix incremental **5000** encoder, connector axial 8-pin M12 ***eurofast***®, push-pull with inverted signals, supply voltage 10-30 VDC (**T8.5000.8353.2000**)

Example part number key: Standard device with absolute encoder, Sendix 5863 or 5868

TD8.4D1.XXXX.6324.G123

Sendix absolute **5863** encoder with SSI interface (Gray code), 2048 pulses/rev., set key, 10-30 VDC, radial 12-pin M23 ***multifast***® connector (**T8.5863.1224.G123**)

TD8.4D1.XXXX.6822.2113

Sendix absolute **5868** encoder with CANopen interface, 4096 pulses/rev. programmable via the bus, Set key, 10-30 VDC, M12 ***eurofast*** connector (**T8.5868.1222.2113**)

TD8.4D1.XXXX.6832.3113

Sendix absolute **5868** encoder with PROFIBUS® connection, 4096 pulses/rev. programmable via the bus, set key, 10-30 VDC, M12 ***eurofast*** connector (**T8.5868.1232.3113**)

Part number key: D135 with analog sensor

TD8.3D1.XXXX.XXXX.0000

Draw wire mechanics

Measuring range

0800 = 8,000 mm
1000 = 10,000 mm
1500 = 15,000 mm
2000 =20,000 mm
2500 = 25,000 mm
3000 = 30,000 mm
3500 = 35,000 mm
4000 = 40,000 mm
Other measuring ranges on request

Type of connection:

1 = axial cable, length 2 m
3 = M12 ***eurofast***® 4-pin connector

Analog sensor output

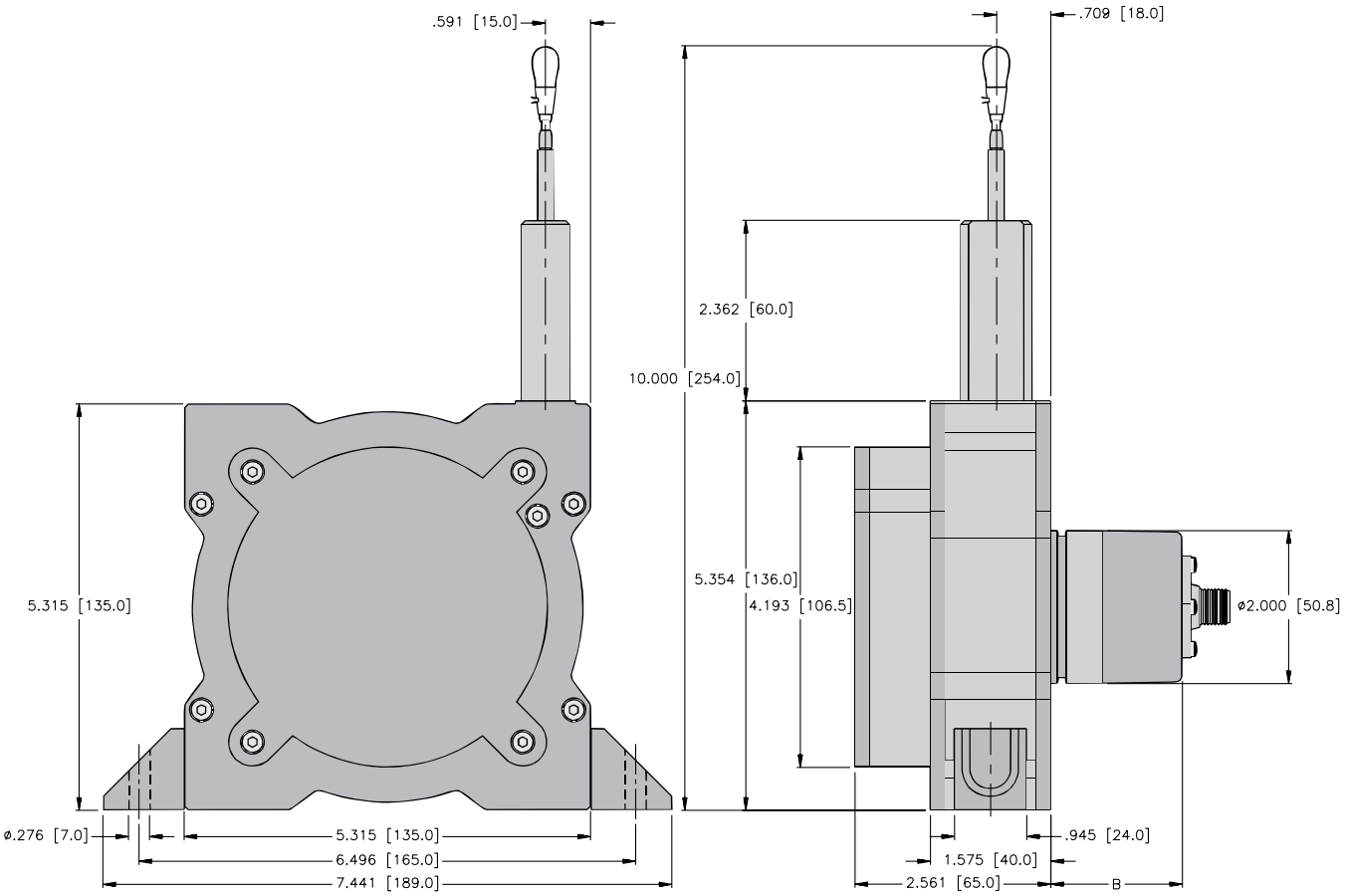
A11 = 12-30 VDC, 4-20 mA
A22 = 12-30 VDC, 0-10 V
A33 = 30 VDC, potentiometer 1 kOhm

Accessories:

- See page J1, Connectivity, for cables and connectors

Draw wire encoder D135

Dimensions: D135 with encoder, measuring range 8,000 mm

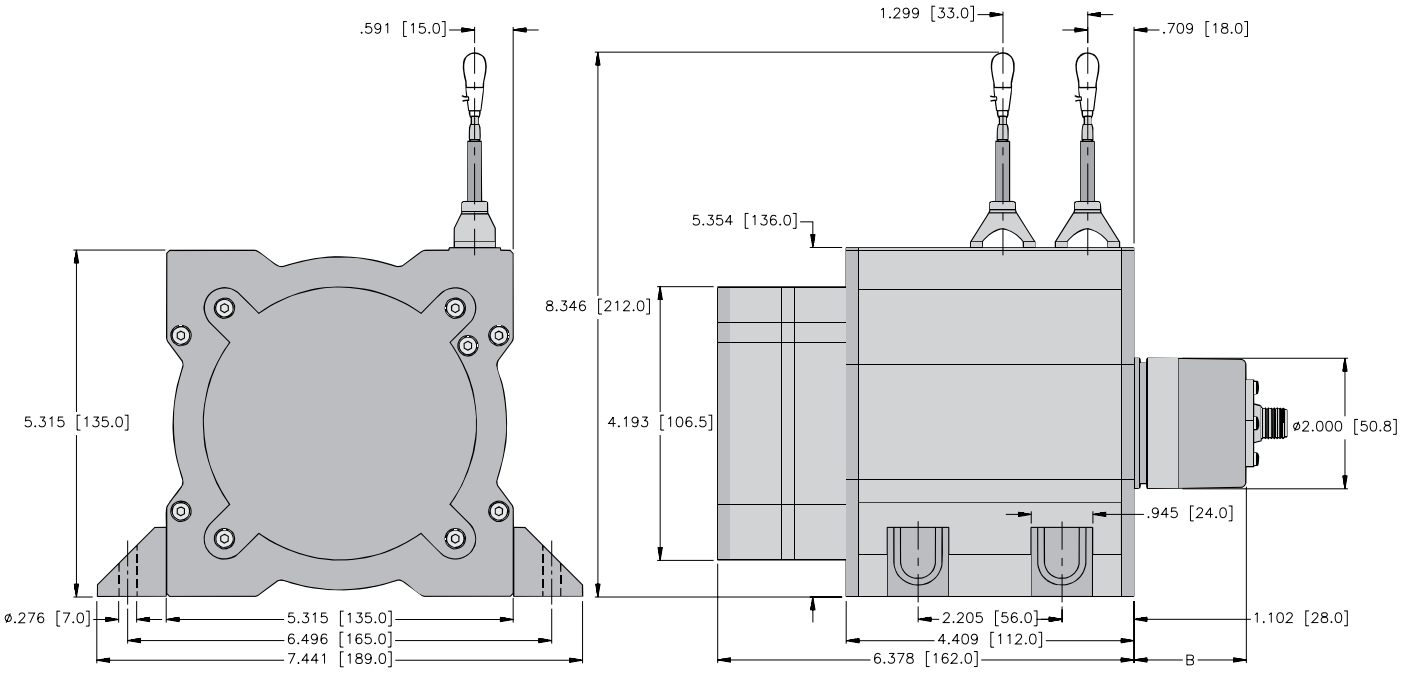


Dimension B depends on the encoder used

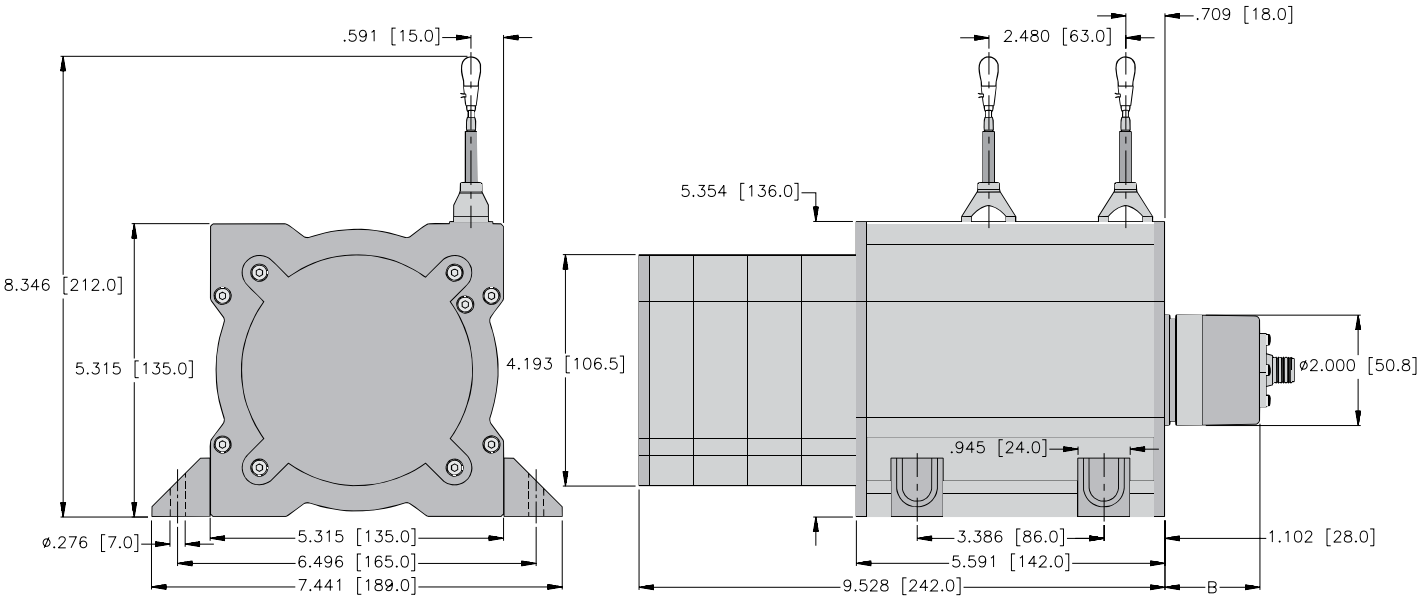
Encoder	**B** in [mm]
Sendix incremental (5000) **D8.4B1.XXXX.00XX.XXXX**	1.457 [37.0]
Sendix absolute (5863) **D8.4B1.XXXX.63XX.XXXX**	1.929 [49.0]
Sendix absolute (5868) **D8.4B1.XXXX.68XX.XXXX**	2.992 [76.0]

Draw wire encoder D135

Dimensions: D135 with encoder, measuring range 10,000 mm-20,000 mm



Dimensions: D135 with encoder, measuring range 25,000 mm-40,000 mm

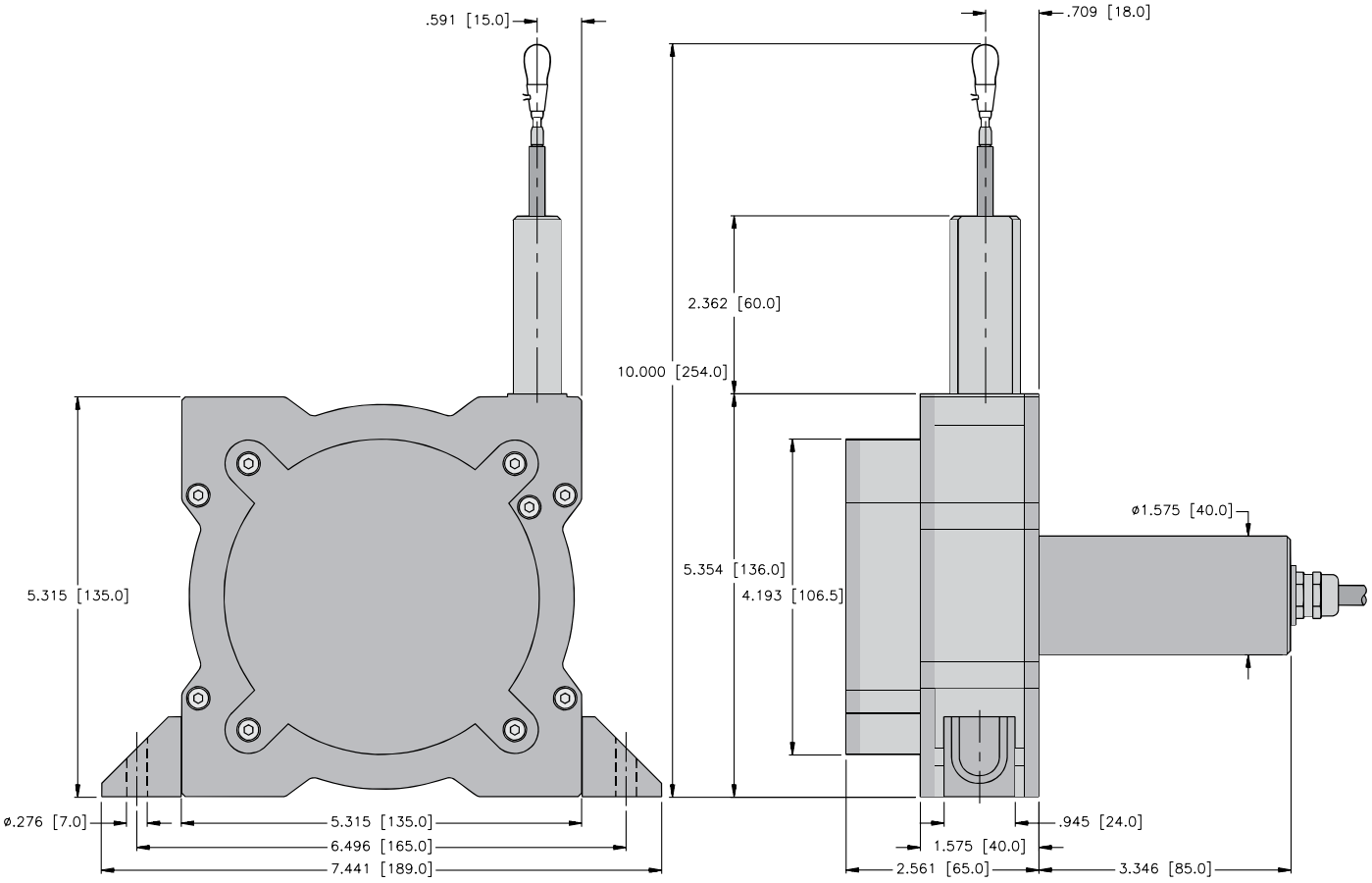


Dimension B depends on the encoder used

Encoder	**B** in [mm]
Sendix incremental (5000) **D8.4B1.XXXX.00XX.XXXX**	1.457 [37.0]
Sendix absolute (5863) **D8.4B1.XXXX.63XX.XXXX**	1.929 [49.0]
Sendix absolute (5868) **D8.4B1.XXXX.68XX.XXXX**	2.992 [76.0]

Draw wire encoder D135

Dimensions: D135 with analog sensor, measuring range 8,000 mm



Draw wire encoder accessories

Part Number:
8.0000.7000.0033

Description:
2 meter steel wire extension

Part Number:
8.0000.7000.0034

Description:
5 meter steel wire extension

Part Number:
8.0000.7000.0032

Description:
2 meter para wire extension

Part Number:
8.0000.7000.0035

Description:
10 meter steel wire extension

Part Number:
8.0000.7000.0031

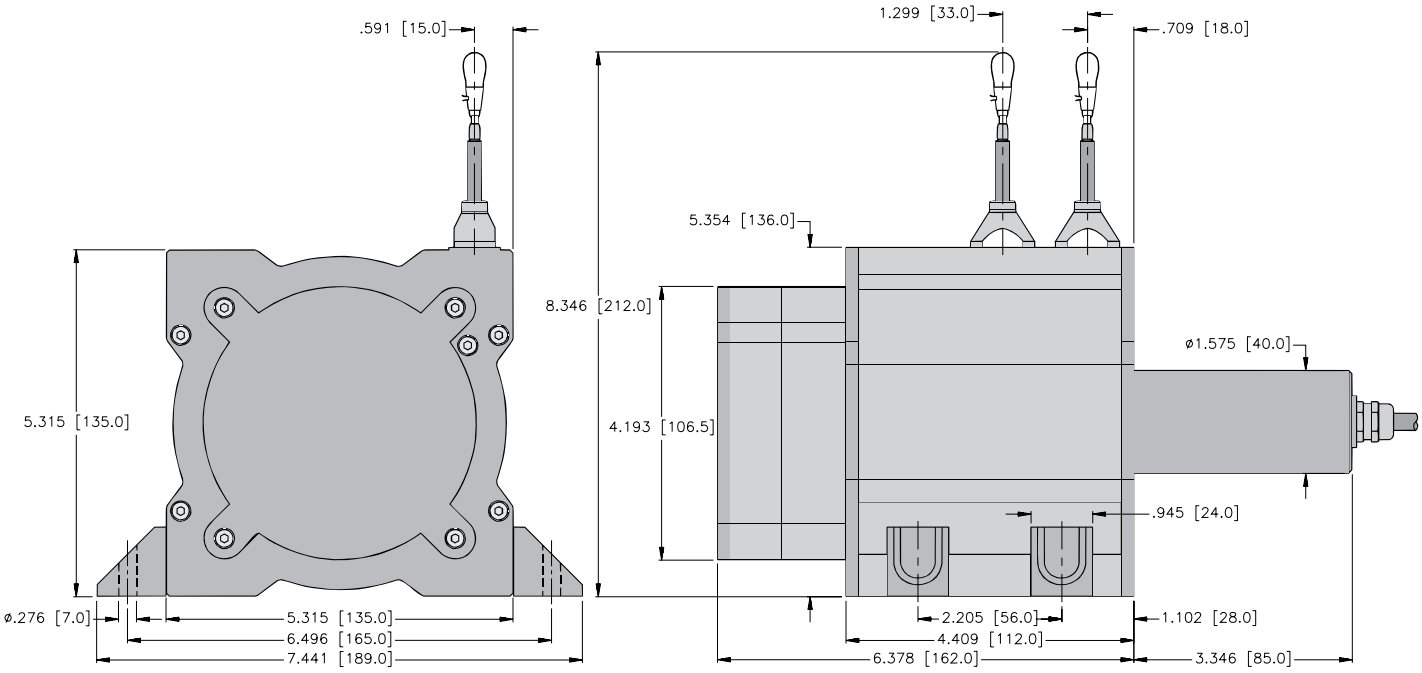
Description:
Guide pulley

Accessories:

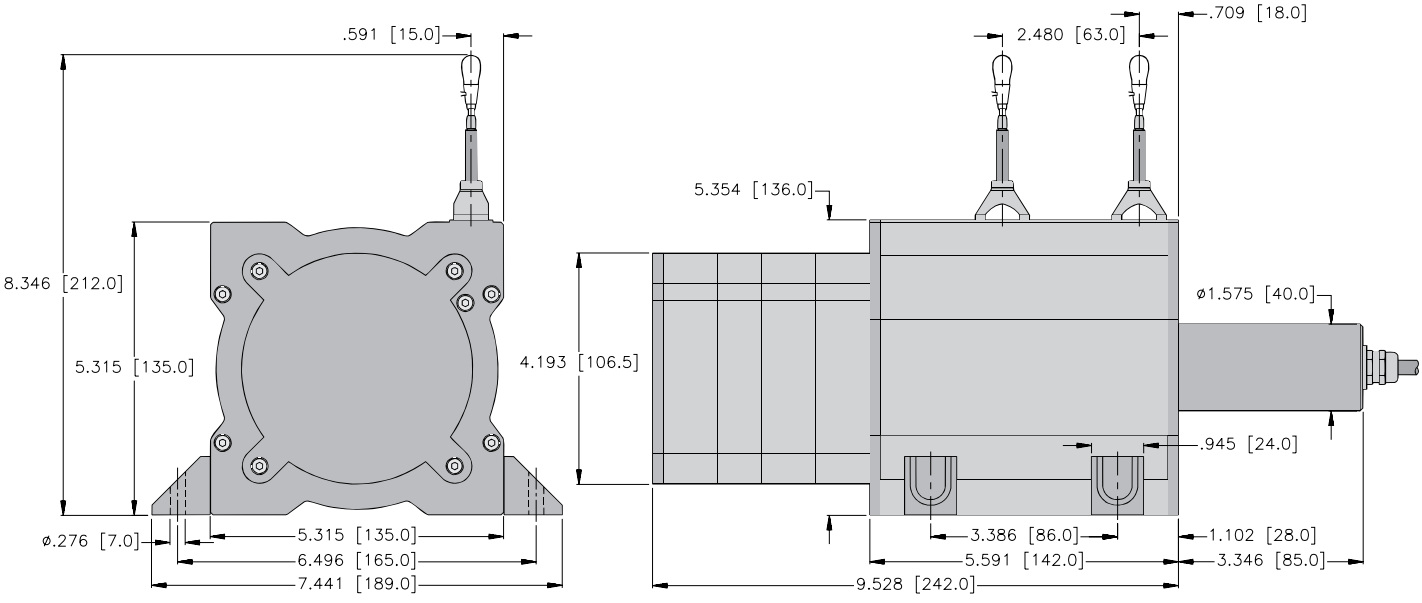
- See page J1, Connectivity, for cables and connectors

Draw wire encoder D135

Dimensions: D135 with analog sensor, measuring range 10,000-20,000 mm



Dimensions: D135 with analog sensor, measuring range 25,000-40,000 mm



Mini draw wire encoder, analog output

Magnetic field proof

Rugged
- Reinforced plastic housing.
- Stainless steel cable.

Compact
- Measuring length up to 2,000 mm.
- 40 x 40 x 58 mm housing.
- Length wire

Versatile
- Simple processing of analog signal by means of a digital panel meter.
- Voltage or current output.
- Radial or axial cable exit.
- Analog outputs4-20 mA, 0-10 VDC or resistance.

Mechanical characteristics of the draw-wire encoder:

Measuring range:	up to 2,000 mm
Absolute accuracy:	±0.35 % for the whole measuring range
Repetition accuracy:	±0.15 mm per direction of travel
Resolution:	analog output signal 1 m ⇒ 0-10 VDC 2 m ⇒ 0-10 VDC 1 m ⇒ 4-20 mA 2 m ⇒4-20 mA 1 m ⇒ 0-10 kΩ 2 m ⇒ 0-10 kΩ
Traversing speed:	max. 2.62 ft/s (800 mm/s)
Required force:	approx. 2.25 lbs (10 N) (on wire)
Material:	Housing: reinforced plastic, Wire: stainless steel Ø 0.45 mm, plastic coated
Weight:	approx. 0.463 lbs (0.210 kg)

Electrical characteristics:

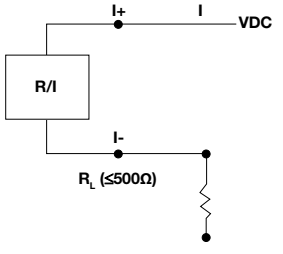
Analog output:	0-10 V	4-20 mA	Potentiometer 10 kΩ
Supply voltage:	15-28 VDC	15-28 VDC	-
Temperature range:	+32 to +122°F (0 to +50°C)	+32 to +122°F (0 to +50°C)	+32 to +122°F (0 to +50°C)
Load:	max 500 Ω	max 500 Ω	-
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3			

Part Number	Description
TD5.3501.A111.0000	1 meter range, 4-20 mA
TD5.3501.A221.0000	1 meter range, 0-10 VDC
TD5.3501.A331.0000	1 meter range, Pot. 10 kΩ
TD5.3502.A111.0000	2 meter range, 4-20 mA
TD5.3502.A221.0000	2 meter range, 0-10 VDC
TD5.3502.A331.0000	2 meter range, Pot. 10 kΩ

Color	WH	BN	GN
4-20 mA	*-I	+I	N/C
0-10 VDC	GND	15-28 VDC	V_{out}
Pot. 10 kΩ	Pe, end position	Pe, start position	Wiper contact

* Loop powered

Electrical connections (4-20 mA):



Mini draw wire encoder, analog output

Part number key: TD5 with analog sensor:

TD5.350X.AXX1

Mini draw wire

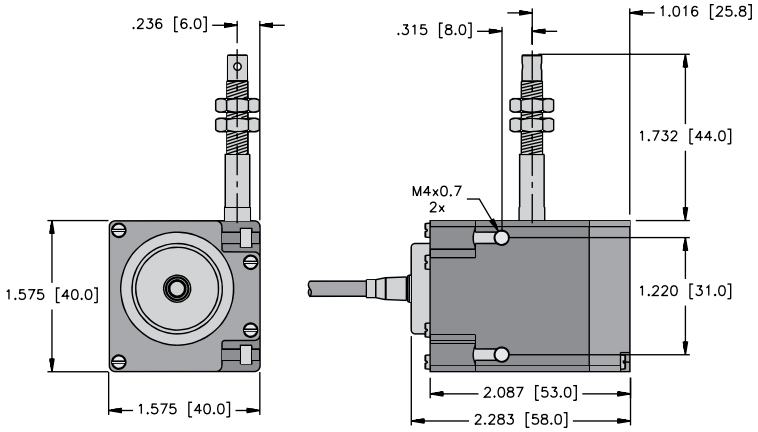
Wire type/length

3501 = 1 m steel wire
3502 = 2 m steel wire

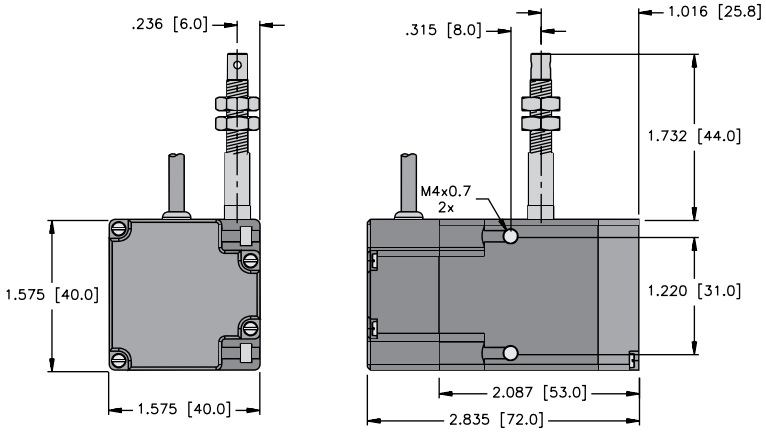
Supply voltage, Output

11 = 15-28 VDC, analog output 4-20 mA
22 = 15-28 VDC, analog output 0-10 VDC
33 = potentiometer output 10 kΩ

Dimensions: TD5.3501



Dimensions: TD5.3502



Draw wire encoder accessories

Part Number:
8.0000.7000.0033

Description:
2 meter steel wire extension

Part Number:
8.0000.7000.0034

Description:
5 meter steel wire extension

Part Number:
8.0000.7000.0032

Description:
2 meter para wire extension

Part Number:
8.0000.7000.0035

Description:
10 meter steel wire extension

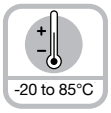
Part Number:
8.0000.7000.0031

Description:
Guide pulley

Accessories:

- See page J1, Connectivity, for cables and connectors

Mini draw wire encoder, incremental



Temperature


Magnetic field proof


Short-circuit proof


Reverse polarity protection

Rugged
- Reinforced plastic housing.
- Stainless steel cable.

Compact
- Measuring length up to 2,000 mm.
- 40 x 40 x 58 mm housing.
- Length wire

Versatile
- Incremental outputs.

Mechanical characteristics of the draw-wire encoder:

Measuring range:	up to 2,000 mm
Absolute accuracy:	±0.35 % for the whole measuring range
Repetition accuracy:	±0.15 mm per direction of travel
Resolution (incremental):	0.1 mm (standard encoder) with 1,000 ppr.
Traversing speed:	max. 2.62 ft/s (800 mm/s)
Required force:	approx. 1.25 lbs (10 N) (on wire)
Material:	Housing: reinforced plastic, Wire: stainless steel ø 0.45 mm, plastic coated
Weight:	approx. 0.463 lbs (0.210 kg)

Description of the incremental encoder (connected on load side)
- Compensation for temperature and aging
- Short-circuit protected outputs
- Reverse polarity protected power-supply input
- Push-pull output

Mechanical characteristics:

Protection acc. to EN 60529:	IP64 from housing side
Working temperature:	-4 to +185°F (-20 to +85°C)
Operating temperature:	-4 to +194°F (-20 to +90°C)
Shock resistance acc. to DIN-IEC 68-2-27:	100 g (1,000 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-27:	10 g (100 m/s²), 55-2,000 Hz

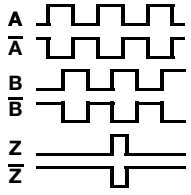
Part Number	Description
TD5.2501.2421.1000	1 meter range, 5-24 VDC
TD5.2102.2421.1000	2 meter range, 5-24 VDC

Electrical characteristics:

Output circuits:	Push-pull	Push-pull
Supply voltage:	5-24 VDC	8-30 VDC
Current consumption (without load):	max. 50 mA	max. 50 mA
Permitted load per channel:	max. 50 mA	max. 50 mA
Pulse rate:	max. 160 kHz	max. 160 kHz
Switching level high:	min. +V – 2.5 V	min. +V – 3 V
Switching level low:	max. 0.5 V	max. 2.5 V
Rise time tr:	max. 1 µs	max. 1 µs
Fall time tf:	max. 1 µs	max. 1 µs
Short-circuit protected outputs:	yes	yes
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3		

Electrical connections:

Color:	Signal:
WH	Common
BN	+V
GN	A
YE	$\overline{A}$
GY	B
PK	$\overline{B}$
BU	Z
RD	$\overline{Z}$



* Index present every 100 mm every linear travel.

Mini draw wire encoder, incremental

Part number key: TD5 incremental

TD5.2XXX.24XX.1000

Mini draw wire

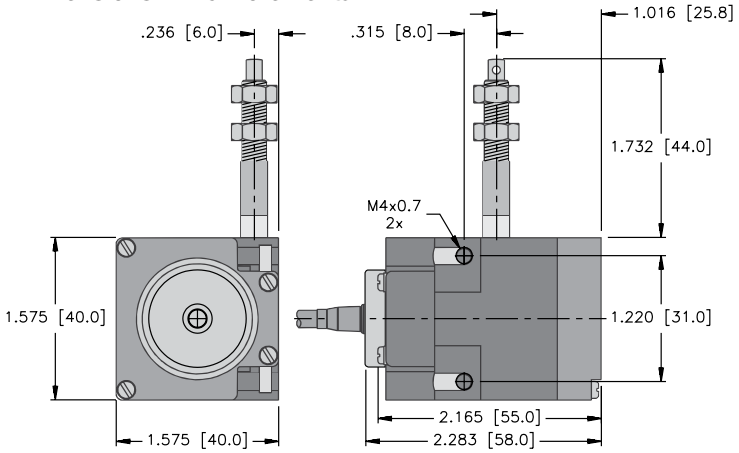
Wire type/length

501 = 1 m steel wire
502 = 2 m steel wire

Supply voltage, Output

21 = 5-24 VDC, push-pull with inverted signal
41 = 8-30 VDC push-pull with inverted signal

Dimensions: TD5 incremental



Draw wire encoder accessories

Part Number:
8.0000.7000.0033

Description:
2 meter steel wire extension

Part Number:
8.0000.7000.0034

Description:
5 meter steel wire extension

Part Number:
8.0000.7000.0032

Description:
2 meter para wire extension

Part Number:
8.0000.7000.0035

Description:
10 meter steel wire extension

Part Number:
8.0000.7000.0031

Description:
Guide pulley

Accessories:

- See page J1, Connectivity, for cables and connectors

Standard draw wire encoder

Description
- Direct length measurement.
- High repeatability.

RoHS compliant

Versatile
- Easy assembly.
- No additional guidance system.
- Wire guidance possible using guide pulleys.
- Multiple encoder outputs available from 58XX type family.

Compact
- Long measuring lengths up to 6,000 mm.

Mechanical characteristics of the draw-wire encoder:

Measuring range:	up to 6,000 mm
Repeatability:	~ 0.05 mm (if position is always approached from same direction)
Resolution:	0.1 mm (standard encoder) with 2,000 ppr.
Extension length 200 mm:	~ 1 encoder revolution
Travel speed:	max. 9.84 ft/s (3,000 mm/s)
Required pull on spring:	min. 1.12 lbs (5 N) (on wire)
Wire diameter:	para wire nylon 2.6 m: 1.05 mm, steel wire 6 m: 0.54mm
Weight:	approx. 2.32 lbs (1.050 kg)

Note:
If the maximum extension length is exceeded, the wire and transducer will be damaged.

Part number key: Standard draw wire encoder

TD8.1XXX.XXXX.XXXX

Draw wire actuator

Wire

106 = steel wire, 6 m
2A1 = para wire nylon, 2.8 m

Encoder*

00 = 5800
04 = 5804
05 = 5805
10 = 5810
22 = 5000
60 = 5860
62 = 5862

Encoder information

Resolution/pulses/protocol,
data depends on the chosen encoder*

Type of connection
data depends on the chosen encoder*

Output circuit
data depends on the chosen encoder*

*The type of encoder and the version are specified here. The first two numbers describe the type of encoder, e.g. 5800.

Further characteristics of the encoder may be found in the description of the encoder and are identical to the encoder part number key.

Order example:
Draw wire actuator with 2.8 m para wire. The encoder should be a 5800 with RS422 (with inverting) and 5 V voltage supply. The connection should be 1 m axial cable (PVC). The pulse rate will be 2048.

Part number key:

TD8.12A1.0041.2048

Pulse rate 2048
Encoder 5800
Specifications for the draw wire actuator

Accessories:
- See page J1, Connectivity, for cables and connectors

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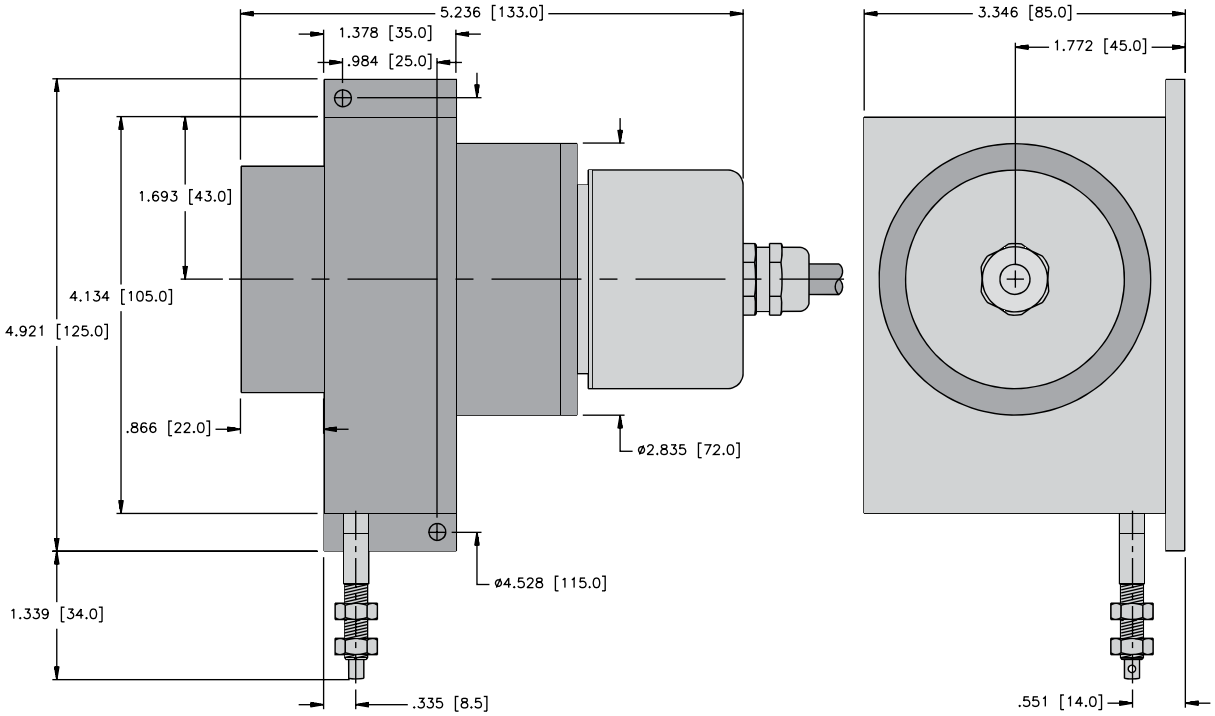
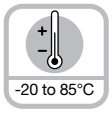
Standard draw wire encoder

Dimensions: Standard draw wire encoder



Mini measurement system type T5.2400


High rotational speed



Temperature


Magnetic field proof


Short-circuit proof


Reverse polarity protection

Rugged
- Wide temperature range -4 to +185°F (-20 to +85°C)
- Robust strain relief on cable outlet thanks to multiple clamping
- Highly flexible cable withstands constant flexing from +32 to +158°F (0 to 70°C)

Compact
- 74 x 50 x 52 mm
- Easy to install, one unit.

Versatile
- Low power consumption despite high scanning rate
- Short-circuit proof
- Temperature compensation
- Broad input voltage range (8-30 V)
- Fix, connect, ready to go

Mechanical characteristics:

Measuring wheel circumference:	100 mm
Resolution:	0.1 mm
Radial cable outlet:	2 m PVC cable
Speed max.:	2000 / min
Protection:	IP64

Standard wiring:

Output:	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Cable:	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Electrical characteristics:

Output circuit:	Push-pull (7272)[1]
Supply voltage:	8-30 VDC
Power consumption (no load):	max. 50 mA
Permissible load/channel:	max. 50 mA
Pulse frequency:	max. 160 kHz
Signal level high:	min. +V = -3 V
Signal level low:	max. 0.5 V
Rise time t_r:	max. 1 µs
Fall time t_f:	max. 1 µs
Short circuit proof outputs:	yes
UL certified:	
Conforms to CE requirements acc. to EN 61000-6-1, EN 61000-6-4 and EN 61000-6-3	
RoHS compliant acc. to EU guideline 2002/95/EG	

[1] Max. recommended cable length 30 m

Part number key: 2400 shaft version

T5.2400.0040.XXXX.5045

Type

Output and voltage supply

0040 = 8-30 VDC, push-pull (with inverted signals) with radial cable (2 m PVC cable Ø 4.5)

Mini measurement kit

Pulse rate

100, 200, 1000
Other pulse rates on request

Resolution = 100 mm circumference wheel is divided by pulse count to determine resoultion in mm

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TURCK Industrial Automation

Linear magnetic displacement sensors WIM Q25L

TURCK's WIM Q25L magnetically actuated linear displacement sensors achieve measuring ranges of up to 200 mm. The sensors are based on the Hall principle, and feature high accuracy, linearity and short blind zones. The WIM Q25L sensor family is suited for applications that require precise signal transmission over long measuring distances. Typical applications include pneumatic pump units, slides, blanking or moulding systems.

Straightforward mounting and installation is easier and more reliable with TURCK's broad line of accessories.

WIM Q25L Series Specifications:

Repeat accuracy:	≤ 0.1 % of measuring range
Linearity deviation:	≤ 1 % of full scale
Temperature drift:	≤ ± 0.006 %/K
Ambient temperature:	-13 to +158°F (-25 to +70°C)
Update time:	5 ms
Operating voltage:	15-30 VDC
Residual ripple:	≤ 10 % Uss
No-load current $I_{0:}$	≤ 15 mA
Rated insulation voltage:	≤ 0.5 kV
Short-circuit protection:	yes
Wire breakage/Reverse polarity protection:	yes/complete
Output function:	4-wire, analog output
Voltage output:	0-10 V
Current output:	4-20 mA
Load resistance voltage output:	≥ 4.7 kΩ
Load resistance current output:	≤ 0.4 kΩ
Output recovery time:	≥ 15 ms
Housing:	rectangular, WIM Q25L
Housing material:	metal, aluminium
Material active face:	plastic, PC-GF20
Vibration resistance:	55 Hz (1 mm)
Shock resistance:	30 g (11 ms)
Degree of protection:	IP67
LED:	green: voltage supply yellow flashing: no positioning magnet within the measuring range after power reset positioning magnet within yellow: the measuring range

Accuracy:
With a repeatability of 0.1% of the measuring range, the WIM Q25L series is the right solution for applications that require high precision.

EMC immunity
The magnetic linear displacement sensors go beyond the strict demands of the currently valid standard EN 609947-5-2, and are compliant with the new draft version in terms of the higher demands (for tests compliant to EN 61000-4-6 "conducted interference").

Small blind zones
Even in applications with limited space conditions, the WIM Q25L is the perfect solution. Due to smaller blind zones of 41 mm in total, position detection is possible nearly up to the complete housing length.

Excellent linearity
The output signal (0-10 V, 4-20 mA) is linearized and independent of the magnet orientation (N/S).

Part number key: WIM Q25L series

WIM [ ] - Q 25L [ ] - LIU 5 X2 - H1141

Sensor family
WIM = linear magnetic

Measurement span
100 = 100 mm
125 = 125 mm
160 = 160 mm
200 = 200 mm

Housing style
Q = profile

Housing height
25L = 25 mm

Housing length (L*)
141 = 141 mm (100 mm span only)
166 = 166 mm (125 mm span only)
201 = 201 mm (160 mm span only)
241 = 241 mm (200 mm span only)

Output configuration
LIU = linear analog current or voltage

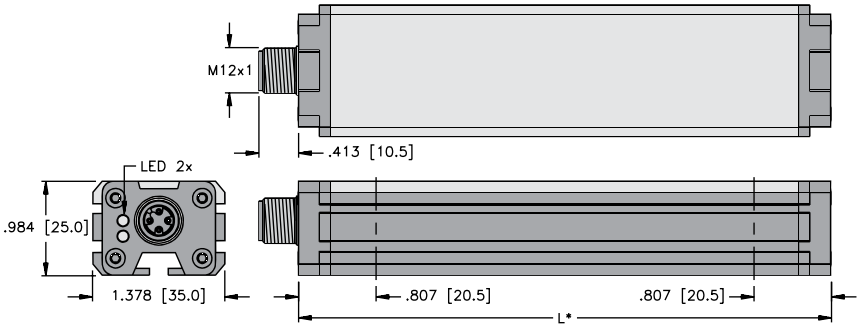
5 = 4-20 mA, 0-10 V

Number of LEDs
X2 = 2 LEDs

Connection type
H1141 = M12 ***eurofast***® 4-pin connector

Linear magnetic displacement sensors WIM Q25L

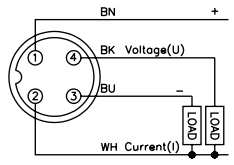
Dimensions: WIM Q25L series



L* = Housing length, see part number key for available lengths..

Wiring Diagram:

4-pin ***eurofast*** ® Connection

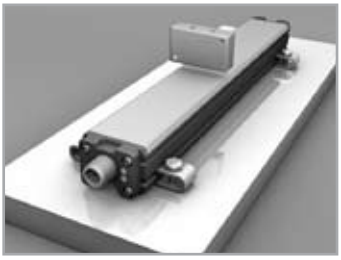


Mating Cordset:
RK 4.4T-*/S618

* Length in meters.

Mounting options for WIM Q25L

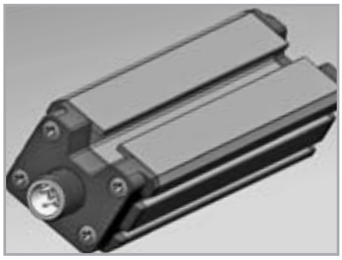
MB-Q21 brackets are used to mount the sensor on a flat surface.



MB1-Q25 brackets and **MN-C** sliding blocks can be used to mount the WIM Q25L with the yellow sensing face towards a pneumatic cylinder with parallel T grooves.

Pneumatic cylinder mounting brackets (**MB2.1-Q25** or **MB2.2-Q25**) can be used to mount the WIM Q25 on other styles of pneumatic cylinders.

Sliding blocks (**MN-M4-Q25** or **MN-M5-Q25**) fit in the backside groove. The sliding block is threaded so that you can thread in a bolt to mount the sensor to a bracket. These can also be used with the **MB3-Q25** (not shown) to mount the sensor at a right angle to a flat surface if needed.

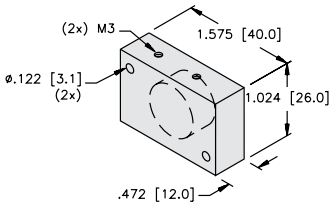


TURCK
Industrial Automation

Linear magnetic displacement sensors WIM Q25L accessories

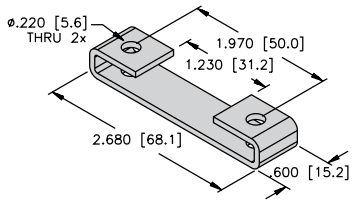
Floating positioning magnet

DM-Q12 [M6900367]



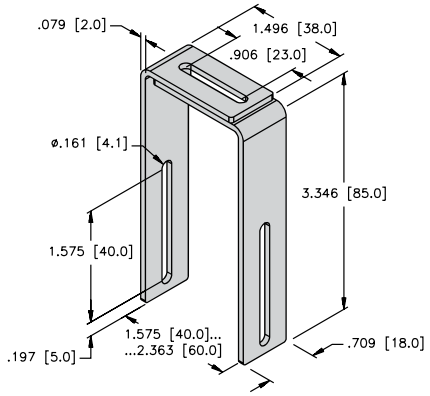
Standard lateral mounting bracket

MB-Q21 [A5700]



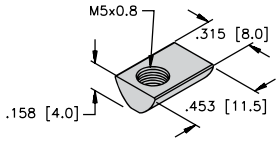
Pneumatic cylinder mounting bracket

MB2.1-Q25 [M6901027]



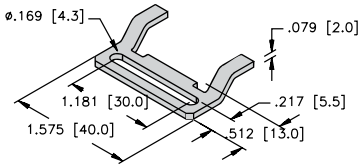
Sliding block for backside sensor profile

MN-M5-Q25 [M6901039]



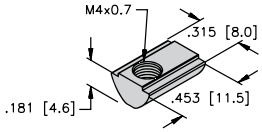
Mounting clip

MB1-Q25 [6901026]



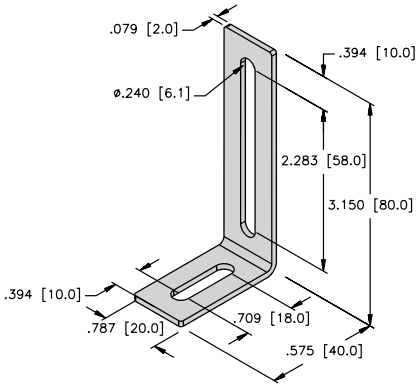
Sliding block for backside sensor profile

MN-M4-Q25 [M6901025]



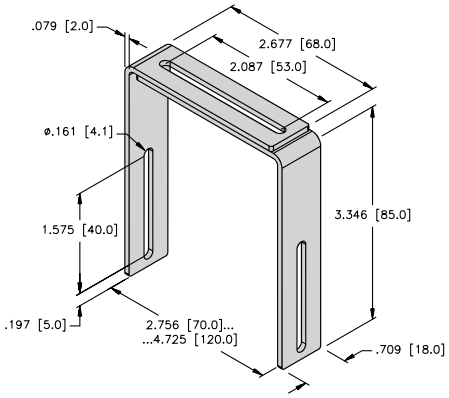
Universal bracket for lateral mounting

MB3-Q25 [M6901029]



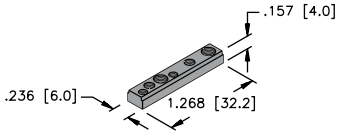
Pneumatic cylinder mounting bracket

MB2.2-Q25 [M6901028]



Sliding block for T-groove cylinders

MN-C [M6901024]



Glossary of terms

Absolute Sensing: Position is accurately known at power ON without the need for a reference or home position.

Accuracy: The difference between the target point and the point actually indicated by the sensor with relation to a fixed reference.

Active Stroke: The area of the sensor between the Null and Dead Zones where the magnet assembly can be accurately sensed.

Dead Zone: An area at the end of the sensor opposite the connector where the magnet cannot be accurately sensed. For Q21 style, the Dead Zone is the last 1.5 inches of the extrusion. For rod styles, the Dead Zone is the last 2.5 inches of the rod (see dimensional drawings).

Hysteresis: The difference of the measured value when approaching a defined point from opposite directions.

Incremental Sensing: A relative position feedback device whose signal is always referenced to the zero position. The LDT produces a digital square wave pulse train that is fed into an up/down counter chip or clock to derive position.

Non-Contact Sensing: The moving fixture to be measured is not mechanically connected to the stationary sensor electronics. The coupling for the ***EZ-track*** line of linear displacement transducers is done with a magnetic field that causes no wear on the sensor parts.

Non-Linearity: The distance the indicated position of the magnet along the stroke varies from the actual physical position. The non-linearity of a sensor is caused by minute differences in physical properties of the waveguide and is measured as a percentage of full stroke length.

Non-Volatile: Position is held in memory and will not be lost on power down.

Null Zone: An area at the connector end of the sensor where the magnet cannot be accurately sensed. For profile styles, the Null Zone is the first 3 inches of the extrusion. For rod styles, the Null Zone is the first 2 inches of the rod (see dimensional drawings).

Quadrature Cycle Output Frequency: The fixed frequency at which the pulse rate is transmitted out of the probe.

Repeatability: The difference in the indicated position of a single point when that point is repeatedly approached from the same direction under the same ambient conditions.

Resolution: The smallest incremental change in position that can be detected and indicated as an output.

Span Point: The end point of the analog measuring distance at which the output signal equals the greatest value of the analog scale. The Span Point on the analog TURCK ***EZ-track*** sensors is adjustable.

Volatile: Position held in memory that is lost on power down.

Zero Point: The beginning point of the analog measuring distance at which the output signal equals the lowest value of the analog scale. The Zero Point is also used as the reference position for the incremental scale used in quadrature output probes. The Zero Point on the TURCK ***EZ-track*** sensors is adjustable.

General overview

TURCK's ***EZ-track*** line of linear displacement transducers (LDTs) is the latest offering in TURCK's continuous effort to change the shape of sensing. Based on magnetostrictive technology, the ***EZ-track*** line will reliably operate in the harsh conditions for which TURCK products are known to withstand. With its unique features, IP67 or optional IP68 environmental rating, easy mounting and absolute positioning, the ***EZ-track*** line will be sure to fit into your tough linear sensing applications.

Features and Benefits:

Non-Contact Sensing Reduces Wear, Breakage, Downtime and Ultimately Cost
TURCK's ***EZ-track*** line is a family of magnetostrictive LDTs. These non-contact devices detect the position of an external magnet along the active stroke of the sensor without causing any wear on the sensor parts. Because there are no parts to wear or break, the sensors can offer better performance over a longer life than competing technologies. ***EZ-track*** LDTs also offer an alternative when a continuous, absolute reading is necessary in the application.

The absolute reading allows the sensor to accurately determine the position at power ON without the need to set up a home position. With this technology, repeatability of up to +/- 0.001% of full stroke can be achieved. See specifications for detailed information on each product family.

Fast Connections
As a leading supplier of connectivity products, TURCK delivers the complete package. Standard, shielded 4 and 5-pin M12 ***eurofast*** ® cables are always available from TURCK for quick connection to ***EZ-track***.

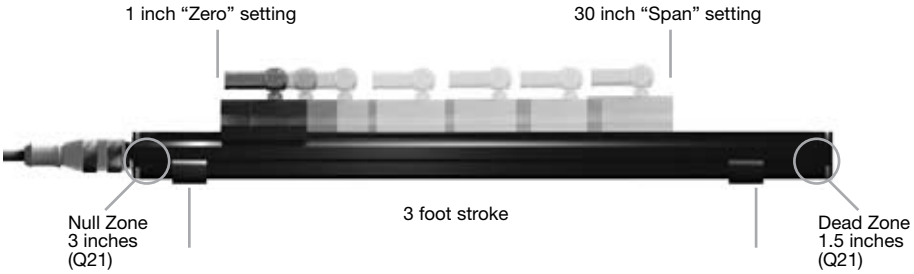
IP67 / IP68 (optional)
The ***EZ-track*** line will stand up in harsh environments, reducing potential downtime due to environmental conditions. Standard units have an environmental rating of IP67, however IP68 versions are also available. Consult factory for details.

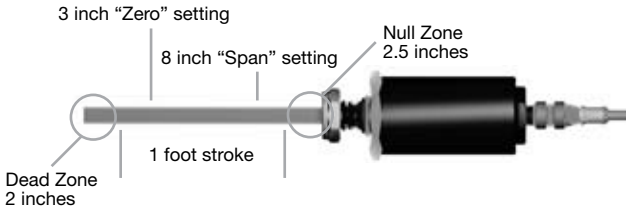
General overview

Programable Stroke:
Programmable zero and span allow standard sensors to have customized stroke lengths, eliminating the need to stock numerous models.

EZ-track's analog outputs are not limited to the entire length of the sensor. The zero and span settings may be programmed anywhere along the active stroke. By utilizing this feature, the user can reduce stock levels for various length LDTs used in the plant by replacing them with standard sizes and programming to the specific applications. The **Q21** profile style transducers are available in stroke lengths up to 180 inches. The **R10** rod style transducer is available in stroke lengths from 2 to 168 inches.

To Program the *EZ-track* Sensor:
Short pin 2 to pin 3 to obtain "Zero" setting, short pin 2 to pin 1 to obtain "Span" setting, or use TURCK's RP-Q21 Programmer.

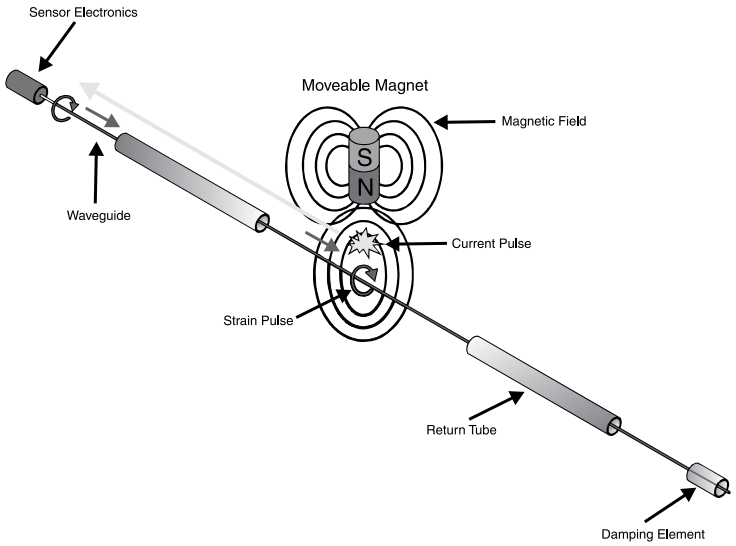




Reliable Accurate Technology:
EZ-track LDTs profile style probes use magnetostrictive technology by applying a mechanical strain pulse to a magnetostrictive waveguide that runs the length of the sensor. When the strain pulse encounters a magnetic field produced by the slide or floating magnet assembly, a current pulse is produced that is picked up by the electronic circuitry. A high speed timer measures the time difference between the applied strain pulse and the return of the induced current pulse. This time, proportional to position, is compared to the "zero" and "span" positions established during the calibration process to scale the output.

Once the position has been scaled accordingly, it is converted to a signal in the form of an analog (voltage or current) output, quadrature pulse output or digital (PWM or start/stop) outputs.

In the **Q21R** and rod style (**R10**) probes, the magnetostrictive effect is used in the opposite manner, in that a current pulse is induced and a strain pulse returns to the sensor electronics. Utilizing the magnetostrictive effect gives you highly accurate, non-contact absolute position sensing with no wear on the sensing element.



Applications

- Hydraulic Cylinders
- Injection / Blow Molding
- Palletizers
- Foundries
- Packaging Machines
- Die Casting
- Medical Systems
- X-Y Axis Positioning
- Rolling Mills
- Stamping Presses
- Elevators
- Extruding Equipment
- Valve / Actuator Position
- Material Handling
- Laminating / Gluing Machines
- Saw Mills / Lumber Equipment
- Cutting / Slitting Machines
- Amusement Park Rides
- Flight Simulators
- Side Guides
- Leveling Machines

Linear Measurement Technology
EZ-track®

Analog profile series

Low Profile Extrusion Housing:

The Q21 series is housed in low profile, environmentally sealed, anodized aluminum housings. The electronics and the sensing element are incorporated into a housing that is less than 1 inch tall without the need for a can or head on the sensor to house the electronics (typical competitive devices are 2.5 times larger). Reducing the profile of the sensor lessens mounting issues and eliminates the need for special mounting fixtures, allowing the Q21 series to fit into applications where others are too bulky.

Enhanced Resolution Analog Profile Series (Q21R/Q35R) Specifications:

Output:	Current: 20-4 mA 4-20 mA	Voltage: 0-10 VDC 10-0 VDC
Load Impedance:	≤ (voltage in - 4) ÷ 0.02 Ω (example: 10 VDC £300 Ω)	≥1000 Ω
Span:	5 to 180 in. (Q35 style maximum length 36 in.)	
Repeatability:	+/-0.006% of full span or +/-0.002 in., whichever is greater	
Resolution:	0.001 in. internal (For span lengths <65"); 16 bit (For lengths >65)	
Operating Temperature:	-40 to +158°F (-40 to +70°C)	
Null Zone:	3.00 in.	
Dead Zone:	2.00 in.	
Operating Voltage:	13.5-30 VDC	
Current Consumption:	120 mA at 15 VDC, 2.5 watts maximum	
Response Time:	≤ 50 in. 1 ms 50 to 100 in 2 ms 101 to 150 in 3 ms 151 to 180 in 4 ms	
LED:	Green = Power is applied and magnet is present in the programmed range Red = Fault, magnet is in the Null Zone, Dead Zone or lost Yellow = Magnet is out of the active programmed range, but still within the active	
Protection Rating:	IP67	
Agency Approval:	CE	

Enhanced Resolution Analog Profile Series (Q21R/Q35R) Specifications:

Output:	Current: 20-4 mA 4-20 mA	Voltage: +5 to -5 VDC 0-10 VDC -5 to +5 VDC 10-0 VDC 0 to +5 VDC -10 to +10 VDC +5 to 0 VDC +10 to -10 VDC
Load Impedance:	≤ (voltage in - 4) ÷ 0.02 Ω (example: 10 VDC ≤ 300 Ω)	≥1000 Ω
Span:	4 to 180 in. (Q35 span maximum length 36 in.)	
Repeatability:	+/-0.01% of full span or +/-0.014 in., whichever is greater	
Resolution:	0.014 in. for stroke lengths less than 60 in.; For lengths over 60 in.: 12 bits	
Operating Temperature:	-40 to +158°F (-40 to +70°C)	
Null Zone:	3.00 in.	
Dead Zone:	1.50 in.	
Operating Voltage:	10-30 VDC	
Current Consumption:	10 mA (maximum)	
Response Time:	50 in. or less: 1 ms updates with 5 ms settling time 50 in. or greater: 2 ms updates with 4 ms settling time	
LED:	Green = power is applied and magnet is present in the programmed range Red = fault, magnet is in the null zone, dead zone or lost Yellow = magnet is out of the active programmed range, but still within the active	
Protection Rating:	IP67	
Agency Approval:	CE	

Diagnostic LED:
The ***EZ-track*** Series utilizes a diagnostic LED that enables the operator to understand the state of the sensor dependent upon the position of the target magnet.

The LED flashes to indicate it is in AGC mode (Q21 and Q35 series). This feature simplifies programming and troubleshooting, effectively reducing setup and maintenance time.

Various Analog Outputs Available Profile Style:
The Q21 and Q35 series may be ordered in a variety of outputs.

Although sensors may be ordered with any of the above outputs, the units may easily be changed in the field to reverse the analog signal. Thus, one model can be used for two applications by programming the "zero" and "span" appropriately.

Automatic Gain Control:
The Automatic Gain Control (AGC) feature allows the ***EZ-track*** to sense a magnet other than the standard slide magnet and adjust to the magnetic field strength accordingly. With the ability to sense a standard floating magnet up to 3/8 inch away, the user has greater mounting flexibility for various applications.

FM Approved Installation (Class I, Division 2):
The ***EZ-track*** Q21 unit can be ordered for use in a Class I, Division 2 environment. The unit utilizes a Euro-G Fast-Lock.

TURCK Industrial Automation

Analog profile series

Part number key: Analog profile series

LT	12	E	-	Q	21	R	-	LI	0	X3	-	H1141	/S16xx

Sensor family
LT = linear transducer

Measurement span

Units of measurement
E = inches

Housing style
Q = profile

Housing height
21 = 21 mm
35 = 35 mm

Resolution
(blank) = standard resolution
R = enhanced resolution

Output configuration
LU = voltage
LI = current

Output type

Voltage	Current
0 = 0-10 V	0 = 4-20 mA
1 = 10-0 V	1 = 20-4 mA
2 = -10 to 10 V*	
3 = 10 to -10 V*	
4 = 0-5 V*	
5 = 5-0 V*	
6 = -5 to 5 V*	
7 = -5 to 5 V*	

* Q21 / Q35 versions only

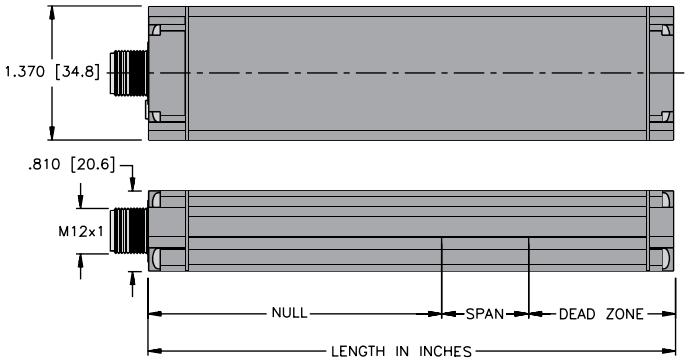
Number of LEDs
X3 = 3 way diagnostic LED

Connection type
H1141 = M12 ***eurofast®*** 4-pin connector (standard res.)
H1151 = M12 ***eurofast*** 5-pin connector (enhanced res.)

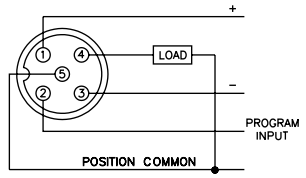
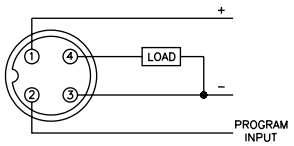
Unit rating
(blank) = IP67
S1661 = IP68

Note: In addition to the LDT, a typical system includes a magnet, mounting feet and cable (all sold separately).

Dimensions: Q21 analog profile series

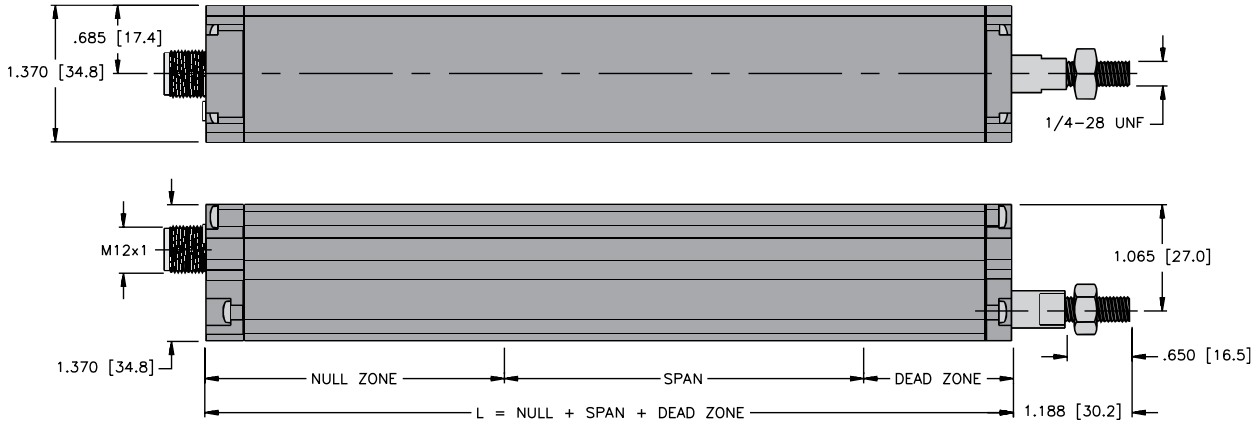


Wiring Diagrams: Q21/Q35

5-pin ***eurofast*** Connection	4-pin ***eurofast*** Connection
	
Mating Cordset: **RK 4.5T-*/S618**	Mating Cordset: **RK 4.4T-*/S618**

* Length in meters.

Dimensions: Q35 analog profile series



Quadrature profile series

Direct Quadrature Output:
Directly interface to the PLC input card and reduce installation time, vendors and cost. The Q21-DQ provides A and B channel quadrature output signals that are proportional to the position of the magnet assembly along the length of the probe, and output directly from the transducer to the controller. The quadrature output makes it possible to directly interface to virtually any incremental encoder input or counter card, eliminating costly absolute encoder converters and special PLC interface modules.

An index channel (Z) is also provided and its position may be set by the user at any position along the active system. The A, B and Z channels are differential outputs: the connection for each output consists of two signal wires. These are typically described as the "+" and "-" signals. Differential signals are much less prone to interference caused by electrical noise or ground loops, often found in single ended connections.

Quadrature Profile Series (Q21-DQ/Q35-DQ) Specifications:

Output:	Quadrature, A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$
Span:	5 to 180 inches (Q35 maximum length 36 inches)
Repeatability:	+/-0.001% of full span or +/- 0.001 inches, whichever is greater
Resolution:	0.001 inches internal (1000 pulses per inch)
Operating Temperature:	-4 to +158°F (-20 to +70°C)
Null Zone:	3.00 in.
Dead Zone:	2.00 in.
Operating Voltage:	13.5-30 VDC
Current Consumption:	3 watts maximum (1 watt typical)
Response Time:	£50 in . 1 ms 50 to 100 in 2 ms 101 to 150 in 3 ms 151 to 180 in 4 ms
Inputs:	Option N NPN (used with sourcing outputs) Option P PNP (used with sinking outputs) Option T TTL Option R 5 V differential Option L 10 to 30 VDC, Volt = Vin-1 Volt
Output Frequency:	10 kHz - 1 MHz
Nonlinearity:	+/- 0.05% of full span
LED:	Green = Power is applied and magnet is present in the programmed range Red = Fault, magnet is in the Null Zone, Dead Zone or lost
Protection Rating:	IP67
Agency Approval:	CE

Replace Incremental Output Devices:
The Q21-DQ may be used in certain applications to replace incremental rotary and linear encoders. The quadrature output may be used in applications requiring 0.001 inch resolution and repeatability.

Velocity Feedback:
The ***EZ-track*** quadrature produces pulses that are sent to the controller in packets at a fixed frequency. The period of the pulses does not change with magnet velocity. Therefore, velocity can not be determined from the pulse packets unless the controller can interpolate velocity from position over time. If your application requires a velocity feedback, please consider the Linear Encoder on pages M4-M5 or consult factory.

Incremental Output, Absolute Functionality:
The Q21-DQ allows you to use an incremental output, while taking advantage of an absolute sensing technology. The Burst Input on the transducer triggers a data transfer of all incremental position data relative to the transducer's zero position. This can be used to achieve absolute position updates when power is restored to the system or anytime an update is needed to re-zero or home the machine.

Programmable Zero Point:
The Zero Input allows you to set the probes reference position at any point along the active span. The probe will output an increasing or decreasing signal based on the direction the magnet is moving in relation to the established zero point. See Quadrature Part Number Key to select storage mode.

Volatile Storage:
The zero point will be kept until a new zero pulse is sent or until the probe loses power. The zero point can be programmed an infinite number of times.

Non-Volatile Storage:
The probe will store the zero position even in the event of a power failure. The zero point can be set 100,000 times.

Transducer Inputs:
The Burst and Zero Inputs are single ended connections: the connection for each input consists of only one wire. The Q21-DQ is available with either +24 VDC level signal or TTL level thresholds. Additionally, the 24 VDC may be specified as either sinking or sourcing relative to the probe's input.

Quadrature Output Resolution and Speed:
The internal resolution of the Q21-DQ transducer is 0.001 inches. This would be represented to the encoder input device by specifying an output resolution of 1,000 cycles per inch (CPI).

Frequency or Pulse Rate:
For a typical incremental encoder output, the resolution of the encoder and the speed of travel govern the frequency and pulse width of the output pulses. The output pulse rate from the ***EZ-track*** transducer is fixed and controlled internally. This output frequency is user specified (10 kHz to 1MHz) so that it does not exceed the maximum input rate of the counter card. If the controller's maximum input frequency falls between two available frequencies, choose the lower frequency.

Output Drivers:
The Q21-DQ uses an OL7272 line driver and may be configured for either a TTL level output or a 10-30 VDC level output. Option R has a 5 VDC TTL level output regardless of input power. Option L has an output of 1 volt less than the probe's input voltage and should be used when driving input cards that are not TTL compatible.

TURCK
Industrial Automation

Quadrature profile series

Part number key: Quadrature profile series

LT	12	E	-	Q	21	-	DQ	R	A	N	N	X2	-	H11121

Sensor family
LT = linear transducer

Measurement span

Units of measurement
E = inches

Housing style
Q = profile

Housing height
21 = 21 mm
35 = 35 mm

Output configuration
DQ = quadrature

Output type
Quadrature
R = differential RS422 line driver (TTL compatible)
L = differential line driver, 10-30 VDC

Quadrature cycle frequency (quadrature)
A = 10 kHz
B = 25 kHz
C = 50 kHz
D = 75 kHz
E = 100 kHz
F = 150 kHz
G = 250 kHz
H = 500 kHz
I = 1.0 MHz

Zero offset storage (quadrature)
V = volatile (non-retentive)
N = nonvolatile (100,000 storage cycles maximum)

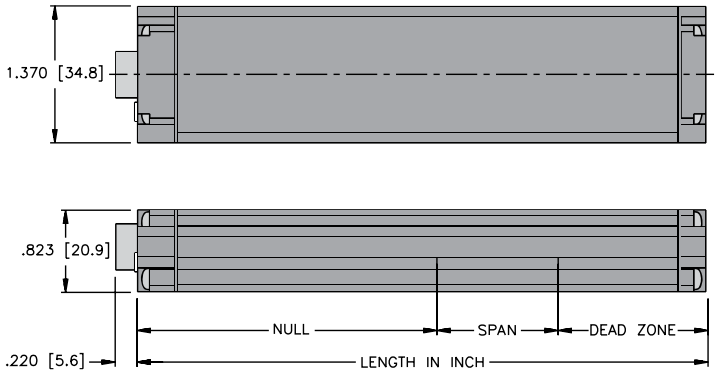
Input type (quadrature)
N = sinking input (used with sourcing outputs)
P = sourcing input (used with sinking inputs)
T = TTL level

Number of LEDs
X2 = 2 way diagnostic LED

Connection type
H11121 = M12 ***eurofast®*** 12-pin connector

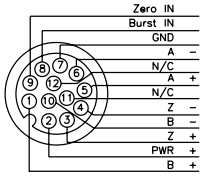
Note: In addition to the LDT, a typical system includes a magnet, mounting feet and cable (all sold separately).

Dimensions: Q21-DQ quadrature profile series



Wiring Diagram: Q21-DQ/ Q35-DQ

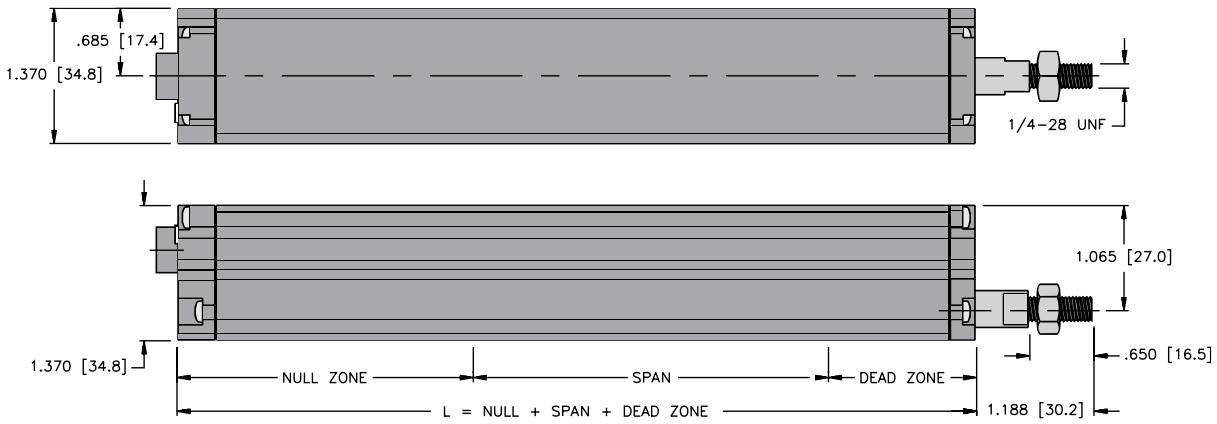
12-pin ***eurofast*** connection



Mating Cordset: **RKC 12T-*/S618**

* Length in meters.

Dimensions: Q35-DQ quadrature profile series



Digital profile series

The **Q21D** is a non-contact LDT with a digital output. This transducer utilizes magnetostrictive technology to give absolute position that is repeatable to .006% of the active sensing distance. It also has the same auto-tuning capability that the other profile series transducers offer, so that it can adjust its signal strength to various magnets.

There is a diagnostic LED that is located at the connector end of the probe and provides visual status information regarding the operation of the **Q21D**. The indications are specified in the table below. The **Q21D** digital transducer provides either a Start/Stop or a Variable Pulse signal interface that is proportional to the position of the slide magnet assembly along the length of the probe.

Digital Profile Series (Q21D) Specifications:

Output:	Start/Stop Pulse: External interrogation; Variable Pulse: Internal or External interrogation
Number of recirculation:	Variable Pulse: 001 (standard) to 127
Span:	5 to 180 in.
Repeatability:	+/-0.006% of full span
Hysteresis:	+/-0.02% of full span
Operating temperature:	-4 to +158°F (-20 to +70°C)
Null Zone:	3.00 in.
Dead Zone:	2.00 in.
Operating voltage:	13.5-30 VDC
Current consumption:	120 mA at 15 VDC, 2.5 watts maximum
Shock:	Tested to 40 G
Vibration:	MIL-STD810E, 10G rms random, 20 Hz - 2 kHz
LED:	Green = power is applied and magnet is present Red = fault, magnet is in the null zone, dead zone or lost Yellow = no interrogation signal detected
Protection rating:	IP67
Agency approval:	CE

Start/Stop (RS):
The Start/Stop signal interface of the **Q21D** digital output series is a differential RS-422 output. To initiate a start pulse, an external device must be used, and should be a minimum of 1 ms in duration. A stop pulse of 1 ms in duration will follow. The time delay from the leading edge of the start pulse to the leading edge of the stop pulse is proportional to the distance form the Null Zone to the Magnet.

Variable Pulse (VP):
The Variable Pulse signal interface digital output is a pulse width modulated signal (RS-422). The **Q21D** LDT can be ordered with either an external (**VPE**) or internal (**VPI**) interrogation.

External interrogation occurs when an external device connected to the **Q21D-VPE** generates a start pulse. This start pulse should be a minimum of 1 ms in duration. Within 50 nanoseconds after the leading edge of the start pulse has been received, the LDT will generate an output pulse. The duration of the output pulse is proportional to the distance from the Null Zone to the Magnet.

The **Q21D-VPI** generates an internal interrogation, and will continually output pulse width modulated signals. The duration of this output pulse is also proportional to the distance from the Null Zone to the Magnet.

TURCK
Industrial Automation

Digital profile series

Part number key: Digital profile series

LT	12	E	-	Q	21	D	-	VPI	-	001	-	X3	-	H1161	/S1661

Sensor family
LT = linear transducer

Measurement span

Units of measurement
E = inches

Housing style
Q = profile

Housing height
21 = 21 mm
35 = 35 mm

Resolution
D = digital

Output mode
RS = RS-422 Start/Stop pulse
VPI = variable pulse internal interrogations
VPE = variable pulse external interrogations

Number of Recirculations (valid if VPI output, otherwise blank)
001 (standard) to 127

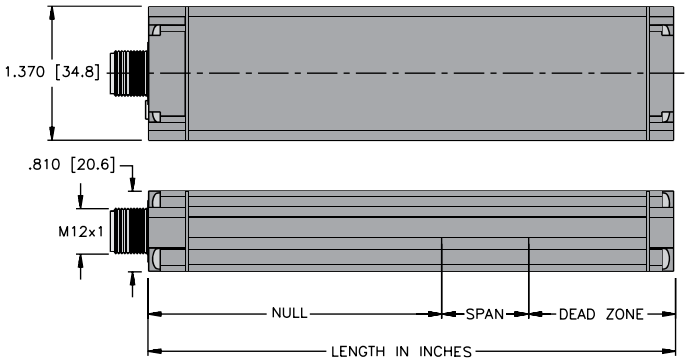
Number of LEDs
X3 = 3 way diagnostic LED

Connection type
H1161 = M12 ***eurofast®*** 6-pin connector

Unit rating
(blank) = IP67
S1661 = IP68

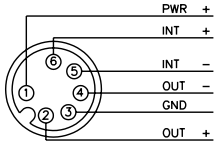
Note: In addition to the LDT, a typical system includes a magnet, mounting feet and cable (all sold separately).

Dimensions: Q21D digital profile series



Wiring Diagram: Q21D/Q35D

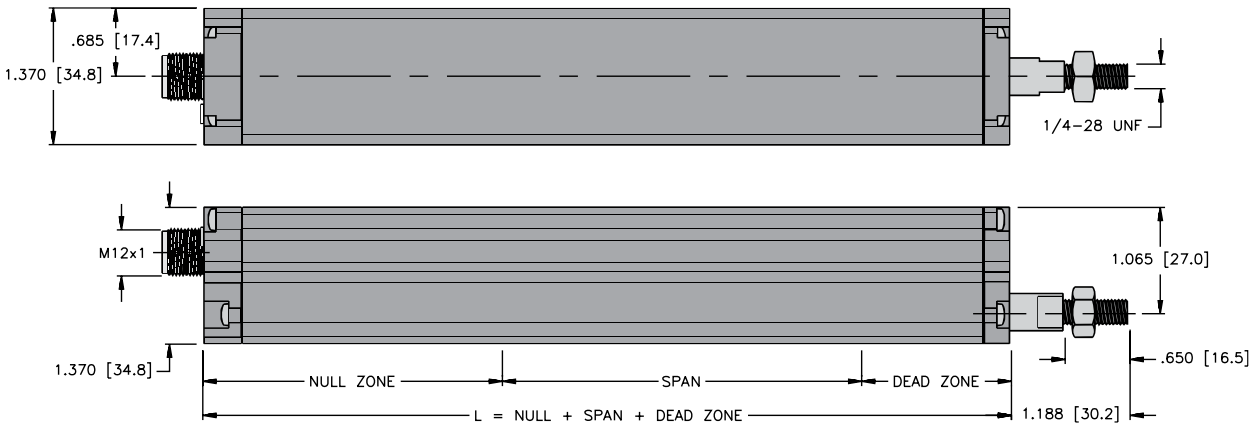
6-pin ***eurofast*** Connection



Mating Cordset: **RKC 6T-*/S618**

* Length in meters.

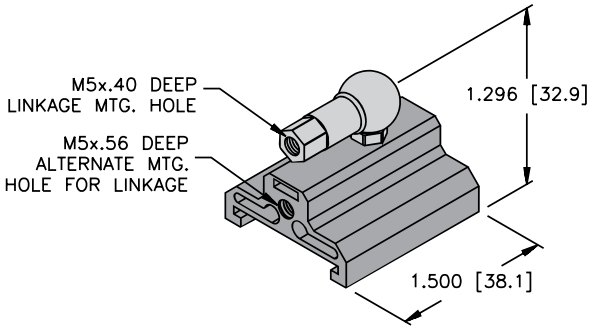
Dimensions: Q35D digital profile series



Profile series accessories

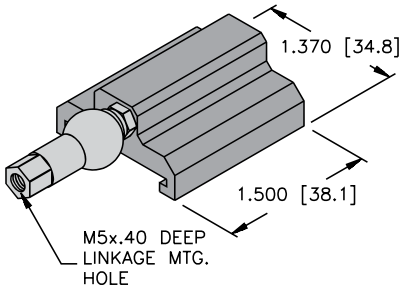
Slide magnet

SM-Q21 [A5600]



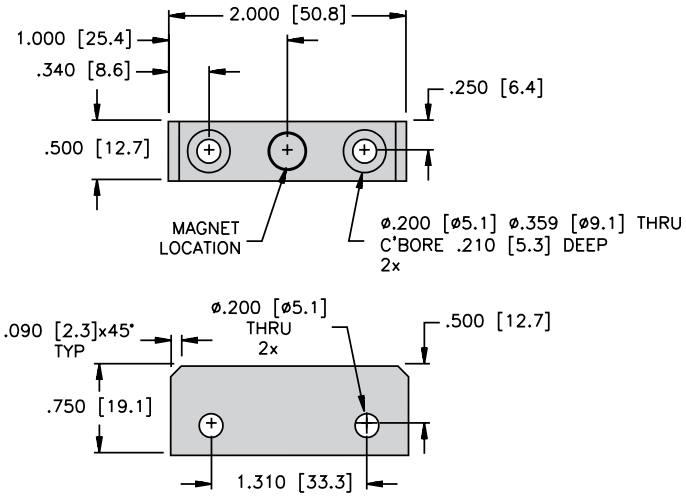
Slide magnet with slide adapter

SA-Q21 [A0864]



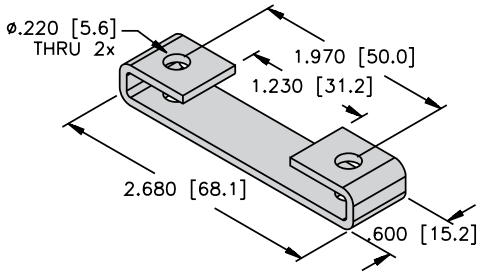
Floating magnet

FM-Q21 [A5500]



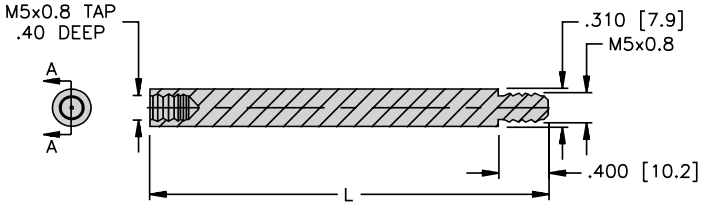
Q21 mounting brackets

LSPM-AL-R10 [A0855] (aluminum)
LSPM-SS-R10 [A0855] (stainless steel)



Control arms

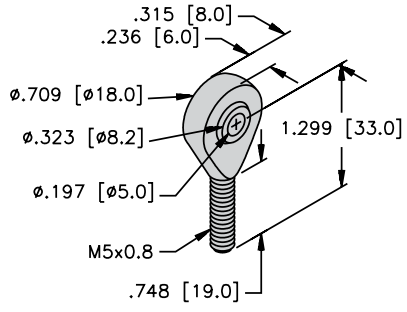
CA*E-Q21



* Lengh in inches.

Rod ends

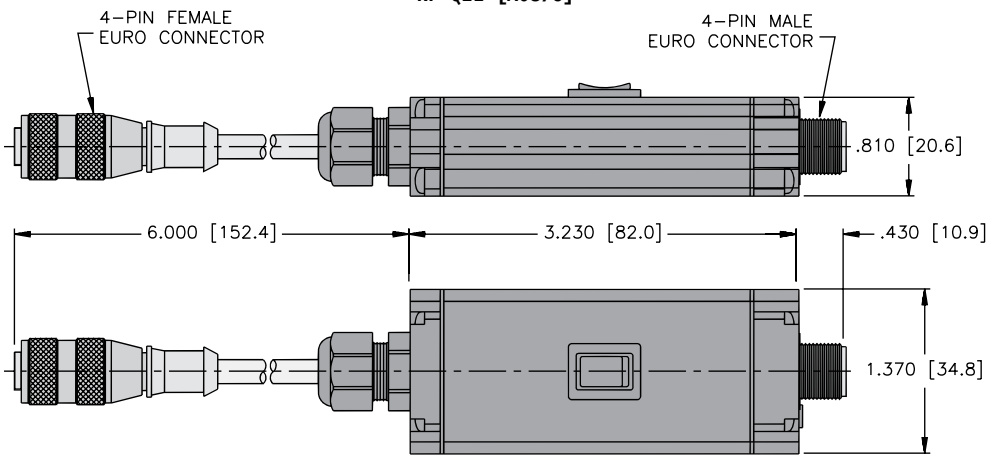
RE-Q21 [A0865]



Profile series accessories

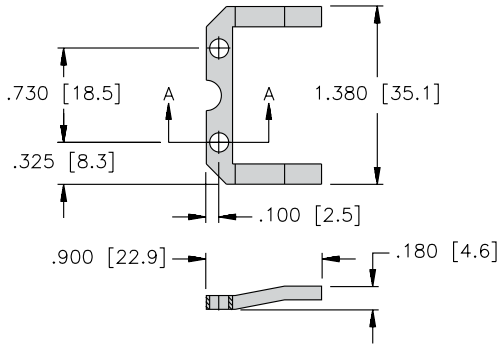
Rocker programmer

RP-Q21 [A0875]



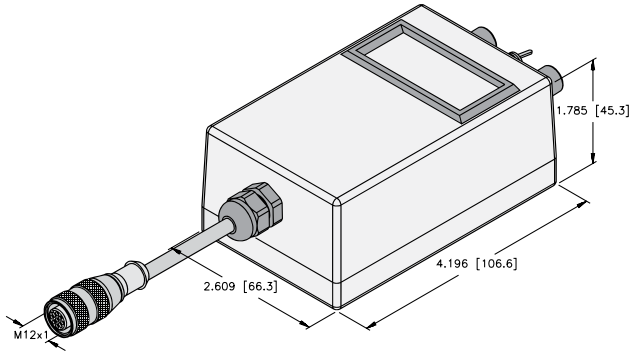
Q21 upside down brackets

UB-Q21 (2/bag) [A5500]



Test and programming device

TB2-LDT [M6900298] (voltage)
TB2-LDT-LI [A58002] (current)



Linear Measurement Technology
EZ-track®

Rod style series

Rugged Rod Style Housings:
Transducers designed to survive in harsh industrial environments to reduce downtime on the plant floor.

The **R10** housing, sensing rod and components are designed and constructed to withstand heavy duty applications, such as those found in lumber mills, steel mills and stamping plants. They have been lab tested and field proven to withstand 2000 g's of shock and 30 g's of random vibration without false signals or mechanical damage. In addition, the **R10's** electronics are enclosed in an aluminum housing with O-ring seals for an IP67 environmental rating.

Although **R10** sensors can be ordered with any of the above outputs, the units can easily be changed in the field to reverse the output signal. Thus, one model can be used for two applications by programming the "zero" and "span" appropriately. The differential feature allows the gap distance between two magnets to be measured. The magnets must remain within the active span at all times and cannot be any closer than 2.5 inches to each other.

Rod Style Series (R10) Specifications:

	Analog	Digital	SSI
Output:	4-20 mA, 20-4 mA, 0-10 VDC, 10-0 VDC	RS422 Start/Stop, Variable Pulse: Internal or External interogation	24, 25 or 26 Bit, Binary or Gray Code
Span:	2-168 in.	1-300 in.	1-300 in.
Repeatability:	+/-0.006% of full span or +/- 0.002 in., whichever is greater	Equal to resolution of controller	Equal to output resolution
Resolution:	0.001 in. / 16 Bit	Controller depedent	English: 0.00005 in., 0.0001 in., 0.0005 in., 0.001 in. Metric: 1, 5, 10, 20 micron
Operating Temperature:	Head(Electronics): -40 to 158°F (-40 to 70°C) Guide Tube: -40 to 221°F (-40 to 105°C)	Head(Electronics): -40 to 185°F (-40 to 85°C) Guide Tube: -40 to 221°F (-40 to 105°C)	Head(Electronics): -40 to 185°F (-40 to 85°C) Guide Tube: -40 to 221°F (-40 to 105°C)
Storage Temperature:	-40 to 185°F (-40° to 85°C)	-40 to 221°F (-40 to 105°C)	-40 to 221°F (-40 to 105°C)
Null Zone:	2.00 in.	2.00 in.	2.00 in.
Dead Zone:	2.50 in.	2.50 in.	2.50 in.
Operating Pressure:	5,000 PSI operating, 10,000 PSI spike	5,000 PSI operating, 10,000 PSI spike	5,000 PSI operating, 1 0,000 PSI spike
Operating Voltage:	13.5-30 VDC	7-30 VDC	7-30 VDC
Current Consumption:	3 watts maximum, 200 mA at 15 VDC	1 watt at 1ms interrogation time with no recirculations. Power consumption increases as interrogation times and recirculations increase. 40 mA at 24 VDC typical	1.3 watt typical at 1ms interrogation time. Power consumption increases as interrogation times increase. 40 mA at 24 VDC typical
Response Time:	1 ms (span length 1-50 in.) 2 ms (span length 51-100 in.) 3 ms (span length 101-150 in.) 4 ms (span length 151-168 in.)	Controller Depedent	4.0 K measurements/sec. (span length 1-12 in.) 2.4 K measurements/sec. (span length 13-30 in.) 2.0 K measurements/sec. (span length 31-40 in.) 1.1 K measurements/sec. (span length 41-80 in.) 0.5 K measurements/sec. (span length 81-197 in.)
Shock:	2000 G	1000 G	1000 G
Vibration:	30 G	30 G	30 G
Hysteresis:	+/- 0.02% of full span	0.001 in.	0.001 in.
Non-Linearity	+/- 0.05% of full span	< 0.01% or +/-0.005 in., whichever is greater	< 0.01% or +/-0.005 in., whichever is greater
Rod End / Mounting Hex:	316 stainless steel, 0.405 in. (10.29 mm) outer diameter	316 stainless steel, 0.405 in. (10.29 mm) outer diameter	316 stainless steel, 0.405 in. (10.29 mm) outer diameter
LED:	N/A	Tri-color diagnostic	Tri-color diagnostic
Protection Rating:	IP67	IP68	IP68
Agency Approval:	CE	CE	CE

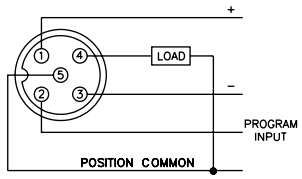
TURCK Industrial Automation

Rod style series

Wiring Diagrams:

R10 Analog

5-pin M12 ***eurofast®*** connection

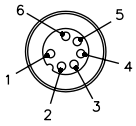


Mating Cordset: **RK 4.5T-*/S618**

* Length in meters.

R10 Digital

6-pin M12 ***eurofast*** connection

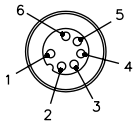


Pinouts
1. PWR+
2. OUT+
3. COMMON
4. OUT-
5. INT-
6. INT+

Mating Cordset: **RKC 6T-*/S618**

R10 SSI

6-pin M12 ***eurofast*** connection



Pinouts
1. PWR+
2. DATA+
3. COMMON
4. DATA-
5. CLOCK-
6. CLOCK+

Mating Cordset: **RKC 6T-*/S618**

Part number key: Analog R10 rod style series

LT 12 E - E R 10 - LU 0 - H1151

Sensor family
LT = linear transducer

Measurement span

Units of measurement
E = inches

Housing material
(blank) = aluminum
E = stainless steel

Housing style
R = rod

Rod diameter
Diameter in millimeters

Output configuration
LU = voltage
LI = current
LD = differential

Output type

Voltage	Current	Differential
0 = 0-10 VDC	0 = 4-20 mA	0 = 0-10 VDC
1 = 10-0 VDC	1 = 20-4 mA	1 = 4-20 mA
4 = 0-5 VDC		
5 = 5-0 VDC		

Connection type
H1151 = M12 ***eurofast®*** 5-pin connector

Part number key: Digital R10 rod style series

LTX 12 E - E R 10 - RS - 001 - X3 - H1161

Sensor family
LTX = linear transducer

Measurement span

Units of measurement
E = inches
M = metrics
(Consult factory for metric orders)

Housing material
(blank) = aluminum
E = stainless steel cover and connector

Housing style
R = rod

Rod diameter
Diameter in millimeters

Digital output mode
RS = RS422 Start/Stop
VPE = external interrogation
VPI = internal interrogation

Number of recirculations
001 = standard
225 = max
(Only valid with VPE or VPI, otherwise leave blank)

Number of LEDs
X3 = 3-way LED

Connection type
H1161 = M12 ***eurofast®*** 6-pin receptacle

Rod style series

Part number key: SSI R10 rod style series

LTX	12	E	-	E	R	10	-	SSI	-	1	-	B	S	F	B	-	X3	-	A	-	H1161

Sensor family
LTX = linear transducer

Measurement span

Units of measurement
E = inches
M =metrics
(Consult factory for metric orders)

Housing material
(blank) = aluminum
E = stainless steel cover and connector

Housing style
R = rod

Rod diameter
Diameter in millimeters

Data mode
SSI = synchronous serial interface

Data length
1 = 24 bit
2 = 25 bit
3 = 26 bit

Data format
B = binary
G = grey

Data type
S = synchronous
A = asynchronous

Direction
F = forward
R = reverse
V = velocity

Resolution

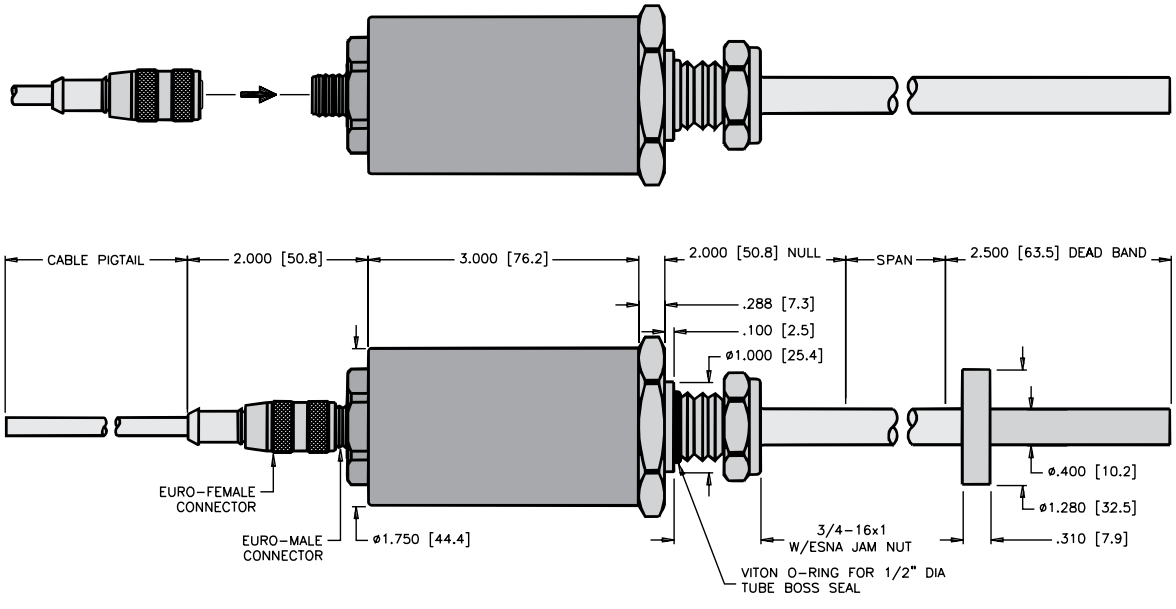
1 = 0.005 mm	5 = 0.02 mm	9 = 0.0001”
2 = 0.01 mm	6 = 0.002 mm	A = 0.0005”
3 = 0.05 mm	7 = 0.001 mm	B = 0.001”
4 = 0.1 mm	8 = 0.00005”	

Number of LEDS
X3 = 3-way LED

Option
(blank) = none
A = alarm

Connection type
H1161 =M12 ***eurofast®*** 6-pin connector

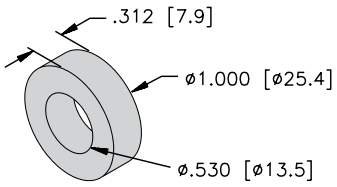
Dimensions: Rod style series



Rod style series accessories

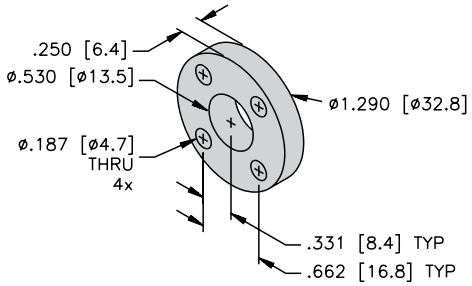
1” diameter cylinder magnet

CM-R10 [A0587]



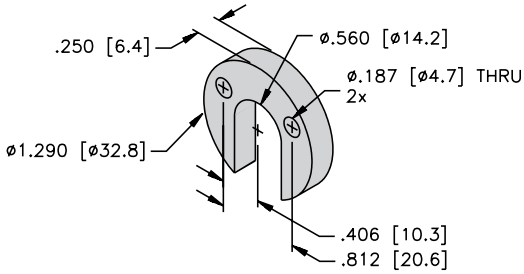
Standard magnet spacer

STS-R10 [A0852]



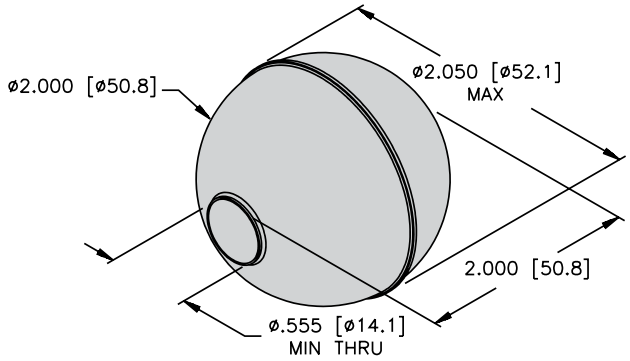
Split magnet spacer

SPS-R10 [A0854]



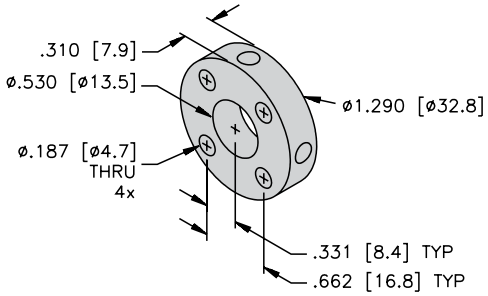
Egg shape float

EF-R10 [A0858]



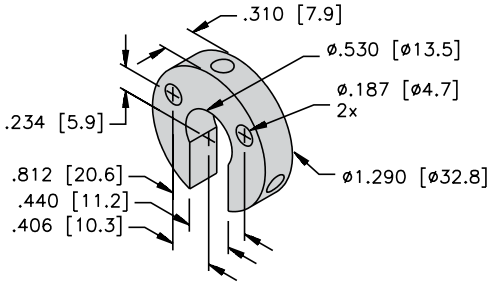
Standard 4-hole magnet

STM-AL-R10 [A0850] (aluminum)
STM-SS-R10 [A0851] (stainless steel)



Split magnet

SPM-AL-R10 [A0853]

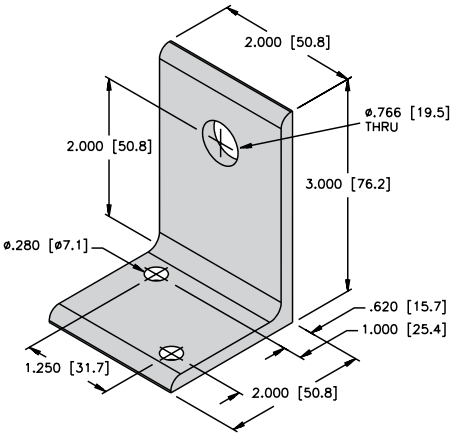


All dimensions shown as: inches [mm]

Rod style series accessories

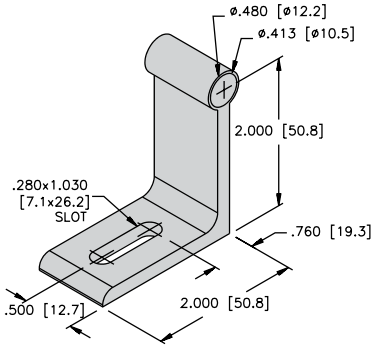
Mounting bracket

LB-R10 [A5900]



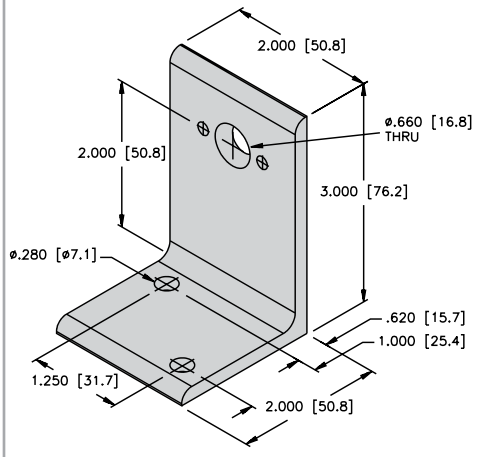
Rod support bracket

RB-R10 [A0861]



Magnet mounting bracket

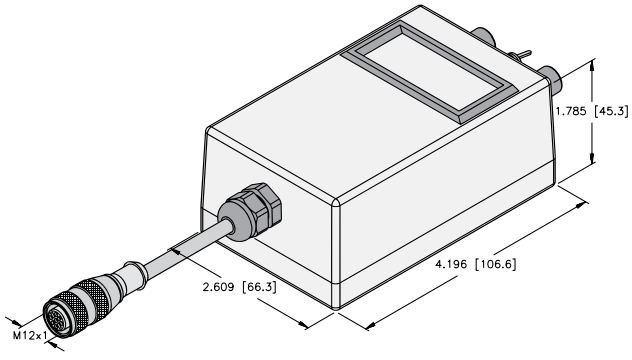
MMB-R10 [A0862]



MB-R10 [A0860]: Part number includes mounting bracket **LB-R10** and rod support bracket **RB-R10**.

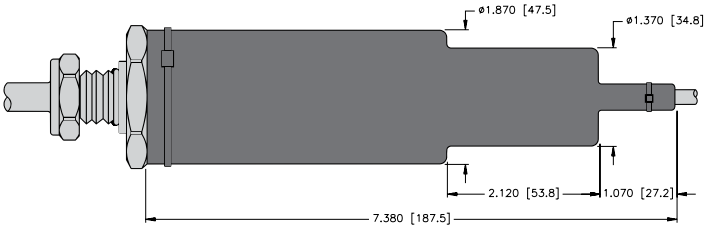
Test and programming device

TB2-LDT [M6900298]
TB2-LDT-LI [A58002]



Rubber boot

BT-R10 [LT0494]



All dimensions shown as: inches [mm]

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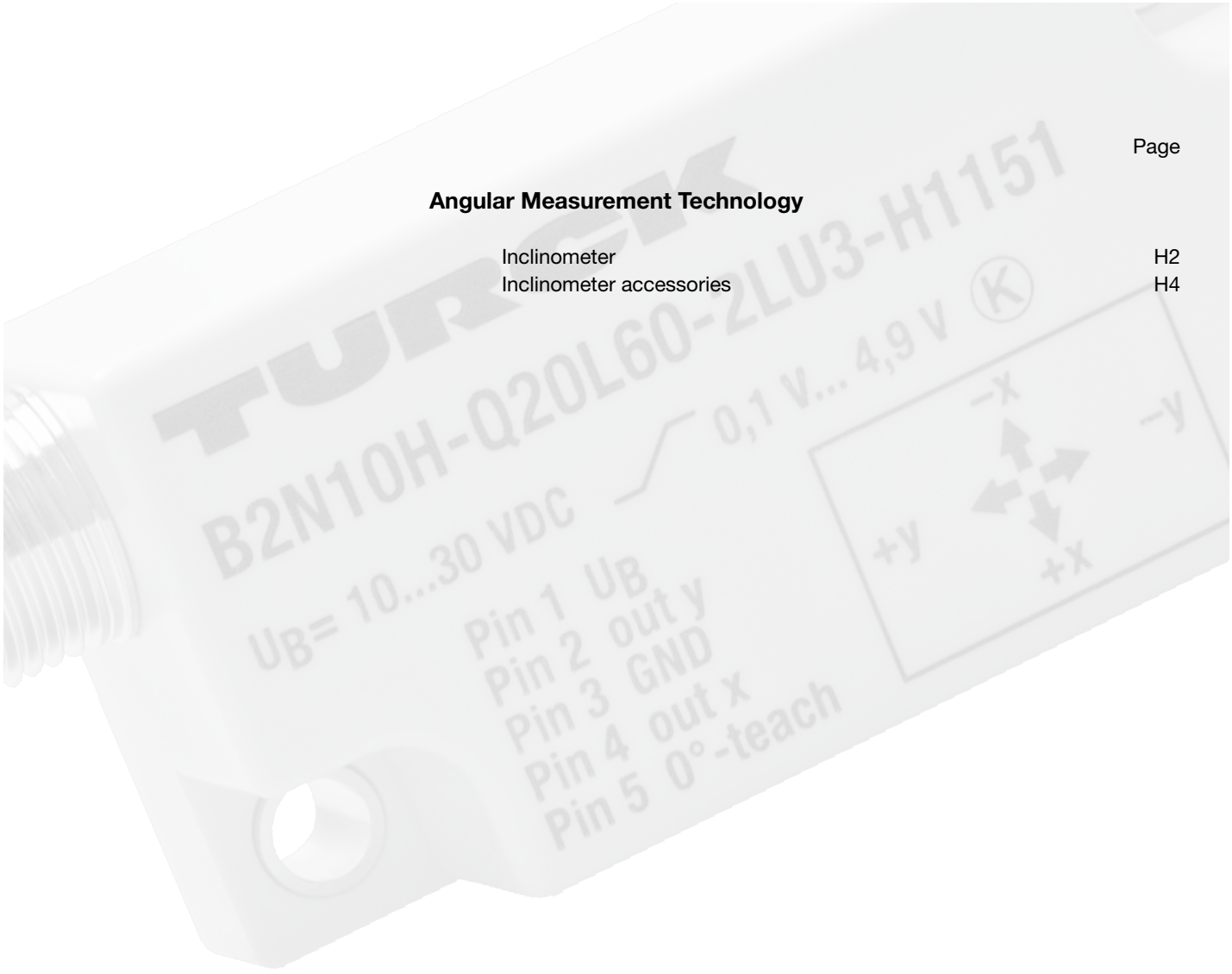


Page

Angular Measurement Technology

Inclinometer H2
Inclinometer accessories H4

Dual Axis Inclinometer Sensor, B2N

The TURCK inclinometer is a dual axis sensor for angular tilt detection. These sensors feature compact rectangular housings, and may be mounted up to a maximum of +/- 85 degree angles. Inclinometer sensors may be used in a wide variety of applications to solve unique feedback requirements where the customer needs to level platforms, control tilt angle or control a dancer.

The new TURCK inclinometer measures angular tilt in reference to gravity. At the heart of the TURCK inclinometer is a MEMS (micro-electro-mechanical system) device that incorporates a micro-electromechanical capacitive element into the sensor that utilizes two parallel plate electrodes, one stationary and one attached to a spring-mass system. Movement causes acceleration that produces deflection in the non-stationary electrode.

Inclinometer Specifications:

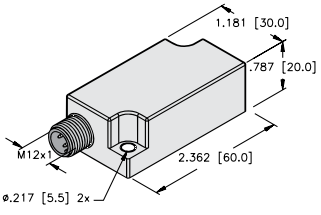
Operational voltage:	10-30 VDC
Output voltage (2LU3 only):	0.1-4.9 V
Output current (2Li2 only):	4-20 mA
No-load current I/O:	< 20 mA
Rated insulation voltage:	< 0.5 kV
Wire-break protection / Reverse polarity protect.:	yes
Output function:	4-wire, analog output
Repeatability:	< 0.2 % of measuring range [A - B] < 0.1 %, after 0.5 h warm-up time
Output recovery time:	< 12 ms
Response time:	0.05-0.1 s (time for the output signal to achieve 90% full scale, if the angle changes from the beginning to the end of the measuring range)
Housing:	rectangular, Q20L60
Dimensions:	60 x 30 x 20 mm
Housing material:	plastic, PBT-GF20-V0
Connection:	connector, M12 x 1
Vibration resistant:	55 Hz (1 mm)
Shock resistance:	30 g (11 ms)
Ambient temperature (std):	-22 to +158°F (-30 to +70°C)
Extended temperature:	-40 to +158°F (-40 to +70°C) with /S97 option only
Degree of protection:	IP67

This results in a measurable change in the capacitance between the two plates that is proportional to the angle of deflection. These signals are conditioned to provide two analog outputs (0.1-4.9 VDC) or two current outputs (4-20 mA). The micro board design in the MEMS technology allows for a compact, precise inclinometer in a very robust, industrialized package. The inclinometer is IP67 rated, with a temperature range of -22 to 158°F (-30 to 70°C). The sensor is also available in the optional -40°F (-40°C) /S97 option.

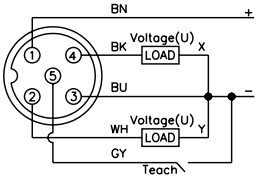
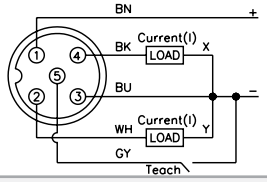
Use in many applications, including:

- Industrial equipment: levers, pedals, flaps, mixing machines, hydraulic jacks, dancers and rotary tables
- Mobile vehicles: cranes, fire trucks, bucket trucks and construction vehicles
- Vertical and horizontal drills used in tunnel and road construction and immersion equipment
- Offshore plants: platforms, cranes
- Conveyors

Dimensions: B2N inclinometer



Wiring Diagram:

2LU3: 5-pin ***eurofast*** ® Connection	**2Li2:** 5-pin ***eurofast*** Connection
	
Mating Cordset: **RK 4.5T-*/S618**	Mating Cordset: **RK 4.5T-*/S618**

* Length in meters.

TURCK Industrial Automation

Dual Axis Inclinometer Sensor, B2N

Part number key and detailed specifications: B2N inclinometer

Part number (2LU3): ID number:	B2N10H-Q20L60-2LU3-H1151 M1534006	B2N45H-Q20L60-2LU3-H1151 M1534007	B2N60H-Q20L60-2LU3-H1151 M1534008	B2N85H-Q20L60-2LU3-H1151 M1534027
Voltage output:	0.1 4.9 V	0.1-4.9 V	0.1-4.9 V	0.1-4.9 V
Measuring range [A to B]:	-10 to 10°	-45 to 45°	-60 to 60°	-85 to 85°
Temperature drift:	< ± 0.05 % / K	< ± 0.025 % / K	< ± 0.025 % / K	< ± 0.025 % / K
Temperature coefficient:	0.01°/K	0.03°/K	0.03°/K	0.03°/K
Resolution:	< 0.04°	< 0.1°	< 0.14°	< 0.14°
Zero-point calibration:	± 5°	± 15°	± 15°	± 15°
Absolute accuracy:	± 0.3°	± 0.5°	± 0.5°	± 0.5°
Load resistance:	≥ 40 kΩ	≥ 40 kΩ	≥ 40 kΩ	≥ 40 kΩ

Part number (2Li2): ID number:	B2N10H-Q20L60-2Li2-H1151 M1534012	B2N45H-Q20L60-2Li2-H1151 M1534013	B2N60H-Q20L60-2Li2-H1151 M1534014	B2N85H-Q20L60-2Li2-H1151 M1534032
Current output:	4-20 mA	4-20 mA	4-20 mA	4-20 mA
Measuring range [A to B]:	-10 to 10°	-45 to 45°	-60 to 60°	-85 to 85°
Temperature drift:	< ± 0.05 % / K	< ± 0.025 % / K	< ± 0.025 % / K	< ± 0.025 % / K
Temperature coefficient:	0.01°/K	0.03°/K	0.03°/K	0.03°/K
Resolution:	< 0.04°	< 0.1°	< 0.14°	< 0.14°
Zero-point calibration:	± 5°	± 15°	± 15°	± 15°
Absolute accuracy:	± 0.3°	± 0.5°	± 0.5°	± 0.5°
Load resistance:	≤ 200 Ω	≤ 200 Ω	≤ 200 Ω	≤ 200 Ω

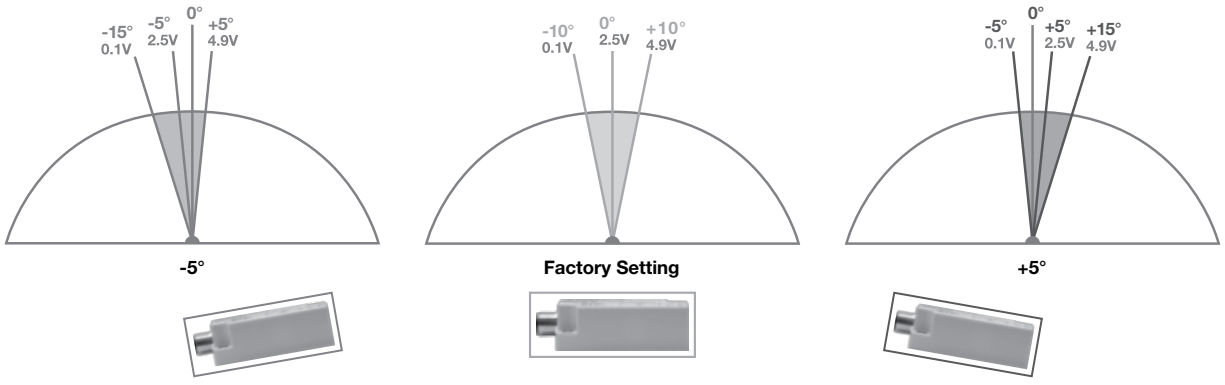
Zero Setpoint Teach Function

The zero point, or level reference, of the inclinometer may be reset to the unique grade of your application. Depending on the model, it is adjustable up to +/- 15 degrees from the factory setting of absolute horizon level. This allows you to effectively shift the sensing window to accommodate slightly non-level rest positions of your equipment, such as the difference between an empty and loaded dump truck. We offer a teaching pendant to make this a simple, single push-button task.

Teach Sequence:

- Both the X and Y axis are programmed at the same time.
- Place the inclinometer in the position desired to become the new “0” degree point for X and Y (level).
- Momentarily (1 second) touch pin 5 to pin 3 (or push the button on the VB2-SP3 teach pendant).
- The X and Y, “0” degree points (level) have been set to the new position.
- If you repeat the process and hold the connection for at least 6 seconds, the unit will revert back to factory default.

Inclinometer Teach Range Example : B2N 10H-Q20L60-2LU3-H1151



Dual Axis Inclinometer Sensor Accessories

Teaching pendant

VB2-SP4 [U2-14372]

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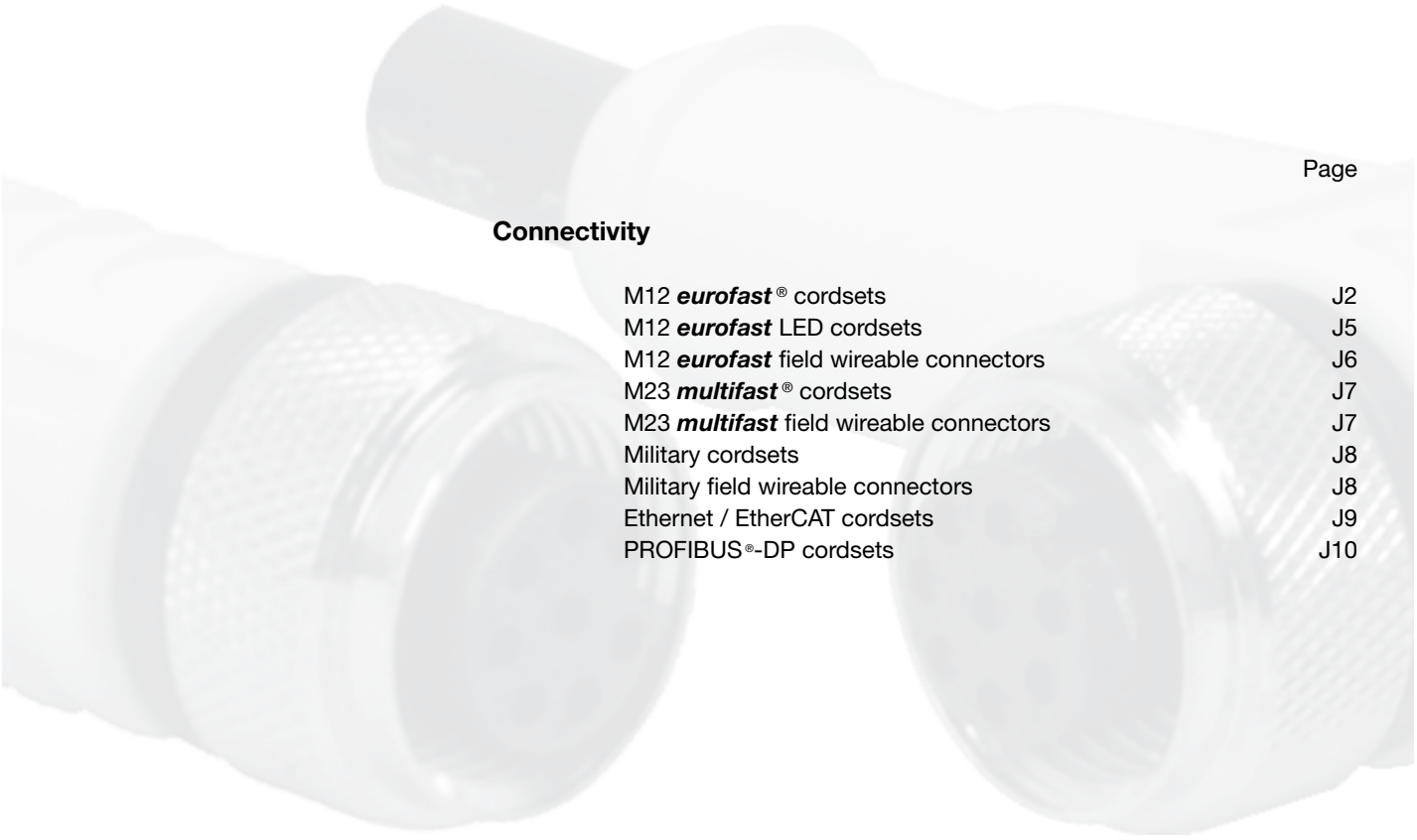


Page

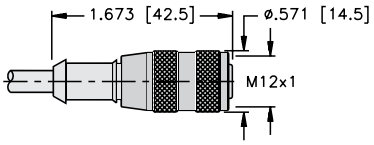
Connectivity

M12 ***eurofast*** ® cordsets	J2
M12 ***eurofast*** LED cordsets	J5
M12 ***eurofast*** field wireable connectors	J6
M23 ***multifast*** ® cordsets	J7
M23 ***multifast*** field wireable connectors	J7
Military cordsets	J8
Military field wireable connectors	J8
Ethernet / EtherCAT cordsets	J9
PROFIBUS®-DP cordsets	J10

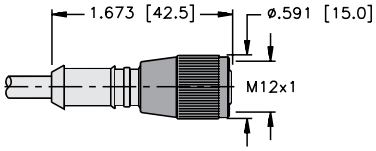
4-Pin M12 *eurofast*® cordsets standard plug body

- **Straight Female Connector**
- **NEMA 1, 3, 4, 6P and IEC IP68 Protection**
- **250 VAC/300 VDC, 4 A**

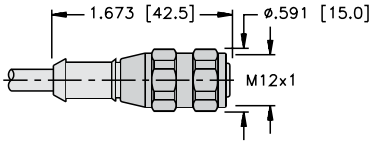
RK .. **



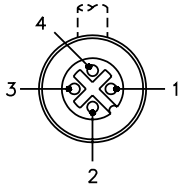
RKK .. **



RKV .. **



Part Number	Cable	Features	Pinouts
RK 4.41T-*	AWM PVC NAMUR Blue 4x22 AWG 221°F (105°C) 5.2 mm OD Cable #RF50598-*M†	*flexlife*®	1. BN 2. WH 3. BU 4. BK
RK 4.41T-*/S529	AWM PUR/Heavy Braid Double Jacket, Yellow 4x20 AWG 221°F (105°C) 5.8 mm OD Cable #RF50526-*M†	*Cut/Abrasion Immune Braided Mechanical Shield*	
RK 4.43T-*	AWM PVC Yellow 4x22 AWG 221°F (105°C) 5.2 mm OD Cable #RF50530-*M†	*flexlife*	
RK 4.43T-*/S90	AWM PUR Yellow 4x22 AWG 221°F (105°C) 5.2 mm OD Cable #RF50613-*M†	*Cut/Abrasion Immune*	
RK 4.4T-*	AWM PVC Grey 4x22 AWG 221°F (105°C) 5.2 mm OD Cable #RF50516-*M†	*flexlife*	
RK 4.4T-*/S90	AWM PUR Grey 4x22 AWG 221°F (105°C), 5.2 mm OD Cable #RF50532-*M†	*Cut/Abrasion Immune*	
RK 4.4T-*/S101	AWM TPE Grey 4x22 AWG 221°F (105°C), 5.7 mm OD Cable #RF50941-*M†	*flexlife-10, High Flex Over 10 Million Cycles*	
RK 4.4T-*/S824	PLTC PVC Grey 4x22 AWG 221°F (105°C), 5.2 mm OD Cable #RF50698-*M†	*Tray Rated*	
RK 4.4T-*/S618	AWM PVC Grey 4x22 AWG, Foil/Drain 221°F (105°C), 5.2 mm OD Cable #RF50577-*M†	*RFI/EMI Shielding*	
RK 4.4T-*/S618/S824	PLTC PVC Grey 4x22 AWG, Foil/Drain 221°F (105°C), 5.2 mm OD Cable #RF50773-*M†	*RFI/EMI Shielding Tray Rate*	

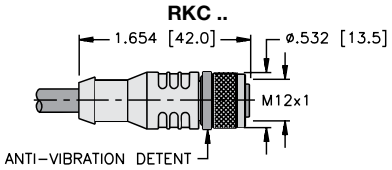
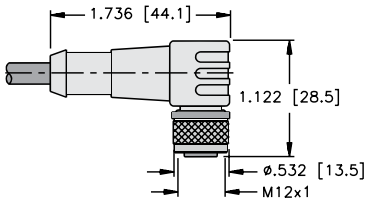
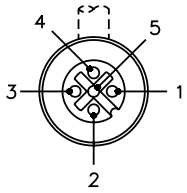
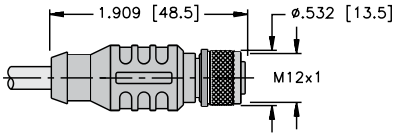
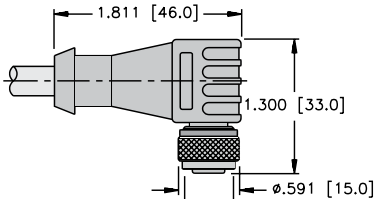


* Length in meters. Standard cable lengths are 2, 4, 6, 8 and 10 meters. Consult factory for other lengths.
** Standard coupling nut material is nickel plated brass "RK .."; "RKK .." indicates nylon and "RKV .." indicates 316 stainless steel.
† For ***reelfast***® cable information see Connectivity Catalog.

TURCK
Industrial Automation

5-Pin M12 *eurofast*® cordsets

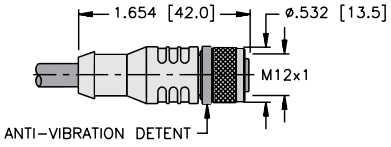
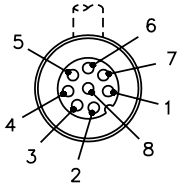
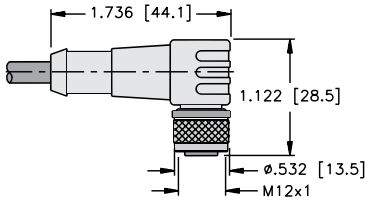
- For use with Kübler by TURCK's Absolute Encoders
- Straight and Right Angle Female Connectors
- NEMA 1, 3, 4, 6P, and IEC IP68

Drawing	Part Number	Cable	Features	Pinouts	
RKC ..  WKC ..  	E-RKC 4.5T-1695-*/A E-WKC 4.5T-1695-*/A	AWM PVC Grey 4x22 AWG 2 STP 221°F (105°C) 5.2 mm OD Cable #RF51695-*M†	*Kübler by TURCK's Analog and CANbus Encoder (without CAN-ground)*	1. N/C 2. BN 3. WH 4. GN 5. YE	
RKC ..  WKC ..  	E-RKC 660-*/A E-RKC 660-*/A	AWM PVC Beige 6x24 AWG 3 STP 176°F (80°C) 7.4 mm OD Cable #RB50699-*M†	*Kübler by TURCK's CANbus Encoder (with CAN-ground)*	1. GY 2. BN 3. WH 4. GN 5. YE N/C PK	

* Length in meters. Standard cable lengths are 2, 5, 10 and 15 meters. Consult factory for other lengths.
** Standard coupling nut material is nickel plated brass "E-RKC../E-WKC..; "E-RKCV../E-WKCV.. indicates 316 stainless steel.
† For ***reelfast***® cable information see Connectivity Catalog.

8-Pin M12 *eurofast*® cordsets

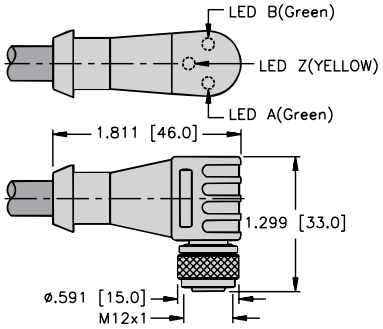
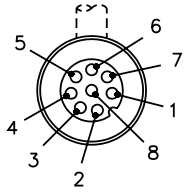
- For use with Kübler by TURCK's Encoders
- Straight and Right Angle Female Connectors
- NEMA 1, 3, 4, 6P, and IEC IP68
- 60 VAC/75 VDC, 2 A

Drawing	Part Number	Cable	Features	Pinouts	
RKC .. 	E-RKC 8T-930-*	AWM PVC Black 8x24 AWG 221°F (105°C) 7.3 mm OD RF50930-*M+	*Incremental, Differential Mode Applications, RFI/ EMI Protection*	1. WH 2. BN 3. GN 4. YE 5. GY 6. PK 7. BU 8. RD	
	E-WKC 8T-930-*				
	E-RKC 8T-930-*/S1115	AWM PVC Black 5x24 AWG 221°F (105°C) 7.3 mm OD RF50930-*M+	*Incremental, Single Ended Mode Applications, RFI/EMI Protection*	1. WH 2. BN 3. GN 4. N/C 5. GY 6. N/C 7. BU 8. N/C	
	E-WKC 8T-930-*/S1115				
WKC .. 	E-RKC 8T-074-*/S3012	AWM PVC Grey 3x22 AWG 221°F (105°C) 5.2 mm OD RF51074-*M+	*Incremental, Single Ended Mode, Single Channel Applications, RFI/ EMI Protection*	1. BN 2. BU 3. BK 4. N/C 5. N/C 6. N/C 7. N/C 8. N/C	
	E-WKC 8T-074-*/S3012				
	E-RKC 8T-264-*	AWM PVC Black 8x24 AWG, 4 STP 221°F (105°C) 7.3 mm OD RF51264-*M+	*Incremental, Absolute, Differential Mode Applications, RFI/ EMI Protection*	1. WH 2. BN 3. GN 4. YE 5. GY 6. PK 7. BU 8. RD	
	E-WKC 8T-264-*				

* Length in meters. Standard cable lengths are 2, 5, 10 and 15 meters. Consult factory for other lengths.
** Standard coupling nut material is nickel plated brass "E-RKC../E-WKC..; "E-RKCV../E-WKCV.. indicates 316 stainless steel.
† For ***reelfast***® cable information see Connectivity Catalog.
STP = Shielded twisted pair.

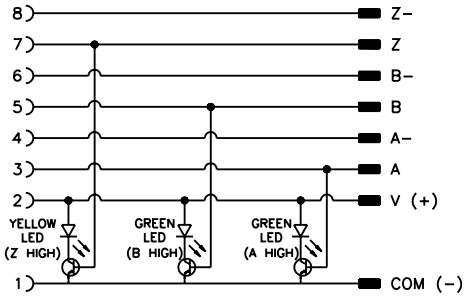
8-Pin M12 *eurofast*® cordset with LEDs

- For use with Kübler by TURCK's Encoders
- Right Angle Female Connector
- NEMA 1, 3, 4, 6P, and IEC IP68
- 5-30 VDC

Drawing	Part Number	Cable	Features	Pinout	
	E-WKC 8T-PX3-930-*	AWM PVC Black 8x24 AWG 221°F (105°C) 7.2 mm OD RF50930-*M†	*Incremental, 3 indicator LEDs in translucent molded connector-for use with Kübler Incremental Encoders*	1. WH 2. BN 3. GN 4. YE 5. GY 6. PK 7. BU 8. RD	
	E-WKC 8T-PX3-264-*	AWM PVC Black 8x24 AWG, 4 STP 221°F (105°C) 7.3 mm OD RF51264-*M+	*Incremental, Absolute, Differential Mode Applications, RFI/ EMI Protection*	1. WH 2. BN 3. GN 4. YE 5. GY 6. PK 7. BU 8. RD	

* Length in meters. Standard cable lengths are 2, 4, 6, 8 and 10 meters.
** Standard coupling nut material is nickel plated brass "WKC.."; "WKCV.." indicates 316 stainless steel.
† For ***reelfast***® cable information see Connectivity Catalog.

Wiring Diagram

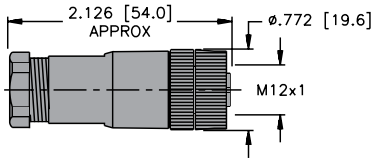
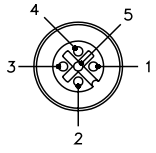
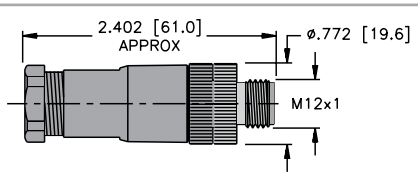
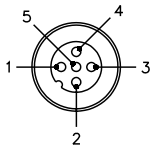


8-pin Cordset with Encoder

Note:
LEDs for indication of channels A, B and Z. Green LEDs indicate channels A and B, while amber is used for the index channel. LEDs can also be used during machine set-up for home position indication, and provide operational status of encoder output channels.

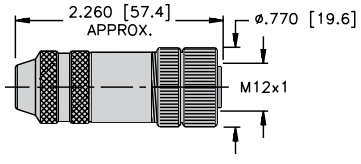
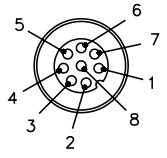
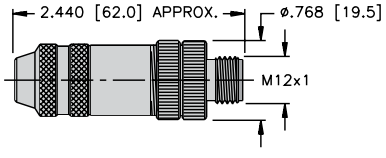
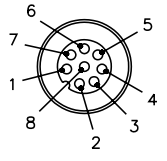
5-Wire M12 *eurofast*® field wireable connectors

- Screw Terminals
- No Soldering Required
- IEC IP67 Protection

Drawing	Part Number	Specifications	Application	Pinouts
	B 8151-0/PG 9	PBT, Black PG 9 cable gland, accepts 6-8 mm cable diameter Screw terminals accepts up to 18 AWG conductors 185°F (85°C) 125 V, 4 A	*Mates with standard key 5-pin cordsets and receptacles*	
	BS 8151-0/PG 9		*Mates with standard key 5-pin cordsets and receptacles*	

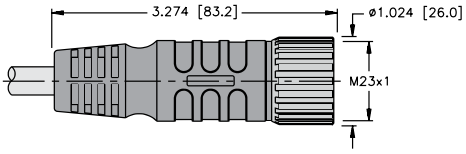
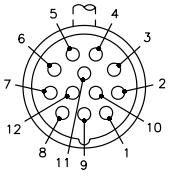
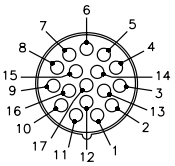
8-Wire M12 *eurofast* field wireable connectors, shielded, screw terminals

- Screw Terminals
- No Soldering Required
- IEC IP67 Protection

Drawing	Part Number	Specifications	Application	Pinouts
	CMB 8181-0	Nickel Plated Brass PG9 cable gland accepts 6-8 mm cable diameter. Screw terminal accepts up to 18 AWG conductors. 185°F (85°C) 60 VAC/75 VDC, 4 A	*Metal, Fully Shielded Mates with standard key 8-pin cordsets and receptacles*	
	CMBS 8181-0		*Metal, Fully Shielded Mates with standard key 8-pin cordsets and receptacles*	

12-Pin and 17-Pin M23 *multifast*® cordsets

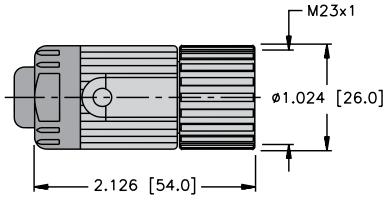
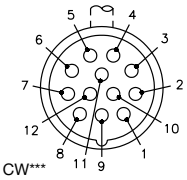
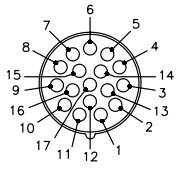
- **Female Coupling Nut, Female Contact**
- **Shielded High Grade Oil and UV Resistant PVC**

Drawing	Part Number	Specifications	Application	Pinouts	
	E-CKM 12-931-*	12x24 Black PVC 7.2 mm O.D. 26 AWG Drain, Foil and Braided Shield 221°F (105°C)	*12-pin Incremental*	1. PK 2. RD/BU 3. BU 4. RD 5. GN 6. YE 7. N/C 8. GY 9. N/C 10. WH 11. PK/GY 12. BN	 CW***
	E-CKM 12-1687-*/A	12x26 Grey PVC 8.4 mm O.D. 28 AWG Drain, Foil and Braided Shield 176°F (80°C)	*12-pin Absolute*	1. WH 2. BN 3. GN 4. YE 5. GY 6. PK 7. BU 8. RD 9. BK 10. VT 11. PK/GY 12. RD/BU	
	E-CKM 17-942-*/A	18x24 Yellow PVC 7.6 mm O.D. 26 AWG Drain, Foil and Braided Shield 221°F (105°C)	*17-pin Absolute*	1. WH 2. BN 3. GN 4. YE 5. GY 6. PK 7. BU 8. RD 9. BK 10. VT 11. PK/GY 12. RD/BU 13. WH/GN 14. BN/GN 15. WH/YE 16. YE/BN 17. WH/GY	

* Length in meters. Standard cable lengths are 2, 5, 10 and 15 meters. Consult factory for other lengths.
** Standard coupling nut material is nickel plated brass "E-RKC../E-WKC..; "E-RKCV../E-WKCV.. indicates 316 stainless steel.
***Reversed from standard M23 connector.
† For ***reelfast***® cable information see Connectivity Catalog.

12-Pin and 17-Pin M23 *multifast* field wireable connectors, shielded, solder cup

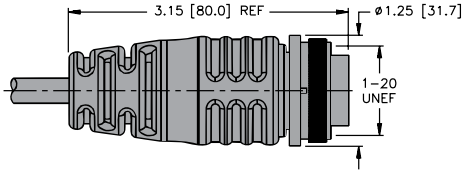
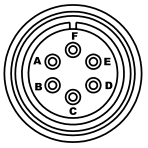
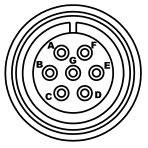
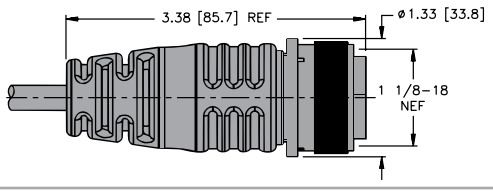
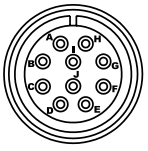
- **Screw Terminals**
- **No Soldering Required**
- **IEC IP67 Protection**

Drawing	Part Number	Specifications	Application	Pinout
	E-CKS 12-0	Solder Cup up to 18 AWG	*Metal, fully shielded Mates with 12-pin encoders*	 CW***
	E-CKS 17-0	Solder Cup up to 18 AWG	*Metal, fully shielded Mates with 17-pin encoders*	

*** Reversed from standard M23 connector.

Military cordsets

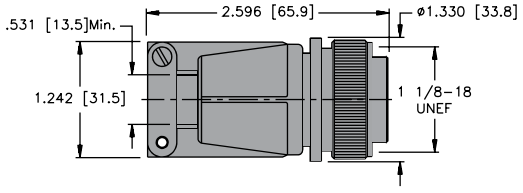
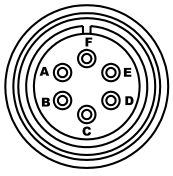
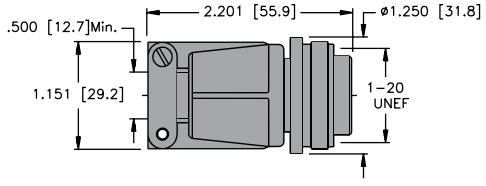
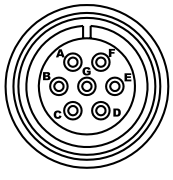
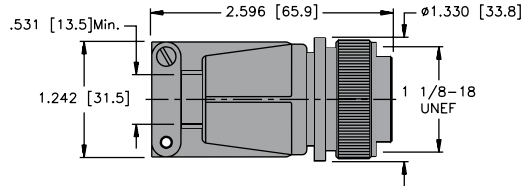
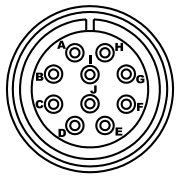
- 6, 7 and 10-Pin
- Shielded High Grade Oil, UV Resistance and PVC

Drawing	Part Number	Specifications	Application	Pinouts	
	E-MK 6-930-*	24 AWG, Black PVC 7.3 mm O.D. 26 AWG Drain Foil & Braided Shield 221°F (105°C)	*6-pin, Threaded* *Mates with* *6-pin encoder*	A. WH B. BN C. BU D. GY E. GN F. N/C	
	E-MK 7-930-*	24 AWG, Black PVC 7.3 mm O.D. 26 AWG Drain Foil & Braided Shield, 221°F (105°C)	*7-pin, Threaded* *Mates with* *7-pin encoder*	A. GN B. GY C. BU D. BN E. WH F. N/C G. N/C	
	E-MK 10-931-*	24 AWG, Black PVC 7.2 mm O.D. 26 AWG Drain Foil & Braided Shield 221°F (105°C)	*10-pin, Threaded* *Mates with* *10-pin encoder*	A. GN F. WH B. GY G. YE C. BU H. PK D. BN I. RD E. BK J. Drain	

* Cable length in meters.
*** Reversed.

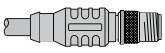
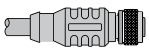
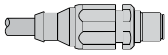
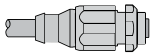
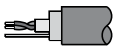
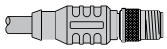
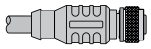
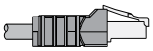
Military field wireable connectors

- 6, 7 and 10-Pin
- Threaded and Bayonet Styles

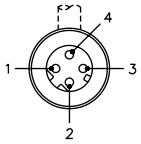
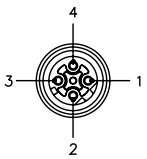
Drawing	Part Number	Specifications	Application	Pinouts
	E-MK 6-0	Solder cup connection	*6-pin, Threaded* *Mates with* *6-pin encoder*	
	E-MK 7-0		*7-pin, Threaded* *Mates with* *7-pin encoder*	
	E-MK 10-0		*10-pin, Threaded* *Mates with* *10-pin encoder*	

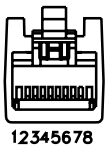
TURCK
Industrial Automation

M12 *eurofast*® D-Coded cordsets selection matrix — Ethernet / EtherCAT

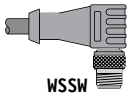
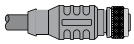
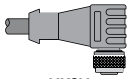
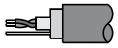
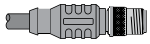
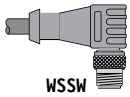
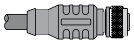
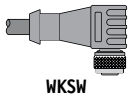
			eurofast				
			Pin (Male)	Socket (Female)	Pin (Male)	Socket (Female)	RJ45 Plug
			 RSSW	 WSSW	 RKSW	 WKSW	 RJ45S
		 Bare	RSSD 441-*M	RKSD 441-*M	FSSDED 441-*M	FKSDED 441-*M	RJ45S 441-*M
eurofast	Pin (Male)	 RSSD	RSSD RSSD 441-*M	RSSD RKSD 441-*M	RSSD FSSDED 441-*M	RSSD FKSDED 441-*M	RSSD RJ45S 441-*M
	Socket (Female)	 RKSD		RKSD RKSD 441-*M	RKSD FSSDED 441-*M	RKSD FKSDED 441-*M	RKSD RJ45S 441-*M
	RJ45 Plug	 RJ45S			RJ45S FSSDED 441-*M	RJ45S FKSDED 441-*M	RJ45S RJ45S 441-*M

* Cable length in meters.
Refer to the Cordsets Builder at www.turck.com for assistance with cordset/cable combinations.
Standard cable lengths are 1, 2, 4, 5, 6, 8, 10, 15, and in +5 meter increments from there. Consult factory for other lengths.
For stainless steel coupling nuts change part number RSSD...RSSDV, FSSDED...FSSDEDV.

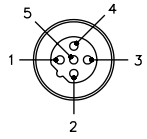
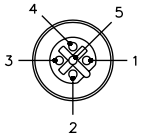
eurofast	Pinout	*eurofast*
 Male	1. WH / OG (+ tx) 2. WH / GR (+ rx) 3. OG (- tx) 4. GR (- rx)	 Female

RJ45 Pinout	RJ45 Plug	RJ45 (CR) Pinout
1. WH / OG 2. OG 3. WH / GR 4. N/C 5. N/C 6. GR 7. N/C 8. N/C	 12345678 Male	1. WH / GR 2. GR 3. WH / OG 4. N/C 5. N/C 6. OG 7. N/C 8. N/C

M12 *eurofast*® cordsets selection matrix — PROFIBUS®-DP

			eurofast			
			Pin (Male)		Socket (Female)	
			 RSSW	 WSSW	 RKSW	 WKSW
		 Bare	RSSW 455-*M	WSSW 455-*M	RKSW 455-*M	WKSW 455-*M
eurofast	Pin (Male)	 RSSW	RSSW RSSW 455-*M	RSSW WSSW 455-*M	RSSW RKSW 455-*M	RSSW WKSW 455-*M
		 WSSW		WSSW WSSW 455-*M	WSSW RKSW 455-*M	WSSW WKSW 455-*M
	Socket (Female)	 RKSW			RKSW RKSW 455-*M	RKSW WKSW 455-*M
		 WKSW				WKSW WKSW 455-*M

* Cable length in meters.
Refer to the Cordsets Builder at www.turck.com for assistance with cordset/cable combinations.
Standard cable lengths are 1, 2, 4, 5, 6, 8, 10, 15, and in +5 meter increments from there. Consult factory for other lengths.
For stainless steel coupling nuts change part number RSSW...RSSWV.
Additional cable types available in the Fieldbus and Network I/O Catalog.

eurofast	455 Series Pinout	*eurofast*
 Male	1. N/C 2. GR (TxD) 3. N/C 4. RD (RxD) 5. Bare (Shield Drain Wire)	 Female

Plug & play with standard automotive connectors

On request, TURCK can also supply the encoders with short cables and connectors, as commonly used with standard makes in the automotive sector: Deutsch, Packard and Molex are just some examples. This makes connection on the prefabricated cable harness a simple plug & play operation with a proven connection technology.

TURCK
Industrial Automation

Warranty terms and conditions

RISK OF LOSS

Delivery of the equipment to a common carrier shall constitute delivery to the Purchaser and the risk of loss shall transfer at that time to Purchaser. Should delivery be delayed due to an act or omission on the part of the Purchaser, risk of loss shall transfer to the Purchaser upon notification by TURCK Inc. that the order is complete and ready for shipment.

WARRANTIES

TURCK INC. (hereinafter "TURCK") offers five (5) WARRANTIES to cover all products sold. They are as follows:
1) The **12-MONTH WARRANTY** is available for the products listed - generally those not covered by **LIFETIME**, **5-YEAR**, **24-MONTH** or **18-MONTH** warranty. No registration required.
2) The **18-MONTH WARRANTY** is available for the products listed - generally those not covered by **LIFETIME** or **5-YEAR WARRANTY**. No registration is required.
3) The **24-MONTH WARRANTY** is available for the products listed - generally those not covered by **LIFETIME**, **5-YEAR** or **18-MONTH**. No registration is required.
4) The **5-YEAR WARRANTY** is available generally for the products listed. No registration is required.
5) A **LIFETIME WARRANTY** is available for the products listed. It becomes effective when the accompanying TURCK **LIFETIME WARRANTY REGISTRATION** is completed and returned to TURCK.

GENERAL TERMS AND CONDITIONS FOR ALL WARRANTIES

- **12-MONTH STANDARD WARRANTY**
- **18-MONTH STANDARD WARRANTY**
- **24-MONTH STANDARD WARRANTY**
- **5-YEAR WARRANTY**
- **LIFETIME WARRANTY**

TURCK warrants the Products covered by the respective WARRANTY AGREEMENTS to be free from defects in material and workmanship under normal and proper usage for the respective time periods listed above from the date of shipment from TURCK. In addition, certain specific terms apply to the various WARRANTIES.

THESE EXPRESS WARRANTIES ARE IN LIEU OF ANDEXCLUDE ALL OTHER REPRESENTATIONSMADE - BOTH EXPRESSEDANDIMPLIED. THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE FOR PRODUCTS COVERED BY THESE TERMS AND CONDITIONS.

TURCK warrants that the goods sold are as described, but no promise, description, affirmation of fact, sample model or representation, oral or written shall be part of an order, unless set forth in these terms and conditions, or are in writing and signed by an authorized representative of TURCK. These WARRANTIES do not apply to any Product which has been subject to misuse, negligence, or accident - or to any Product which has been modified or repaired, improperly installed, altered, or disassembled - except according to TURCK's written instructions.

These WARRANTIES are subject to the following conditions:
1) These WARRANTIES are limited to the electronic and mechanical performance only, as expressly detailed in the Product specifications and NOT to cosmetic performance.
2) These WARRANTIES shall not apply to any cables attached to, or integrated with the Product. However, the **18-MONTH WARRANTY** shall apply to cables sold separately by TURCK.
3) These WARRANTIES shall not apply to any Products which are stored, or utilized, in harsh environmental or electrical conditions outside TURCK's written specifications.
4) The WARRANTIES are applicable only to Products shipped from TURCK subsequent to January 1, 1988.

ADDITIONAL SPECIFIC TERMS FOR:

(12-MONTH STANDARD WARRANTY) for Linear Displacement Transducers and RFID products.

(18-MONTH STANDARD WARRANTY) FOR ULTRASONIC SENSORS, FLOW SENSORS, PRESSURE SENSORS, TEMP. SENSORS, INCLINOMETERS, CABLES AND ALL NON-SENSING PRODUCTS SOLD BY TURCK INC. INCLUDING MULTI-SAFE, MULTI-MODUL, MULTI-CART AND RELATED AMPLIFIER PRODUCTS, RELAYS AND TIMERS.

(24-MONTH STANDARD WARRANTY) FOR ENCODERS.

5-YEAR WARRANTY FOR INDUCTIVE AND CAPACITIVE PROXIMITY SENSORS: The periods covered for the above WARRANTIES and Products shall be 12 MONTHS, 18-MONTHS, 24-MONTHS and 5-YEARS, respectively, from the date of shipment from TURCK.

LIFETIME WARRANTY (OPTIONAL - REGISTRATION REQUIRED) FOR INDUCTIVE, INDUCTIVE MAGNET OPERATED AND CAPACITIVE PROXIMITY SENSORS SOLD TO THE ORIGINAL PURCHASER FOR THE LIFETIME OF THE ORIGINAL APPLICATION.

Warranty terms and conditions

The following terms apply to the LIFETIME WARRANTY in addition to the General Terms:

1) This WARRANTY shall be effective only when the LIFETIME WARRANTY REGISTRATION has been completed, signed by the End User and an authorized TURCK Representative or Distributor and has been received by TURCK no later than six (6) months after installation in the End User's Plant, or two (2) years from the date product was shipped from TURCK, whichever is sooner.
2) This warranty is available only to TURCK's authorized Representatives, Distributors and to the Original User. (The term "Original User" means that person, firm, or corporation which first uses the Product on a continuous basis in connection with the operation of a production line, piece of machinery, equipment, or similar device.) In the event the ownership of the product is transferred to a person, firm or corporation other than the Original User, this WARRANTY shall terminate.
3) This WARRANTY is applicable only to the Original Application. In the event the machinery, equipment, or production line to which the Product is connected, or on which it is installed, is substituted, changed, moved or replaced, the WARRANTY shall terminate.
4) This WARRANTY shall be valid only if the Product was purchased by the Original User from TURCK, or from an authorized TURCK Distributor, or was an integral part of a piece of machinery and equipment obtained by the Original user from an Original Equipment Manufacturer, which itself, was purchased directly from TURCK or from an authorized Distributor.

PURCHASER'S REMEDIES

This Remedy shall apply to all WARRANTIES. If a TURCK Distributor desires to make a WARRANTY Claim, the Distributor shall, if requested by TURCK, ship the Product to TURCK's factory in Minneapolis, Minnesota, postage or freight prepaid. If the User desires to make a WARRANTY Claim, they shall notify the authorized TURCK Distributor from whom it was purchased or, if such Distributor is unknown, shall notify TURCK. TURCK shall, at its option, take any of the following two courses of action for any products which TURCK determines are defective in materials or workmanship.

1) Repair or replace the Product and ship the Product to the Original Purchaser or to the authorized TURCK Distributor, postage or freight prepaid; or
2) Repay to the Original Purchaser that price paid by the Original Purchaser; provided that if the claim is made under the LIFETIME WARRANTY, and such Product is not then being manufactured by TURCK, then the amount to be repaid by TURCK to the Original Purchaser shall be reduced according to the following schedule:

Number of Years Since Date of Purchase by Original Purchaser	Percent of Original Purchase Price To Be Paid by TURCK
10	50%
15	25%
20	10%
More than 20	5%

PURCHASER'S REMEDIES SHALL BE LIMITED EXCLUSIVELY TO THE RIGHT OF REPLACEMENT, REPAIR OR REPAYMENT AS PROVIDED AND DOES NOT INCLUDE ANY LABOR COST OR REPLACEMENT AT ORIGINAL PURCHASER'S SITE. TURCK SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF ANY WARRANTY, EXPRESSED OR IMPLIED, APPLICABLE TO THE PRODUCT, INCLUDING WITHOUT LIMITATION, ANY DAMAGES RESULTING FROM PROPERTY DAMAGE, PERSONAL INJURY OR BUSINESS INTERRUPTION.

CONSIDER SAFETY AND PROTECTION PRECAUTIONS

TURCK takes great care to design and build reliable and dependable products, however, some products can fail eventually. You must take precautions to design your equipment to prevent property damage and personal injury in the unlikely event of failure. As a matter of policy, TURCK does NOT recommend the installation of electronic controls as the sole device FOR THE PROTECTION OF PERSONNEL in connection with power driven presses, brakes, shears and similar equipment and, therefore, the customer should build in redundancy or dual control using approved safety devices for these applications.

TURCK Inc. sells its products through Authorized Distributors. These distributors provide our customers with technical support, service and local stock. TURCK distributors are located nationwide - including all major metropolitan marketing areas.

For Application Support or for the location of your nearest TURCK distributor, call:

1-800-544-7769

Specifications in this manual are subject to change without notice. TURCK also reserves the right to make modifications and makes no guarantee of the accuracy of the information contained herein.

Literature and Media questions or concerns?
Contact Marketing Services TURCK USA: media@turck.com

TURCK

YOUR **AUTOMATION SOLUTIONS** PROVIDER

TURCK ***proximity*** sensors pave the way for automation success by:

- Utilizing the latest technological advancements in inductive, capacitive, ultrasonic and magnetic technology to meet increasing demands of customers.
- Being able to offer a wide variety of housing, environmental ratings and output configurations that help customers quickly find the correct solution.
- Incorporating special features to withstand environmental conditions, such as in welding, stamping dies, high or low temperatures, wash down and hazardous locations.

PROXIMITY

TURCK ***position*** solutions are synonymous with precision and provide you with:

- Optical encoders with temperature and aging compensation for extended life .
- Incremental encoders with housing sizes from 1 to 3.5 inches in a wide variety of signal outputs that are compatible with industrial control platforms.
- Single and multi-turn absolute encoders with numerous fieldbus options in shaft and hollow shaft housings.
- Magnetic encoder designs for high shock and wet environments.
- Magnetostrictive linear displacement transducers that save wear breakage, downtime and cost.

POSITION

TURCK ***measurement*** solutions makes obtaining data easier than ever, with a complete line of:

- High tech programmable pressure sensors and transmitters – some for hazardous areas.
- Temperature monitors with wide variety of probe styles.
- State-of-the-art air and liquid flow monitors, signal processors and amplifiers.
- Non-intrusive level and probe style sensors that utilize ultrasonic technology.

MEASUREMENT

RELECO by TURCK ***relays*** provide superior reliability and time-saving features, including:

- Optional LED indication and push to test features.
- Integrated RC or freewheeling diodes to extend contact life.
- Optional contact materials for a wide variety of signals.
- New solid state relay outputs that provide extended life over traditional electromechanical relays.

RELAYS

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