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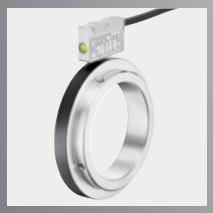

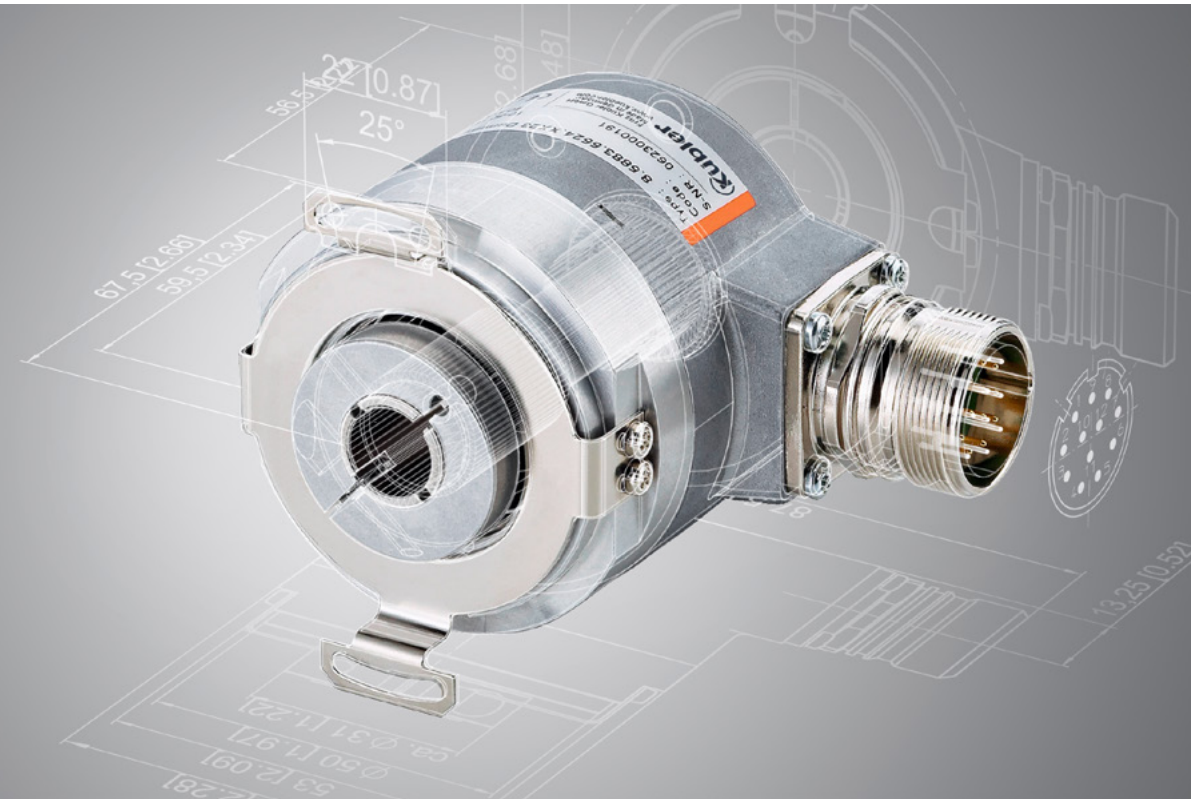

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- Bearingless Encoders
- Linear Measuring Technology
- Inclinometers
- Connection Technology
- Accessories

pulses for automation

Position and Motion Sensors

Our Pulses for Innovations

The Kübler Group belongs today to the leading specialists worldwide in the fields of position and motion sensors, functional safety, counting and process technology and transmission technology.

Founded in the year 1960 by Fritz Kübler, the family business is now led by the next generation of Gebhard and Lothar Kübler.

Ten international group members and distributors in more than 50 countries offer local product know-how, service and advice throughout the world.

Innovative product and sector solutions, as well as solutions for functional safety and a high level of service, are the reasons behind our global success.

The strict focus on quality ensures the highest levels of reliability and a long service life for our products in the field.

Over 480 dedicated people worldwide make this success possible and ensure that customers can continue to place their trust in our company.

Kübler Service for worldwide Planning Reliability

24one delivery promise

Manufacturing in 24 hours. For orders placed on working days before 9 AM, the product will be ready for dispatch on that same day. 24one is limited to 20 pieces per delivery.

10 by 10

We will manufacture and deliver 10 encoders within 10 working days (365 days a year - with the exception of 24th Dec. until 2nd Jan.)

48 h Express-Service

We can process your order within 48 hours; we can ship stock items the same day.

Sample Service

We manufacture samples of special designs or according to customer specification within shortest time.

Safety Services

- Adapted service packages
- Individual customer solutions

Tailor-made Solutions – Kübler Design System (KDS) OEM Products and Systems (OPS)

We develop jointly with our customers product and engineering solutions for customer-specific products, integrated drive solutions, up to complete systems.

Technical Support

Kübler' applications team is present on site all over the world for advice, analysis and support.

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Kübler Turkey +90 216 999 9791
Kübler China +86 10 8471 0818
Kübler India +91 8600 147 280
Kübler USA +1 855 583 2537

Our Product Portfolio

Position and Motion Sensors

- Incremental and absolute encoders
- Fieldbus and Industrial Ethernet encoders
- Bearingless encoders
- Explosion protected encoders ATEX / IECEx
- Linear magnetic measuring systems
- Draw-wire encoders
- Inclinometers
- Connection technology

Functional Safety

- Certified incremental and absolute encoders
- Certified explosion-protected encoders ATEX / IECEx
- Modules for safe drive monitoring
- Safe fieldbus gateways
- Safe speed monitors
- Adapted service packages
- Connection technology

Transmission Technology

- Slip rings, modular system
- Slip rings, bearingless modular system
- Slip rings, contactless transmission
- Slip rings, compact and low-maintenance
- Slip rings, Ethernet transmission
- Optical fiber signal transmission modules
- Cables, connectors and pre-assembled cordsets

Counters and Process Devices

- Pulse counters and preset counters
- Hour meters and timers
- Frequency meters and tachometers
- Combination time and energy meters
- Position displays
- Process displays and controllers for temperature, analog signals and strain-gauge
- Setpoint adjuster

We offer Solutions for the following Industries:

The high performance level and reliability of the Kübler products are based on our long experience in these demanding application sectors. Learn more about our application-specific solutions under:

www.kuebler.com/industries

Position and Motion Sensors

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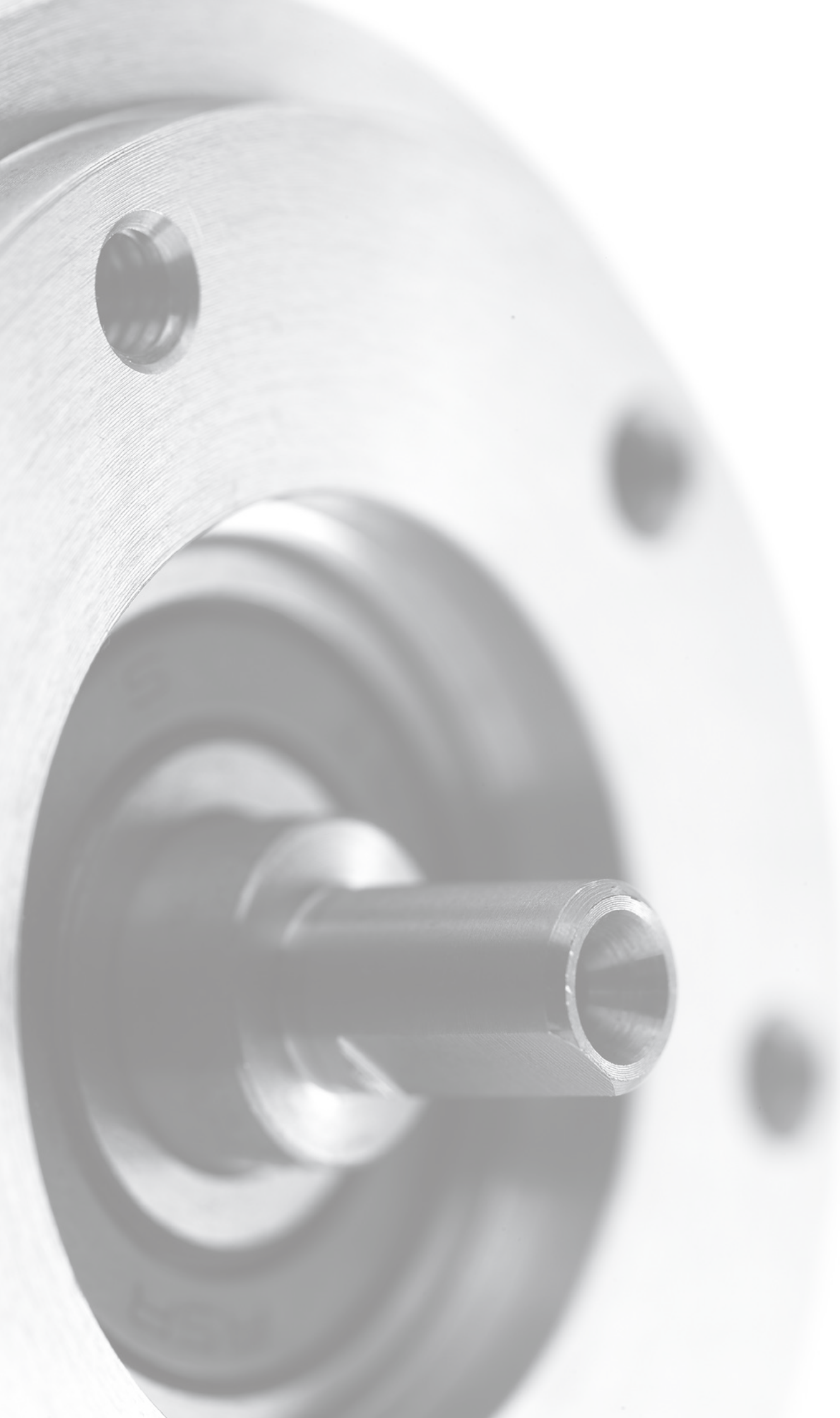

Product overview / Technical basics

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You will find comprehensive information about the basic technical knowledge relating to our products on our homepage, at the address
www.kuebler.com/basics

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Product overview

Incremental encoders

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in ppr	Push-pull	RS422	SinCos	Open collector	Ø Hollow shaft max. in mm [inch]	Speed max. in min^{-1}	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	Pulse frequency max. in kHz	RoHS compliant	Approvals	Page
	Miniature, optical **2400** (shaft) **2420** (hollow shaft)	24 [0.94]	–	•	1.024	•	–	–	–	6 [0.24]	12.000	-20 ... +85 [-4 ... +185]	IP64	cable	5 ... 24 8 ... 30	160	•	cULus	**50**
	Miniature, magnetic **2430** (shaft) **2440** (hollow shaft)	24 [0.94]	•	–	256	–	•	–	–	6 [0.24]	12.000	-20 ... +85 [-4 ... +185]	IP67	cable	5	300	•	–	**53**
new	Compact, optical **Sendix Base KIS40** (shaft) **Sendix Base KIH40** (hollow s.)	40 [1.57]	–	•	2.500	•	•	–	•	8 [0.31]	4.500	-20 ... +70 [-4 ... +158]	IP64	cable	5 10 ... 30	250	•	cULus	**56**
	Compact, optical **3610** (shaft) **3620** (hollow shaft)	36 [1.43]	–	•	2.500	•	•	–	–	8 [0.31]	12.000	-20 ... +85 [-4 ... +185]	IP64	cable M12	5 5 ... 18 8 ... 30	300	•	cULus	**60**
	Compact, optical plastic housing **3700** (shaft) **3720** (hollow shaft)	37 [1.46]	–	•	1.024	•	•	–	–	8 [0.31]	6.000	-20 ... +70 [-4 ... +158]	IP65	cable	5 5 ... 30 10 ... 30	250	•	cULus	**64**
	Standard, optical **Sendix 5000** (shaft) **Sendix 5020** (hollow shaft) 24one [1]	58 [2.28]	–	•	5.000	•	•	–	•	15 [0.59] 15.87 [5/8"]	12.000	-40 ... +85 [-40 ... +185]	IP67	cable M12 M23 MIL Sub-D	5 5 ... 30 10 ... 30	300	•	cULus Ex 2/22	**68**
new	Standard, optical **Sendix Base KIS50** (shaft) **Sendix Base KIH50** (hollow s.)	58 [2.28]	–	•	5.000	•	•	–	•	15 [0.59]	6.000	-20 ... +70 [-4 ... +158]	IP65	cable M12 M23	5 5 ... 30 10 ... 30	300	•	CE Ex 2/22	**81**
	Standard, optical high temperature **5803** (shaft) **5823** (hollow shaft)	58 [2.28]	–	•	5.000	•	•	–	–	12 [0.47]	12.000	-20 ... +110 [-4 ... +230]	IP65	cable M23 MIL	5 10 ... 30	300	•	cULus	**85**
	Standard, optical sine wave output, with zero pulse **5804** (shaft) **5824** (hollow shaft)	58 [2.28]	–	•	5.000	–	–	•	–	12 [0.47]	12.000	-20 ... +85 [-4 ... +185]	IP65	cable M23	5 10 ... 30	180	•	cULus	**90**
	Standard, optical sine wave output, highly interpolable **Sendix 5814** (shaft) **Sendix 5834** (hollow shaft)	58 [2.28]	–	•	1.024 and 2.048	–	–	•	–	15 [0.59]	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12	5 10 ... 30	400	•	cULus Ex 2/22	**94**
	Standard, optical sine wave output, SIL2 / PLd **Sendix SIL 5814FS2** (shaft) **Sendix SIL 5834FS2** (hollow s.)	58 [2.28]	–	•	1.024 and 2.048	–	–	•	–	14 [0.55]	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M12 M23	5 10 ... 30	400	•	cULus Ex 2/22 SIL 2 PLd	**98**
	Standard, optical sine wave output, SIL3 / PLe **Sendix SIL 5814FS3** (shaft) **Sendix SIL 5834FS3** (hollow s.)	58 [2.28]	–	•	1.024 and 2.048	–	–	•	–	14 [0.55]	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M12 M23	5 10 ... 30	400	•	cULus Ex 2/22 SIL 3 PLe	**104**

1) We offer for all encoders configured with the underlined preferential options our free of charge 24one delivery promise.
Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.

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Product overview

Incremental encoders

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ± 1°)	Optical (Accuracy ≤ ± 0.015°)	Resolution max. in ppr	Push-pull	RS422	SinCos	Open collector	Ø Hollow shaft max. in mm [inch]	Speed max. in min^{-1}	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	Pulse frequency max. in kHz	RoHS compliant	Approvals	Page
	Standard, optical high resolution **5805** (shaft) **5825** (hollow shaft)	58 [2.28]	–	•	36.000	•	•	–	–	12 [0.47]	12.000	-20 ... +105 [-4 ... +221]	IP65	cable M23	5 10 ... 30	800	•	cULus	110
	Standard, optical stainless-steel **Sendix 5006** (shaft) **Sendix 5026** (hollow shaft)	58 [2.28]	–	•	5.000	•	•	–	–	15 [0.59]	6.000	-40 ... +85 [-40 ... +185]	IP67	cable M12	5 5 ... 30 10 ... 30	300	•	cULus Ex 2/22	114
	Standard, optical ATEX / IECEx – zone 1/21 **7000** (shaft) **7020** (hollow shaft)	70 [2.76]	–	•	5.000	•	•	–	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 5 ... 30 10 ... 30	300	•	Ex IECEx	118
	Standard, optical ATEX / IECEx – zone 1/21 SIL2 / PLd **Sendix SIL 7014FS2** (shaft)	70 [2.76]	–	•	1.024 and 2.048	–	–	•	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 10 ... 30	400	•	Ex IECEx SIL 2 PLd	123
	Standard, optical ATEX / IECEx – zone 1/21 SIL3 / PLe **Sendix SIL 7014FS3** (shaft)	70 [2.76]	–	•	1.024 and 2.048	–	–	•	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 10 ... 30	400	•	Ex IECEx SIL 3 PLe	126
	Standard, optical ATEX / IECEx – mining **7100** (shaft) **7120** (hollow shaft)	70 [2.76]	–	•	5.000	•	•	–	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 5 ... 30 10 ... 30	300	•	Ex IECEx	129
	Standard, optical large hollow shaft **5821** (hollow shaft)	58 [2.28]	–	•	5.000	•	•	–	–	28 [1.10]	2.500	-20 ... +70 [-4 ... +158]	IP64	cable M12	5 8 ... 30	300	•	–	134
	Large hollow shaft, optical **A020** (hollow shaft)	100 [3.94]	–	•	5.000	•	•	•	–	42 [1.65]	3.000	-40 ... +70 [-40 ... +140]	IP65	cable M12 M23	5 5 ... 30 10 ... 30	300	•	cULus	137
	Large hollow shaft, optical robust **A02H** (hollow shaft)	100 [3.94]	–	•	5.000	•	•	•	–	42 [1.65]	6.000	-40 ... +80 [-40 ... +176]	IP65	cable M12 M23 MIL	5 5 ... 30 10 ... 30	300	•	cULus Ex 2/22 GL	141
	Heavy Duty, optical **Sendix H100** (shaft)	115 [4.53]	–	•	3.600	•	•	–	–	–	6.000	-40 ... +100 [-40 ... +212]	IP66	cable [1]	5 ... 30 10 ... 30	300	•	Ex 2/22	148
	Heavy Duty, optical **Sendix H120** (hollow shaft)	100 [3.94]	–	•	5.000	•	•	–	–	28 [1.10]	6.000	-40 ... +100 [-40 ... +212]	IP67	cable [1] M12 M23 opt. fiber	5 10 ... 30	300	•	Ex 2/22	153

1) With terminal box

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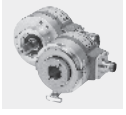
Absolute encoders
Singleturn

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit	SSI interface	BiSS interface	Analog/RS485 interface	Parallel interface	Additional incremental track	Speed max. in min^{-1}	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Page
	Miniature, magnetic **2450** (shaft) **2470** (hollow shaft)	24 [0.94]	•	–	12	•	–	–	–	–	12.000	-20 ... +85 [-4 ... +185]	IP67	cable	5	•	–	**162**
	Compact, magnetic analog **Sendix 3651** (shaft) **Sendix 3671** (hollow shaft)	36 [1.43]	•	–	12	–	–	4 ... 20 mA 0 ... 10 V	–	–	6.000	-40 ... +85 [-40 ... +185]	IP69k	cable M12	10 ... 30 15 ... 30	•	e1 Ex 2/22	**165**
	Compact, optical **Sendix F3653** (shaft) **Sendix F3673** (hollow shaft)	36 [1.43]	–	•	17	•	•	–	–	SinCos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12	5 10 ... 30	•	cULus	**180**
	Standard, optical parallel / analog **5850** (shaft) **5870** (hollow shaft)	58 [2.28]	–	•	13	–	–	4 ... 20 mA	•	–	12.000	-20 ... +85 [-4 ... +185]	IP66	cable M23	5 10 ... 30	•	cULus	**191**
	Standard, optical parallel, highspeed **5852** (shaft) **5872** (hollow shaft)	58 [2.28]	–	•	14	–	–	–	•	–	12.000	-20 ... +85 [-4 ... +185]	IP66	cable M23	5 10 ... 30	•	cULus	**196**
	Standard, optical **Sendix 5853** (shaft) **Sendix 5873** (hollow shaft)	58 [2.28]	–	•	21	•	•	–	–	SinCos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12 M23	5 10 ... 30	•	cULus Ex 2/22	**200**
new	Standard, optical Motor-Line **Sendix 5873** (tapered shaft)	58 [2.28]	–	•	21	•	•	–	–	SinCos RS422	9.000	-40 ... +90 [-40 ... +194]	IP65	cable	5 10 ... 30 4,5 ... 5,5	•	cULus	**208**
	Standard, optical SIL2 / PLd **Sendix SIL 5853FS2** (shaft) **Sendix SIL 5873FS2** (hollow s.)	58 [2.28]	–	•	17	•	•	–	–	SinCos	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•	cULus Ex 2/22 SIL2 PLd	**212**
	Standard, optical SIL3 / PLe **Sendix SIL 5853FS3** (shaft) **Sendix SIL 5873FS3** (hollow s.)	58 [2.28]	–	•	17	•	•	–	–	SinCos	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•	cULus Ex 2/22 SIL3 PLe	**219**
	Standard, optical stainless-steel SSI / parallel **5876** (hollow shaft)	58 [2.28]	–	•	14	•	–	–	•	–	6.000	-20 ... +80 [-4 ... +176]	IP67	cable M12	5 10 ... 30	•	cULus Ex 2/22	**254**
	Standard, optical ATEX / IECEx – zone 1 / 21 **Sendix 7053** (shaft) **Sendix 7073** (hollow shaft)	70 [2.76]	–	•	17	•	•	–	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex IECEx	**258**

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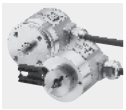
Product overview

Absolute encoders
Singleturn

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit	SSI interface	BiSS interface	Analog/RS485 interface	Parallel interface	Additional incremental track	Speed max. in min^{-1}	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Page
	Standard, optical ATEX/IECEx – Zone 1/21 SIL2/PLd **Sendix SIL 7053FS2** (shaft)	70 [2.76]	–	•	17	•	•	–	–	SinCos	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		**263**
	Standard, optical ATEX/IECEx – zone 1/21 SIL3/PLe **Sendix SIL 7053FS3** (shaft)	70 [2.76]	–	•	17	•	•	–	–	SinCos	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		**267**
	Standard, optical ATEX/IECEx – mining **Sendix 7153** (shaft) **Sendix 7173** (hollow shaft)	70 [2.76]	–	•	17	•	•	–	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		**281**

Absolute encoders
Singleturn
Fieldbus

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit	Speed max. in min^{-1}	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Fieldbus system	Page
	Compact, magnetic **Sendix M3658** (shaft) **Sendix M3678** (hollow shaft)	36 [1.43]	•	–	14	6.000	-40 ... +85 [-40 ... +185]	IP69k	cable M12	8 ... 30	•		CANopen	**170**
													SAE J1939	**175**
	Compact, optical **Sendix F3658** (shaft) **Sendix F3678** (hollow shaft)	36 [1.43]	–	•	16	12.000	-40 ... +85 [-40 ... +185]	IP67	cable	10 ... 30	•		CANopen	**186**
	Standard, optical **Sendix 5858** (shaft) **Sendix 5878** (hollow shaft)	58 [2.28]	–	•	16	9.000	-40 ... +80 [-40... +176]	IP67	cable M12 M23	10 ... 30	•		PROFIBUS DP	**227**
													CANopen	**232**
													EtherCAT	**240**
													PROFINET IO	**245**
	Standard, optical electronic singleturn **Sendix F5858** (shaft) **Sendix F5878** (hollow shaft)	58 [2.28]	–	•	16	8.000	-40 ... +80 [-40... +176]	IP65	M12	10 ... 30	•		EtherNet/IP	**250**
	Standard, optical ATEX/IECEx – zone 1/21 **Sendix 7058** (shaft) **Sendix 7078** (hollow shaft)	70	–	•	16	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		PROFIBUS DP	**272**
													CANopen	**277**
	Standard, optical ATEX/IECEx – mining **Sendix 7158** (shaft) **Sendix 7178** (hollow shaft)	70	–	•	16	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		PROFIBUS DP	**287**
													CANopen	**291**

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Absolute encoders
Multiturn

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit ST+MT	SSI interface	BiSS interface	Analog/RS485 interface	Additional incremental track	Speed max. in min^{-1}	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Page
new	Compact, magnetic electronic multiturn **Sendix M3661** (shaft) **Sendix M3681** (hollow shaft)	36 [1.42]	•	–	12 + 16	–	–	4 ... 20 mA 0 ... 10 V 0 ... 5 V	–	6.000	-40 ... +85 [-40 ... +185]	IP67	cable M12	10 ... 30 15 ... 30	•	e1 pending cULus Ex2/22	298
new	Compact, magnetic electronic multiturn **Sendix M3663** (shaft) **Sendix M3683** (hollow shaft)	36 [1.42]	•	–	14 + 24	•	–	–	–	6.000	-40 ... +85 [-40 ... +185]	IP67	cable M12	10 ... 30	•	e1 pending cULus Ex2/22	304
new	Compact, magnetic robust, electronic multiturn **Sendix M3661R** (shaft)	36 [1.42]	•	–	12 + 16	–	–	4 ... 20 mA 0 ... 10 V 0 ... 5 V	–	4.000	-40 ... +85 [-40 ... +185]	IP69k	cable M12	10 ... 30 15 ... 30	•	e1 pending cULus Ex2/22 pending	314
new	Compact, magnetic robust, electronic multiturn **Sendix M3663R** (shaft)	36 [1.42]	•	–	14 + 24	•	–	–	–	4.000	-40 ... +85 [-40 ... +185]	IP69k	cable M12	10 ... 30	•	e1 pending cULus Ex2/22 pending	318
	Compact, optical electronic multiturn **Sendix F3663** (shaft) **Sendix F3683** (hollow shaft)	36 [1.42]	–	•	17 +24	•	•	–	SinCos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12	5 10 ... 30	•	cULus	325
new	Standard, magnetic electronic multiturn **Sendix M5861** (shaft)	58 [2.28]	•	–	12 + 16	–	–	4 ... 20 mA 0 ... 10 V 0 ... 5 V	–	4.000	-40 ... +85 [-40 ... +185]	IP65	cable M12	10 ... 30 15 ... 30	•	cULus Ex2/22	336
new	Standard, magnetic electronic multiturn **Sendix M5863** (shaft)	58 [2.28]	•	–	14 + 24	•	–	–	–	4.000	-40 ... +85 [-40 ... +185]	IP65	cable M12	10 ... 30	•	cULus Ex2/22	340
	Standard, optical electronic multiturn **Sendix F5863** (shaft) **Sendix F5883** (hollow shaft)	58 [2.28]	–	•	17 +24	•	•	–	SinCos RS422	12.000	-40 ... +85 [-40 ... +185]	IP67	cable M12 M23	5 10 ... 30	•	cULus Ex2/22	347
new	Standard, optical Motor-Line electronic multiturn **Sendix F5883M** (hollow shaft)	58 [2.28]		•	17 +24	•	–	–	SinCos RS422	9.000	-40 ... +85 [-40 ... +185]	IP65	cable	5 10 ... 30	•	cULus pending	354
	Standard, optical mechanical multiturn **Sendix 5863** (shaft) **Sendix 5883** (hollow shaft)	58 [2.28]	–	•	17 +12	•	•	–	SinCos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12 M23	5 10 ... 30	•	cULus Ex2/22	358

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Absolute encoders
Multiturn

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit ST+MT	SSI interface	BiSS interface	Analog / RS485 interface	Additional incremental track	Speed max. in min^{-1}	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Page
	Standard, optical mechanical multiturn SIL2 / PLd **Sendix SIL 5863FS2** (shaft) **Sendix SIL 5883FS2** (hollow s.)	58 [2.28]	–	•	17 +12	•	•	–	SinCos	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•	cULus, Ex 2/22, SIL2 PLd	**366**
	Standard, optical mechanical multiturn SIL3 / PLe **Sendix SIL 5863FS3** (shaft) **Sendix SIL 5883FS3** (hollow s.)	58 [2.28]	–	•	17 +12	•	•	–	SinCos	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•	cULus, Ex 2/22, SIL3 PLe	**373**
	Standard, optical mechanical multiturn ATEX / IECEx – zone 1 / 21 **Sendix 7063** (shaft) **Sendix 7083** (hollow shaft)	70 [2.76]		•	17 +12	•	•	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	**426**
	Standard, optical mechanical multiturn ATEX / IECEx – zone 1 / 21 SIL2 / PLd **Sendix SIL 7063FS2** (shaft)	70 [2.76]		•	17 +12	•	•	–	SinCos	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx, SIL2 PLd	**431**
	Standard, optical mechanical multiturn ATEX / IECEx – zone 1 / 21 SIL3 / PLe **Sendix SIL 7063FS3** (shaft)	70 [2.76]		•	17 +12	•	•	–	SinCos	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx, SIL3 PLe	**435**
	Standard, optical mechanical multiturn ATEX / IECEx – mining **Sendix 7163** (shaft) **Sendix 7183** (hollow shaft)	70 [2.76]		•	17 +12	•	•	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	**449**
	Large hollow shaft, optical / magnetic, programmable **9081** (large hollow shaft)	90 [3.54]		•	13 +12	•	–	–	–	6.000	-20 ... +70 [-4 ... +158]	IP65	cable M23	4.75... 30 5 ... 30	•	cULus	**471**

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Absolute encoders
Multiturn
Fieldbus

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit ST+MT	Speed max. in min-1	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Fieldbus system	Seite
new	Compact, magnetic electronic multiturn, **Sendix M3668** (shaft) **Sendix M3688** (hollow shaft)	36 [1.42]	•	–	14 +24	6.000	-40 ... +85 [-40... +185]	IP67	cable M12	10 ... 30	•	e1 pending, cULus, Ex 2/22	CANopen	309
new	Compact, magnetic robust, electronic multiturn **Sendix M3668R** (shaft)	36 [1.42]	•	–	14 +24	4.000	-40 ... +85 [-40... +185]	IP69k	cable M12	10 ... 30	•	e1 pending, cULus, Ex 2/22 pending	CANopen	321
	Compact, optical electronic multiturn **Sendix F3668** (shaft) **Sendix F3688** (hollow shaft)	36 [1.42]	–	•	14 +24	12.000	-40 ... +85 [-40... +185]	IP67	cable	10 ... 30	•	Ex 2/22	CANopen	331
new	Standard, magnetic electronic multiturn **Sendix M5868** (shaft)	58 [2.28]	•	–	14 + 24	4.000	-40 ... +85 [-40... +185]	IP65	cable M12	10 ... 30	•	cULus, Ex 2/22	CANopen	343
new	Standard, optical electronic multiturn **Sendix F5868** (shaft) **Sendix F5888** (hollow shaft)	58 [2.28]	–	•	16 +16	12.000	-40 ... +80 [-40... +176]	IP67	cable M12	10 ... 30	•	cULus, Ex 2/22	CANopen	380
													EtherNet/IP	390
													MODBUS RTU	395
new	Standard, optical Motor-Line electronic multiturn **Sendix F5888M** (hollow shaft)	58 [2.28]	–	•	16 +16	9.000	-40 ... +85 [-40... +185]	IP65	cable	10 ... 30	•	cULus	CANopen	386
	Standard, optical mechanical multiturn **Sendix 5868** (shaft) **Sendix 5888** (hollow shaft)	58 [2.28]	–	•	16 +12	9.000	-40 ... +85 [-40... +185]	IP67	cable M12 Sub-D	10 ... 30	•	cULus, Ex 2/22	PROFIBUS DP	400
													CANopen / CANopenLift	405
													EtherCAT	416
													PROFINET IO	421
	Standard, optical mechanical multiturn ATEX / IECEx – zone 1 / 21 **Sendix 7068** (shaft) **Sendix 7088** (hollow shaft)	70 [2.76]	–	•	16 +12	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	PROFIBUS DP	439
													CANopen	444
	Standard, optical mechanical multiturn ATEX / IECEx – minig **Sendix 7168** (shaft) **Sendix 7188** (hollow shaft)	70 [2.76]	–	•	16 +12	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	PROFIBUS DP	454
													CANopen	459
	Large hollow shaft, optical / magnetic **9080** (large hollow shaft)	70 [2.76]	–	•	13 +12	6.000	-10 ... +70 [-14 ... +158]	IP65	cable M12	10 ... 30	•	cULus	PROFIBUS DP	464
													CANopen / DeviceNet	467

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Bearingless encoders

		Hollow shaft **max.** in mm [“]	**Magnetic** (Accuracy ±1°)	**With zero pulse**	**Resolution** max. in ppr	**Push-pull**	**RS422**	**SSI**	**CANopen**	**Speed** max. in min^{-1}	**Temperature range** in °C [°F]	**Protection** max.	**Type of connection**	**Power supply** in V DC	**Pulse frequency** max. in kHz	**RoHS compliant**	**Approvals**	**Page**
new	Incremental, standard magnetic **RLI20** (hollow shaft)	30 [1.18]	•	–	3.600	•	•	–	–	12.000	-20 ... +80 [-4°F ... +176°F]	IP69k	cable	4.8 ... 26 4.8 ... 30	250	•	–	**476**
new	Incremental, standard zero pulse, magnetic **RLI50** (hollow shaft)	35 [1.38]	•	•	3.600	•	•	–	–	12.000	-20 ... +80 [-4°F ... +176°F]	IP69k	cable	4.8 ... 26 4.8 ... 30	250	•	–	**479**
	Incremental, standard magnetic **RI20/Limes LI20** (hollow shaft)	30 [1.18]	•	–	3.600	•	•	–	–	12.000	-20 ... +80 [-4°F ... +176°F]	IP69k	cable	4.8 ... 26 4.8 ... 30	250	•	–	**482**
	Incremental, standard zero pulse, magnetic **RI50/Limes LI50** (hollow shaft)	35 [1.38]	•	•	3.600	•	•	–	–	12.000	-20 ... +80 [-4°F ... +176°F]	IP69k	cable	4.8 ... 26 4.8 ... 30	250	•	–	**485**
new	Incremental, large hollow shaft magnetic **RLI200** (hollow shaft)	390 [15.35]	•	–	16.000	•	•	–	–	12.000	-20 ... +80 [-4°F ... +176°F]	IP69k	cable	4.8 ... 26 4.8 ... 30	250	•	–	**488**
new	Incremental, large hollow shaft zero pulse, magnetic **RLI500** (hollow shaft)	350 [13.78]	•	•	6.400	•	•	–	–	12.000	-20 ... +80 [-4°F ... +176°F]	IP69k	cable	4.8 ... 26 4.8 ... 30	250	•	–	**491**
new	Absolut singleturn, standard, magnetisch **RLA50** (Hohlwelle)	30	•	–	16.000	–	–	•	•	1.000	-15 ... +70	IP50	M12	10 ... 30	–	•	–	**494**

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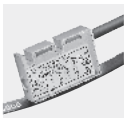
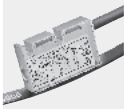
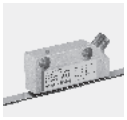
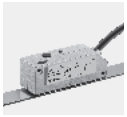
Linear measuring technology
Magnetic measurement system

		Measuring range max. in m	**Accuracy** max.	**Resolution** max. in µm	**Dimensions** in mm [inch]	**Incremental RS422/Push-Pull**	**Incremental SinCos**	**Absolute analog**	**Absolute SSI/BiSS**	**Absolute fieldbus**	**Traverse speed** max. in m/s	**Temperature range** in °C [°F]	**Protection** max.	**Type of connection**	**RoHS compliant**	**Page**
	Incremental sensor head, magnetic band **Limes LI20/B1**	50	dep. on meas. length 0.08 mm for 1 m	10	10x25x40 [0.39 x 0.98 x 1.57]	•	–	–	–	–	25	-20 ... +80 [-4 ... +176]	IP69k	cable	•	**500**
	Incremental sensor head, magnetic band **Limes LI50/B2**	50	dep. on meas. length 0.1 mm for 1 m	5	10x25x40 [0.39 x 0.98 x 1.57]	•	–	–	–	–	16	-20 ... +80 [-4 ... +176]	IP69k	cable	•	**503**
	Absolute sensor head, magnetic band **Limes LA10/BA1**	8	dep. on meas. length 0.03 mm for 1 m	1	16x30x70 [0.63 x 1.18 x 2.76]	–	•	–	•	•	10	-10 ... +70 [+14 ... +158]	IP64	M12	•	**506**
	Absolute sensor head, magnetic band **Limes LA50/BA5**	20	dep. on meas. length 0.17 mm for 1 m	10	24x26x75 [0.94 x 1.02 x 2.95]	–	–	–	•	•	4	-10 ... +70 [+14 ... +158]	IP40	cable	•	**510**

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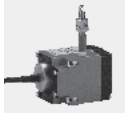
Product overview

Linear measuring technology
Draw wire mechanics

		Measuring range max. in m	Accuracy max.	Resolution max. [mm]	Dimensions in mm [inch]	Incremental RS422/Push-Pull	Absolute analog	Absolute SSI/BiSS	Absolute fieldbus	Traverse speed max. in m/s	Temperature range max. in °C [°F]	Protection max.	Type of connection	RoHS compliant	Page
	Draw wire encoder **A30** with analog sensor	0.6	±0.1 % of measuring range	0.15	32.45 x 40.7 x 28.6 [1.28 x 1.60 x 1.13]	–	4 ... 20 mA 0 ... 10 V DC 10kΩ	–	–	0.8	-10 ... +80 [-4 ... +176]	IP50	cable	•	**514**
	Draw wire encoder **A40** with analog sensor	1	±0.1 % of measuring range	0.1	40 x 40 x max. 72 [1.57 x 1.57 x 3.90]	–	4 ... 20 mA 0 ... 10 V 10kΩ	–	–	0.8	-20 ... +90 [-4 ... +194]	IP50 IP65	cable	•	**516**
	Draw wire encoder **A50** with encoder or analog sensor	1.25	±0.02 % of measuring range	0.05	50 x 50 x max. 99 [1.97 x 1.97 x 3.90]	•	4 ... 20 mA 0 ... 10 V 1kΩ	•	•	10	-40 ... +120 [-40 ... +248]	IP67	cable M12	•	**518**
	Draw wire encoder **A40** with incremental encoder	2	±0.1 % of measuring range	0.15	32.45 x 40.7 x 28.6 [1.28 x 1.60 x 1.13]	•	4 ... 20 mA 0 ... 10 V DC 10kΩ	–	–	0.8	-10 ... +80 [-4 ... +176]	IP45	cable	•	**523**
	Draw wire encoder **A41** with analog sensor	2	±0.1 % of measuring range	0.1	40 x 40 x max. 72 [1.57 x 1.57 x 2.83]	•	4 ... 20 mA 0 ... 10 V 10kΩ	–	–	0.8	-20 ... +90 [-4 ... +194]	IP50 IP65	cable	•	**516**
	Draw wire encoder **A41** with absolute encoder	2	±0.35 % of measuring range	0.15	41 x 41 x max. 96.3 [1.61 x 1.61 x 3.79]	–	4 ... 20 mA 0 ... 10 V DC 10kΩ	•	•	1	-10 ... +80 [-4 ... +176]	IP50	cable	•	**525**
	Draw wire encoder **B75** with encoder or analog sensor	3	±0.35 % of measuring range	0.15	75 x 75 x max. 127.4 [2.95 x 2.95 x 5.02]	–	4 ... 20 mA 0 ... 10 V DC 10kΩ	–	–	0.8	-40 ... +80 [-40 ... +176]	IP65	cable	•	**528**
	Draw wire encoder **B80** with encoder or analog sensor	3	±0.02 % of measuring range	0.05	80 x 80 x max.144 [3.15 x 3.15 x 5.67]	•	4 ... 20 mA 0 ... 10 V 1kΩ	•	•	10	-40 ... +120 [-40 ... +248]	IP67	cable M12 M23	•	**532**
	Draw wire encoder **C105** with encoder	6	±0.1 % of measuring range	0.1	105 x 85 x max. 163 [4.13 x 3.35 x 6.42]	•	–	•	•	3	-20 ... +80 [-4 ... +176]	–	cable	•	**538**
	Draw wire encoder **C120** with encoder or analog sensor	6	±0.02 % of measuring range	0.08	120 x 120 x max. 136 [4.72 x 4.72 x 5.35]	•	4 ... 20 mA 0 ... 10 V 1kΩ	•	•	10	-40 ... +120 [-40 ... +248]	IP67	cable M12 M23	•	**541**
new	Draw wire encoder **D120** for outdoor applivations	10	±0.05 % of measuring range	0.1	120 x 120 x max. 381,5 [4.72 x 4.72 x 15.02]	•	4 ... 20 mA 0 ... 10 V 1kΩ	–	•	3	-40 ... +85 [-40... +185]	IP69k	cable M12	•	**547**
	Draw wire encoder **D135** with encoder or analog sensor	42.5	±0.02 % of measuring range	0.08	135 x 135 x max. 318 [5.32 x 5.32 x 12.52]	•	4 ... 20 mA 0 ... 10 V 1 kΩ	•	•	10	-40 ... +120 [-40 ... +248]	IP67	cable M12 M23	•	**554**

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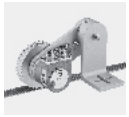
Linear measuring technology

		Measuring range max. in m	**Accuracy** max.	**Resolution** min. in mm	**Dimensions** in mm [inch]	**Incremental RS422/Push-Pull**	**Incremental SinCos**	**Absolute analog**	**Absolute SSI/BiSS**	**Absolute fieldbus**	**Traverse speed** max.	**Temperature range** in °C [°F]	**Protection** max.	**Type of connection**	**RoHS compliant**	**Page**
	Lift measuring system for shaftcopying **LM3**	53	±0.5 mm	0.1	dep. on type	•	•	–	•	•	6 m/s	-20 ... +85 [-4 ... +185]	IP67	cable M12 M23 MIL	•	**561**
	Length measuring kit with spring encoder arm **Limes Kit TB1**	∞	±0,015°	0.1	–	•	•	•	•	•	5 m/s	-10 ... +80 [+14 ... +176]	IP67	cable M12 M23 MIL	•	**563**
	Length measuring kit with rack and pinion incremental / absolute incl. encoder / preset counter	∞	0.5 mm	0.1	dep. on rack	•	•	–	•	•	0.5 m/s	-20 ... +80 [-4 ... +176]	IP67	cable M12 M23 MIL	•	**567**
	Length measuring kit with measuring wheels incremental / absolute incl. encoder / preset counter	∞	±0.015°	0.1	dep. on the measuring wheel	•	•	–	•	•	2.000 min^{-1}	-20 ... +80 [-4 ... +176]	IP67	cable M12 M23 MIL	•	**568**
	Length measuring kit, mini measuring wheel system, incremental incl. encoder	∞	±0.015°	0.1	74 x 50 x 52 [2.91 x 1.97 x 2.05]	•	•	–	–	–	2.000 min^{-1}	-20 ... +80 [-4 ... +176]	IP64	cable	•	**569**

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Inclinometers

		Measuring angle max.	Accuracy max.	Resolution max.	Dimensions in mm [inch]	Absolute analog	CANopen	Modbus	Reaction time in s	Temperature range in °C [°F]	Protection max.	Type of connection connector	RoHS compliant	Approvals	Page
new	Inclinometer MEMS, capacitive analog **IN81, 1- und 2-dimensional**	±85° 360°	±0,2°	12 bit	80 x 60 x 23 [3.15 x 2.36 x 0.91]	4 ... 20 mA 0,1 ... 4,9 V 0,5 ... 4,5 V 0 ... 5 V 0 ... 10 V	–	–	0,1	-40 ... +85 [-40 ... +185]	IP69k	M12	•	pending	**576**
new	Inclinometer MEMS, capacitive CANopen **IN88, 1- and 2-dimensional**	±85° 360°	±0.4°	0.01°	80 x 60 x 23 [3.15 x 2.36 x 0.91]	–	•	–	0.1	-40 ... +85 [-40 ... +185]	IP69k	M12	•	pending	**581**
new	Inclinometer MEMS, capacitive Modbus **IN88, 1- und 2-dimensional**	±85° 360°	±0,4°	0.01°	80 x 60 x 23 [3.15 x 2.36 x 0.91]	–	–	•	0.1	-40 ... +85 [-40 ... +185]	IP69k	M12	•	pending	**584**
	Inclinometer MEMS, capacitive analog **IS40, 1-dimensional**	360°	±0.5°	0.15°	60 x 30 x 20 [2.36 x 1.18 x 0.79]	4 ... 20 mA 0.1 ... 4.9 V	–	–	0.1	-30 ... +70 [-24 ... +158]	IP69k	M12	•	–	**588**
	Inclinometer MEMS, capacitive analog **IS40, 2-dimensional**	±60°	±0.5°	0.15°	60 x 30 x 20 [2.36 x 1.18 x 0.79]	4 ... 20 mA 0.1 ... 4.9 V 2 % ... 98 %	–	–	0.1	-30 ... +70 [-24 ... +158]	IP69k	M12	•	–	**590**
	Inclinometer MEMS, capacitive CANopen **IS60, 1-dimensional**	360°	±0.5°	0.1°	68 x 42.5 x 42.5 [2.68 x 1.67 x 1.67]	–	•	–	0.1	-40 ... +80 [-40 ... +176]	IP69k	M12	•	–	**592**
	Inclinometer MEMS, capacitive CANopen **IS60, 2-dimensional**	±60°	±0.5°	0.1°	68 x 42.5 x 42.5 [2.68 x 1.67 x 1.67]	–	•	–	0.1	-40 ... +80 [-40 ... +176]	IP69k	M12	•	–	**594**

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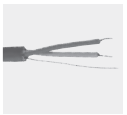
Connection technology
Cable, unprepared, cut to length

		PVC cable	PUR cable	TPE cable	Cross section in mm²	Cable diameter in mm	for incremental encoders	for absolute encoders	Page
	5 core + shield	•	•	–	5 x 0.14 [AWG25] 5 x 0.75 [AWG18]	approx. 4.7 approx. 7.5	•	–	**598**
	8 core + shield	–	•	–	8 x 0,14 8 x 0.14 [AWG25] 3 x 2 x 0,14 [AWG25] + 2 x 0,5 [AWG20]	approx. 5.5 approx. 7.4	–	•	**598**
	10 core + shield	–	•	–	4 x 2 x 0.25 [AWG23] + 2 x 1 [AWG17]	approx. 7.9	•	•	**598**
	12 core + shield	•	•	•	10 x 0.14 [AWG25] + 2 x 0.5 [AWG20] 12 x 0.14 [AWG25] 6 x 2 x 0.14 [AWG25] 5 x 2 x 0.14 [AWG25] + 2 x 0.5 [AWG20] 6 x 2 x 0.14 [AWG25]	approx. 6.9 approx. 6.7 approx. 7.5 approx. 8.5 approx. 7.3	•	•	**599**
	18 core + shield	•	–	–	18 x 0.14 [AWG25]	approx. 7.8	–	•	**599**
	PROFIBUS DP DeviceNet CANopen EtherCAT, PROFINET IO, EtherNet/IP	•	•	–	2 x 0.34 [AWG25] 2 x 0.52 [AWG20] + 2 x 1.04 [AWG17] 3 x 2 x 0.25 [AWG23] 2 x 2 x 0.34 [AWG22]	approx. 7.6 approx. 8.4 approx. 6.2 approx. 4.8	•	•	**600**

Connection technology
Connectors, self-assembly

		N° of pins	Housing	Connection technology	Cable diameter Ø in mm	Straight connector	Right angle connector	Wall/panel lead-through	for fieldbus	Page
	M12	4/5/8/12	Metal	Screw terminals	6 - 8	•	•	•	•	**601**
	M23	12/17	Metal	Solder pins	5.5 - 10.5	•	–	•	–	**619**
	MIL	7/10	Metal	Solder pins	5 - 8	•	–	–	–	**625**

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Product overview

Connection technology
Cordsets, pre-assembled

	PVC cable	PUR cable	TPE cable	Optical fiber	Straight connector	Right angle connector	for incremental encoders	for SSI / BiSS encoders	for fieldbus	for analog interfaces	Page
with M12 connector	•	•	–	–	•	•	•	•	•	•	**607**
with M23 connector	•	•	•	–	•	–	•	•	–	•	**621**
with Sub-D connector	–	•	–	–	–	•	–	–	•	–	**626**
Simplex patch cable optical fiber	–	–	–	•	•	–	•	•	–	–	**634**

Optical fiber transmission modules (LWL)

	Interface	Transmission distance in m	Input frequency in kHz	Temperature range in °C [°F]	Power / Current in VDC	Power consumption in W	Page
Optical fiber module, incremental **LWL**	RS422 HTL	2.000	400	-10 ... +60 [-14 ... +140]	5 10 ... 30	2	**634**
Optical fiber module, absolute **LWL.A**	SSI	2.000	1.000	-10 ... +70 [-14 ... +158]	5 10 ... 30	1	**636**

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Encoders

Introduction

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

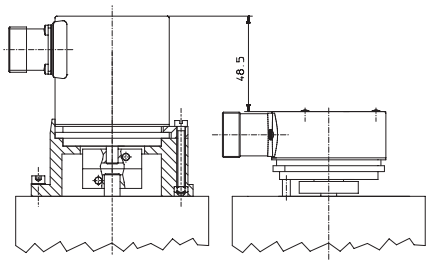
Incremental encoders generate pulses, where the number of pulses can be a measure of speed, length or position.

In absolute encoders, every position corresponds to an unique code pattern. No reference runs after starting-up are necessary as with incremental systems. Safety is increased and the time taken for reference runs is saved.

In principle we can supply all encoders, whether with a solid shaft or in a hollow shaft version.

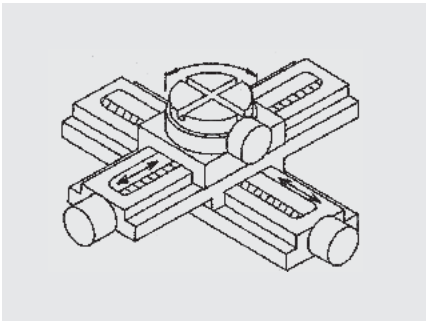
Using a hollow shaft encoder saves up 30 % of costs and up to 50 % of the required space compared to a shaft encoder. This is achieved by avoiding additional couplings, brackets and other assembly aids.

To mount a hollow shaft encoder it just needs to be pushed onto the shaft, clamped, and in the simplest case prevented from rotating by using a cylinder pin. Moreover, in principle, hollow shaft encoders require less installation depth.

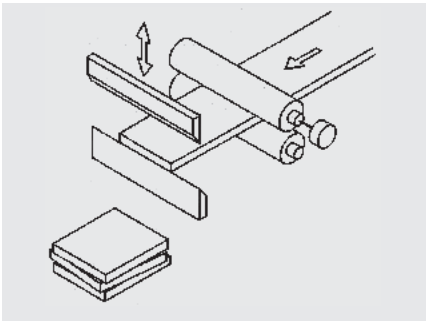


Application examples

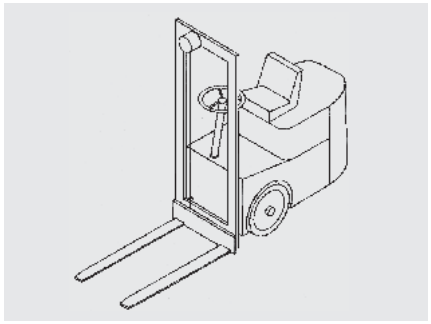
Angular measurement



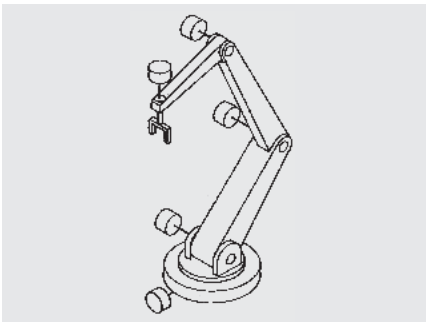
Positioning



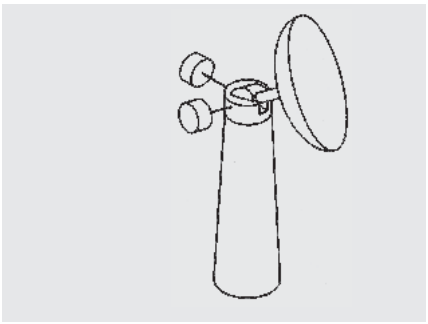
Detecting of fork's position



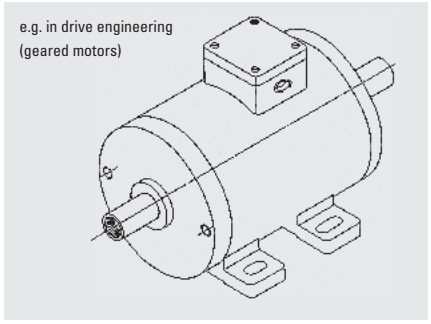
Detecting of position



Angular measurement



Velocity measurement



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Encoders

Functional principle

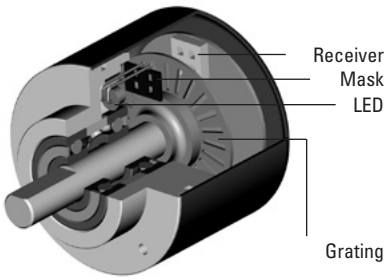
Assembly and function

Optical scanning (incremental)

A disc fitted with a grating, having a code pattern of slits and bars, is mounted so that it can rotate between an LED and a receiver.

The light emitted by the LED is modulated by the mask and grating and then strikes the receiver, which produces a signal proportional to the luminosity.

When the disc rotates this signal has a shape that approximates to a sine wave.



Optical scanning (absolute)

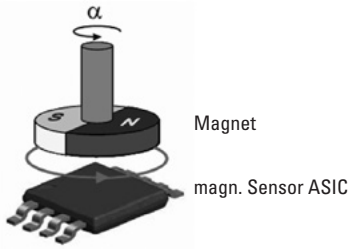
The light that is emitted by an LED is modulated by a code pattern, which is applied to a rotating disc; this is scanned by a special Kübler Opto ASIC. A unique bit pattern is assigned to each position and this is generally available as Gray Code.

The advantage, compared with incremental encoders, lies in the fact that any movement of the shaft whilst voltage is not applied is immediately detected when power is re-applied, ensuring the correct position is always available.

Magnetic scanning

The magnetic field created by a rotating permanent magnet is scanned by a sensor ASIC. Each angular position has underlying field vectors, which are converted by the ASIC into incremental signals.

Depending on the version, this signal will be emitted as an incremental signal or in absolute form as a SSI, 0 ... 10 V, 4 ... 20 mA signal or as a fieldbus signal.



Limes rotary / Limes ring

The Limes rotary magnetic measuring systems are suitable for machines and plants where installation space is tight.

The bearingless and non-contact measuring principle allows error-free operation in environmental conditions that require a high IP protection level (up to IP69k) or high rotary speeds.

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Encoders | Incremental encoders

Processing of the signals (optical, incremental encoders)

The sine wave signals are then processed in a specially designed electronic circuitry. Most controllers require square-wave signals on their input.

The signals are therefore pre-processed accordingly in the encoder and made available using various output circuits depending on the application.

Number of channels

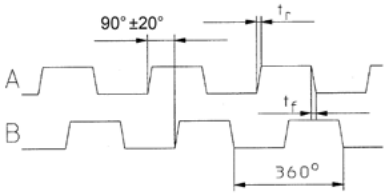
Encoders with one output channel:

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

Encoders with two output channels:

Applications, where the direction of rotation should be sensed, e.g. positioning, require encoders with two channels A and B being shifted 90° out of phase. By detecting the phase shift, the direction can be determined.

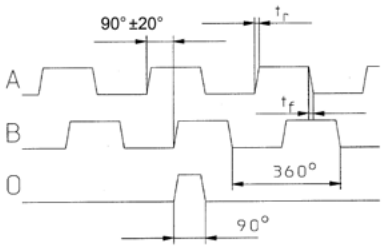
- Shaft turning clockwise, top-view of shaft / for hollow shaft encoders, viewing the flange
- Inverted signals available
  t_r = rise time
  t_f = fall time



Encoders with three output channels:

In addition to the two channels A and B a zero pulse is available, which occurs once per revolution and is usually used for the reference run (zero point calibration) of a machine.

- Shaft turning clockwise, top-view of shaft / for hollow shaft encoders, viewing the flange
- Inverted signals available
- 0 pulse is linked to AND with channel A and B
  t_r = rise time
  t_f = fall time



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Encoders | Incremental encoders

Multiplication of pulses

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

An encoder with physically 5000 pulses per revolution can generate 20000 pulses per revolution using this technique.

Inverted signals

When used in environments, with a lot of electrical noise and/or if very long cable distances are required, we recommend using encoders with inverted (complementary) signals.

These signals are always available with output circuits of the RS422 type and sine wave outputs or optionally with push-pull outputs.

Resolution

The required angular or linear resolution of a application determines the number of pulses per revolution. Linear movements must first be converted into rotary, for example by means of a spindle.

Example:

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 = 200 mm
- Accuracy of the system = 0.1 mm

wanted:
- Resolution of the encoder [ppr] [1)]

$$\text{Resolution} = \frac{\text{Circumference}}{\text{Accuracy}}$$

The required resolution would be 2000 ppr [1)].

Pulse frequency

The required pulse frequency can be calculated as a result of the number of pulses per revolution (ppr) and the maximum speed (rpm). The maximum pulse frequency is shown in the data sheet specifications for each encoder.

Generally this is 300 KHz, but can be up to 800 KHz with high-resolution encoders.

Example:

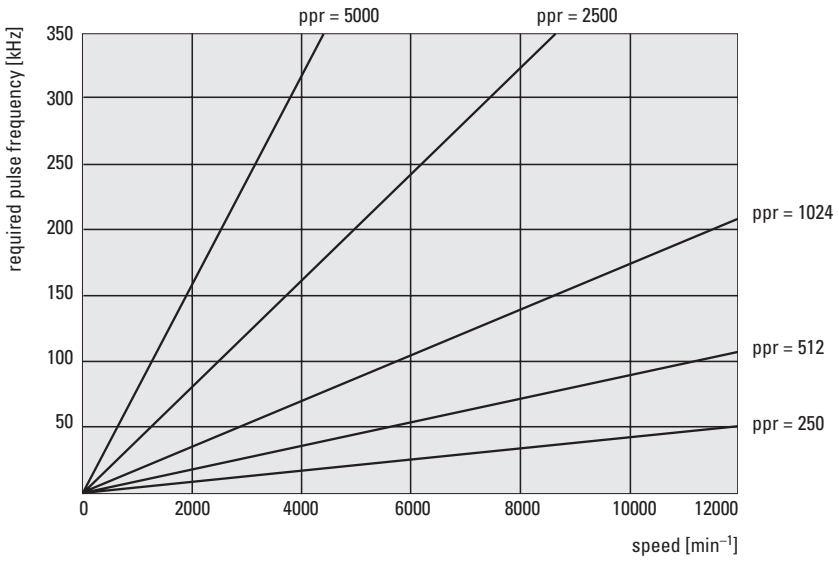
given:
- Speed = 3000 min^{-1}
- Resolution of the encoder= 1000 ppr [1)]

wanted:
- Required pulse frequency of the encoder

$$\text{Pulse frequency} = \frac{\text{Speed x Resolution}}{60}$$

The required pulse frequency is thus 50 KHz. This can now be compared with the maximum possible pulse frequency of the desired encoder.

This diagram can be used to estimate the required pulse frequency



1) ppr = Pulses per revolution

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Encoders | Incremental encoders

Sensor outputs

With long cable runs, the inherent resistance of the cables can lead to a situation where insufficient supply voltage is available to the encoder.

Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.

Digital outputs

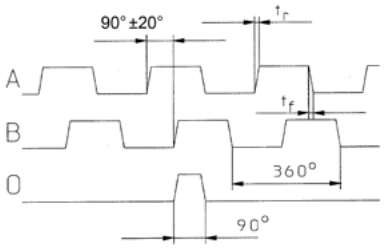
The sine wave signal from the optical system is first digitized to have square wave signals available.

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

To transmit the signals there are two possible outputs available. RS422 (TTL compatible) or push-pull.

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 required cable length
- The sensitivity against electrical noise or other interference



Push-pull outputs (HTL)

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

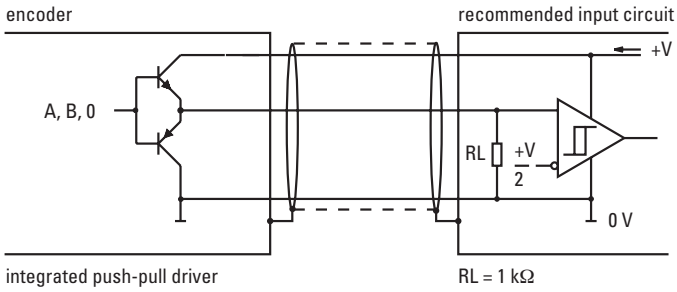
Push-pull:

- 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 without inverted signals (HTL)



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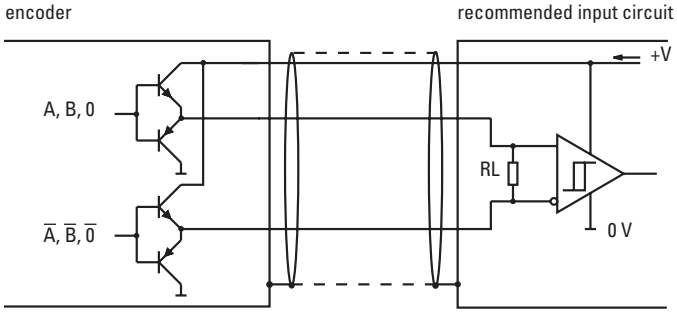
Encoders

Incremental encoders

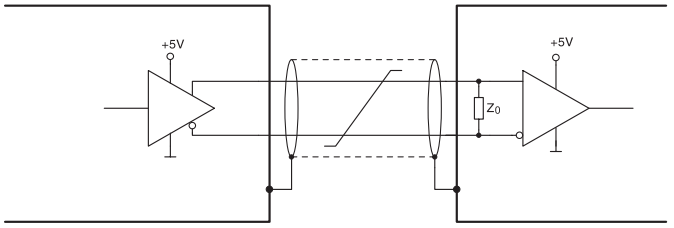
Output circuit and recommended input circuit push-pull with inverted signals (HTL)



Integrated push-pull driver

RL = 1 kΩ

RS422 Output circuit and recommended input circuit (TTL)



RS422 line driver

RS422 line receiver

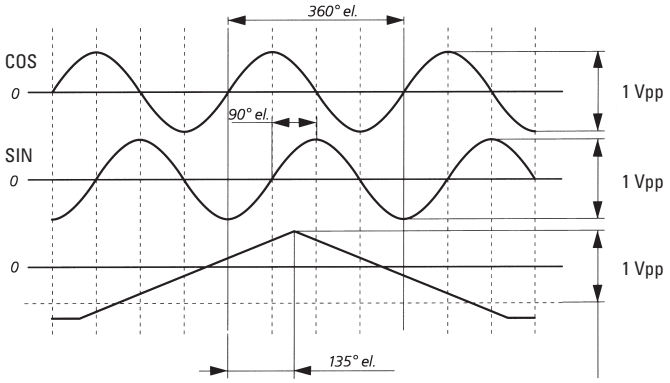
e.g. AM26 C 32 / Z = 120 Ω

Sine wave outputs

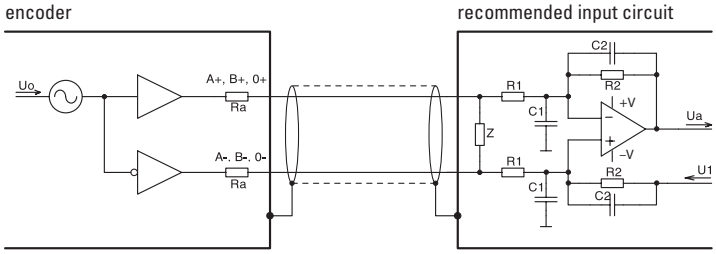
The sine wave signals are available as voltage signals. They can be further processed in the evaluation electronics. Due to the interpolation of the two signals, which are 90° out of phase, a very high resolution can be achieved.

Further they are very suitable for digital drives with a very slow movement, e.g. for grinding machines or lifts and elevators.

- Shaft turning clockwise, top view of shaft
- 0 pulse is generated once per turn (only with 5804 / 5824)



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
$U_1 = U_0$

operation amplifier:
e.g. MC33074

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Encoders | 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 e.g.
Push-pull without inverted signals	100 m [1]	Kübler counter/SPS
Push-pull with inverted signals	250 m [1]	SPS/IPC [2]
Push-Pull with inverted signals (7272)	30 m	
RS422 with inverted signals	up to 1000 m (> 50 m dep. on frequency)	SPS/IPC [2]
Voltage sine with inverted signals	50 m	SPS/IPC [2]
Sine wave 1 Vpp	50 m	10 ... 30 V DC

Annotations:

- Depending on the application the recommended cable length can be shorter, especially in areas with a high level of electrical noise.
- Always use shielded cables - the shield should be connected at both the encoder and controller ends!
- The core diameter of the signal cores should be > 0.14 mm^2
- 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!

1) Depends on frequency
2) IPC = industrial PC

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Encoders

Absolute encoders

Versions

Singleturn encoders

Depending on the number of divisions they generate unique positions per revolution. After one complete revolution the process re-commences at the start position.

They are suitable for angular measurement over a maximum of one turn of the shaft (=360°), for example in robotics, with cam controllers and in other controlled rotary motion.

Multiturn encoders

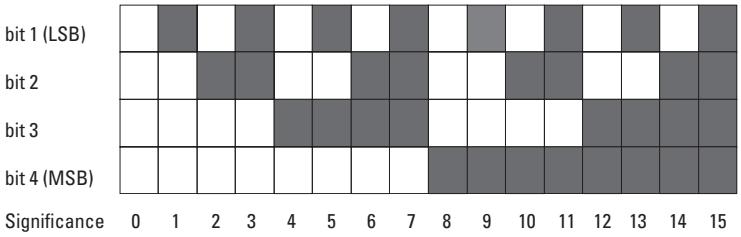
Up to 17 bit unique angular positions per revolution are provided. In addition the number of revolutions is detected. Up to 4096 (12 bit) unique revolutions can be made available on the output.

Multiturn encoders are suitable for angular measurement over more than one turn of a shaft, for example with longer traverse paths, such as high rack storage areas, cranes or machine tools.

Code types

Binary code

The Binary code can be processed very easily by computer systems. When using optical read-out, errors may occur, because the change from one bit to another on the different concentric tracks (LSB, LSB+1...) is not exactly synchronized. Due to this, without any correction of the code, the position information could be wrong.



Gray code

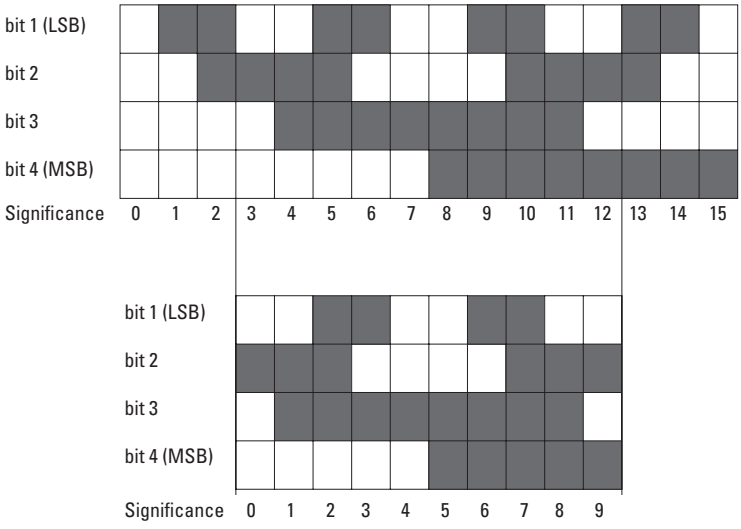
The Gray Code is a single-step code, which guarantees that from one position to the next only 1 bit changes.

This leads to reliable scanning of the code and consequently of the positions.

Symmetrically capped Gray code (Gray-Excess):

If a particular section of the complete Gray Code is extracted, this results in the so-called Gray Excess Code

This permits even-numbered divisions, such as 360, 720, 1000, and 1440.



Reversion of the Gray code

The code values increase when the shaft is turning clockwise.

The Gray code is reversible, i.e. if the most significant bit (MSB) is inverted, the code values decrease when the shaft is turning clockwise.

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Encoders

Absolute encoders

The mechanical Sendix multiturn stage with gear

Kübler plus

- Multiturn gear with purely optical scanning technology. Completely resistant to magnetic fields.
- First stage with double bearing layer.
- Special materials ensure temperature stability and long service life.
- Through hollow shaft diameter up to 14 mm - up to 15 mm as blind hollow shaft.
- Specially developed gear teeth allow for very high rotational speeds and eliminate wear.

The patented electronic Sendix multiturn stage with Intelligent Scan Technology™

Kübler plus

Firstly all the single and multiturn functions of the encoder are integrated on an Opto ASIC.

With multiturn versions the optical sensor technology can achieve a resolution of up to 41 bits.

Furthermore, the new Intelligent Scan Technology ensures 100% magnetic insensitivity.

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 in particular are now being employed, where previously incremental encoders had predominated, 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 swear by electronic counters with electronic data storage. They are critical of any other technology.

The fact is however: it is not a case of which is better or worse; each technology has its advantages and drawbacks.

Only the actual application can decide.

Intelligent Sensing Technology

A new operating principle, based on a non-contact multiturn stage, eliminates the system drawbacks linked with the encoders with mechanical gear or with the usual electronic gear technology.

Advantages

- High operational safety
- Compensation of high EMC disturbances thanks to logical filters and a novel operating principle of the system
- Free of wear

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Encoders | Absolute encoders

Outputs

To transfer the position data to a controller, different interfaces are available.

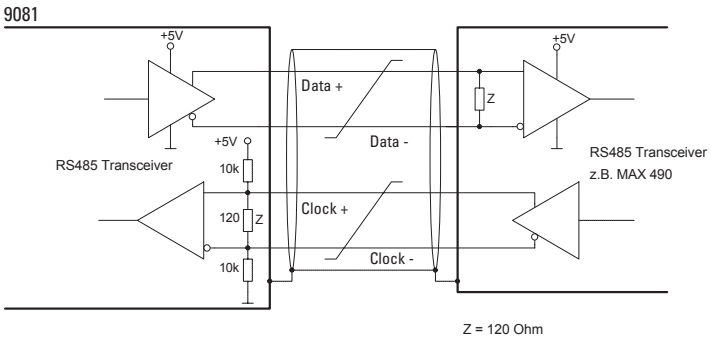
Synchronous serial interface (SSI)

Compared to the parallel interface, the SSI interface needs less components and the EMC characteristics are much better.

In addition less lines are needed for transmission and the possible cable length is much longer.

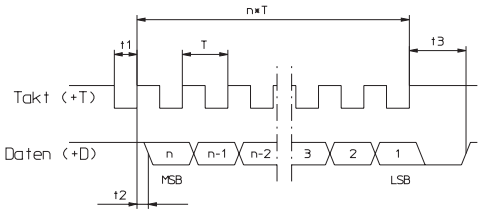
Output circuit and recommended input circuit

9081



Z = 120 Ohm

Data transmission SSI



t_1 = T / 2

t_2 < 1 / (4 x fmax)

t_3 = Monoflop time (see below)

n = Resolution in bit

$1/ f_{max} \leq T \leq 1 / f_{min}$

f_{min} = min. clock rate (see data sheet)

f_{max} = max. 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 are stored in the buffer ready to be sent. With the next rising clock-pulse edge, the data are 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 last positive-going clock-pulse edge the data line will remain for the duration of the monoflop time t_3 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.

Please note!

Only for type 5850, 5870 and 9081:

The updating of the data occurs synchronously with the read-out cycle. So, the data are as up-to-date as the interval time between two read-outs.

A periodic read-out of the encoder in the application is therefore 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: t_3 = max. 40µs

Only for the new Sendix absolute encoders:

The updating of the data occurs immediately with the first falling edge of the clock signal. The data are thus 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 t_3. 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 after a further time interval t_3 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: t_3 = see data sheet.

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Encoders

Absolute encoders

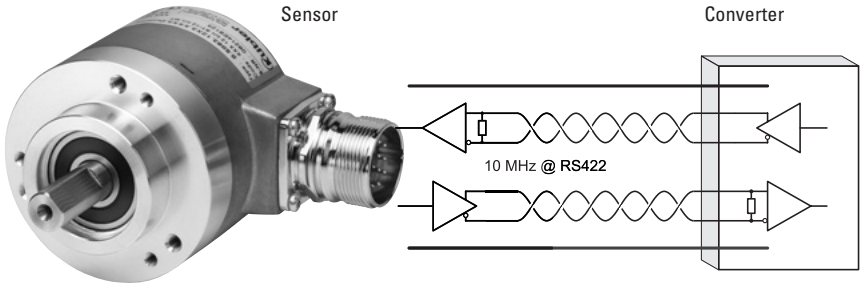
BiSS interface

Point-to-point communication

- Bidirectional isochronous connection between drive, converter and sensor.
- Purely digital link for maximum performance, reliability and safety in transmission.
- Reduction of hardware, installation and maintenance work.

Advantages at a glance

- Flexible.
- Fast and safe.
- Cost-effective and non proprietary / Open source.
- Fully digital and bidirectional.
- Suitable for motor feedback systems.
- Plug and Play.



Extended possibilities with BiSS

- Motor data and maintenance information can be stored and read out easily in the encoder.
- Condition monitoring through register communication.

Easy supplementing of the BiSS master function

- The existing standard control hardware can mostly be used also for BiSS.
- Extension by firmware update is in most cases possible.
- BiSS as a real alternative to existing, RS422 or RS485-based interfaces.
- Fast and simple BiSS master implementation with free-of-charge BiSS IPs on processors and FPGAs.

Details about our BiSS interface can be found on our website at: www.kuebler.com/service/biss_en.pdf.

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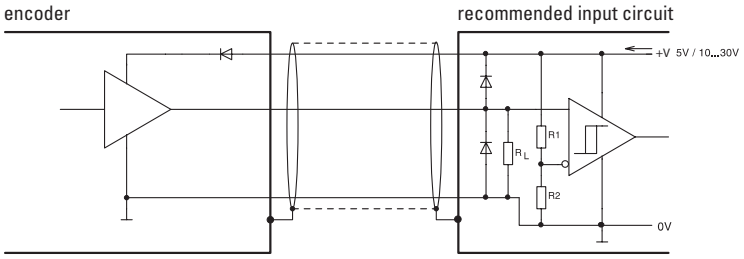
Encoders

Absolute encoders

Parallel output

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

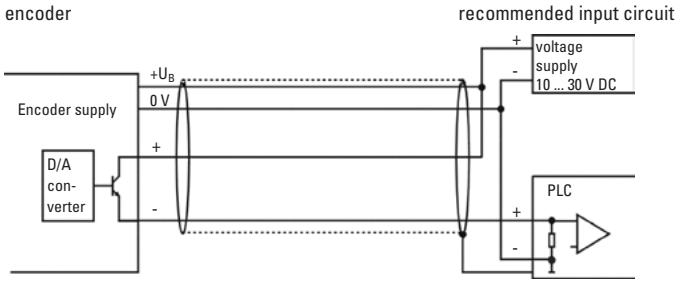
Output circuit and recommended input circuit



Integrated push-pull driver

Analog output 4 ... 20 mA

Output circuit and recommended input circuit



Cable lengths

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	2 m	SPS / IPC [1]
Parallel push-pull (HTL)	100 m	SPS / IPC [1]
SSI	up to 1000 m [2]	SPS / IPC [1]
RS422 / RS485	1000 m	SPS / IPC [1]
Analog 4 ... 20 mA	200 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 cable shield should be connected at both the encoder and controller ends.
- The core diameter of the signal cores should be ≥ 0.14 mm^2
- 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!

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

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Encoders

Installing encoders

Encoders shafts and in turn their 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.

Facilities must therefore be provided during installation to compensate for these forces. For encoders having 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 stator couplings, fixing brackets or torque stops between the encoder flange and the mounting surface.

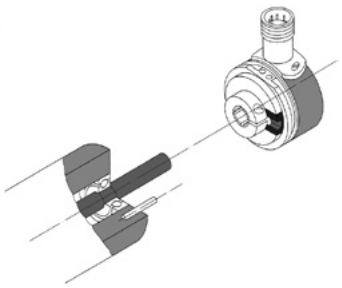
Not making use of a coupling but instead rigidly mounting the shaft and the encoder housing generally leads to unacceptably high loads on the bearings; the ensuing wear will cause the encoder to fail prematurely.

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 stator couplings that are available from Kübler are used, then no problems should occur. For solid shaft encoders the maximum permitted axial and radial loads are shown in the appropriate technical data.

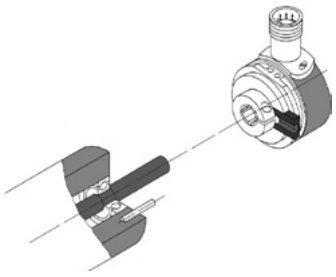
Mounting options for hollow shaft encoders

Hollow shaft encoder with torque stop and pin

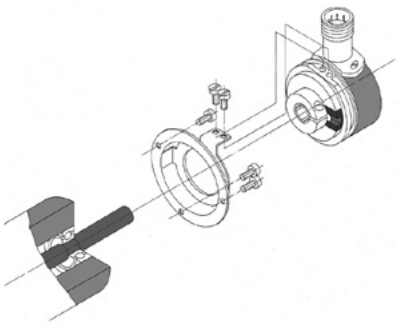
(easiest and fastest mounting)
Standard hollow shaft encoders are equipped with the torque stop (cylindrical pin not supplied).



Extended torque stop and long pin



Stator coupling



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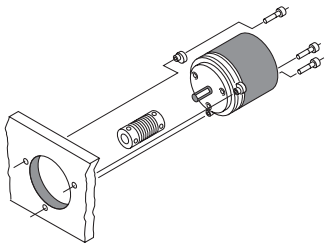
Encoders

Installing encoders

Mounting examples for shaft encoders with synchronous flange

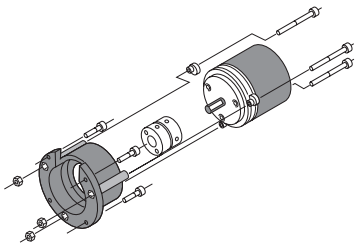
Fastening eccentrics + coupling

(to reduce shaft overload)



Assembly bell, fastening eccentrics + coupling

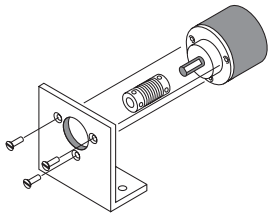
(to prevent shaft overload and to isolate the encoder thermally and electrically)



Mounting examples for shaft encoders with clamping bracket

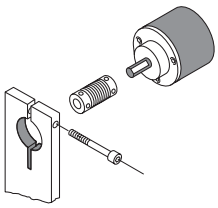
Angular bracket + coupling

(to reduce shaft overload)



Clamping device + coupling

(to reduce shaft overload)



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Encoders

Installing encoders

Loading of encoder shaft bearings using coupling forces

With all spring couplings (shaft coupling, stator 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, then with all Kübler couplings 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 also 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 of course dependent on it being mounted in such a way that it has freedom to move radially and especially 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:

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

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	10

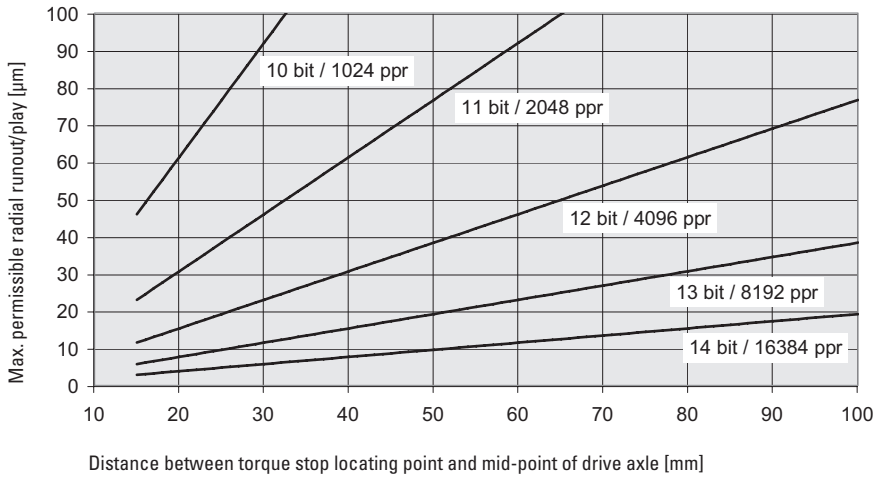
2. Deviations in accuracy caused by radial play in the drive shaft with asymmetrical mounting of the couplings

Here one has to differentiate between couplings that are mounted in an axially symmetrical manner round the shaft (all shaft couplings, many stator couplings) and asymmetrically mounted couplings (many stator 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); this is determined by the system. 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



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Encoders

Installing 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 prestressing and angular acceleration.

Kübler encoders are designed so that they can 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 may be exceeded in a particular application, then the encoder shaft must be isolated from the radial load by interposing an appropriate shaft with its own bearings that can absorb the forces.

Kübler offers suitable bearing blocks and bearing boxes for this purpose (please refer to the ‚Accessories' section in the catalog).

Isolation insert

Thermal and electrical isolation of the encoders.

Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled threephase or AC vector motors and considerably shorten the service life of the encoder bearings. In addition the encoder is thermally isolated as the plastic does not transfer the heat to the encoder.

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Encoders

Functional Safety

Incremental and absolute encoders for Functional Safety

Further information about Functional Safety can be found in our catalog "Functional Safety" or at:

www.kuebler.com/safety

Safe incremental encoder function

In order to achieve safe incremental information with the encoder, the controller must monitor the validity of the analog, 90° phase-shifted sine/cosine signals with the help of the function:
$\sin^2 + \cos^2 = 1$

Safe absolute encoder function

In order to obtain safe information with the encoder regarding the absolute position, the controller counts the incremental pulses and compares the result with the absolute positions also provided by the encoder.

Safe mechanical connection

A 100% reliable mechanical connection is required for a safe function in the applications. Suitably sturdy fixing elements can help eliminate the risk of faults.

Compliance with Safety standards

According to EN ISO 13849-1, EN ISO 13849-2 and EN 61800-5-2 up to SIL3/PLe/Cat.4 the following safety functions can be implemented with the encoder:

Acronym	Designation	Function
SSX	Safe Stop 1 or 2	Monitoring of the braking ramp and switch-off of the motor after standstill (SSI) or monitoring of the braking ramp and SOS after standstill (SS2). Corresponds to Stop Category 1 or 2 acc. DIN EN 60204-1.
SOS	Safe Operating Stop	Monitoring of the standstill of the active motor.
SLA	Safely Limited Acceleration	Monitoring of the exceeding of an acceleration limit value.
SLS	Safely Limited Speed	Monitoring of a speed limit value.
SLT	Safely Limited Torque	Monitoring of a torque / force limit value.
SLP	Safely Limited Position	The exceeding of a position limit value is monitored.
SEL	Safe Emergency Limit	Safe monitoring of the minimum and maximum position or of the allowed position range. Optional monitoring of the speed / position limit curve for minimizing the worst-case overtravel.
SLI	Safely Limited Increment	The respect of a specific step value during the movements is monitored.
SDI	Safe Direction	Monitoring of the unintended direction of movement of the motor.
SBC	Safe Brake Control	Safe control and monitoring of an external brake.
SCA	Safe Cam	A safe output signal is generated when the motor position is in a specified range.
SSM	Safe Speed Monitor	A safe output signal is generated when the motor speed is lower than a specified value.
SAR	Safe Acceleration Range	Monitoring of the respect of the acceleration of the motor within specified limit values.
ECS	Encoder Status	Error status of the speed / position sensor.
PDM	Position Deviation Muting	Muting of the deviation monitoring in 2-sensor operation.

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Linear measuring systems

Technology

Magnetic measuring system (incremental)

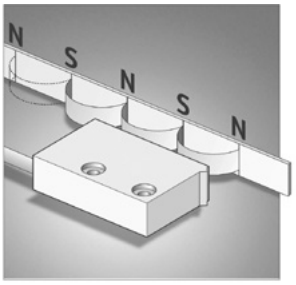
up to 70 m measuring length
(other length on request)
up to 0.005 mm resolution

The idea:

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.



Kübler plus

The distance between the sensor and the magnetic band can be up to 2 mm.

Repeat accuracy is very high.

Where is our Limes 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 till 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 offers a further interesting area of application, due to the fact that it can be fitted round very large shafts.

The maximum length of the magnetic band is 70 m!

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Linear measuring systems

Technology

Magnetic measuring system Limes (absolute)

up to 8 m measuring length, up to 0.001 mm resolution
up to 20 m measuring length, up to 0.01 mm resolution

The LA series are absolute length measuring systems. Sensor and translator and interpolation unit are together in one housing. The magnetic tape of the BA series is paste up to a plain area. The sensor can be mounted with a max. of 0.2 / 1.5 mm distance to the magnetic tape with reduced measuring accuracy.

Different interfaces are available (SSI, CANopen (DS406)).

Typical applications are handling systems, conveyor and storage technology, hydraulic presses, stamping machines, casting machines, linear slides, linear drives and pick and place systems.

Overview of features:

- No reference necessary.
- Direct contact free measurement.
- Distance between sensor and magnetic tape can be between 0.1... 0.2 / 1.5 mm
  –> Distance not OK = LED glow red.
- Up to 8 / 20 m measuring length.
- High resolution 1 / 10 µm.
- Repeat accuracy +/- 1 µm.
- Inured against dirt.

Functional principle

A hall sensor and a magneto-resistive impedance measuring bridge are guided over a two-track magnetic tape with a fine-interpolation trace and an absolute trace.

Together with the sensor line the absolute track provides an absolute value and the fine-interpolation trace provides together with the interpolation electronic the measuring systems high resolution.

Figure 1

Shows two magnetic traces, with north pole and south pole magnetization.

The fine interpolation trace encloses alternately north and south pole traces with a distance of 1 / 5 mm, these are scanned with resistance bridges and provide a resolution of 0.001 / 0.01 mm. The absolute value provides the sensor line with 16 single Hall sensors, these sensors are scanning the code sections of the north and south poles. The absolute value on the magnetic tape recurs every 8 / 20 m.

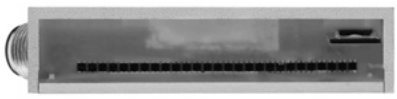

Fig. 1: Coding

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Linear measuring systems

Technology

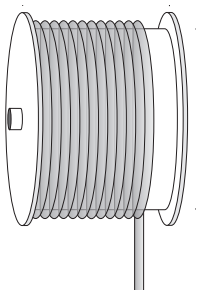
Draw wire systems

Measuring length up to 40 m,
Resolution up to 0.1 mm

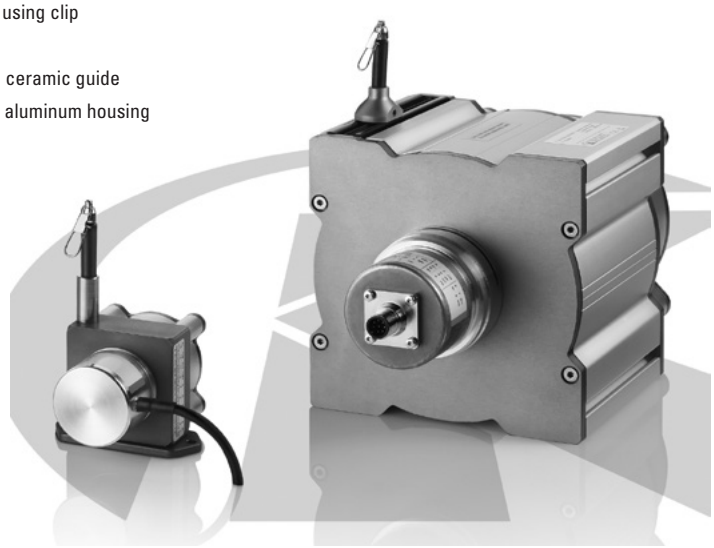
Kübler plus

The idea:

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.



- 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 40000 mm
- High travelling speed
- High acceleration
- Dynamic spring traction by means of a constant force spring, long service life
- Simple wire fixing using clip
- Quick mounting
- Diamond-polished ceramic guide
- Titanium anodized aluminum housing



Length measuring kits

We have taken our expertise from the fields of sensor and counting technology and applied this to length measuring kits.

We will supply you the measuring wheel, the encoder and the counter – all from one source. Plug in and go – saves you time and effort – no need to assemble the component parts.

We supply the complete kits.

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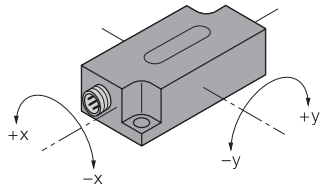
Inclinometers | Technology

Inclinometers

The 1 and 2-dimensional inclinometers are used for measuring inclinations in the ranges of ±10°, ±45°, ±60° and 0-360°.

To ensure high accuracy, the zero point and the limit values of the measuring range are factory-calibrated at a temperature of 25°C.



These inclinometers are based on the MEMS technology (Micro Electro-Mechanical Systems). They can be used for a wide range of different applications such as:

- Machines and automats
- Vehicles and planes
- Harvesting, agricultural and construction machinery
- Transport equipment

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Connection technology

Introduction / Cables and connectors

The idea behind our connection technology system

Connection technology from Kübler = system safety!

All the products in the connection technology section have been tested and approved with the relevant compatible Kübler sensors.

They ensure the full functionality and high signal quality of our sensors.

Your benefit:

- Elimination of connection errors
  – no laborious fault finding
- Optimal shielding
  – avoids EMC problems
- Shorter installation times
  – saves time, cuts costs
- No time-consuming search for the right connector or cable
  – saves time, eliminates errors

Material information - cables

PVC

- Suitable for average mechanical stresses in the area of packaging machines and assembly and production lines.
- Good resistance against acids and alkalis and thus predestined for use in the food and beverage industry.
- Limited friction resistance and partial resistance to oils and chemicals.

PUR

- Flexible, PVC, silicone and halogen-free control cable with PUR cable jacket and polypropylene wire insulation.
- The cable is oil-resistant and non-flammable according to VDE 0472, and it is resistant to chemicals, hydrolysis and microbes.
- Temperature resistance from -30°C to + 90°C.
- Use is possible in trailing cable carriers with a bending radius equal at least to 10 x D.
- Thanks to its resistance to welding sparks, this cable is very well adapted for flexible use in the area of robotics, machine tools and metal cutting production.

Material information - connectors

Two material groups are used for the connectors described in the catalog:

Metals for contacts and housings

- Contacts:
  metal, CuZn, gilded
- Connecting nut /compression screw:
  metal, CuZn, nickel-plated

Plastics for insulator and housing

- Contact carrier:
  plastic, TPU, black
- Body:
  plastic, TPU, black
- Seal:
  plastic, fluorine rubber (FKM/FPM) FPM/FKM or nitrile-butadiene rubber (NBR)

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Connection technology | Introduction / Cables and connectors

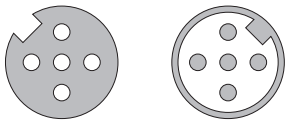
Coding of the M12 x 1 connectors

The connectors are coded to guarantee protection against polarity reversal. This coding is achieved by means of a peg or a notch in the contact carrier.

Kübler connectors make a distinction between A, B or D coding.

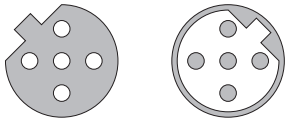
A-coding

Female connector with coupling nut:	Coding notch
Male connector with external thread:	Coding peg
Use:	CANopen and 8-pin connector



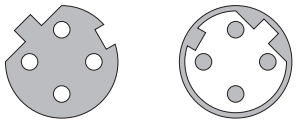
B-coding

Female connector with coupling nut:	Coding peg
Male connector with external thread:	Coding notch
Use:	Profibus



D-coding

Female connector with coupling nut:	Coding peg and Coding notch
Male connector with external thread:	Coding peg and Coding notch
Use:	Profinet and EtherCAT



Shielding

With round connectors, care must be taken to connect carefully the shielding braid of the cable to the shield connection of the connector.

An all-round contact (360°) is optimal.
Good (in practice often sufficient) shielding values are also reached by connecting the shielding braid firmly to the electrically conductive housing. Connectors purely out of plastic, without metal sleeve, providing no contact for the shielding braid, are not sufficient.

Furthermore, a proper contact with the mating connector is also important, as well as a good contact of the mating connector with the chassis of the equipment.

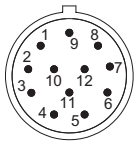
"Allround" shielding with Kübler cordsets

Counting direction cw/ccw

The counting direction of the connectors is indicated by cw for a clockwise arrangement and ccw for a counter-clockwise arrangement. The connector is always viewed from the mating side.

Top view of mating side

Counting direction cw
(e.g. female connector)



Counting direction ccw
(e.g. male connector)

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Optical fiber signal transmission

General information

Description

The system is made up of an optical fiber transmitter and an optical fiber receiver.

The optical fiber transmitter converts the electrical signals of an encoder into optical fiber signals. A simple glass fiber allows reliable transmission up to distances of 2000 m.

The receiver module converts the optical signals back into electrical signals.

The modules are available in various level and power supply voltage variants.

Main advantages of an optical fiber transmission:

- Insensitivity to electromagnetic interferences and to leakage effects between lines routed parallel
- Significantly higher transmission speeds
- The optical fiber cable can be routed through explosive atmospheres
- Cost and weight savings thanks to reduced cabling work, especially for important cable lengths

Mounting of optical fiber modules

The optical fiber modules can be mounted directly on a TS35 DIN rail (top-hat rail) according to EN 50022.

The installation width for every module is only 19 mm.

Laying and connection of glass fiber cables

Laying the cable is generally easy.

Care must nevertheless be taken to make sure that the bending radius does not become smaller than 30 mm for static laying and 60 mm for dynamic laying.

When connecting the cable, make sure that the bayonet catch is locked and remove the dust protection caps only just before connecting the cable.

Glass fiber cables

The modules can be connected together using 50/125 µm or 62.5/125 µm multimode glass fiber cables with ST/PC type connectors with bayonet catch. Single-mode Simplex patch cables are not suitable.

Kübler offers finished confectioned patch cables adapted to the optical fiber modules as accessories.

They ensure the full functionality and high signal quality of our sensors.

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Encoders | Technologies

Safety-Lock™

All Kübler encoders are equipped with the Safety-Lock™ bearing structure.

Safety-Lock™

Interlocked bearings, large bearing span and extra strong outer bearings ensure stability when subjected to vibration and tolerance of installation errors. Machine downtime and repairs are eliminated.

Safety-Lockplus™

The proven Safety-Lock™ construction with additional mechanically protected shaft seal.

Kübler plus

HD-Safety-Lock™ = Safety-Lock™ + additional engineering

Floating bearing on the cover-side eliminates internal stress [1]

- Mechanically decoupled sensor unit ensures constant signal quality with large temperature fluctuations and other adverse environmental influences [1]
- Dual seals on the shaft-side – friction seal against humidity, labyrinth seal against dust and water jet ingress
- Very large, highly-robust flange bearings
- Even greater bearing clearance
- Extremely robust flange mounting due to screw-on housing
- Bearing design incorporates integrated isolation (isolating inserts not required), tested up to 2.5 kV for high running accuracy; metal to metal connection for slip free mounting. [2]

Benefits:

The resistance against adverse environmental conditions is greatly increased – especially against high bearing loads and high temperatures.

[1] for Sendix H100 [2] for Sendix H120

	Safety-Lock™	HD-Safety-Lock™
Stability with vibration	+	++
Robustness against installation errors	++	++
Radial load	80 N	400 N
Axial load	40 N	300 N
Elimination of internal stresses	0	++
Constant signal quality with extended temperatures	+	++
Mechanical protection of the seal	0	++

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Encoders | Technologies

Ageing compensation (optical encoders)

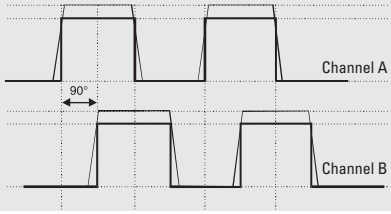
Every LED loses some of its luminosity over time. Without ageing compensation the excellent quality of the output signals would suffer. The phase shift of 90° necessary to detect the direction of rotation would be lost. This effect however is prevented by means of special electronic circuitry.

Benefit:

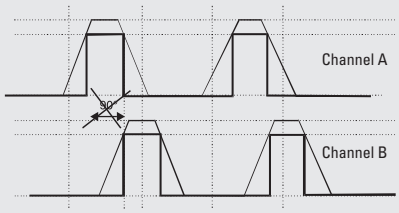
The ageing compensation circuit ensures the same signal, even after many years of operating time.

The downtime of machines will be reduced dramatically and the reliability is increased.

Signals of a new encoder



Signals of an older encoder without ageing compensation



Temperature compensation

This circuit ensures that the signal will remain the same over the whole working temperature range.

Benefit:

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

Current consumption

The typical values for current consumption given in the 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 therefore 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 $+U_B$ 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 of day-to-day industrial environments do not lead to the encoder being permanently damaged.

Environmental conditions

Kübler plus

The environmental conditions in which the encoder operates can have a significant influence on its service life, for example

- The ambient temperature
- The expected shaft load
- Soiling and humidity
- Noise interference

Thanks especially to the high-quality technology employed in our encoders, they are particularly suitable for use in harsh environments.

Numerous references from our customers, including Bosch, Siemens, Bombardier and from suppliers to the automotive industry, are proof of this.

Bearing life

All Kübler encoders are designed to ensure that their bearings give a long service life. This is subject of course to correct installation and to the load limits for the shaft (shaft encoders) being complied with or, in the case of hollow shaft encoders, being mounted with the appropriate stator couplings or torque stops.

The following diagrams show the expected service life of the shaft encoder bearings depending on the bearing load. The calculations are based on a mixed load, where the axial force components are always half of the radial shaft load.

The use of the torque stops and stator couplings that are offered ensure that the shaft load with the hollow shaft encoders as supplied from the factory is kept very small.

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Encoders

Glossary

Bit (Binary Digit)

Smallest discrete piece of information. A bit can be allocated to the value 0 or 1.

ccw (counter clockwise)

Turning the encoder shaft in counterclockwise direction (in view of the shaft side of the encoder).

cw (clockwise)

Turning the encoder shaft in clockwise direction (in view of the shaft side of the encoder).

Zero signal

The zero signal is emitted once per revolution, it can be used e.g. as a reference signal during the first revolution after power.

Temperature

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, in which the encoder can be operated without incurring damage.

Soiling and humidity

The IP classification according to EN 60529 describes how the encoder is protected against particles and water. It is described as an abbreviation "IP" followed by two numbers.

These two tables summarize the most used IP ratings.

Protection against particles (first digit)

The higher the number the smaller the particles.

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

Protection against water (second digit)

The higher the number, the higher the water pressure can be.

0	Not protected
1	Protected against vertically falling drops of water
2	Protected against vertically falling drops of water when enclosure is tilted up to 15°
3	Protected against spraying water
4	Protected against splashing water
5	Protected against water jets
6	Protected against powerful water jets
7	Protected against the effects of temporary immersion in water
8	Protected against the effects of continuous immersion in water

Our encoders have a protection up to IP69k.

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

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Designation of colors to DIN IEC 757

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

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Type:
10-30 8.5020.D85H.1024
S-Nr: 0929502BD4
VDC 100 mA
Kübler
Fritz Kübler GmbH
Made in Germany
www.kuebler.com
0V
+UB

Incremental encoders

Series		Type	Output circuit	Page
Miniature, optical		2400 / 2420 (shaft / hollow shaft)	Push-pull	**50**
Miniature, magnetic		2430 / 2440 (shaft / hollow shaft)	RS422	**53**
Compact, optical	new	Sendix Base KIS40 / KIH40 (shaft / hollow s.)	Push-pull / RS422 open collector	**56**
		3610 / 3620 (shaft / hollow shaft)	Push-pull / RS422	**60**
	Plastic housing	3700 / 3720 (shaft / hollow shaft)	Push-pull / RS422	**64**
Standard, optical	24one [1]	5000 / 5020 (shaft / hollow shaft)	Push-pull / RS422 open collector	**68**
	new	Sendix Base KIS50 / KIH50 (shaft / hollow s.)	Push-pull / RS422 open collector	**81**
	High temperature	5803 / 5823 (shaft / hollow shaft)	Push-pull / RS422	**85**
	Sine wave output, with zero pulse	5804 / 5824 (shaft / hollow shaft)	SinCos	**90**
	Sine wave output, highly interpolable	Sendix 5814 / 5834 (shaft / hollow shaft)	SinCos	**94**
	Sine wave output, SIL2 / PLd	Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow s.)	SinCos	**98**
	Sine wave output, SIL3 / PLe	Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow s.)	SinCos	**104**
	High resolution	5805 / 5825 (shaft / hollow shaft)	Push-pull / RS422	**110**
	Stainless steel	Sendix 5006 / 5026 (shaft / hollow shaft)	Push-pull / RS422	**114**
Standard, optical ATEX / IECEx – zone 1/21		Sendix 7000 / 7020 (shaft / hollow shaft)	Push-pull / RS422	**118**
	SIL2 / PLd	Sendix SIL 7014FS2 (shaft)	SinCos	**123**
	SIL3 / PLe	Sendix SIL 7014FS3 (shaft)	SinCos	**126**
Standard, optical ATEX / IECEx – mining		Sendix 7100 / 7120 (shaft / hollow shaft)	Push-pull / RS422	**129**
Large hollow shaft, optical		5821 (hollow shaft)	Push-pull / RS422	**134**
		A020 (hollow shaft)	Push-pull / RS422 / SinCos	**137**
	Robust	A02H (hollow shaft)	Push-pull / RS422 / SinCos	**141**
Heavy Duty, optical	Shaft	Sendix Heavy Duty H100 (shaft)	Push-pull / RS422 / speed switch	**148**
	Hollow shaft	Sendix Heavy Duty H120 (hollow shaft)	Push-pull / RS422 / optical fiber	**153**

1) We offer for all encoders configured with the underlined preferential options our free of charge 24one delivery promise.
Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.

Miniature optical | **2400 / 2420 (shaft / hollow shaft)** | **Push-pull**

The incremental miniature encoders type 2400 / 2420 with their optical sensor technology offer a resolution of up to 1024 pulses per revolution.

With a diameter of just 24 mm this encoder is ideal for use where space is tight.

High rotational speed | Temperature range | Shock / vibration resistant | Short-circuit proof | Magnetic field proof | Optical sensor

Reliable

- Robust bearing construction.
- Cable outlet boasts high degree of strain relief thanks to multiple clamping.
- Short-circuit proof outputs.

Versatile

- Ideally suited for use in small devices.
- Meets the certification requirements of railways standard EN 50121.

Order code Shaft version

05.2400	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = ø 24 mm [0.94“]
3 = ø 28 mm [1.10“]
2 = ø 30 mm [1.18“]

b *Shaft (ø x L)*
1 = ø 4 x 10 mm [0.16 x 0.39“]
3 = ø 5 x 10 mm [0.20 x 0.39“], with flat
2 = ø 6 x 10 mm [0.24 x 0.39“]
4 = ø 1/4“ x 10 mm [1/4“ x 0.39“], with flat [1)]
6 = ø 6 x 10 mm [0.24 x 0.39“], with flat [1)]

c *Output circuit / power supply*
1 = push-pull (without inverted signal) / 5 ... 24 V DC
2 = push-pull (with inverted signal) / 5 ... 24 V DC
3 = push-pull (without inverted signal) / 8 ... 30 V DC
4 = push-pull (with inverted signal) / 8 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [6.56'] PVC
B = radial cable, special length PVC *)
*) Available special lengths (connection types A, B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 05.2400.122A.1024.0030 (for cable length 3 m)

e *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**, **1024**
(e.g. 360 pulses => 0360)

Stock types
05.2400.1122.0050
05.2400.1122.0360
05.2400.1122.0500
05.2400.1122.1000
05.2400.1122.1024

Optional on request
- other pulse rates

1) US version.

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Incremental encoders

Miniature optical | 2400 / 2420 (shaft / hollow shaft) | Push-pull

Order code Hollow shaft

05.2420	.	1	X	X	X	.	XXXX
Type		a	b	c	d		e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = ø 24 mm [0.94"]

b *Blind hollow shaft (insertion depth max. 14 mm [0.55"])*
1 = ø 4 mm [0.16"]
2 = ø 6 mm [0.24"]
4 = ø 1/4" [1)]

c *Output circuit / power supply*
1 = push-pull (without inverted signal) / 5 ... 24 V DC
2 = push-pull (with inverted signal) / 5 ... 24 V DC
3 = push-pull (without inverted signal) / 8 ... 30 V DC
4 = push-pull (with inverted signal) / 8 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [6.56'] PVC
B = radial cable, special length PVC *)
*) Available special lengths (connection types A, B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 05.2420.122A.1024.0030 (for cable length 3 m)

e *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**, **1024**
(e.g. 360 pulses => 0360)

Stock types
05.2420.1212.0500
05.2420.1222.0500
05.2420.1222.1000
05.2420.1222.1024

Optional on request
- other pulse rates

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 15 mm [0.59"] for shaft 4 mm [0.16"]	**8.0000.1202.0404**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Mass moment of inertia		approx. 0.1 x 10^{-6} kgm^2
Starting torque – at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial	10 N
	axial	20 N
Weight		approx. 0.06 kg [2.12 oz]
Protection acc. to EN 60529		
	housing side	IP65
	flange side	IP50 (IP64 on request)
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]
Materials	shaft	stainless steel
	blind hollow shaft	brass
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Output circuit		**Push-pull** [2)] (7272 compatible)	**Push-pull** [2)] (7272 compatible)
Power supply		5 ... 24 V DC [3)]	8 ... 30 V DC
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 - 3.0 V
	LOW	max. 0.5 V	max. 0.5 V
Rising edge time t_r		max. 1 µs	max. 1 µs
Falling edge time t_f		max. 1 µs	max. 1 µs
Short circuit proof outputs		yes	yes
UL approval		file 224618	
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

An independent test laboratory (TTI-P-G115/96-01) approved by the German Accreditation Council (DAR) certified the compliance with the Railways Standard, according to EN 50121. This means our encoder is compatible with higher electromagnetic noise standards than standard industrial encoders.

You will have a higher quality encoder even in applications with higher EMC noise levels. We will gladly send you a copy of the test report on request. When ordering an encoder to the railway standard, please ensure you state this explicitly on the order.

Deutscher Akkreditierungs Rat DAR

1) US version.
2) Max. recommended cable length 30 m [98.4'].
3) With 24 V DC there is no tolerance above 24 V DC. Please use output circuit 8 ... 30 V DC.

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Miniature optical | **2400 / 2420 (shaft / hollow shaft)** | **Push-pull**

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 3 without inv. signal	1, 2, A, B	Signal:	0 V	+V	A	B	0		
		Cable color:	WH	BN	GN	YE	GY		

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2, 4 with inv. signal	1, 2, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD

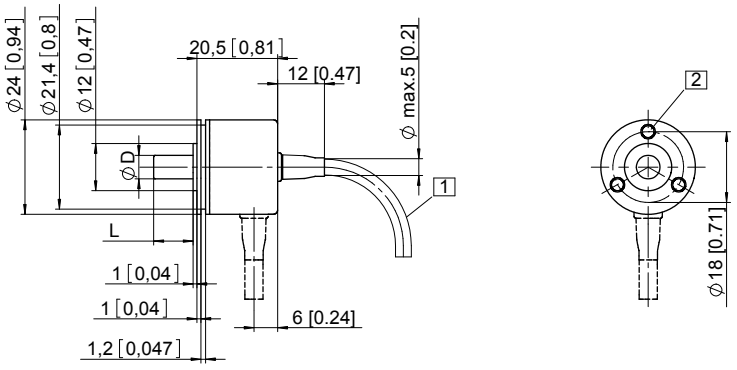
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal

Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

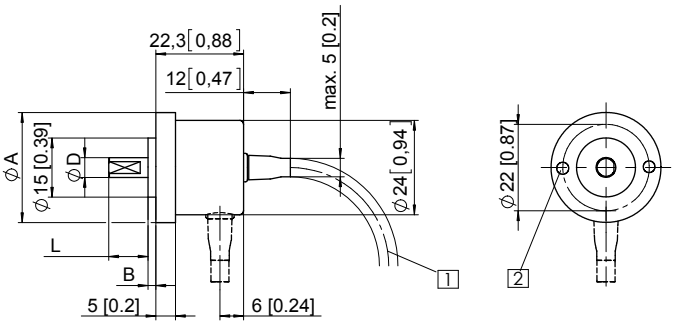
1 min R50 [1.97]
2 3 x M3, 4 [0.16] deep



D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4“	f7	10 [0.39]

Flange type 2, ø 30 [1.18]
Flange type 3, ø 28 [1.10]

1 min R50 [1.97]
2 2 x M3, 4 [0.16] deep



D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4“	f7	10 [0.39]

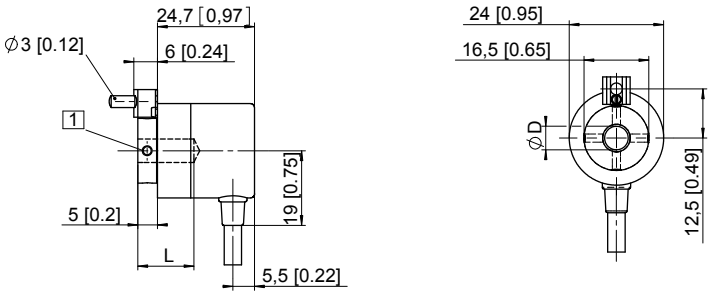
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 4 x M3 DIN 915 - SW1.5



D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4“	H7	14 [0.55]
L = insertion depth max. blind hollow shaft		

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Miniature magnetic | 2430 / 2440 (shaft / hollow shaft) | RS422

Thanks to their non-contact magnetic scanning technology the miniature-format encoders 2430 and 2440 guarantee exceptional ruggedness – and this with a resolution of up to 256 pulses per revolution.

As a result of their compact outer diameter of only 24 mm, they are ideal for use where installation space is restricted.

RoHS

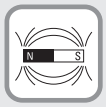
High rotational speed

Temperature range

Shock / vibration resistant

Short-circuit proof

Reverse polarity protection



Magnetic sensor technology

Magnetically robust

- The non-contact magnetic technology prevents wear and guarantees a long service life.
- Multiple clamping affords high strain relief to the cable outlet, ensuring longer life.
- Wide temperature range from -20°C up to +85°C.
- Flexible connection possibilities: can be supplied with radial or axial cable outlet.

Compact power

- Resolution up to 256 pulses per revolution.
- Shaft and hollow shaft version.

Order code Shaft version

8.2430	.	X	X	6	X	.	XXXX
Type		a	b	c	d		e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = ø 24 mm [0.94"]
3 = ø 28 mm [1.10"]
2 = ø 30 mm [1.18"]

b *Shaft (ø x L)*
1 = ø 4 x 10 mm [0.16 x 0.39"]
3 = ø 5 x 10 mm [0.20 x 0.39"], with flat
2 = ø 6 x 10 mm [0.24 x 0.39"]

c *Output circuit / power supply*
6 = RS422 (with inverted signal) / 5 V DC

d *Type of connection*
1 = axial cable, 2 m [5.56'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [5.56'] PVC
B = radial cable, special length PVC *)
*) Available special lengths (connection types A, B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.2430.126A.0256.0030 (for cable length 3 m)

e *Pulse rate*
1 ... 128 (factory programmable)
256
(e.g. 128 pulses => 0128)

Optional on request
- other pulse rates

Order code Hollow shaft

8.2440	.	1	X	6	X	.	XXXX
Type		a	b	c	d		e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = ø 24 mm [0.94"]

b *Blind hollow shaft*
(insertion depth max. 14 mm [0.55"])
1 = ø 4 mm [0.16"]
2 = ø 6 mm [0.24"]

c *Output circuit / power supply*
6 = RS422 (with inverted signal) / 5 V DC

d *Type of connection*
1 = axial cable, 2 m [5.56'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [5.56'] PVC
B = radial cable, special length PVC *)
*) Available special lengths (connection types A, B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.2440.126A.0256.0030 (for cable length 3 m)

e *Pulse rate*
1 ... 128 (factory programmable)
256
(e.g. 128 pulses => 0128)

Optional on request
- other pulse rates

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Miniature magnetic	2430 / 2440 (shaft / hollow shaft)	RS422

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 15 mm [0.59“] for shaft 4 mm [0.16“]	**8.0000.1202.0404**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Mass moment of inertia		approx. 0.1 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial	10 N
	axial	20 N
Weight		approx. 0.06 kg [2.11 oz]
Protection acc. to EN 60529		
	housing side	IP65 (IP67 on request)
	flange side	IP50 (IP67 on request)
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	clamping flange	MS58
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Output circuit		RS422 (TTL compatible)
Power supply		5 V DC (±5 %)
Power consumption with inverted signal (no load)		typ. 40 mA max. 90 mA
Permissible load / channel		max. +/- 20 mA
Pulse frequency		max. 300 kHz
Signal level	HIGH	min. 2.5 V
	LOW	max. 0.5 V
Rising edge time t_r		max. 200 ns
Falling edge time t_f		max. 200 ns
Min. pulse edge interval		0.5 µs [1]
Short circuit proof outputs [2]		yes [3]
Reverse polarity protection of the power supply		no
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
6 with inv. signal	1, 2, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal

1) For max. speed use a counter with input frequency of min. 500 kHz.
2) If power supply correctly applied.
3) Only one channel allowed to be shorted-out:
If +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.

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Miniature magnetic | **2430 / 2440 (shaft / hollow shaft)** | **RS422**

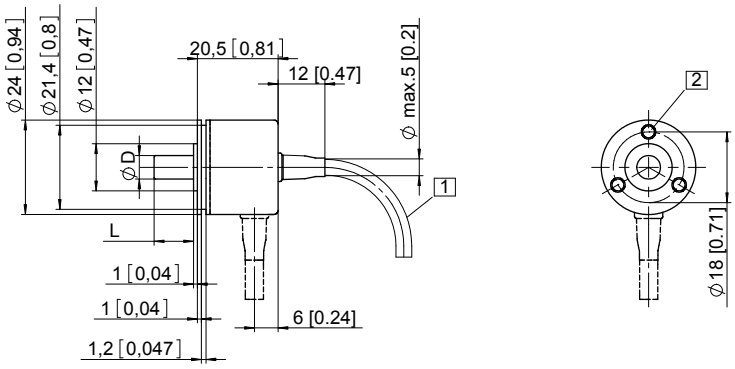
Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 min R50 [1.97]

2 3 x M3, 4 [0.16] deep

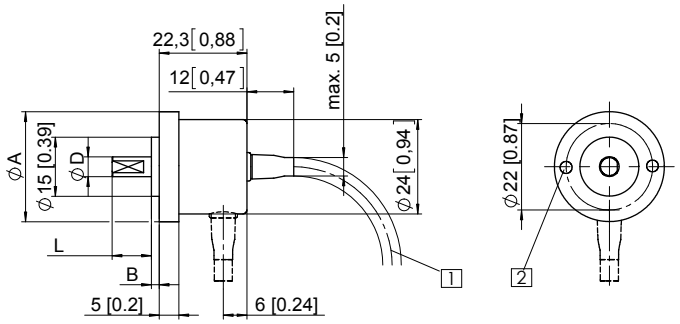


D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]

Flange type 2, ø 30 [1.18]
Flange type 3, ø 28 [1.10]

1 min R50 [1.97]

2 2 x M3, 4 [0.16] deep



D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]

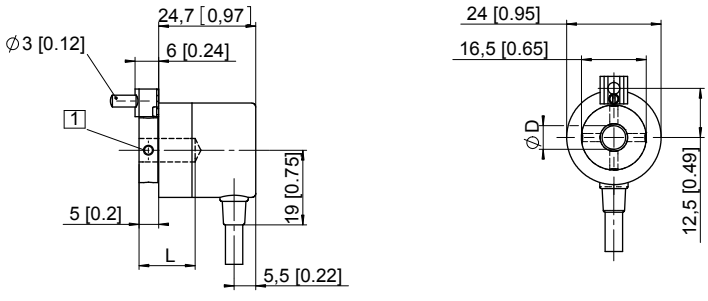
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 4 x M3 DIN 915 - SW1.5



D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4"	H7	14 [0.55]
L = insertion depth max. blind hollow shaft		

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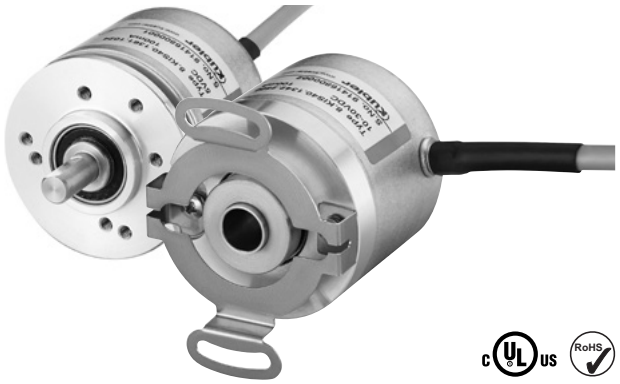
Compact optical | **Sendix Base KIS40 / KIH40 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**



The incremental encoders type Sendix Base KIS40 / KIH40 with optical sensor technology have been designed for highest cost-effectiveness. They are available with a resolution of up to 2500 pulses per revolution.

They are particularly suitable for tight mounting spaces and small machines and appliances.

Safety-Lock™ | High rotational speed | Temperature range -20°...+70°C | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic field proof | Optical sensor

Compact and robust

- Only 40 mm outer diameter.
- Ideally suited for use where space is tight.
- Sturdy bearing construction in Safety Lock™ design.
- Safe commissioning: reverse polarity protection and short-circuit proof.

Flexible

- Maximum resolution of 2500 pulses per revolution.
- Power supply 5 V DC or 10 ... 30 V DC.
- Push-pull, RS422 or open collector
- Radial or axial cable.

Order code Shaft version

8.KIS40	.	1	X	X	X	.	XXXX	.	PXX [1]
Type		a	b	c	d		e		f

a *Flange*
1 = clamping-synchro flange, ø 40 mm [1.57"]

b *Shaft (ø x L)*
3 = ø 6 x 12 mm [0.24 x 0.47"], with flat
5 = ø 1/4" x 12 mm [1/4" x 0.47"], with flat

c *Output circuit / power supply*
3 = open collector (with inverted signal) / 10 ... 30 V DC
4 = push-pull (with inverted signal) / 10 ... 30 V DC
6 = RS422 (with inverted signal) / 5 V DC
7 = open collector (without inverted signal) / 10 ... 30 V DC
8 = push-pull (without inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
2 = radial cable, 2 m [6.56'] PVC

e *Pulse rate*
25, 100, 200, 360, 500, 512, 600, 1000, 1024, 2000, 2048, 2500
(e.g. 500 pulses => 0500)

f *Special signal format*
P03 = see page 58

Stock types

8.KIS40.1342.0360	8.KIS40.1362.0500
8.KIS40.1342.0500	8.KIS40.1362.1024
8.KIS40.1342.1000	8.KIS40.1362.2048
8.KIS40.1342.1024	
8.KIS40.1342.2048	
8.KIS40.1342.2500	

Optional on request
- other pulse rates

1) Is only necessary when a special output signal format is required.

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Incremental encoders

Compact optical | **Sendix Base KIS40 / KIH40 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Order code Hollow shaft

8.KIH40	.	X	X	X	X	.	XXXX	.	PXX [1]
Type		a	b	c	d		e		f

a *Flange*
2 = with spring element, long
5 = with stator coupling, ø 46 mm [1.81"]

b *Blind hollow shaft (insertion depth max. 18 mm [0.71"])*
4 = ø 8 mm [0.32"]
3 = ø 1/4"

c *Output circuit / power supply*
3 = open collector (with inverted signal) / 10 ... 30 V DC
4 = push-pull (with inverted signal) / 10 ... 30 V DC
6 = RS422 (with inverted signal) / 5 V DC
7 = open collector (without inverted signal) / 10 ... 30 V DC
8 = push-pull (without inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
2 = radial cable, 2 m [6.56'] PVC

e *Pulse rate*
25, 100, 200, 360, 500, 512, 600, 1000, 1024, 2000, 2048, 2500
(e.g. 500 pulses => 0500)

f *Special signal format*
P03 = see page 58

Stock types

8.KIH40.2442.1024	8.KIH40.5442.0360
8.KIH40.2462.1000	8.KIH40.5442.0500
8.KIH40.2462.1024	8.KIH40.5442.1024
	8.KIH40.5442.2048
	8.KIH40.5442.2500
	8.KIH40.5462.0500
	8.KIH40.5462.2048

Optional on request
- other pulse rates

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 15 mm [0.59"] for shaft 6 mm [0.24"]	**8.0000.1202.0606**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMBS 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		4500 min^{-1}
Mass moment of inertia		approx. 0.2 x 10^{-6} kgm^2
Starting torque – at 20°C [68°F]		< 0.05 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		ca. 0.17 kg [6.00 oz]
Protection acc. to EN 60529		IP64

Working temperature range		-20°C ... +70° [-4°F ... +158°F]
Materials	shaft	stainless steel
	flange	aluminum
	housing	aluminum
	cable	PVC
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Output circuit		**RS422** (TTL comp.)	**Push-pull** [2] (7272 comp.)	**Open collector** (7273)
Power supply		5 V DC (±5 %)	10 ... 30 V DC	10 ... 30 V DC
Power consumption with inverted signal (no load)		typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	100 mA
Permissible load / channel		max. +/- 20 mA	max. +/- 20 mA	+/- 20 mA sink at 30 V DC
Pulse frequency		max. 250 kHz	max. 250 kHz	max. 250 kHz
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V	
Rising edge time t_r		max. 200 ns	max. 1 µs	
Falling edge time t_f		max. 200 ns	max. 1 µs	
Short circuit proof outputs [3]		yes [4]	yes	yes
Reverse polarity protection of the power supply		no	yes	yes
UL approval		file 224618		
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) Is only necessary when a special output signal format is required.
2) Max. recommended cable length 30 m [98.43'].
3) If power supply correctly applied.
4) Only one channel allowed to be shorted-out:
at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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Compact optical | **Sendix Base KIS40 / KIH40 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Terminal assignment

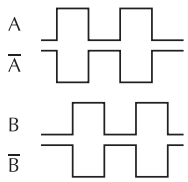
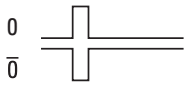
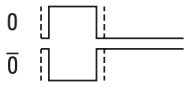
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3, 4, 6 with inv. signal	1, 2	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
7, 8 without inv. signal	1, 2	Signal:	0 V	+V	A	–	B	–	0	–
		Cable color:	WH	BN	GN	–	GY	–	BU	–

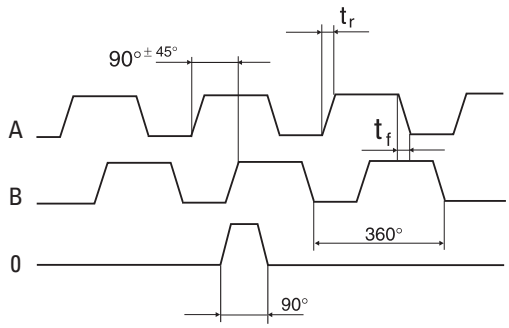
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal

Output signal formats

All Kübler 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.

A leads B when the shaft is rotated in the clockwise direction viewing the shaft or collet end. This is the Kübler standard. This format applies to the pin key codes listed below.		
Order code ⓘ		
standard	0 gated with A & B. This is the Kübler standard. 0 is 90° wide.	
P03	0 ungated. 0 is 330° to 360° wide.	

Wave form tolerances



t_r = rising edge time
t_f = falling edge time

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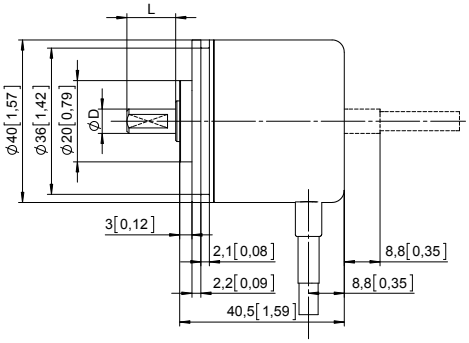
Compact optical | **Sendix Base KIS40 / KIH40 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

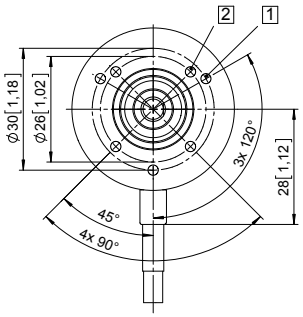
Dimensions shaft version

Dimensions in mm [inch]

Clamping-synchro flange, ø 40 [1.57]
Flange type 1

1 3 x M3, 4 [0.16] deep
2 4 x M3, 4 [0.16] deep





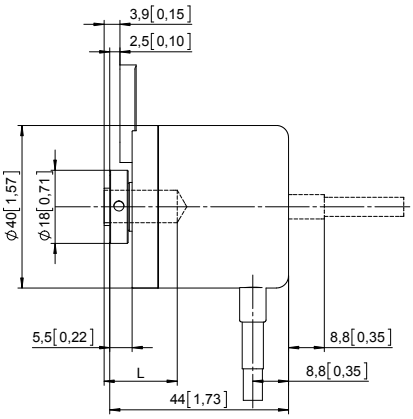
D	Fit	L
6 [0.24]	h7	12 [0.47]
1/4"	h7	12 [0.47]

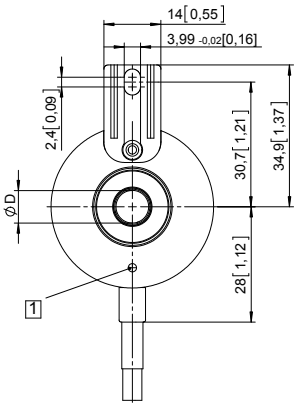
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 2

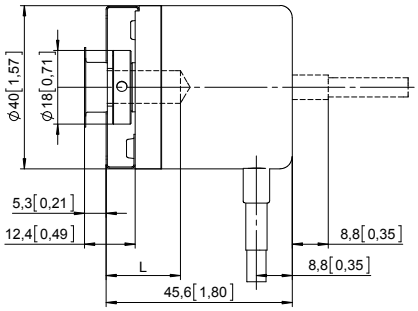
1 M2,5, 4 [0.16] deep

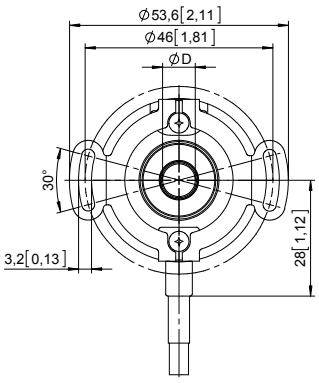




D	Fit	L
8 [0.32]	H7	18 [0.71]
1/4"	H7	18 [0.71]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 46 [1.81]
Flange type 5





D	Fit	L
8 [0.32]	H7	18 [0.71]
1/4"	H7	18 [0.71]
L = insertion depth max. blind hollow shaft insertion depth min. = 1.5 x D		

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Compact optical | 3610 / 3620 (shaft / hollow shaft) | Push-pull / RS422

The compact incremental encoders type 3610 / 3620 with optical sensor technology are available with a resolution of up to 2500 pulses per revolution.

The versions with hollow shaft are designed for diameters up to 8 mm.

High rotational speed | Temperature range -20°...+85°C | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic field proof | Optical sensor

Compact

- Only 36 mm outer diameter.
- Through hollow shaft up to 8 mm.
- Ideally suited for use where space is tight.

Versatile

- Available with cable outlet or M12 connector.
- Maximum resolution of 2500 pulses per revolution.
- Power supply 5 ... 18 V DC or 8 ... 30 V DC.

Order code Shaft version

8.3610 . X X X X . XXXX
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = synchro flange, ø 36.5 mm [1.44"]
3 = clamping flange, ø 36.5 mm [1.44"]

b *Shaft (ø x L)*
1 = ø 4 x 10 mm [0.16 x 0.39"]
2 = ø 5 x 10 mm [0.20 x 0.39"]
3 = ø 6 x 12.5 mm [0.24 x 0.49"], with flat
5 = ø 1/4" x 12.5 mm [1/4" x 0.49"], with flat

c *Output circuit / power supply*
2 = push-pull (with inverted signal) / 5 ... 18 V DC
4 = push-pull (with inverted signal) / 8 ... 30 V DC
3 = push-pull (without inverted signal) / 8 ... 30 V DC
6 = RS422 (with inverted signal) / 5 V DC
5 = RS422 (with inverted signal) / 8 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [5.56'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [5.56'] PVC
B = radial cable, special length PVC *)
3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-pin

*) Available special lengths (connection types A, B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.3610.334A.1024.0030 (for cable length 3 m)

e *Pulse rate*
25, 100, **200**, 360, **500**, 512, 600, 1000, **1024**, 1500, 2000, **2048**, **2500**
(e.g. 500 pulses => 0500)

Optional on request
- other pulse rates

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Incremental encoders

Compact optical | 3610 / 3620 (shaft / hollow shaft) | Push-pull / RS422

Order code Hollow shaft

8.3620	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, short
2 = with spring element, long
5 = with stator coupling, ø 46 mm [1.81"]

b *Through hollow shaft*
2 = ø 6 mm [0.24"]
4 = ø 8 mm [0.32"]
3 = ø 1/4"

c *Output circuit / power supply*
2 = push-pull (with inverted signal) / 5 ... 18 V DC
4 = push-pull (with inverted signal) / 8 ... 30 V DC
3 = push-pull (without inverted signal) / 8 ... 30 V DC
6 = RS422 (with inverted signal) / 5 V DC
5 = RS422 (with inverted signal) / 8 ... 30 V DC

d *Type of connection*
E = radial cable, 2 m [5.56'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 8-pin
*) Available special lengths (connection type B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.3620.224B.1024.0030 (for cable length 3 m)

e *Pulse rate*
25, 100, **200**, 360, **500**, 512, 600, 1000, **1024**, 1500, 2000, **2048**, **2500**
(e.g. 500 pulses => 0500)

Optional on request
- other pulse rates

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 15 mm [0.59"] for shaft 6 mm [0.24"]	**8.0000.1202.0606**

Connection technology

		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	shaft version	12000 min^{-1}
	hollow shaft version	6000 min^{-1}
Mass moment of inertia		approx. 0.2 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]		< 0.05 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.08 kg [2.82 oz]
Protection acc. to EN 60529		
	housing side	IP65
	flange side	IP50 (IP64 on request)
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]
Materials	shaft	stainless steel
	hollow shaft	brass
	housing	aluminum
	cable	PVC
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Output circuit	**RS422**	**Push-pull** [1] (7272 comp.)	**Push-pull** [1] (7272 comp.)
Power supply	5 V DC (±5 %) or 8 ... 30 V DC	5 ... 18 V DC	8 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 40 mA / max. 90 mA	max. 40 mA	max. 40 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA
Pulse frequency	max. 300 kHz	max. 200 kHz	max. 200 kHz
Signal level HIGH	min. 2.5 V	min. +V - 2.5 V	min. +V - 3.0 V
LOW	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs [2]	yes	yes	yes
Reverse polarity protection of the power supply	yes	yes	yes
UL approval	file 224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) Max. recommended cable length 30 m [98.43'].
2) If power supply correctly applied.

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Compact optical | **3610 / 3620 (shaft / hollow shaft)** | **Push-pull / RS422**

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2, 4, 5, 6 with inv. signal	1, 2, A, B, E	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3 without inv. signal	1, 2, A, B, E	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable color:	WH	BN	GN	-	YE	-	GY	-

Output circuit	Type of connection	M12 connector, 8-pin								
2, 4, 5, 6 with inv. signal	3, 4	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Pin:	1	2	3	4	5	6	7	8

Output circuit	Type of connection	M12 connector, 8-pin								
3 without inv. signal	3, 4	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Pin:	1	2	3	-	5	-	7	-

Top view of mating side, male contact base

M12 connector, 8-pin

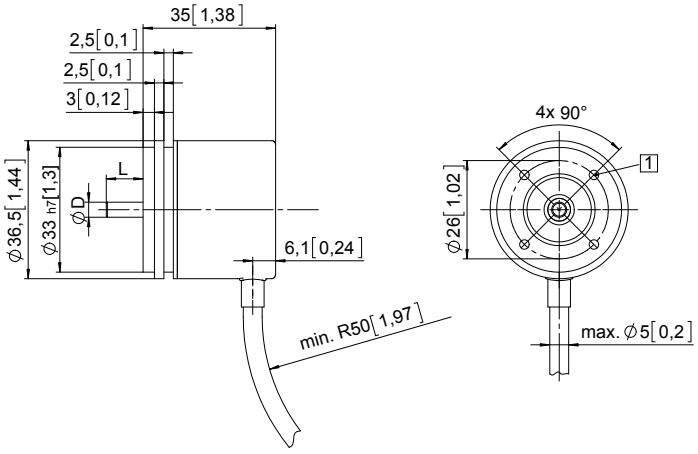
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 36.5 [1.44]
Flange type 2

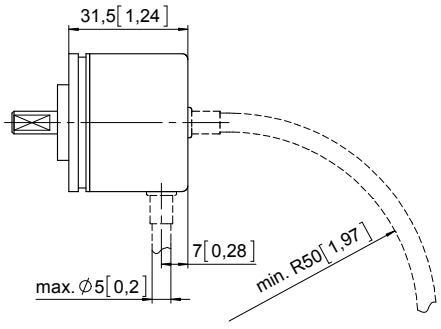
1 4 x M3, 5 [0.20] deep

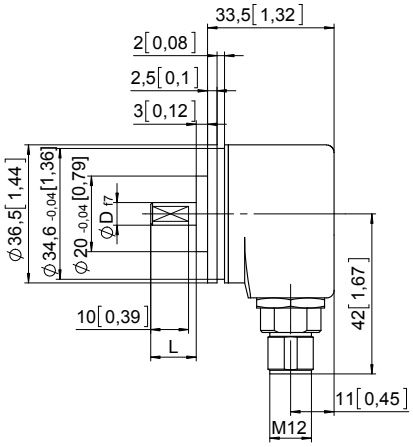


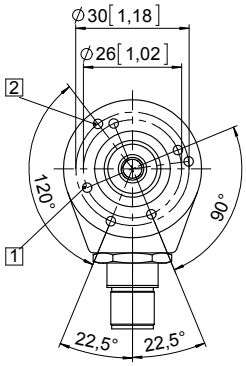
D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	12.5 [0.49]
1/4“	f7	12.5 [0.49]

Clamping flange, ø 36.5 [1.44]
Flange type 3

1 4 x M3, 5 [0.20] deep
2 3 x M3, 5 [0.20] deep







D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	12.5 [0.49]
1/4“	f7	12.5 [0.49]

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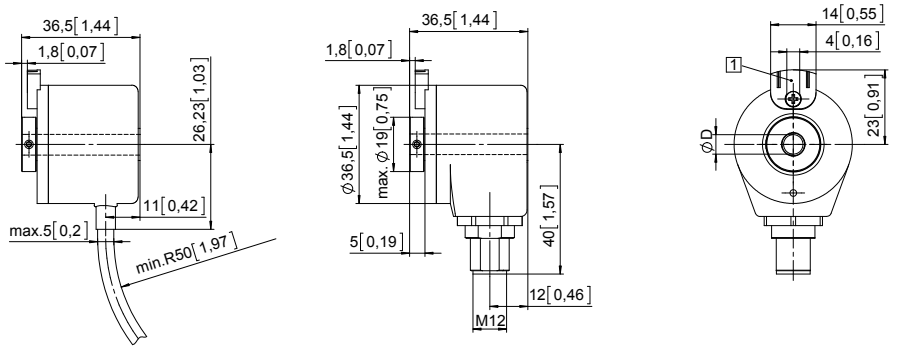
Compact optical | **3610 / 3620 (shaft / hollow shaft)** | **Push-pull / RS422**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

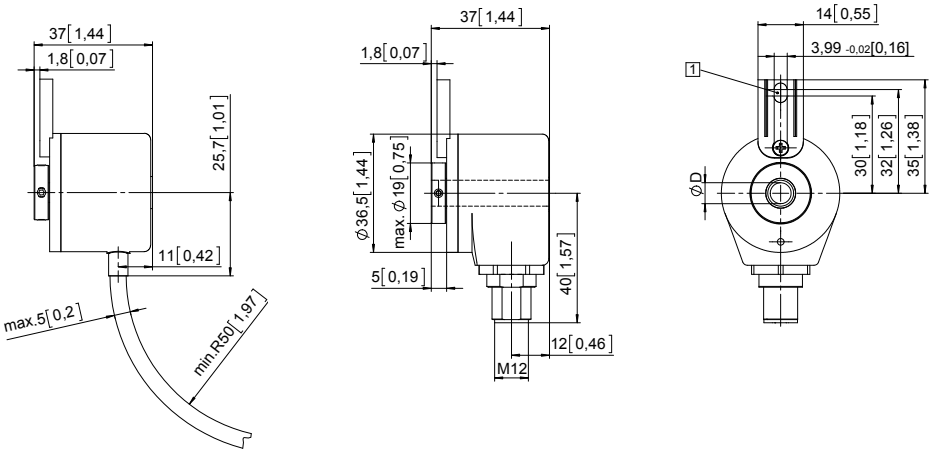
1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]



D	Fit
6 [0.24]	H7
8 [0.32]	H7
1/4"	H7

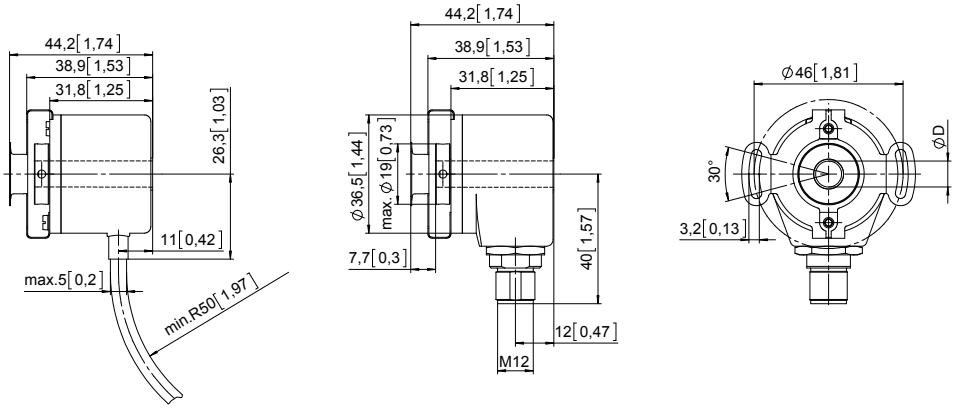
Flange with spring element, long
Flange type 2

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]



D	Fit
6 [0.24]	H7
8 [0.32]	H7
1/4"	H7

Flange with stator coupling, ø 46 [1.81]
Flange type 5



D	Fit
6 [0.24]	H7
8 [0.32]	H7
1/4"	H7

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Compact plastic housing, optical | 3700 / 3720 (shaft / hollow shaft) | Push-pull / RS422

The incremental economy encoders type 3700 / 3720 with optical sensor technology are a particularly compact and economical solution.

The carbon-fiber reinforced plastic housing of these incremental encoders is, nevertheless, extremely robust and resistant.

Magnetic field proof | Reverse polarity protection | Short-circuit proof | High protection level | Optical sensor

Reliable

- Tube Tech® cable outlet with extremely high strain relief.
- Ideal for outdoor use thanks to high IP protection.

Versatile

- Through hollow shaft up to 8 mm.
- Compact size of only 37 mm.
- Up to 1024 pulses per revolution.

Order code Shaft version

8.3700 (Type) . X (a) X (b) X (c) X (d) . XXXX (e)

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping-synchro flange, ø 36.8 mm [1.45"]
A = flange adapter, mounted, ø 40 mm [1.57"] 2)

b *Shaft with flat, ø x L* 2)
1 = ø 4 x 12.5 mm [0.16 x 0.49"]
2 = ø 5 x 12.5 mm [0.20 x 0.49"]
3 = ø 6 x 12.5 mm [0.24 x 0.49"]
6 = ø 8 x 12.5 mm [0.32 x 0.49"]
4 = ø 1/4" x 12.5 mm [1/4" x 0.49"]

c *Output circuit / power supply*
1 = RS422 / 5 V DC (±5 %)
3 = push-pull (with inverted signal) / 5 ... 30 V DC
4 = push-pull (with inverted signal) / 10 ... 30 V DC

d *Type of connection* 1)
1 = axial cable, 1 m [3.28'] PVC
2 = radial cable, 1 m [3.28'] PVC
3 = axial cable, 2 m [6.56'] PVC
4 = radial cable, 2 m [6.56'] PVC
5 = axial cable, 3 m [9.84'] PVC
6 = radial cable, 3 m [9.84'] PVC
7 = axial cable, 5 m [16.40'] PVC
8 = radial cable, 5 m [16.40'] PVC

e *Pulse rate*
10, 25, 50, 60, 100, 200, 250, 300, **360**, 400, **500**, **512**, 600, **1000**, **1024**
(e.g. 360 pulses => 0360)

Stock types
8.3700.1332.0360
8.3700.1332.0500
8.3700.1332.1000
8.3700.1332.1024

Optional on request
- other pulse rates

Order code Hollow shaft

8.3720 (Type) . X (a) X (b) X (c) X (d) . XXXX (e)

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, short
2 = with spring element, long
5 = with stator coupling, ø 46 mm [1.81"]

b *Through hollow shaft*
1 = ø 4 mm [0.16"]
2 = ø 5 mm [0.20"]
3 = ø 6 mm [0.24"]
6 = ø 8 mm [0.32"]
4 = ø 1/4"

c *Output circuit / power supply*
1 = RS422 / 5 V DC (±5 %)
3 = push-pull (with inverted signal) / 5 ... 30 V DC
4 = push-pull (with inverted signal) / 10 ... 30 V DC

d *Type of connection* 1)
1 = radial cable, 1 m [3.28'] PVC
2 = radial cable, 2 m [6.56'] PVC
3 = radial cable, 3 m [9.84'] PVC
4 = radial cable, 5 m [16.40'] PVC

e *Pulse rate*
10, 25, 50, 60, 100, 200, 250, 300, **360**, 400, **500**, **512**, 600, **1000**, **1024**
(e.g. 360 pulses => 0360)

Stock types
8.3720.5631.0360
8.3720.5611.1024

Optional on request
- other pulse rates

1) "Tube Tech®" cable outlet guarantees 10 x higher strain relief than traditional cabling methods plus higher IP protection.
2) With flange adapter L = 8.9 mm [0.35"].

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Compact plastic housing, optical | **3700 / 3720 (shaft / hollow shaft)** | **Push-pull / RS422**

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 15 mm [0.59"] for shaft 6 mm [0.24"]	**8.0000.1202.0606**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1}
Mass moment of inertia	shaft version	approx. 0.4 x 10^{-6} kgm^2
	hollow shaft version	1.4 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]		
	shaft version	< 0.007 Nm
	hollow shaft version	< 0.01 Nm
Shaft load capacity	radial	20 N
	axial	10 N
Weight		approx. 0.1 kg [35.27 oz]
Protection acc. to EN 60529		
	bearings, shaft	IP65
	cable outlet	IP67
Working temperature range		-20°C ... +70°C [-4°F ... 158°F] 1)
Materials	shaft / hollow shaft	stainless steel
	housing, flange	plastic PPA, 40 % CF (carbon fiber)
	cable	PVC
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Output circuit	**RS422** (TTL compatible)	**Push-pull** (7272 comp.) 4)	**Push-pull** (7272 comp.) 4)
Power supply	5 V DC (±5 %)	5 ... 30 V DC	10 ... 30 V DC
Power consumption with inverted signal (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. +/- 20 mA	max. +/- 20 mA
Pulse frequency	max. 250 kHz	max. 250 kHz	max. 250 kHz
Signal level HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs 2)	yes 3)	yes	yes
Reverse polarity protection of the power supply	no	no	yes
UL approval	file 224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
1, 3, 4	1 ... 8	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal

1) For versions with push-pull output and power supply >15 V DC: max. 55°C [+131°F].
2) If power supply correctly applied.
3) Only one channel allowed to be shorted-out:
if +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.
if +V = 5 ... 30 V DC short circuit to channel or 0 V is permitted.
4) Max. recommended cable length 30 m [98.43'].

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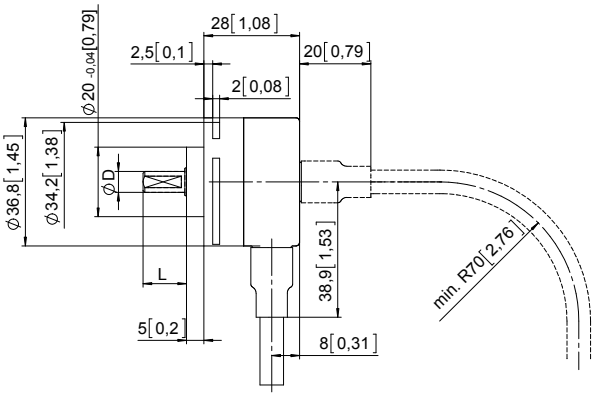
Compact plastic housing, optical | **3700 / 3720 (shaft / hollow shaft)** | **Push-pull / RS422**

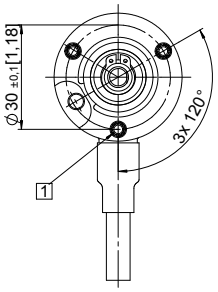
Dimensions shaft version

Dimensions in mm [inch]

Clamping-synchro flange, ø 36.8 [1.45]
Flange type 1

1 3 x M3, 6 [0.24] deep

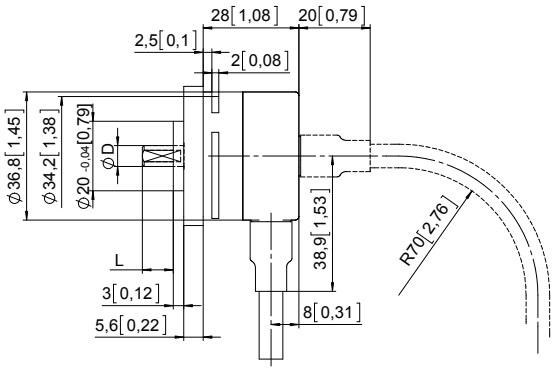


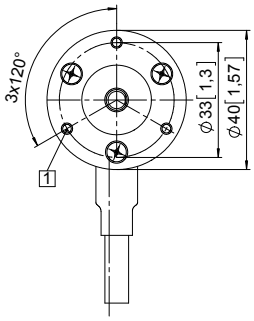


D	Fit	L
4 [0.16]	h7	12.5 [0.49]
5 [0.20]	h7	12.5 [0.49]
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4“	h7	12.5 [0.49]

Flange adapter, ø 40 [1.57]
Flange type A

1 3 x M3, 6 [0.24] deep





D	Fit	L
4 [0.16]	h7	12.5 [0.49]
5 [0.20]	h7	12.5 [0.49]
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4“	h7	12.5 [0.49]

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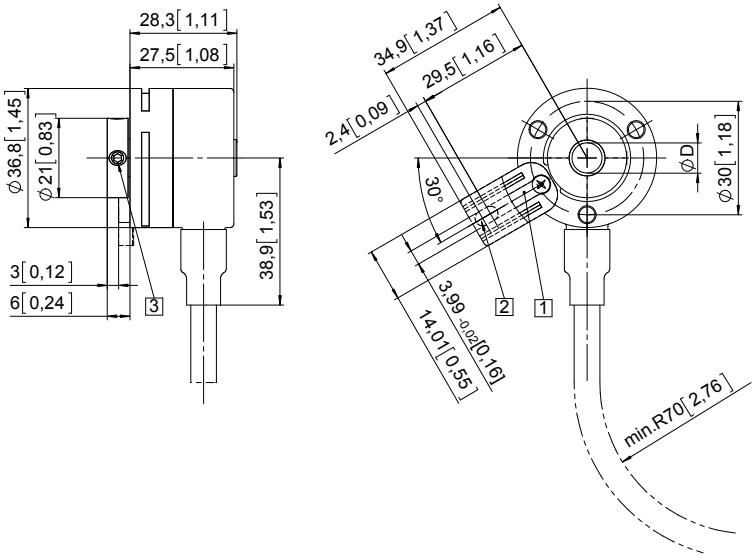
Compact plastic housing, optical | 3700 / 3720 (shaft / hollow shaft) | Push-pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
(long spring element version is shown dashed)
Flange type 1 (2)

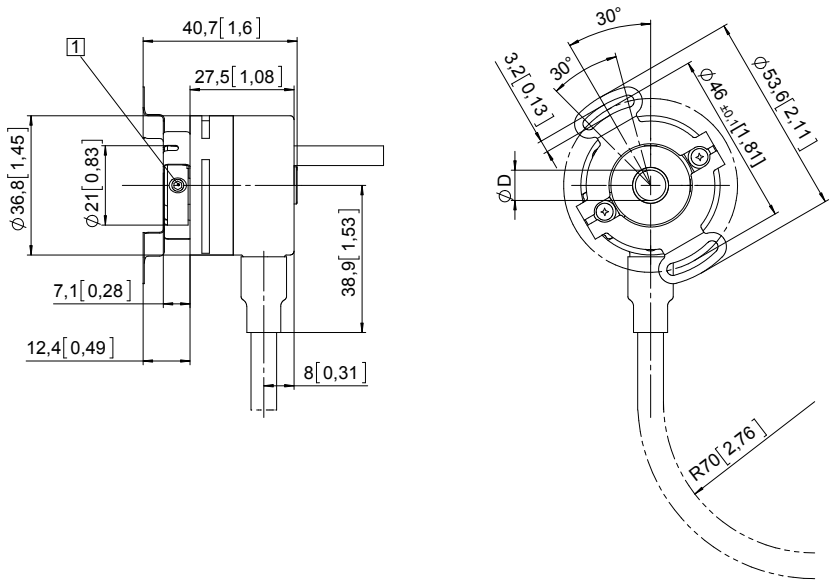
1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 Spring element, long
3 Recommended torque for the clamping ring 1.0 Nm



D	Fit
4 [0.16]	H7
5 [0.20]	H7
6 [0.24]	H7
8 [0.32]	H7
1/4"	H7

Flange with stator coupling, ø 46 [1.81]
Flange type 5

1 Recommended torque for the clamping ring 1.0 Nm



D	Fit
4 [0.16]	H7
5 [0.20]	H7
6 [0.24]	H7
8 [0.32]	H7
1/4"	H7

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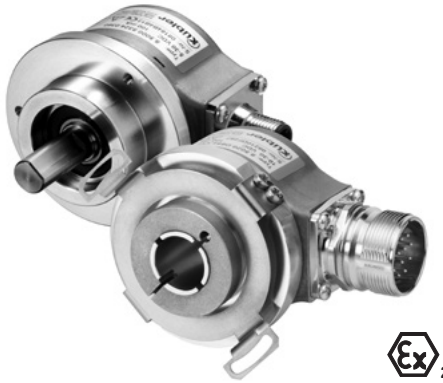
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**



Due to their sturdy bearing construction in Safety-Lock™ Design, the Sendix 5000 and 5020 offer high resistance against vibration and installation errors.

The rugged housing, high protection level of up to IP67, as well as the wide temperature range of -40°C up to +85°C, make this product range the perfect encoder for all applications.

NEW: 24one delivery promise

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

Robust performance

- Increased resistance against vibrations and tolerance of installation errors, elimination of machine downtime and repairs thanks to sturdy bearing construction in "Safety-Lock™ Design".
- Ensures highest safety against field breakdowns and is thus suitable also for outside use thanks to its resistant die-cast housing and protection up to IP67.
- Undetachable clamping ring on hollow shaft encoders.
- Wide temperature range, -40°C ... +85°C.

NEW:

- Higher shock resistance.
- Higher vibration resistance.
- IP66 and IP67 protection level in one version.

Many variants

- Suitable connection variant for every specific case: cable connection, M12, M23, MIL and Sub-D connector.
- Reliable mounting in a wide variety of installation situations: comprehensive and proven fixing possibilities.
- Compatible with all US and European standards.
- Max. 5000 pulses per revolution.

NEW:

- Double number of standard pulse numbers.
- Variants with connector fitted in the cable – for error-free electrical connection to your control.
- Additional connector variants (M12 / 5-pin, Sub-D).
- Additional standard cable lengths.

Technology in detail

Robust Safety-Lock™ bearing structure

Cables with fitted connector

Undetachable clamping ring

Slotted clamping ring + slotted shaft

Tangential cable outlet

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Incremental encoders

Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Order code Shaft version

8.5000	.	X	X	X	X	.	XXXX
Type		ⓐ	ⓑ	ⓒ	ⓓ		ⓔ

We offer for all encoders configured with the **underlined preferential options** our free of charge 24one delivery promise.

Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.

24one

ⓐ *Flange*

5 = synchro flange, IP66/IP67 ø 50.8 mm [2“]
6 = synchro flange, IP65 ø 50.8 mm [2“]
7 = clamping flange, IP66/IP67 ø 58 mm [2.28“]
8 = clamping flange, IP65 ø 58 mm [2.28“]
A = synchro flange, IP66/IP67 ø 58 mm [2.28“] 1)
B = synchro flange, IP65 ø 58 mm [2.28“] 1)
C = square flange, IP66/IP67 □63.5 mm [2.5“]
D = square flange, IP65 □63.5 mm [2.5“]
G = Euroflansch, IP66/IP67 ø 115 mm [4.53“] 2)

1 = servo flange, IP66/IP67 ø 50.8 mm [2“] 3)
2 = servo flange, IP65 ø 50.8 mm [2“] 3)
3 = square flange, IP66/IP67 □52.3 mm [2.06“] 3)
4 = square flange, IP65 □52.3 mm [2.06“] 3)
E = servo flange, IP66/IP67 ø 63.5 mm [2.5“] 3)
F = servo flange, IP65 ø 63.5 mm [2.5“] 3)

ⓑ *Shaft (ø x L), with flat*

1 = ø 6 x 10 mm [0.24 x 0.39“]
2 = ø 1/4 x 5/8“ (6.35 x 15.875 mm)
6 = ø 8 x 15 mm [0.32 x 0.59“]
3 = ø 10 x 20 mm [0.39 x 0.79“]
4 = ø 3/8 x 5/8“(9.5 x 15.875 mm)
B = ø 11 x 33 mm [0.43 x 1.30“], with feather key shaft slot 4)
5 = ø 12 x 20 mm [0.47 x 0.79“]

7 = ø 1/4 x 7/8“ 3)
8 = ø 3/8 x 7/8“ 3)

ⓒ *Output circuit / power supply*

4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC
7 = push-pull (without inverted signal) / 10 ... 30 V DC 5)

3 = open collector (with inverted signal) / 5 ... 30 V DC 3)
8 = push-pull (7272 with inverted signal), without capacitor / 5 ... 30 V DC 1) 3) 6)

ⓓ *Type of connection – cable*

1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)

Type of connection – connector

P = axial M12 connector, 5-pin 7)
R = radial M12 connector, 5-pin 7)
3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-pin
7 = axial M23 connector, 12-pin
8 = radial M23 connector, 12-pin
Y = radial MIL connector, 10-pin
W= radial MIL connector, 7-pin

9 = radial MIL connector, 6-pin 3)

Type of connection – connector with cable

L = radial cable with M12 connector, 8-pin, special length PVC *)
M = radial cable with M23 connector, 12-pin, special length PVC *)
N = radial cable with Sub-D connector, 9-pin, special length PVC *)

*) Available special lengths (connection types A, B, L, M, N: 0.3, 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20 m [0.98, 1.64, 3.28, 6.56, 9.84, 13.12, 16.40, 19.69, 26.25, 32.80, 39.37, 49.21, 65.62']
order code expansion .XXXX = length in dm
ex.: 8.5000.814A.1024.0030 (for cable length 3 m)

ⓔ *Pulse rate*

1, 2, 4, 5, 10, 12, 14, 20, 25, 28, 30, 32, 36, 50, 60, 64, 80, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates
- Ex 2/22 8)
- surface protection salt spray

Salt spray tested as standard type (deliverable as from 1 unit)
8.5000.73X4.XXXX-C

1) 24one type only in conjunction with shaft type 1.
2) Only in conjunction with shaft type B.
3) US version.
4) Only in conjunction with flange type G.
5) Only in conjunction with type of connection P or R.
6) Attention: no CE types!
7) Only in conjunction with output circuit 7.
8) For the cable connection type, cable material PUR.

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Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Order code Hollow shaft

8.5020 . X X X X . XXXX
Type . a b c d . e

We offer for all encoders configured with the **underlined preferential options** our free of charge 24one delivery promise.

Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.

24one

a *Flange*

1 = with spring element, long, IP66/IP67
2 = with spring element, long, IP65
3 = with torque stop, long, IP66/IP67
4 = with torque stop, long, IP65
7 = with stator coupling, IP66/IP67 ø 65 mm [2.56"]
8 = with stator coupling, IP65 ø 65 mm [2.56"]
C = with stator coupling, IP66/IP67 ø 63 mm [2.48"]
D = with stator coupling, IP65 ø 63 mm [2.48"]

5 = with stator coupling, IP66/IP67 ø 57.2 mm [2.25"] 1)
6 = with stator coupling, IP65 ø 57.2 mm [2.25"] 1)

b *Through hollow shaft*

1 = ø 6 mm [0.24"]
2 = ø 1/4"
9 = ø 8 mm [0.32"]
4 = ø 3/8"
3 = ø 10 mm [0.39"]
5 = ø 12 mm [0.47"]
6 = ø 1/2"
A = ø 14 mm [0.55"]
8 = ø 15 mm [0.59"]
7 = ø 5/8"

c *Output circuit / power supply*

4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC
7 = push-pull (without inverted signal) / 10 ... 30 V DC 3)

3 = open collector (with inverted signal) / 5 ... 30 V DC 1)
8 = push-pull (7272 with inverted signal), without capacitor / 5 ... 30 V DC 1) 2)

d *Type of connection – cable*

1 = radial cable, 1 m [3.28'] PVC
A = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)

Type of connection – connector

R = radial M12 connector, 5-pin 4)
2 = radial M12 connector, 8-pin
4 = radial M23 connector, 12-pin
6 = radial MIL connector, 7-pin
7 = radial MIL connector, 10-pin

Type of connection – connector with cable

H = tangential cable, 0.3 m [0.98'] PVC, incl. M12 connector, 8-pin for central fastening
L = tangential cable with M12 connector, 8-pin, special length PVC *)
M = tangential cable with M23 connector, 12-pin, special length PVC *)
N = tangential cable with Sub-D connector, 9-pin, special length PVC *)

*) Available special lengths (connection types A, F, L, M, N):
0.3, 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20 m [0.98, 1.64, 3.28, 6.56, 9.84, 13.12, 16.40, 19.69, 26.25, 32.80, 39.37, 49.21, 65.62']
order code expansion .XXXX = length in dm
ex.: 8.5020.234A.1024.0030 (for cable length 3 m)

e *Pulse rate*

1, 2, 4, 5, 10, 12, 14, 20, 25, 28, 30, 32, 36, 50, 60, 64, 80, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates
- Ex 2/22 (not for type of connection E, F, H, L, M, N) 5)
- surface protection salt spray

Salt spray tested as standard type
(deliverable as from 1 unit)
8.5020.18X2.XXXX-C
8.5020.1AX2.XXXX-C

1) US version.
2) Attention: no CE types!
3) Only in conjunction with type of connection R.
4) Only in conjunction with output circuit 7.
5) For the cable connection type, cable material PUR.

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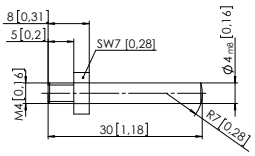
Incremental encoders

Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Isolation / adapter inserts for hollow shaft encoders order code 8.5020.X8XX.XXXX	D1	Isolation insert
Thermal and electrical isolation of the encoders (Temperature range -40 ... +115°C [-40°F ... +239°F]) Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC vector motors and considerably shorten the service life of the encoder bearings. In addition the encoder is thermally isolated as the plastic does not transfer the heat to the encoder.	6 mm [0.24“]	**8.0010.4021.0000**
	8 mm [0.32“]	**8.0010.4020.0000**
	10 mm [0.39“]	**8.0010.4023.0000**
	12 mm [0.47“]	**8.0010.4025.0000**
	1/4“	**8.0010.4022.0000**
	3/8“	**8.0010.4024.0000**
	1/2“	**8.0010.4026.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56’] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56’] PVC cable	**8.0000.6901.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**
	MIL female connector with coupling nut, 10-pin	**8.0000.5062.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Technical data

Mechanical characteristics

Maximum speed	IP65	12000 min^{-1} 6000 min^{-1} (continuous)
	IP66/IP67	6000 min^{-1} 3000 min^{-1} (continuous)
Mass moment of inertia		
	shaft version	approx. 1.8 x 10^{-6} kgm^2
	hollow shaft version	approx. 6 x 10^{-6} kgm^2
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP66/IP67	< 0.05 Nm
Shaft load capacity	radial	100 N
	axial	50 N

Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529		
	without shaft seal	IP65
	with shaft seal	IP66/IP67
Working temperature range		-40°C [1] ... +85°C [-40°F [1] ... +185°F]
Material	shaft	stainless steel
Shock resistance acc. to EN 60068-2-27		3000 m/s^2, 6 ms [2]
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz [3]

Electrical characteristics

Output circuit	**RS422** (TTL compatible)	**RS422** (TTL compatible)	**Push-pull**	**Push-pull** (7272 compatible)	**Push-pull** (7272, without capacitor)	**Open collector** (7273)
Order code	**1**	**4**	**5, 7**	**2**	**8**	**3**
Power supply	5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC	5 ... 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	typ. 50 mA max. 100 mA	100 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	+/- 20 mA sink at 30 V DC
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz [4]	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	min. +V - 2.0 V	
LOW	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V	
Rising edge time t_r	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	max. 1 µs	
Falling edge time t_f	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	max. 1 µs	
Short circuit proof outputs [5]	yes [6]	yes [6]	yes	yes	yes [6]	yes
Reverse polarity protection of the power supply	yes	no	yes	no	no	no
UL approval	file 224618					
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU					

1) With connector: -40°C [-40°F], cable fixed: -30°C [-22°F], cable moved: -20°C [-4°F].
2) For MIL connectors: 2500 m/ s^2
3) For MIL connectors: 100 m/ s^2
4) Max. recommended cable length 30 m [98.43'].
5) If power supply correctly applied.
6) Only one channel allowed to be shorted-out:
at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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Incremental encoders

Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2, 3, 4, 5, 8	5000: 1, 2, A, B	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: 1, A, E, F	Cable color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M12 connector, 5-pin						
1, 2, 3, 4, 7, 8	5000: P, R	Signal:	0 V	+V	A	B	0	⏚
	5020: R	Pin:	1	2	3	4	5	PH [1]

Output circuit	Type of connection	M12 connector, 8-pin								
1, 2, 3, 4, 5, 8	5000: 3, 4, L	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: 2, H [2], L	Pin:	1	2	3	4	5	6	7	8	PH [1]

Output circuit	Type of connection	M23 connector, 12-pin											
1, 2, 3, 4, 5, 8	5000: 7, 8, M	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: 4, M	Pin:	10	12	11	2	5	6	8	1	3	4	PH [1]

Output circuit	Type of connection	MIL connector, 10-pin									
1, 2, 3, 4, 5, 8	5000: Y	Signal:	0 V	+V	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: 7	Pin:	F	D	E	A	G	B	H	C	I	J

Output circuit	Type of connection	MIL connector, 7-pin							
1, 3, 4, 7, 8	5000: W	Signal:	0 V	+V	+Vsens	A	B	0	⏚
	5020: 6	Pin:	F	D	E	A	B	C	G

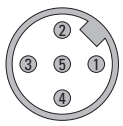
Output circuit	Type of connection	MIL connector, 6-pin						
1, 3, 4, 7, 8	5000: 9	Signal:	0 V	+V	A	B	0	⏚
		Pin:	A	B	E	D	C	

Output circuit	Type of connection	Sub-D connector, 9-pin									
1, 2, 3, 4, 5, 8	5000: N	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: N	Pin:	9	5	1	6	2	7	3	8	PH [1]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.

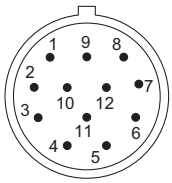
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

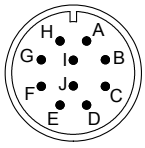


M12 connector, 5-pin

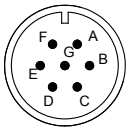
M12 connector, 8-pin



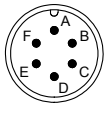
M23 connector, 12-pin



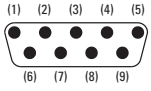
MIL connector, 10-pin



MIL connector, 7-pin



MIL connector, 6-pin



Sub-D connector, 9-pin

1) PH = shield is attached to connector housing.
2) With type of connection H shield is not attached to connector housing.

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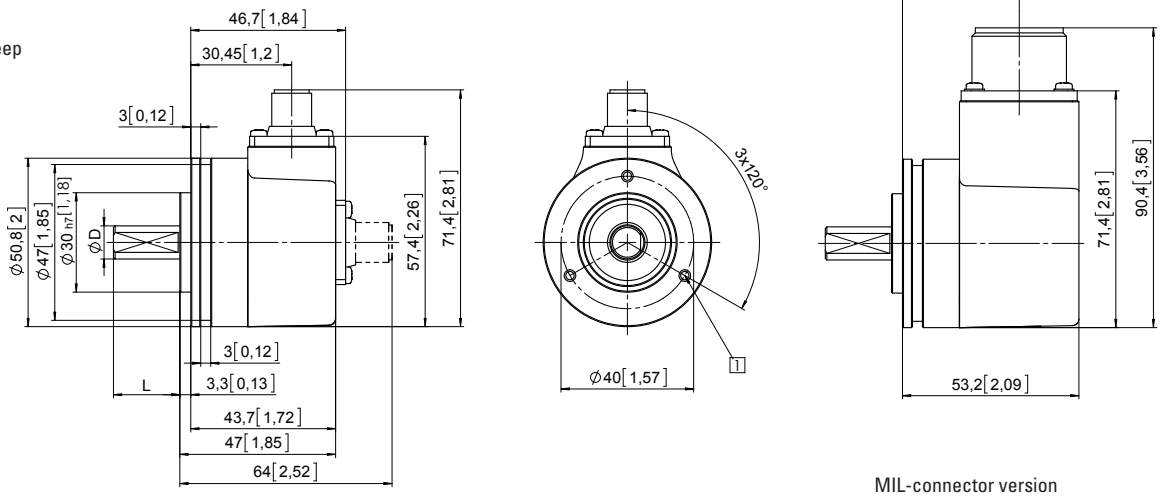
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 50.8 [2]
Flange type 5 and 6

1 3 x M3, 6 [0.24] deep

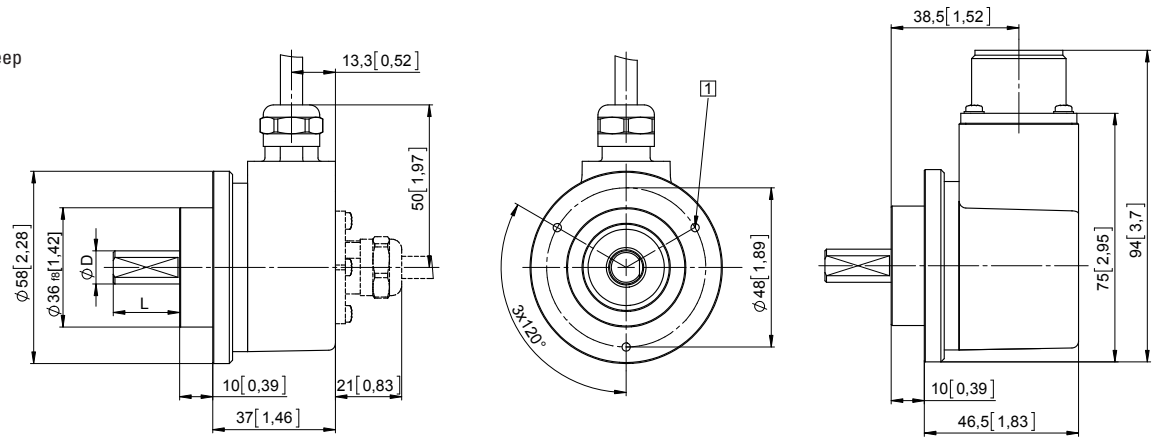


MIL-connector version

D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]
1/4“	h7	5/8“
3/8“	h7	5/8“
1/4“	h8	7/8“
3/8“	h8	7/8“

Clamping flange, ø 58 [2.28]
Flange type 7 and 8

1 3 x M3, 6 [0.24] deep



MIL-connector version

D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]
1/4“	h7	5/8“
3/8“	h7	5/8“
1/4“	h8	7/8“
3/8“	h8	7/8“

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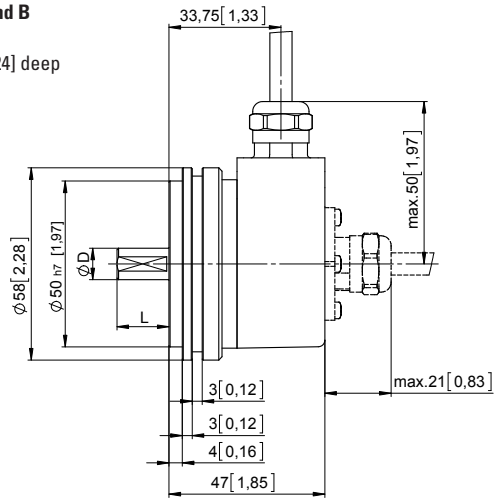
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

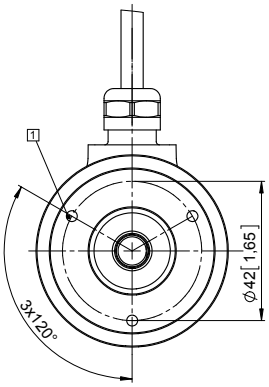
Dimensions shaft version

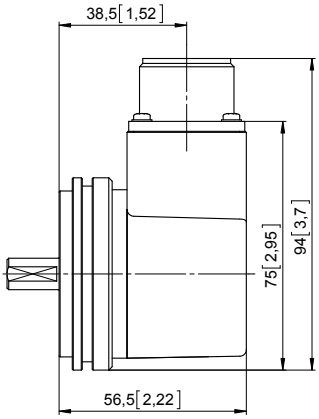
Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type A and B

1 3 x M4, 6 [0.24] deep



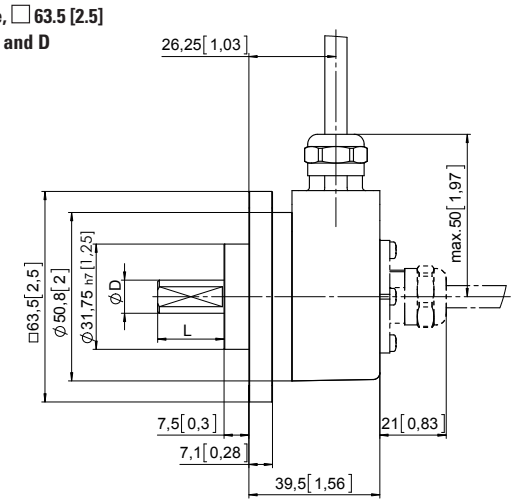


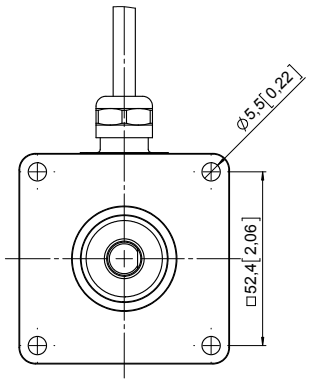


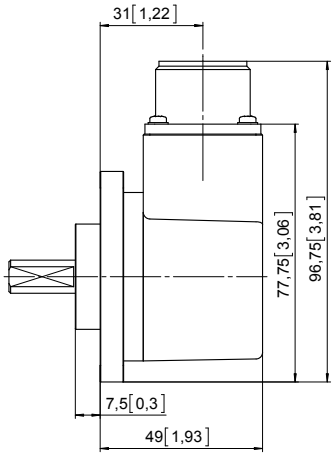
MIL-connector version

D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]
1/4"	h7	5/8"
3/8"	h7	5/8"
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type C and D







MIL-connector version

D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]
1/4"	h7	5/8"
3/8"	h7	5/8"
1/4"	h8	7/8"
3/8"	h8	7/8"

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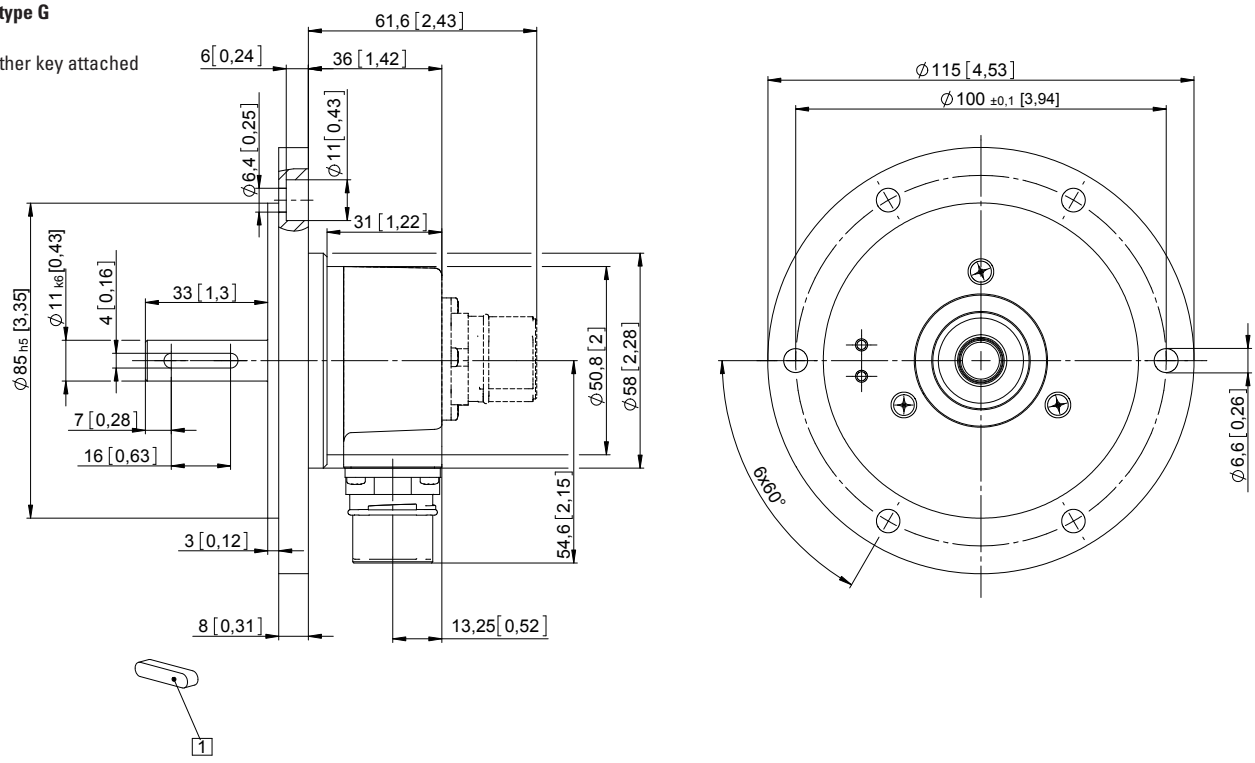
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Dimensions shaft version

Dimensions in mm [inch]

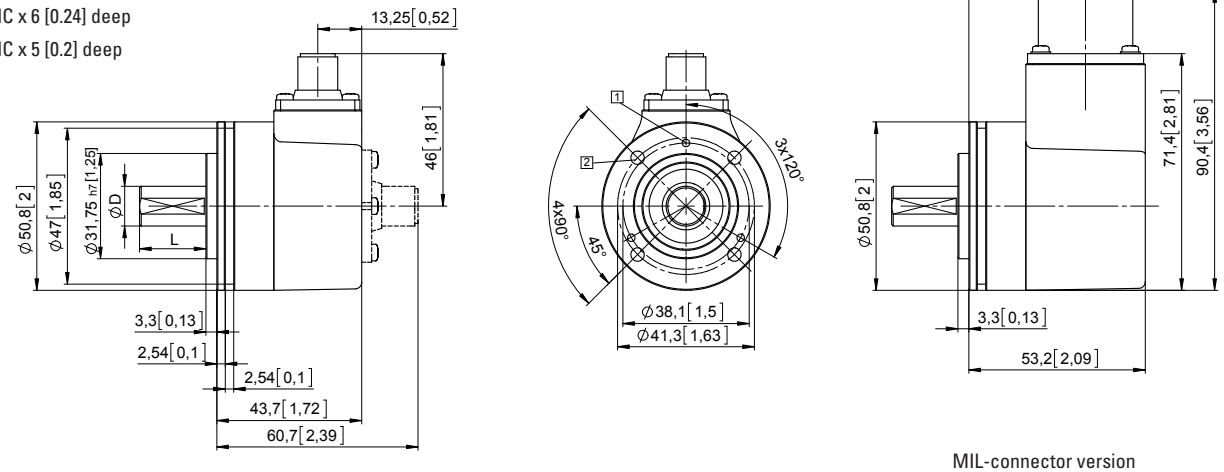
Euro flange, ø 115 [4.53]
Flange type G

1 Feather key attached



Servo flange, ø 50.8 [2]
Flange type 1 and 2

1 4-40 UNC x 6 [0.24] deep
2 6-32 UNC x 5 [0.2] deep



MIL-connector version

D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]
1/4“	h7	5/8“
3/8“	h7	5/8“
1/4“	h8	7/8“
3/8“	h8	7/8“

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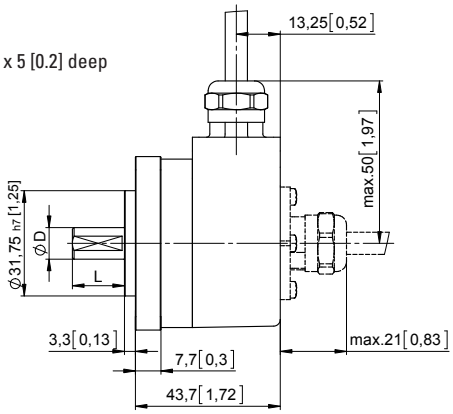
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

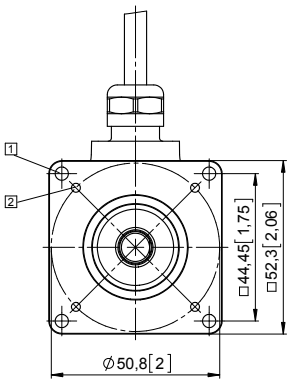
Dimensions shaft version

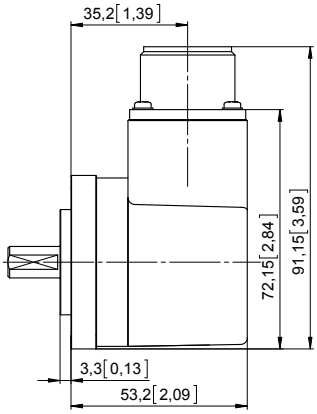
Dimensions in mm [inch]

Square flange, □ 52.3 [2.06]
Flange type 3 and 4

1 ø 4 [0.16]
2 6-32 UNC x 5 [0.2] deep





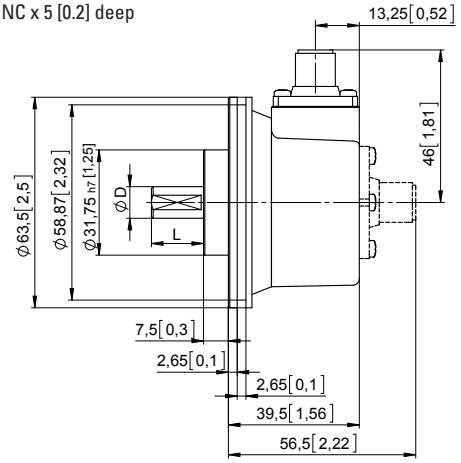


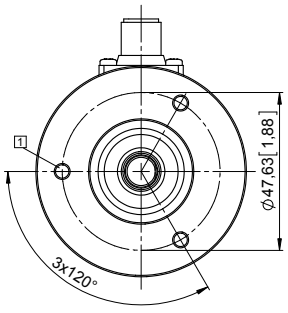
MIL-connector version

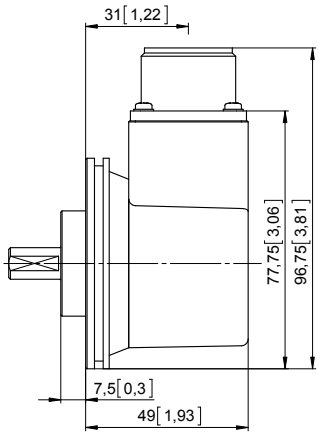
D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]
1/4"	h7	5/8"
3/8"	h7	5/8"
1/4"	h8	7/8"
3/8"	h8	7/8"

Servo flange, ø 63.5 [2.5]
Flange type E and F

1 6-32 UNC x 5 [0.2] deep







MIL-connector version

D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]
1/4"	h7	5/8"
3/8"	h7	5/8"
1/4"	h8	7/8"
3/8"	h8	7/8"

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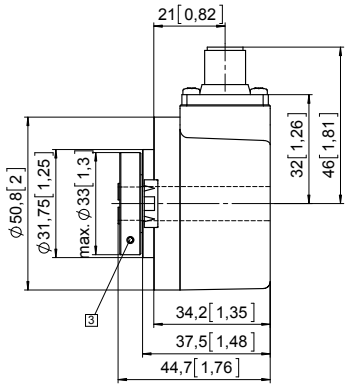
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

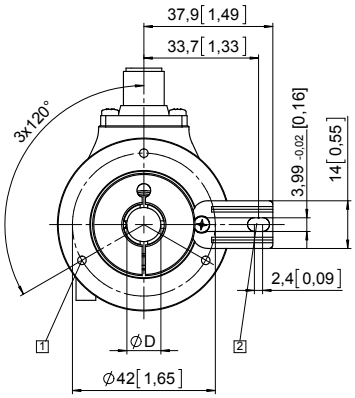
Dimensions hollow shaft version

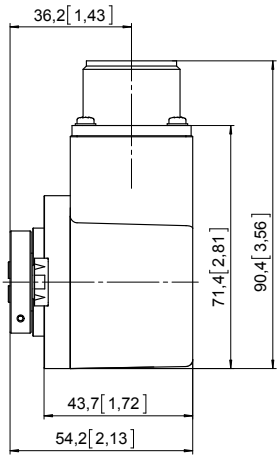
Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

1 3 x M3, 6 [0.24] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 0.6 Nm





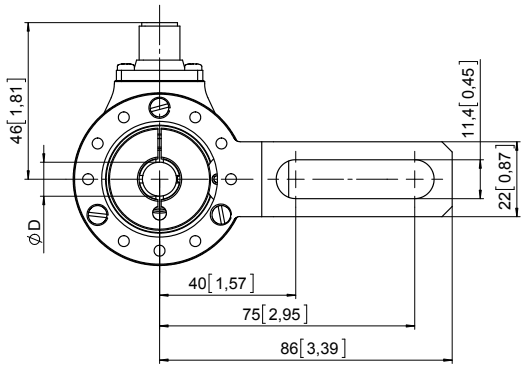


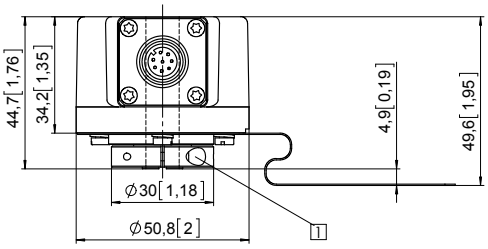
MIL-connector version

D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4“	H7
3/8“	H7
1/2“	H7
5/8“	H7

Flange with torque stop, long
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4“	H7
3/8“	H7
1/2“	H7
5/8“	H7

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Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

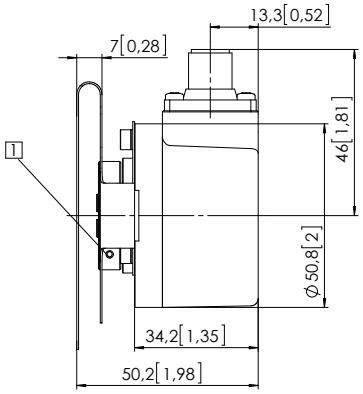
Dimensions hollow shaft version

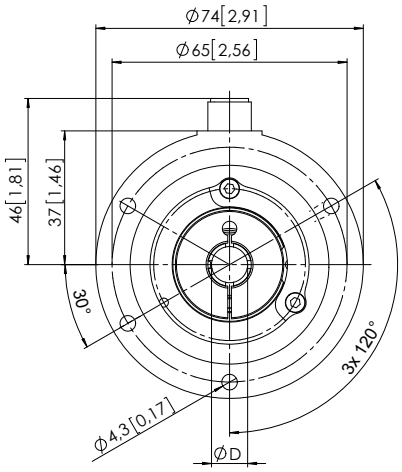
Dimensions in mm [inch]

Flange with stator coupling, ø 65 [2.56]
Flange type 7 and 8

1 Recommended torque for the clamping ring 0.6 Nm

D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4"	H7
3/8"	H7
1/2"	H7
5/8"	H7

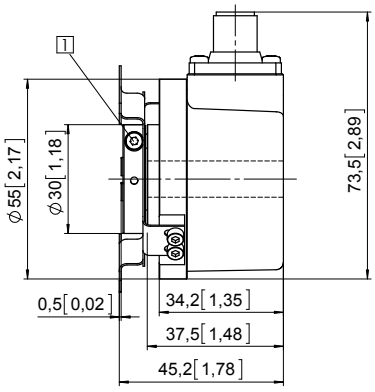


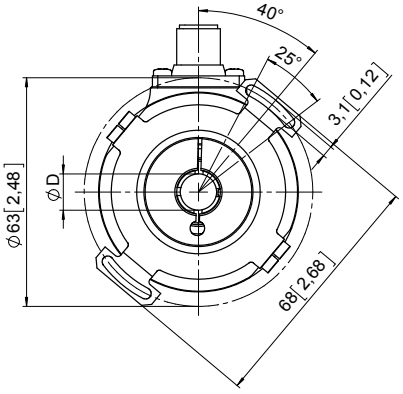


Flange with stator coupling, ø 63 [2.48]
Flange type C and D

1 Recommended torque for the clamping ring 0.6 Nm

D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4"	H7
3/8"	H7
1/2"	H7
5/8"	H7

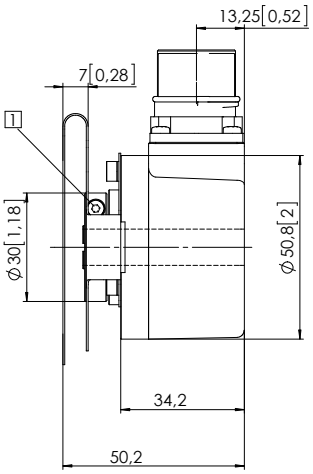


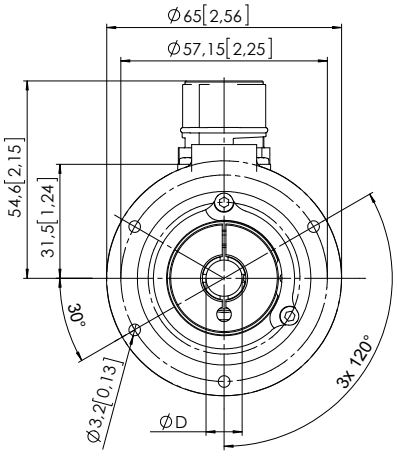


Flange with stator coupling, ø 57.2 [2.25]
Flange type 5 and 6

1 Recommended torque for the clamping ring 0.6 Nm

D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4"	H7
3/8"	H7
1/2"	H7
5/8"	H7





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Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Dimensions hollow shaft version

Dimensions in mm [inch]

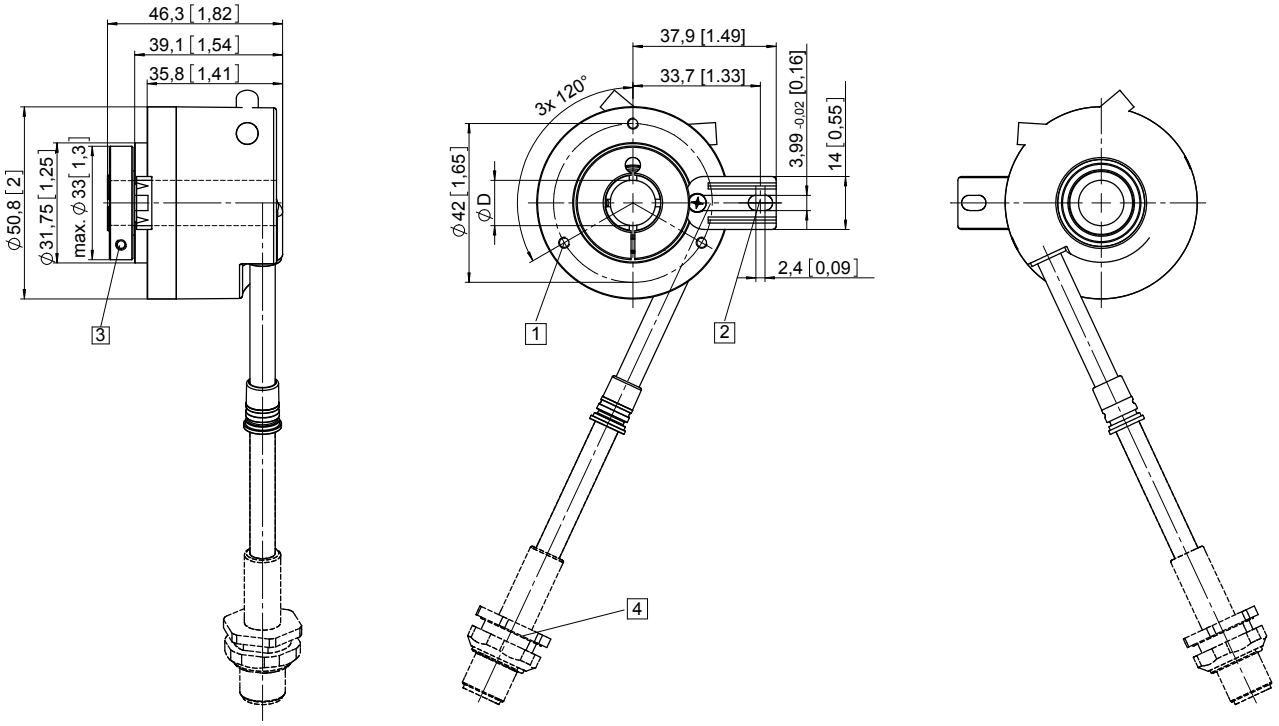
Flange with spring element, long and tangential cable outlet
Type of connection E, F and H

1 3 x M3, 6 [0.24] deep

2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

3 Recommended torque for the clamping ring 0.6 Nm

4 Shield is not applied on connector



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4“	H7
3/8“	H7
1/2“	H7
5/8“	H7

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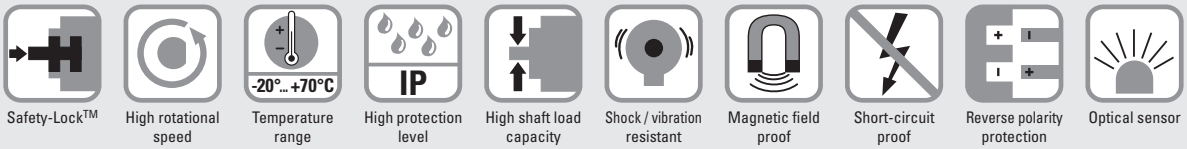
Standard optical | **Sendix Base KIS50 / KIH50 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

The encoders Sendix Base KIS50 / KIH50 offer a protection level up to IP65 and can be used with temperatures from -20°C up to +70°C. They are ideal for use in standard applications and in simple machines.

The Sendix Base KIS50 / KIH50 family also features our well proven Safety-Lock™ system, allowing higher tolerance of possible installation errors and increasing the overall performance of this encoder.



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

Robust

- Resistant die-cast housing and protection up to IP65.
- Wide temperature range, -20°C ... +70°C.
- Elimination of machine downtime thanks to sturdy bearing construction in "Safety-Lock™ Design".

Flexible

- Suitable connection variant for every specific case: cable connection, M12 and M23 connector.
- Various mounting options.
- Up to 5000 pulses per revolution.

Order code Shaft version

8.KIS50	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

a *Flange*
8 = clamping flange, IP65 ø 58 mm [2.28"]
B = synchro flange, IP65 ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 10 mm [0.24 x 0.39"]
6 = ø 8 x 15 mm [0.32 x 0.59"]
3 = ø 10 x 20 mm [0.39 x 0.79"]
5 = ø 12 x 20 mm [0.47 x 0.79"]

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC
3 = open collector (with inverted signal) / 5 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
2 = radial cable, 1 m [3.28'] PVC
3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-pin
7 = axial M23 connector, 12-pin
8 = radial M23 connector, 12-pin

e *Pulse rate*
100, 200, 250, 256, 360, 500, 512, 600, 1000, 1024, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

Order code Hollow shaft

8.KIH50	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

a *Flange*
2 = with spring element, long, IP65
4 = with torque stop, long, IP65
D = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
9 = ø 8 mm [0.32"]
3 = ø 10 mm [0.39"]
5 = ø 12 mm [0.47"]
A = ø 14 mm [0.55"]
8 = ø 15 mm [0.59"]

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC
3 = open collector (with inverted signal) / 5 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
2 = radial M12 connector, 8-pin
4 = radial M23 connector, 12-pin
E = tangential cable, 1 m [3.28'] PVC

e *Pulse rate*
100, 200, 250, 256, 360, 500, 512, 600, 1000, 1024, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

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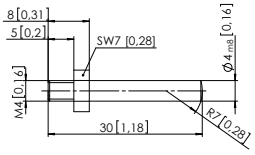
Standard optical | **Sendix Base KIS50 / KIH50 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56‘] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56‘] PVC cable	**8.0000.6901.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1} 3000 min^{-1} (continuous)
Mass moment of inertia		
	shaft version	approx. 1.8 x 10^{-6} kgm^2
	hollow shaft version	approx. 6 x 10^{-6} kgm^2
Starting torque at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial	80 N
	axial	40 N

Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-20°C ... +70°C [-4°F ... +158°F]
Material	shaft	stainless steel
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Output circuit Order code		**RS422** (TTL compatible) **1**	**RS422** (TTL compatible) **4**	**Push-pull** **5**	**Push-pull** (7272 compatible) **2**	**Open collector** (7273) **3**
Power supply		5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 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	100 mA
Permissible load / channel		max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	+/- 20 mA sink at 30 V DC
Pulse frequency		max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz [1]	max. 300 kHz
Signal level	HIGH	min. 2.5 V	min. 2.5 V	min +V - 1.0 V	min. +V - 2.0 V	
	LOW	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V	
Rising edge time t_r		max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	
Falling edge time t_f		max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	
Short circuit proof outputs [2]		yes [3]	yes [3]	yes	yes	yes
Reverse polarity protection of the power supply		yes	no	yes	no	no
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU				

1) Max. recommended cable length 30 m [98.43‘].
2) If power supply correctly applied.
3) Only one channel allowed to be shorted-out:
at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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Standard optical | **Sendix Base KIS50 / KIH50 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2, 3, 4, 5	KIS50: 1, 2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	KIH50: 1, E	Cable color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield

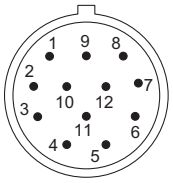
Output circuit	Type of connection	M12 connector, 8-pin											
1, 2, 3, 4, 5	KIS50: 3, 4	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	KIH50: 2	Pin:	1	2			3	4	5	6	7	8	PH [1]

Output circuit	Type of connection	M23 connector, 12-pin											
1, 2, 3, 4, 5	KIS50: 7, 8	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	KIH50: 4	Pin:	10	12	11	2	5	6	8	1	3	4	PH [1]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



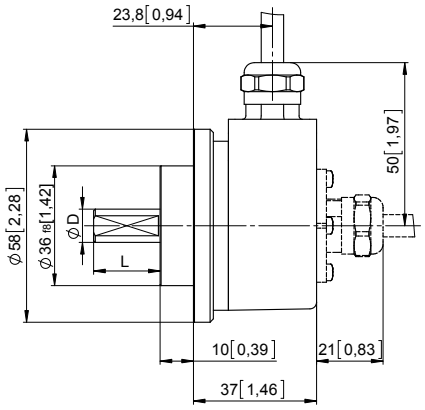
M23 connector, 12-pin

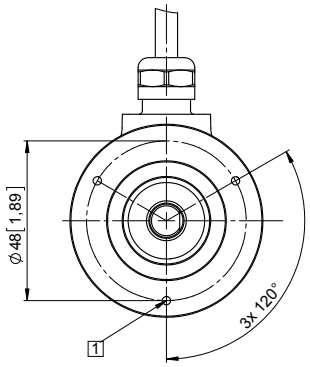
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 8

1 3 x M3, 6 [0.24] deep

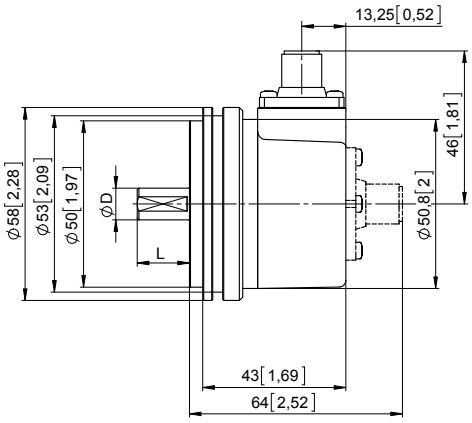


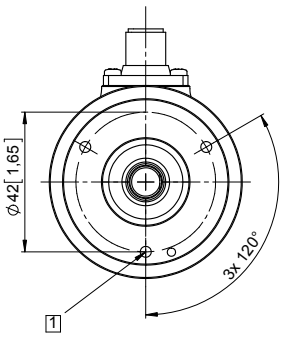


D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]

Synchro flange, ø 58 [2.28]
Flange type B

1 3 x M4, 6 [0.24] deep





D	Fit	L
6 [0.24]	h7	10 [0.39]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
12 [0.47]	h7	20 [0.79]

1) PH = shield is attached to connector housing.

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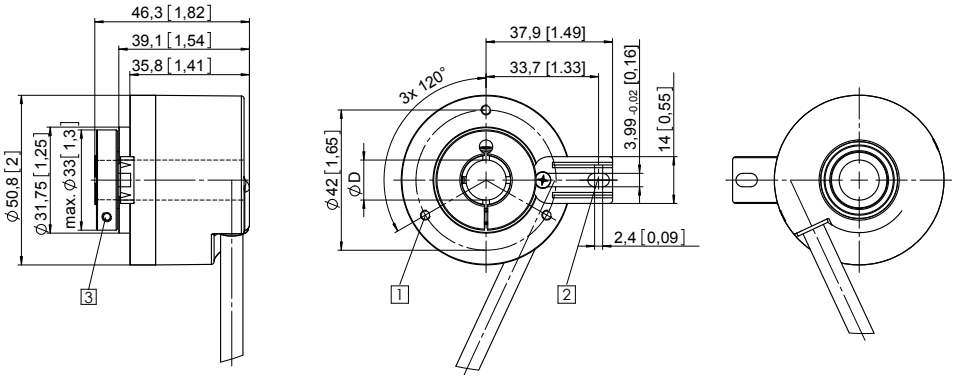
Standard optical | **Sendix Base KIS50 / KIH50 (shaft / hollow shaft)** | **Push-pull / RS422 / Open collector**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 2

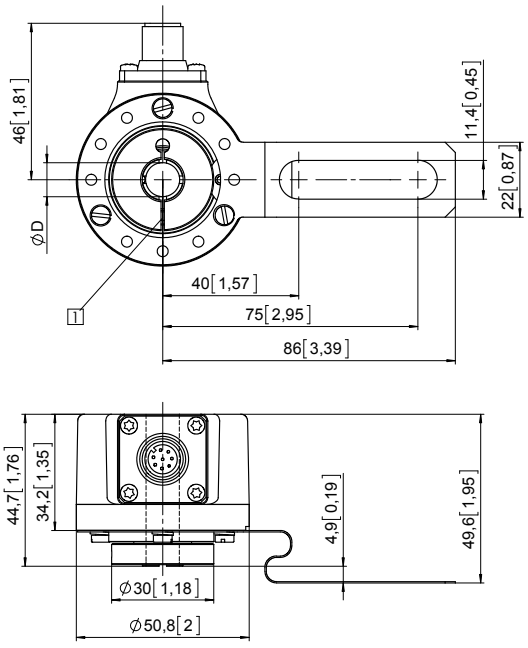
1 3 x M3, 6 [0.24] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7

Flange with torque stop, long
Flange type 4

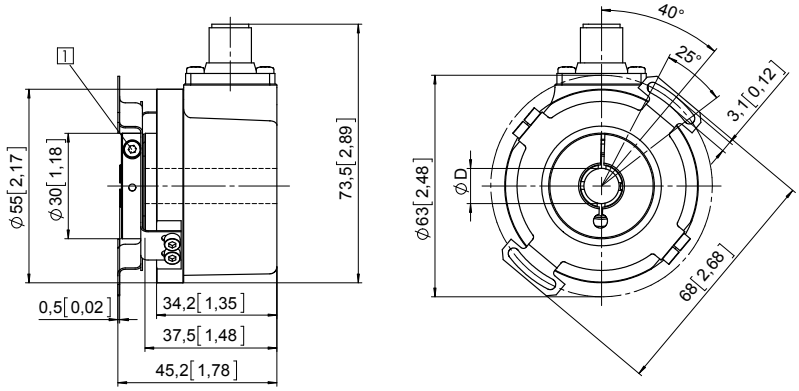
1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type D

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7

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Standard high temperature, optical | **5803 / 5823 (shaft / hollow shaft)** | **Push-pull / RS422**

The incremental encoders of the high temperature series 5803 / 5823 can be used at up to max. 110°C.

The high heat resistance – at the same time as high speed – make these encoders the ideal solution for all applications in a high temperature environment.

High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor

Powerful

- Can be used at temperatures of up to max. 110°C.
- High resolution up to 5000 pulses per revolution.
- Maximum speed of 12000 revolutions per minute.

Flexible

- Various connection types for different application purposes.
- Shaft or hollow shaft version.
- With push-pull or RS422 interface.

Order code Shaft version

8.5803	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

a *Flange*
1 = clamping flange ø 58 mm [2.28"]
2 = synchro flange ø 58 mm [2.28"]
P = synchro flange ø 63.5 mm [2.5"]
M = square flange □ 63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 10 mm [0.24 x 0.39"]
2 = ø 10 x 20 mm [0.39 x 0.79"]
P = ø 3/8'' x 7/8" [1)]

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
5 = RS422 (with inverted signal) / 10 ... 30 V DC
6 = push-pull (with inverted signal) / 10 ... 30 V DC
7 = push-pull (without inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] TPE
2 = radial cable, 1 m [3.28'] TPE
3 = axial M23 connector, 12-pin, without mating connector
5 = radial M23 connector, 12-pin, without mating connector
W = radial MIL connector, 7-pin, without mating connector [2)]
Y = radial MIL connector, 10-pin, without mating connector

e *Pulse rate*
25, 50, 60, 100, 125, 200, 250, 256, 300, 360, 500, 512, 600, 720, 800, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates

1) Only in conjunction with flange M or P.
2) Only with output circuit 7.

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Incremental encoders

Standard
high temperature, optical | **5803 / 5823 (shaft / hollow shaft)** | **Push-pull / RS422**

Order code Hollow shaft

8.5823	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

a *Flange*
1 = with hollow shaft and spring element, short
2 = with blind hollow shaft and spring element, short
3 = with hollow shaft and stator coupling, ø 65 mm [2.56"]
4 = with blind hollow shaft and stator coupling, ø 65 mm [2.56"]

b *Hollow shaft*
(insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])
1 = ø 6 mm [0.24"], IP40
2 = ø 6 mm [0.24"], IP66
3 = ø 8 mm [0.32"], IP40
4 = ø 8 mm [0.32"], IP66
5 = ø 10 mm [0.39"], IP40
6 = ø 10 mm [0.39"], IP66
7 = ø 12 mm [0.47"], IP40
8 = ø 12 mm [0.47"], IP66

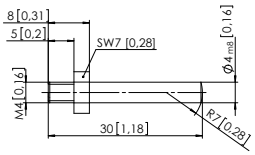
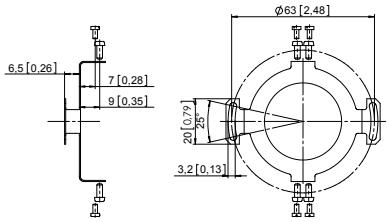
c *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 V DC
4 = RS422 (with inverted signal) / 10 ... 30 V DC
3 = push-pull (with inverted signal) / 10 ... 30 V DC
2 = push-pull (without inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28'] TPE
2 = radial M23 connector, 12-pin, without mating connector

e *Pulse rate*
25, 50, 60, 100, 125, 200, 250, 256, 300, 360, 500, 512, 600, 720, 800, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**
Stator coupling, ø 63 mm		**8.0010.4D00.0000**

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6E01.0002**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Standard high temperature, optical | **5803 / 5823 (shaft / hollow shaft)** | **Push-pull / RS422**

Technical data

Mechanical characteristics

Maximum speed	shaft IP65	12000 min^{-1}
	hollow shaft IP40	12000 min^{-1}
	hollow shaft IP66 [1]	6000 min^{-1}
Mass moment of inertia	shaft	approx. 1.8 x 10^{-6} kgm^2
	hollow shaft	approx. 6.0 x 10^{-6} kgm^2
Starting torque – at 20°C [68°F]		
shaft IP65 / hollow shaft IP40		< 0.01 Nm
hollow shaft IP66		< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529		
shaft		IP65
hollow shaft without seal		IP40
hollow shaft with seal		IP66
Working temperature range		
shaft IP65 / hollow shaft IP40		-20°C ... +110°C [-4°F ... +230°F]
hollow shaft IP66		-20°C ... +90°C [-4°F ... +194°F]
Material	shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Output circuit		**RS422 (TTL compatible)**	**Push-pull**
Power supply		5 V DC (±5 %) or 10...30 V DC	10 ... 30 V DC
Power consumption (no load)			
without inverted signal		–	typ. 55 mA / max. 125 mA
with inverted signal		typ. 40 mA / max. 100 mA	typ. 80 mA / max. 150 mA
Permissible load / channel		max. +/- 20 mA	max. +/- 30 mA
Pulse frequency		max. 300 kHz	max. 300 kHz
Signal level	HIGH	min. 2.5 V	min. +V - 2.5 V
	LOW	max. 0.5 V	max. 2.0 V
Rising edge time t_r		max. 200 ns	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 1 µs
Short circuit proof outputs [2]		yes [3]	yes
Reverse polarity protection of the power supply		no; 10 ... 30 V DC: yes	yes
UL approval		file 224618	
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2, 3, 4, 5, 6, 7	5803: 1, 2	Signal:	0 V	+V	0 Vsens [5]	+Vsens [5]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5823: 1	Cable color:	WH 0.5 mm²	BN 0.5 mm²	WH	BN	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M23 connector, 12-pin											
1, 2, 3, 4, 5, 6, 7	5803: 3, 5	Signal:	0 V	+V	0 Vsens [5]	+Vsens [5]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5823: 2	Pin:	10	12	11	2	5	6	8	1	3	4	PH [4]

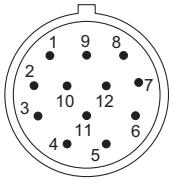
Output circuit	Type of connection	MIL connector, 7-pin											
7	5803: W	Signal:	0 V	+V	0 Vsens [5]	+Vsens [5]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5823: –	Pin:	F	D	–	E	A	–	B	–	C	–	G

Output circuit	Type of connection	MIL connector, 10-pin											
1, 2, 3, 4, 5, 6, 7	5803: Y	Signal:	0 V	+V	0 Vsens [5]	+Vsens [5]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5823: –	Pin:	F	D	–	E	A	G	B	H	C	I	J

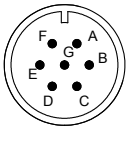
Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

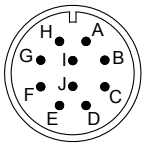
Top view of mating side, male contact base



M23 connector, 12-pin



MIL connector, 7-pin



MIL connector, 10-pin

1) For continuous operation max. 3000 min^{-1}, ventilated.
2) If power supply correctly applied.
3) Only one channel allowed to be shorted-out:
if +V = 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
if +V = 10 ... 30 V DC, short-circuit to channel or 0 V is permitted.
4) PH = shield is attached to connector housing.
5) The sensor cables are connected to the power supply internally. If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.

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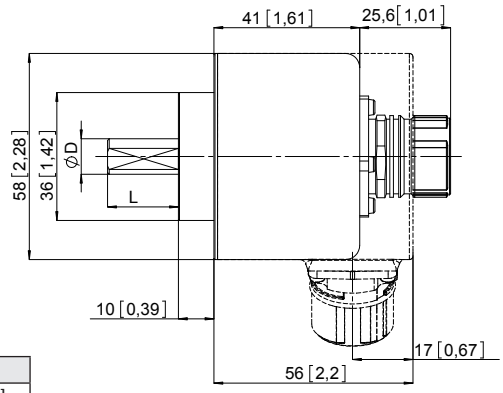
Standard
high temperature, optical | **5803 / 5823 (shaft / hollow shaft)** | **Push-pull / RS422**

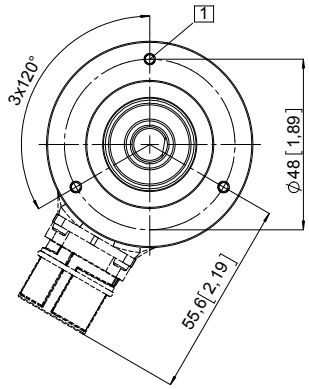
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

1 3 x M3, 5 [0.2] deep



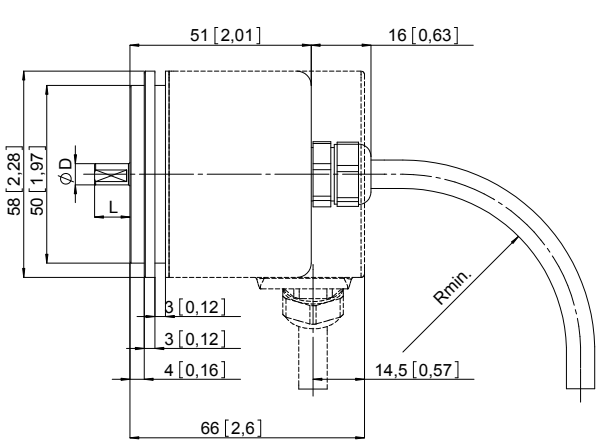


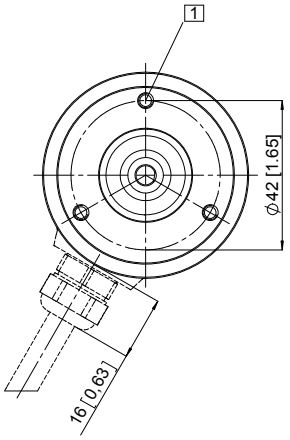
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2

1 3 x M4, 5 [0.2] deep

$R_{min.}$:
- securely installed: 55 [2.17]
- flexibly installed: 70 [2.76]





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h7	7/8"

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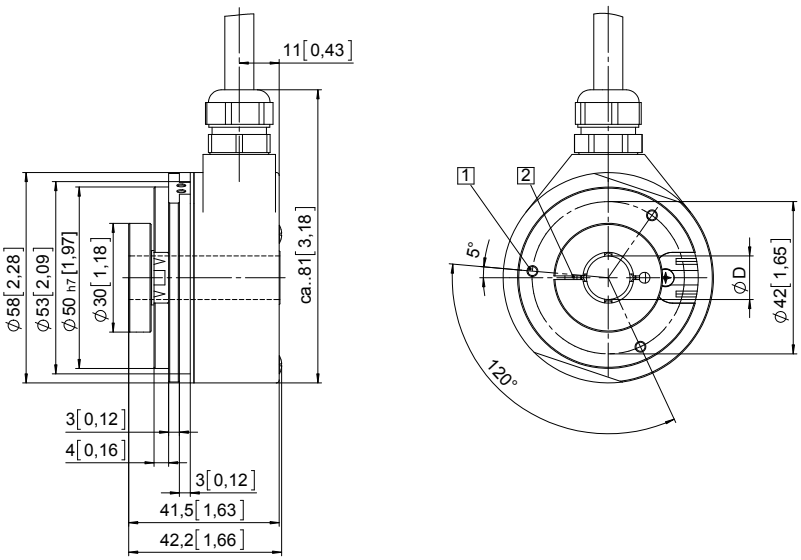
Standard high temperature, optical | **5803 / 5823 (shaft / hollow shaft)** | **Push-pull / RS422**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1 and 2

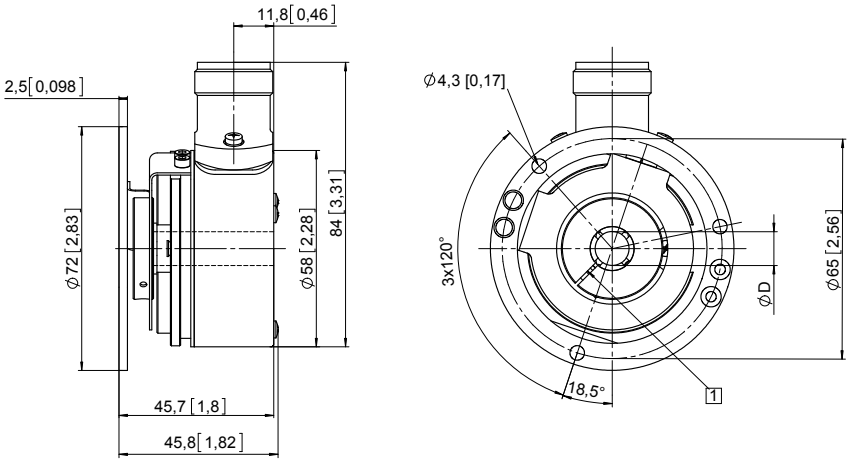
1 3 x M3, 5 [0.2] deep
2 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
Insertion depth blind hollow shaft with flange 2: max. 30 mm [1.18"]	

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
Min. insertion depth = 1.5 x D Insertion depth blind hollow shaft with flange 4: max. 30 mm [1.18"]	

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Standard
sine wave output, with zero pulse, optical | 5804 / 5824 (shaft / hollow shaft) | SinCos

The incremental encoders type 5804 / 5824 offer a SinCos interface.

They are ideal for use in drive engineering.

These encoders are used preferably in applications for which a standard SinCos interface is sufficient.

High rotational speed | Temperature range (-20°...+85°C) | High protection level (IP) | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Optical sensor

High performance

- High resolution up to 5000 pulses per revolution.
- Maximum speed up to 12000 revolutions per minute.
- High IP protection up to max. IP66.

Adaptable

- Shaft or hollow shaft version.
- With cable or connector.

Order code Shaft version

8.5804 . X X X X . XXXX
Type — a b c d — e

a *Flange*
1 = clamping flange ø 58 mm [2.28“]
2 = synchro flange ø 58 mm [2.28“]

b *Shaft (ø x L), with flat*
1 = ø 6 x 10 mm [0.24 x 0.39“]
2 = ø 10 x 20 mm [0.39 x 0.79“]

c *Output circuit / power supply*
1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28‘] TPE
2 = radial cable, 1 m [3.28‘] TPE
3 = axial M23 connector, 12-pin, without mating connector
5 = radial M23 connector, 12-pin, without mating connector

e *Pulse rate*
512, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
(e.g. 512 pulses => 0512)

Optional on request
- other pulse rates

Order code Hollow shaft

8.5824 . X X X X . XXXX
Type — a b c d — e

a *Flange*
1 = with hollow shaft and spring element, short
2 = with blind hollow shaft and spring element, short
3 = with hollow shaft and stator coupling, ø 65 mm [2.56“]
4 = with blind hollow shaft and stator coupling, ø 65 mm [2.56“]

b *Hollow shaft*
(insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18“])
1 = ø 6 mm [0.24“], IP40
2 = ø 6 mm [0.24“], IP66
3 = ø 8 mm [0.32“], IP40
4 = ø 8 mm [0.32“], IP66
5 = ø 10 mm [0.39“], IP40
6 = ø 10 mm [0.39“], IP66
7 = ø 12 mm [0.47“], IP40
8 = ø 12 mm [0.47“], IP66

c *Output circuit / power supply*
1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28‘] TPE
2 = radial M23 connector, 12-pin, without mating connector

e *Pulse rate*
512, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
(e.g. 512 pulses => 0512)

Optional on request
- other pulse rates

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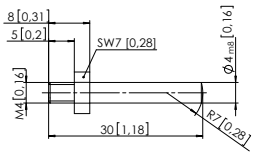
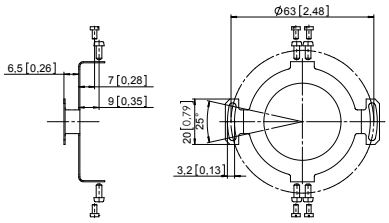
Incremental encoders

Standard sine wave output, with zero pulse, optical	5804 / 5824 (shaft / hollow shaft)	SinCos

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**
Stator coupling, ø 63 mm [2.48"]		**8.0010.4D00.0000**

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6E01.0002**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum Speed	shaft IP65	12000 min^{-1}
	hollow shaft IP40	12000 min^{-1}
	hollow shaft IP66 [1]	6000 min^{-1}
Mass moment of inertia	shaft	approx. 1.8 x 10^{-6} kgm^2
	hollow shaft	approx. 6.0 x 10^{-6} kgm^2
Starting torque – at 20°C [68°F]		
shaft IP65 / hollow shaft IP40		< 0.01 Nm
hollow shaft IP66		< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529		
shaft		IP65
hollow shaft without seal		IP40
hollow shaft with seal		IP66
Working temperature range		
shaft IP65 / hollow shaft IP40		-20°C ... +85°C [-4°F ... +185°F] [2]
hollow shaft IP66		-20°C ... +80°C [-4°F ... +176°F] [2]
Material	shaft	stainless steel H7
Shock resistance acc. EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Output circuit	**SinCos, U = 1 Vpp**	**SinCos, U = 1 Vpp**
Power supply	5 V DC (±5 %)	10 ... 30 V DC
Power consumption with inverted signal (no load)	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 Vpp (±20 %)	1 Vpp (±20 %)
channel 0	0.1 ... 1.2 V	0.1 ... 1.2 V
Short circuit proof outputs [3]	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	file 224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

1) For continuous operation max. 3000 min^{-1}, ventilated.
2) 70°C [158°F] for cable version.
3) If power supply correctly applied.

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Standard
sine wave output, with zero pulse, optical | 5804 / 5824 (shaft / hollow shaft) | SinCos

Terminal assignment

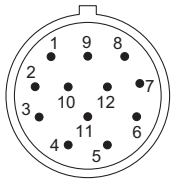
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2	5804: 1, 2	Signal:	0 V	+V	0Vsens[2]	+Vsens[2]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5824: 1	Cable color:	WH 0.5 mm²	BN 0.5 mm²	WH	BN	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M23 connector, 12-pin											
1, 2	5804: 3, 5	Signal:	0 V	+V	0Vsens[2]	+Vsens[2]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5824: 2	Pin:	10	12	11	2	5	6	8	1	3	4	PH [1]

Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



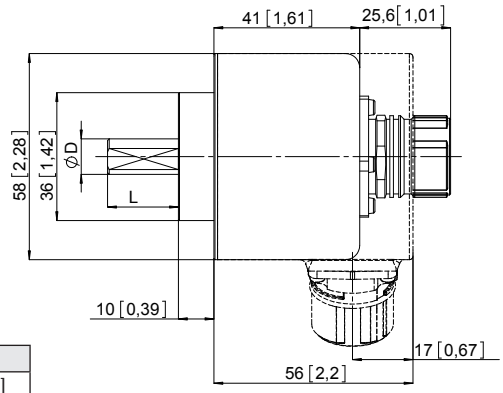
M23 connector, 12-pin

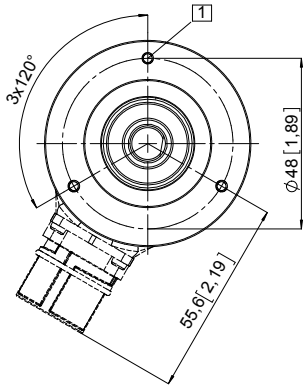
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

1 3 x M3, 5 [0.2] deep



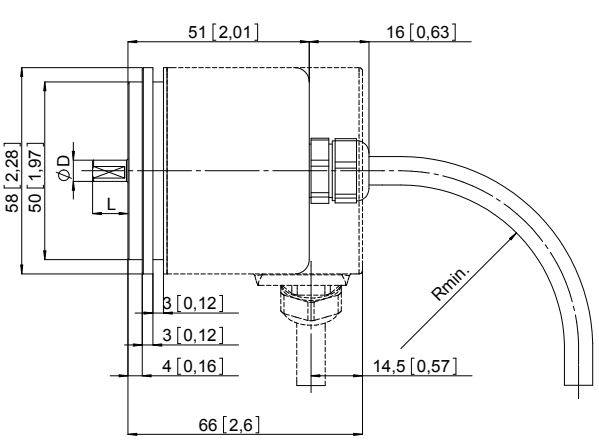


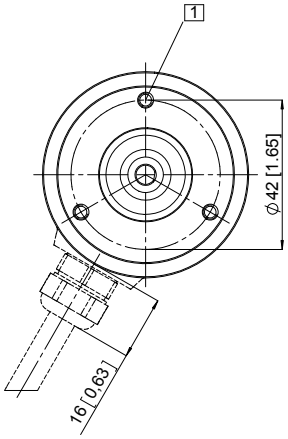
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]

Synchro flange, ø 58 [2.28]
Flange type 2

1 3 x M4, 5 [0.2] deep

$R_{min.}$:
- securely installed: 55 [2.17]
- flexibly installed: 70 [2.76]





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]

1) PH = shield is attached to connector housing.
2) The sensor cables are connected to the power supply internally. If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.

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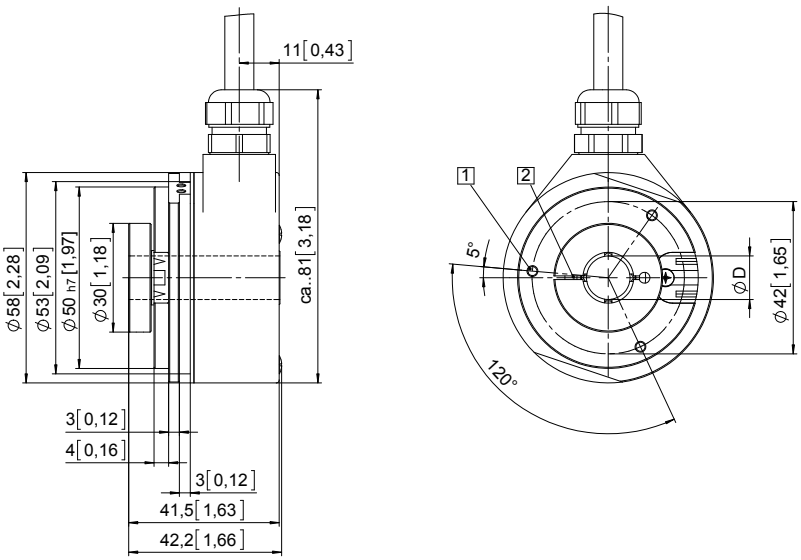
Standard
sine wave output, with zero pulse, optical | 5804 / 5824 (shaft / hollow shaft) | SinCos

Dimensions hollow shaft version
Dimensions in mm [inch]

Flange with spring element, short
Flange type 1 and 2

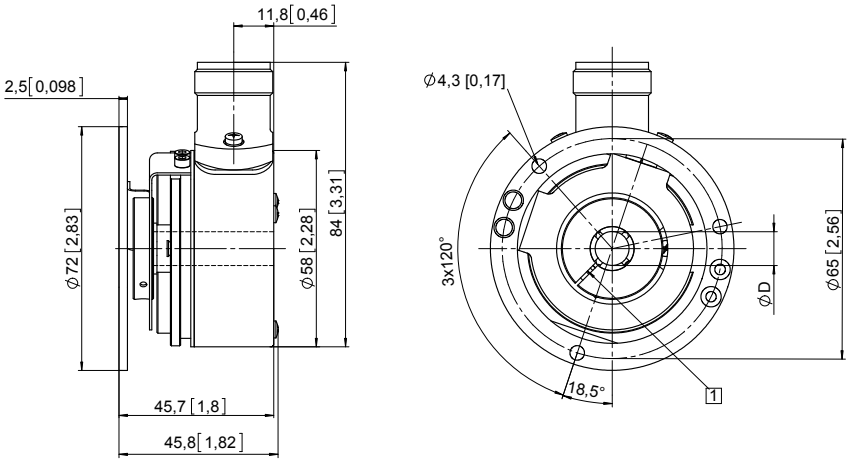
1 3 x M3, 5 [0.2] deep
2 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
Insertion depth blind hollow shaft with flange 2: max. 30 mm [1.18"]	

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
Min. insertion depth = 1.5 x D Insertion depth blind hollow shaft with flange 4: max. 30 mm [1.18"]	

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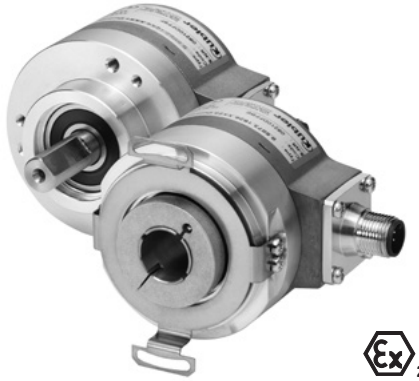
Standard
sine wave output, highly interpolable, optical | **Sendix 5814 / 5834 (shaft / hollow shaft)** | **SinCos**



The incremental encoders Sendix 5814 and 5834 with SinCos interface are particularly suited for applications in the field of drive technology.

Thanks to their high signal quality, they are optimally suited for further interpolation.

Safety-Lock™ | High rotational speed | Temperature range -40°...+90°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor | Surface protection salt spray-tested optional

Powerful

- With incremental SinCos tracks.
- Very high signal quality.
- Suited for motor feedback applications.

Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Order code Shaft version

8.5814 . 1 2 X X . XXXX
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = clamping flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
5 = axial M12 connector, 8-pin
6 = radial M12 connector, 8-pin

*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5814.122A.2048.0030 (for cable length 3 m)

e *Pulse rate*
1024, **2048**

Optional on request
- Ex 2/22 [1]
- surface protection salt spray tested

Order code Hollow shaft

8.5834 . X X X X . XXXX
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = with spring element, long, IP65
5 = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"
Tapered shaft
K = ø 10 mm [0.39"]

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
6 = radial M12 connector, 8-pin

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5834.142B.2048.0030 (for cable length 3 m)

e *Pulse rate*
1024, **2048**

Optional on request
- Ex 2/22
(not for type of connection E, F) [1]
- surface protection salt spray tested

1) For the cable connection type, cable material PUR.

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Incremental encoders

Standard
sine wave output, highly interpolable, optical | Sendix 5814 / 5834 (shaft / hollow shaft) | SinCos

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	IP65	12000 min^{-1}, 5000 min^{-1} (continuous)
	IP67	8000 min^{-1}, 2000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft	4.0 x 10^{-6} kgm^2
	hollow shaft	7.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.85 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] 1)
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes 2)
Pulse rate	1024 / 2048 ppr

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 2	1, 2, A, B, E, F	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	shield

Output circuit	Type of connection	M12 connector, 8-pin							
1, 2	5, 6	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	1	2	3	4	5	6	PH 3)

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

1) Cable version: -30°C ... + 90°C [-22°F ... +194°F] fixed installation.
2) Short circuit to 0V or to output, one channel at a time, power supply correctly applied.
3) PH = shield is attached to connector housing.

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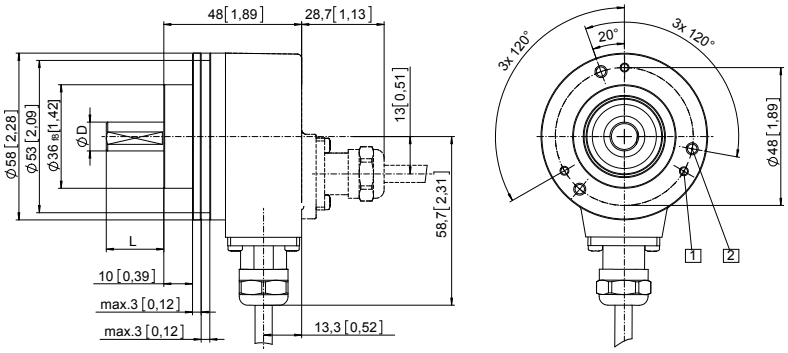
Standard
sine wave output, highly interpolable, optical | **Sendix 5814 / 5834 (shaft / hollow shaft)** | **SinCos**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



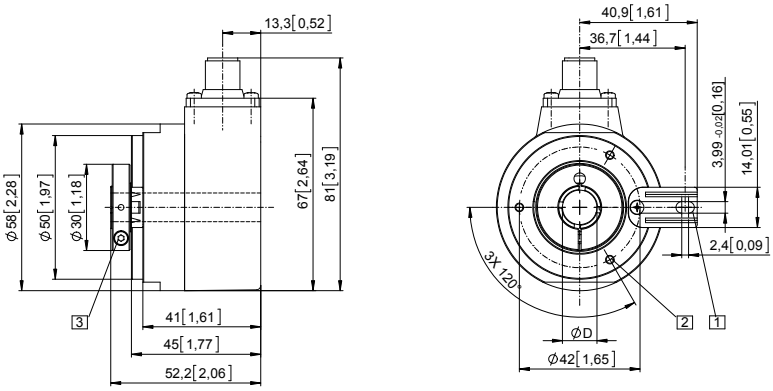
D	Fit	L
10 [0.39]	f7	20 [0.79]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1
(drawing with M12 connector)

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7

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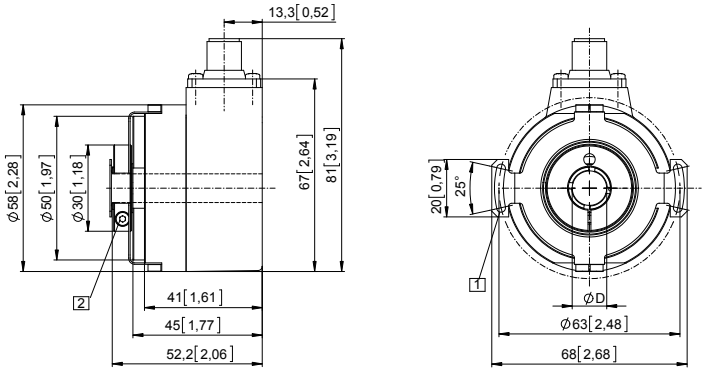
Standard
sine wave output, highly interpolable, optical | **Sendix 5814 / 5834 (shaft / hollow shaft)** | **SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
and hollow shaft
Flange type 5
(drawing with M12 connector)

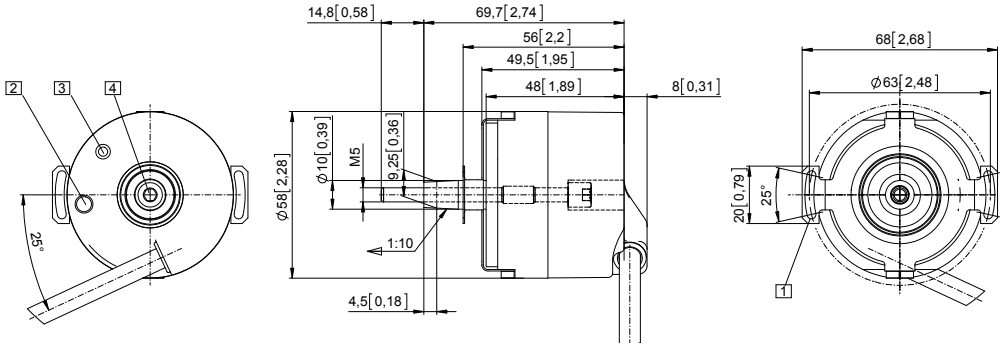
1 For (4x) M3 screw
2 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7

Flange with stator coupling, ø 63 [2.48]
and tapered shaft
Flange type 5
(drawing with tangential cable outlet)

1 For (4x) M3 screw
2 Status LED
3 SET button
4 SW 4



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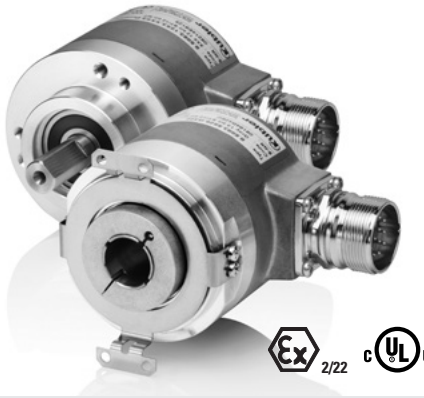
Standard
sine wave output, SIL2/PLd, optical | **Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)** | **SinCos**



The incremental encoders 5814FS2 and 5834FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

These encoders are particularly suited for applications in the field of safe drive technology.

Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Order code Shaft version

8.5814FS2	.	1	X	X	X	.	XXXX
Type		a	b	c	d		e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
5 = axial M12 connector, 8-pin
6 = radial M12 connector, 8-pin

*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5814FS2.122A.2048.0030 (for cable length 3 m)

e *Pulse rate*
1024, **2048**

Optional on request
- Ex 2/22 [1)]

1) For the cable connection type, cable material PUR.

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Standard
sine wave output, SIL2/PLd, optical | **Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)** | **SinCos**

Order code Hollow shaft

8.5834FS2 . X X X X . XXXX
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
9 = with torque stop, flexible, IP65
A = with torque stop set, rigid, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
Tapered shaft
K = ø 10 mm [0.39"]

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin
6 = radial M12 connector, 8-pin

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5834FS2.B42B.2048.0030 (for cable length 3 m)

e *Pulse rate*
1024, **2048**

Optional on request
- Ex 2/22
(not for connection type E + F) [1]

Accessories

		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.

Connection technology

		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable [2]	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable [2]	**8.0000.6901.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value [3]	2.16 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

1) For the cable connection type, cable material PUR.
2) Other lengths available.
3) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.

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Standard
sine wave output, SIL2/PLd, optical

Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)

SinCos

Mechanical characteristics

Maximum speed, shaft version		
	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed, hollow shaft version		
	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		
	shaft version	< 0.01 Nm
	hollow shaft version	< 0.03 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.0 x 10^{-6} kgm^2
Insertion depth for shaft		
	hollow shaft version	min. 34 mm [1.34“]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] 1)
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Power consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes 2)
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-3:2007 / A1:2011 EN 61000-6-2:2005

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes 2)
Pulse rate	1024 / 2048 ppr

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 2	1, 2, A, B, E, F	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	shield

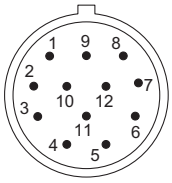
Output circuit	Type of connection	M23 connector, 12-pin							
1, 2	3, 4	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	10	12	5	6	8	1	PH 3)

Output circuit	Type of connection	M12 connector, 8-pin							
1, 2	5, 6	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	1	2	3	4	5	6	PH 3)

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

1) Cable version: -30°C ... + 90°C [-22°F ... +194°F] fixed installation.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
3) PH = shield is attached to connector housing.

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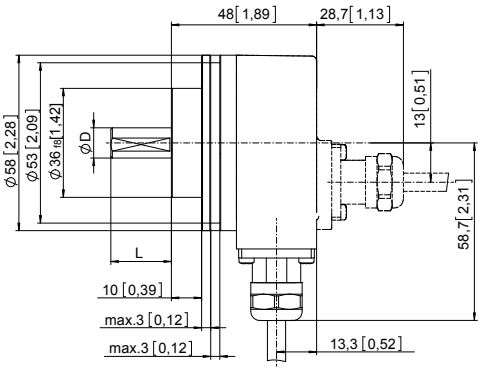
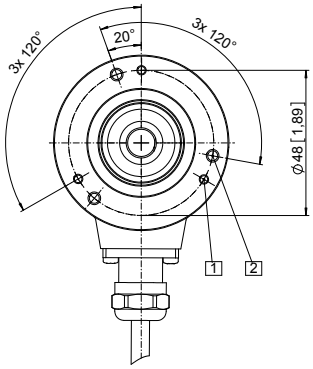
Standard
sine wave output, SIL2/PLd, optical | Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft) | SinCos

Dimensions shaft version
Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

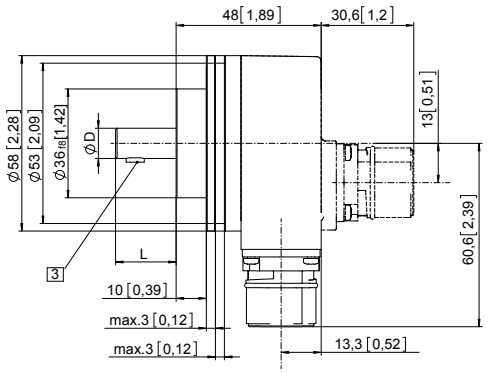


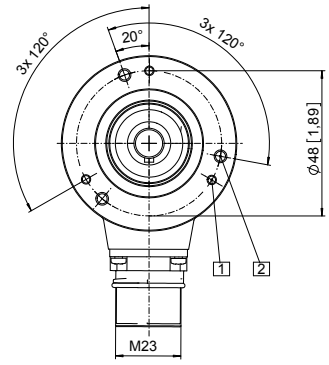


D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6

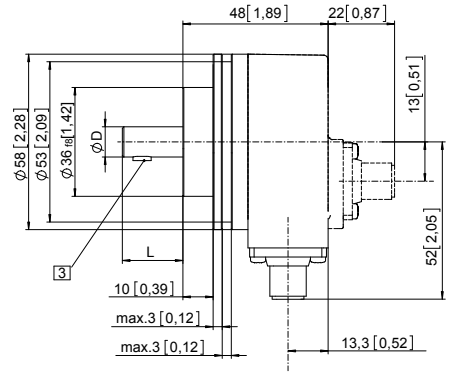


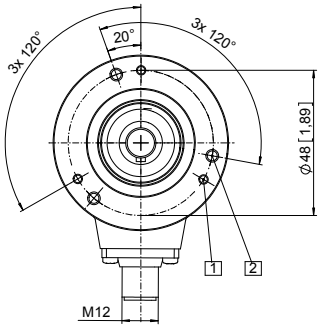


D	Fit	L
10 [0.39]	f7	20 [0.79]

(drawing with M12 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6





D	Fit	L
10 [0.39]	f7	20 [0.79]

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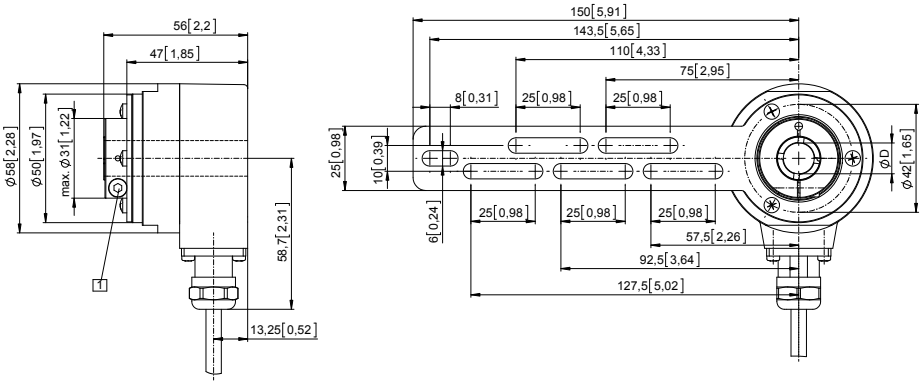
Standard
sine wave output, SIL2/PLd, optical | **Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)** | **SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with torque stop set, rigid
Flange type A
Through hollow shaft
(drawing with cable)

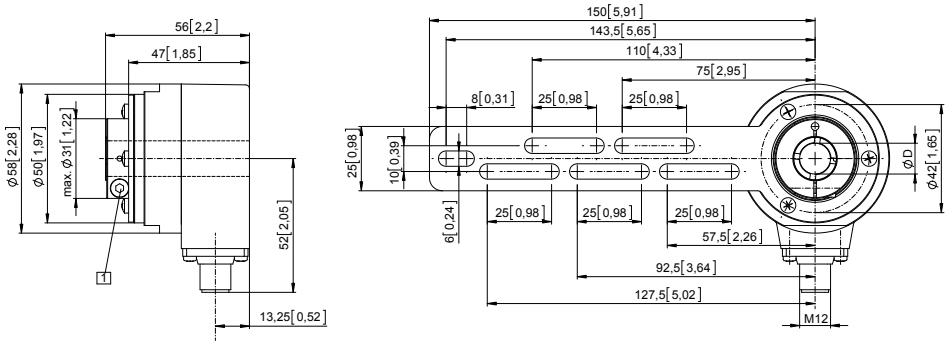
1 SW 3, recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

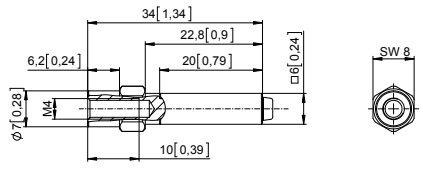
(drawing with M12 connector)

1 SW 3, recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Torque pin with rectangular sleeve with M4 thread, 10 [0.39] deep



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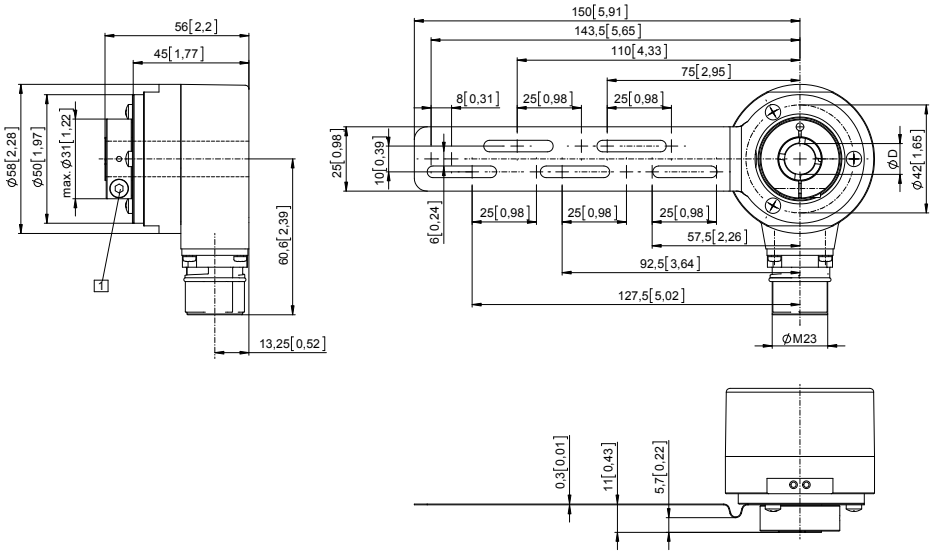
Standard
sine wave output, SIL2/PLd, optical | Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft) | SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with torque stop, flexible
Flange type 9
Through hollow shaft
(drawing with M23 connector)

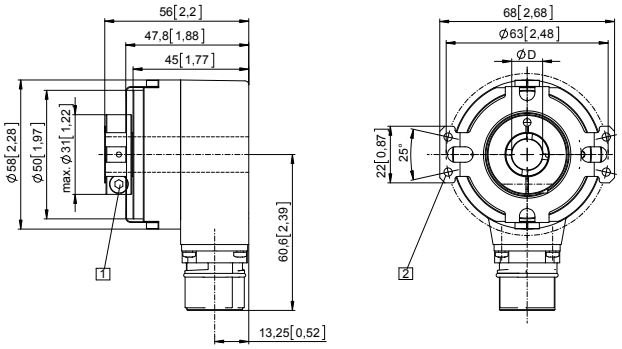
1 SW 3, recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Through hollow shaft
(drawing with M23 connector)

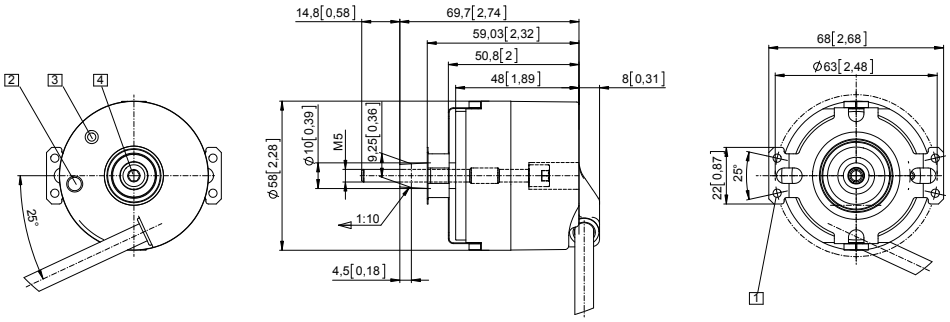
1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Tapered shaft
(drawing with tangential cable outlet)

1 For (4x) M3 screw
2 Status LED
3 SET button
4 Recommended torque for (SW 4) tightening screw 3 $^{+0,5}$ Nm



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Standard
sine wave output, SIL3/PLe, optical | **Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)** | **SinCos**

The incremental encoders 5814FS3 and 5834FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

These encoders are particularly suited for applications in the field of safe drive technology.

Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Order code Shaft version

8.5814FS3	.	1	X	X	X	.	XXXX
Type		a	b	c	d		e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
5 = axial M12 connector, 8-pin
6 = radial M12 connector, 8-pin

*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5814FS3.122A.2048.0030 (for cable length 3 m)

e *Pulse rate*
1024, **2048**

Optional on request
- Ex 2/22 [1)]

1) For the cable connection type, cable material PUR.

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Incremental encoders

Standard
sine wave output, SIL3/PLe, optical | Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft) | SinCos

Order code Hollow shaft

8.5834FS3 . X X X X . XXXX
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
9 = with torque stop, flexible, IP65
A = with torque stop set, rigid, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
Tapered shaft
K = ø 10 mm [0.39"]

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin
6 = radial M12 connector, 8-pin

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5834FS3.B42B.2048.0030 (for cable length 3 m)

e *Pulse rate*
1024, **2048**

Optional on request
- Ex 2/22
(not for connection type E + F) [1]

Accessories

		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.

Connection technology

		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable [2]	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable [2]	**8.0000.6901.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value [3]	1.09 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

1) For the cable connection type, cable material PUR.
2) Other lengths available.
3) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.

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Standard
sine wave output, SIL3/PLe, optical | **Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)** | **SinCos**

Mechanical characteristics

Maximum speed, shaft version		
	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed, hollow shaft version		
	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		
	shaft version	< 0.01 Nm
	hollow shaft version	< 0.03 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.0 x 10^{-6} kgm^2
Insertion depth for shaft		
	hollow shaft version	min. 34 mm [1.34“]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] 1)
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Power consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes 2)
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-3:2007 / A1:2011 EN 61000-6-2:2005

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes 2)
Pulse rate	1024 / 2048 ppr

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 2	1, 2, A, B, E, F	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	shield

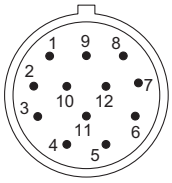
Output circuit	Type of connection	M23 connector, 12-pin							
1, 2	3, 4	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	10	12	5	6	8	1	PH 3)

Output circuit	Type of connection	M12 connector, 8-pin							
1, 2	5, 6	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	1	2	3	4	5	6	PH 3)

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

1) Cable version: -30°C ... + 90°C [-22°F ... +194°F] fixed installation.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
3) PH = shield is attached to connector housing.

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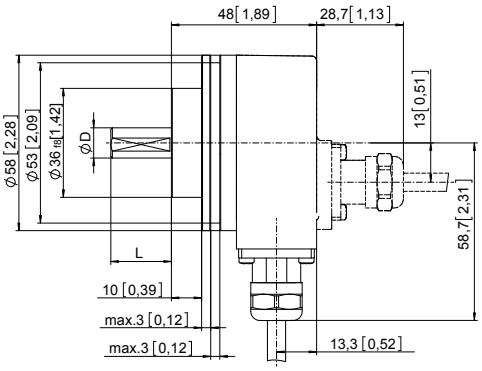
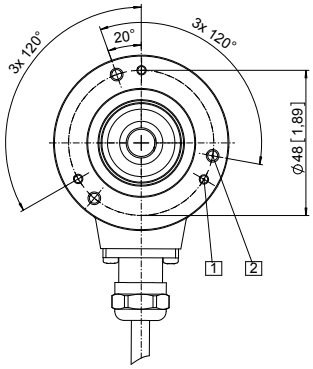
Standard
sine wave output, SIL3/PLe, optical | Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft) | SinCos

Dimensions shaft version
Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

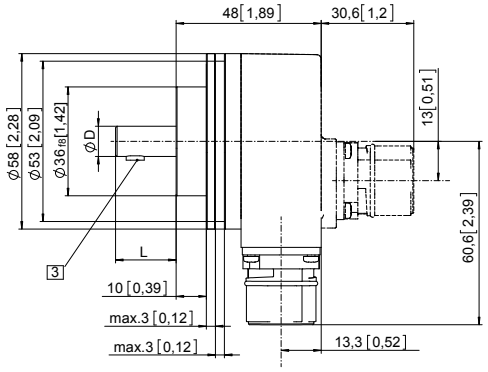


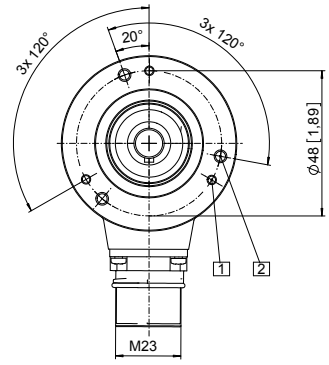


D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6

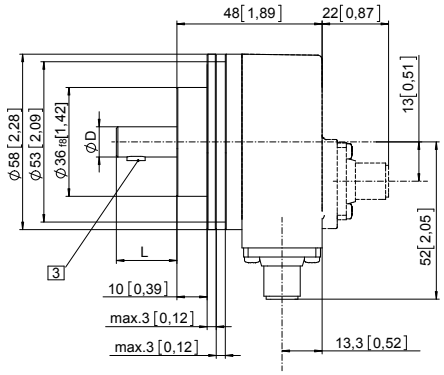


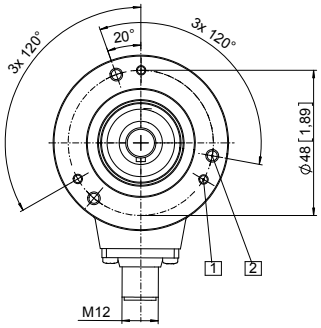


D	Fit	L
10 [0.39]	f7	20 [0.79]

(drawing with M12 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6





D	Fit	L
10 [0.39]	f7	20 [0.79]

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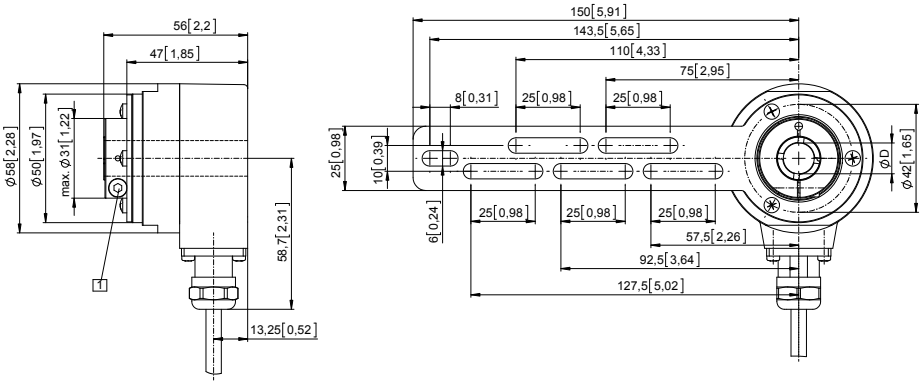
Standard
sine wave output, SIL3/PLe, optical | **Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)** | **SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with torque stop set, rigid
Flange type A
Through hollow shaft
(drawing with cable)

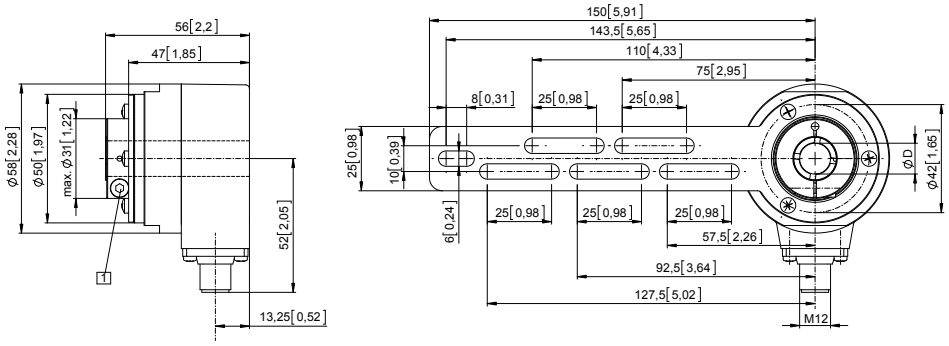
1 SW 3, recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

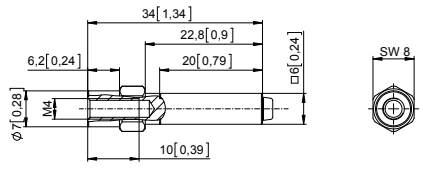
(drawing with M12 connector)

1 SW 3, recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Torque pin with rectangular sleeve with M4 thread



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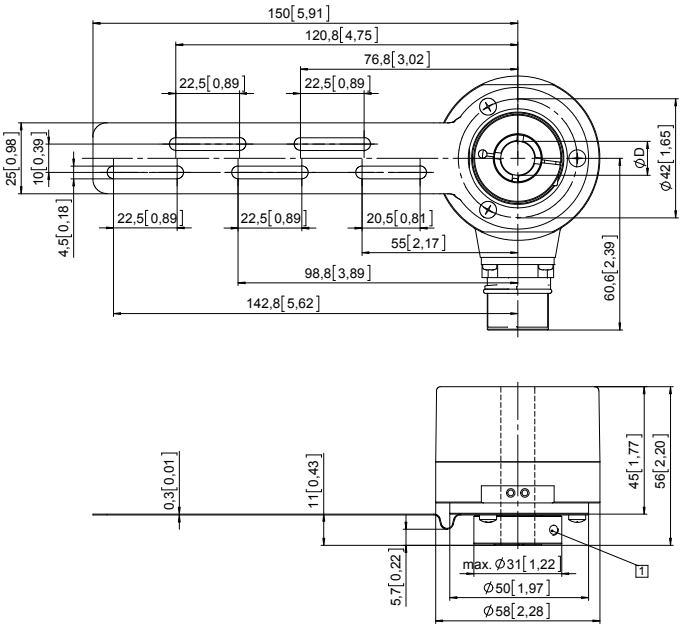
Standard
sine wave output, SIL3/PLe, optical | Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft) | SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with torque stop, flexible
Flange type 9
Through hollow shaft
(drawing with M23 connector)

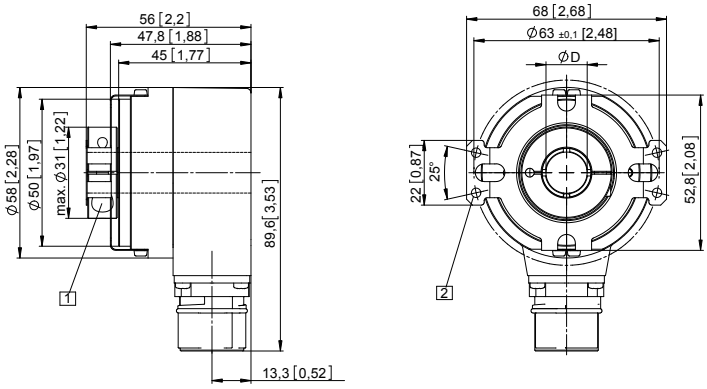
1 Recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Through hollow shaft
(drawing with M23 connector)

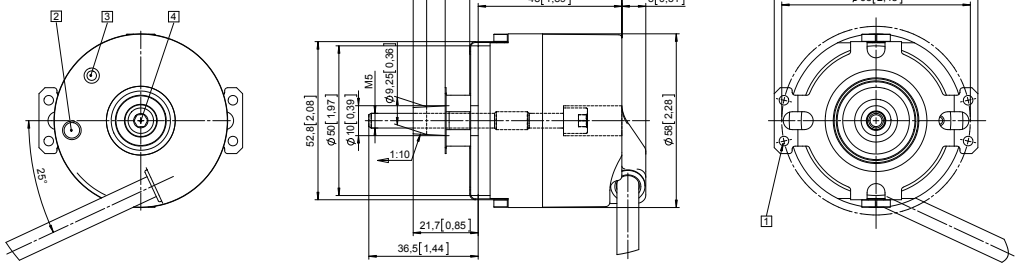
1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Tapered shaft
(drawing with tangential cable outlet)

1 For (4x) M3 screw
2 Status LED
3 SET button
4 Recommended torque for (SW 4) tightening screw 3 $^{+0,5}$ Nm



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Standard high resolution, optical | 5805 / 5825 (shaft / hollow shaft) | Push-pull / RS422

The incremental encoders type 5805 / 5825 offer resolutions up to max. 36000 pulses per revolution.

They are thus perfect for use in applications where a very high level of accuracy is required.

High rotational speed | Temperature range -20°...+85°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Optical sensor

High performance

- High shaft loading capability.
- Maximum speed up to 12000 revolutions per minute.
- High IP protection up to max. IP66.

Many variants

- With RS422 or push-pull interface.
- With cable or connector.

Order code Shaft version

8.5805 . X X X X . XXXXX
Type — a b c d — e

a *Flange*
1 = clamping flange ø 58 mm [2.28"]
2 = synchro flange ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 10 mm [0.24 x 0.39"]
2 = ø 10 x 20 mm [0.39 x 0.79"]

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
5 = RS422 (with inverted signal) / 10 ... 30 V DC
6 = push-pull (with inverted signal) / 10 ... 30 V DC
7 = push-pull (without inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PUR
2 = radial cable, 1 m [3.28'] PUR
3 = axial M23 connector, 12-pin, without mating connector
5 = radial M23 connector, 12-pin, without mating connector
T = axial M12 connector, 8-pin
G = radial M12 connector, 8-pin

e *Pulse rate*
6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000
(e.g. 18000 pulses => 18000)

Optional on request
- other pulse rates

Order code Hollow shaft

8.5825 . X X X X . XXXXX
Type — a b c d — e

a *Flange*
1 = with hollow shaft and spring element, short
2 = with blind hollow shaft and spring element, short
3 = with hollow shaft and stator coupling, ø 65 mm [2.56"]
4 = with blind hollow shaft and stator coupling, ø 65 mm [2.56"]

b *Hollow shaft (insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])*
1 = ø 6 mm [0.24"], IP40
2 = ø 6 mm [0.24"], IP66
3 = ø 8 mm [0.32"], IP40
4 = ø 8 mm [0.32"], IP66
5 = ø 10 mm [0.39"], IP40
6 = ø 10 mm [0.39"], IP66
7 = ø 12 mm [0.47"], IP40
8 = ø 12 mm [0.47"], IP66

c *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 V DC
4 = RS422 (with inverted signal) / 10 ... 30 V DC
2 = push-pull (without inverted signal) / 10 ... 30 V DC
3 = push-pull (with inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
2 = radial M23 connector, 12-pin, without mating connector
C = radial M12 connector, 8-pin

e *Pulse rate*
6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000
(e.g. 18000 pulses => 18000)

Optional on request
- other pulse rates

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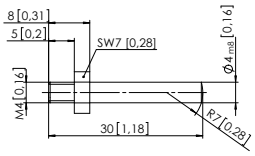
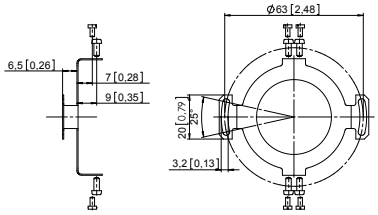
Incremental encoders

Standard high resolution, optical	5805 / 5825 (shaft / hollow shaft)	Push-pull / RS422

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**
Stator coupling, ø 63 mm [2.48“]		**8.0010.4D00.0000**

Connection technology			Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56’] PVC cable		**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56’] PVC cable	for 5805	**8.0000.6101.0002**
	M23 female connector with coupling nut, 12-pin 2 m [6.56’] PVC cable	for 5825	**8.0000.6901.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin		**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin		**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Speed	shaft IP65	12000 min^{-1}
	hollow shaft IP40	12000 min^{-1}
	hollow shaft IP66 [1]	6000 min^{-1}
Mass moment of inertia	shaft	approx. 1.8 x 10^{-6} kgm^2
	hollow shaft	approx. 6.0 x 10^{-6} kgm^2
Starting torque – at 20°C [68°F]		
shaft IP65 / hollow shaft IP40		< 0.01 Nm
hollow shaft IP66		< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529		
shaft		IP65
hollow shaft without seal		IP40
hollow shaft with seal		IP66
Working temperature range		
shaft IP65 / hollow shaft IP40		-20°C ... +105°C [-4°F ... +221°F]
hollow shaft IP66		-20°C ... +90°C [-4°F ... +194°F]
Material	shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Output circuit		**RS422** (TTL compatible)	**Push-pull**
Power supply		5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC
Power consumption (no load)			
without inverted signal		–	typ. 90 mA / max. 135 mA
with inverted signal		typ. 70 mA / max. 120 mA	typ. 115 mA / max. 160 mA
Permissible load / channel		max. +/- 20 mA	max. +/- 30 mA
Pulse frequency		max. 800 kHz	max. 600 kHz
Signal level	HIGH	min. 2.5 V	min. +V - 2.5 V
	LOW	max. 0.5 V	max. 2.0 V
Rising edge time t_r		max. 200 ns	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 1 µs
Short circuit proof outputs [2]		yes [3]	yes
Reverse polarity protection of the power supply		no; 10 ... 30 V DC: yes	yes
UL approval		file 224618	
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

1) For continuous operation max. 3000 min^{-1}, ventilated.
2) If power supply correctly applied.
3) Only one channel allowed to be shorted-out
at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.
at +V = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

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Standard high resolution, optical | 5805 / 5825 (shaft / hollow shaft) | Push-pull / RS422

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2, 3, 4, 5, 6, 7	5805: 1, 2	Signal:	0 V	+V	0Vsens 2)	+Vsens 2)	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5825: 1	Cable color:	WH 0.5 mm²	BN 0.5 mm²	WH	BN	GN	YE	GY	PK	BU	RD	shield

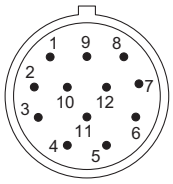
Output circuit	Type of connection	M23 connector, 12-pin											
1, 2, 3, 4, 5, 6, 7	5805: 3, 5	Signal:	0 V	+V	0Vsens 2)	+Vsens 2)	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5825: 2	Pin:	10	12	11	2	5	6	8	1	3	4	PH 1)

Output circuit	Type of connection	M12 connector, 8-pin											
1, 2, 3, 4, 5, 6, 7	5805: G, T	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5825: C	Pin:	1	2			3	4	5	6	7	8	PH 1)

Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

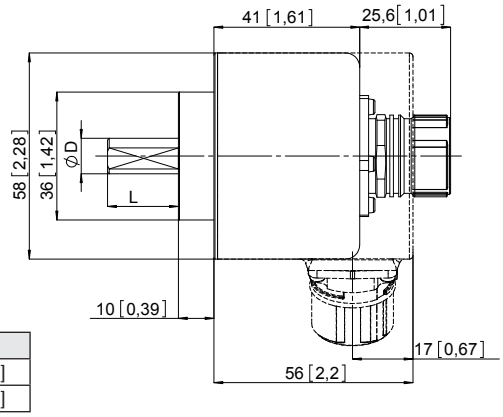
M12 connector, 8-pin

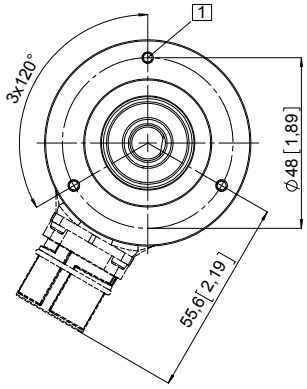
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

1 3 x M3, 5 [0.2] deep



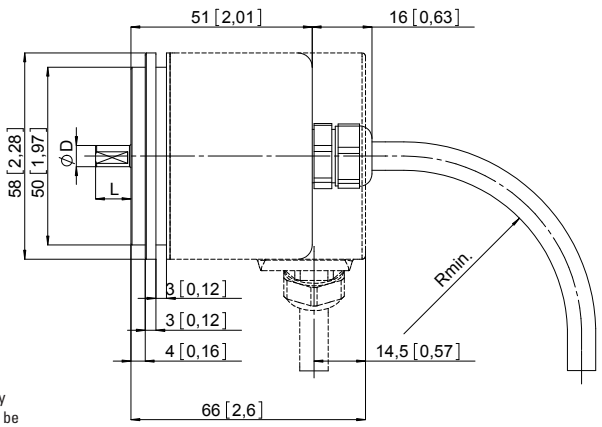


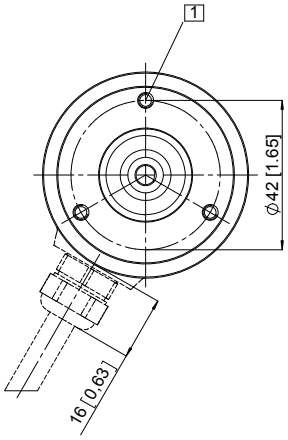
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]

Synchro flange, ø 58 [2.28]
Flange type 2

1 3 x M4, 5 [0.2] deep

$R_{min.}$:
- securely installed: 55 [2.17]
- flexibly installed: 70 [2.76]





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]

1) PH = shield is attached to connector housing.
2) The sensor cables are connected to the power supply internally. If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.

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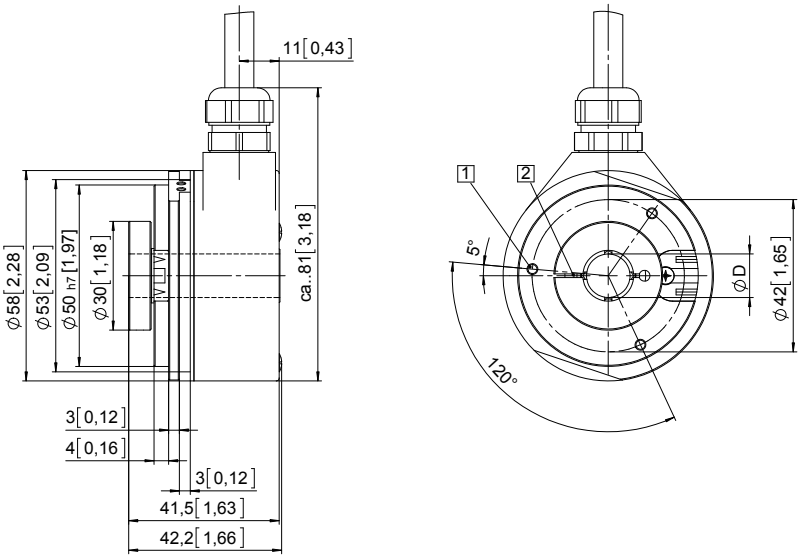
Standard high resolution, optical | 5805 / 5825 (shaft / hollow shaft) | Push-pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1 and 2

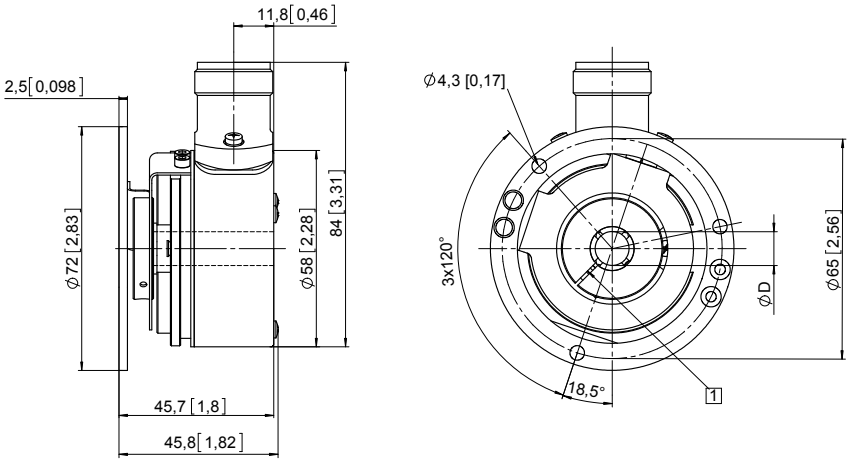
1 3 x M3, 5 [0.2] deep
2 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
Insertion depth blind hollow shaft with flange 2: max. 30 mm [1.18"]	

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
Min. insertion depth = 1.5 x D Insertion depth blind hollow shaft with flange 4: max. 30 mm [1.18"]	

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Standard stainless steel, optical | **Sendix 5006 / 5026 (shaft / hollow shaft)** | **Push-pull / RS422**

The incremental Sendix encoders 5006 / 5026 in stainless steel offers optimum material resistance and thus virtually unlimited durability.

The high-grade seals, the IP66/IP67 level of protection as well as the wide temperature range additionally ensure impermeability and ruggedness.

Ex 2/22 | cULus | RoHS

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

Durable and sealed

- Protection rating IP66/IP67.
- Rugged stainless steel housing.
- Wide temperature range -40 ... +85°C.
- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors.

Flexible in use

- Compatible with all common US and european standards.
- Power supply 5 ... 30 V DC, various interface options, max. 5000 pulses per revolution.
- Compact dimensions: outer diameter 50 mm, installation depth max. 47 mm.

Order code Shaft version

8.5006	.	X	X	X	4	.	XXXX
Type		a	b	c	d		e

a *Flange*
- 7 = clamping flange ø 58 mm [2.28"]
- A = synchro flange ø 58 mm [2.28"]
- C = square flange □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
- 1 = ø 6 x 10 mm [0.24 x 0.39"]
- 3 = ø 10 x 20 mm [0.39 x 0.79"]
- 8 = ø 3/8" x 7/8"

c *Output circuit / power supply*
- 2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
- 5 = push-pull (with inverted signal) / 10 ... 30 V DC
- 4 = RS422 (with inverted signal) / 5 V DC

d *Type of connection*
- 4 = radial M12 connector, 8-pin

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates
- Ex 2/22
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)

V4A 1.4404 — 8.5006.73X4.XXXX-V4A

Order code Hollow shaft

8.5026	.	X	X	X	2	.	XXXX
Type		a	b	c	d		e

a *Flange*
- 1 = with spring element, long
- C = with stator coupling, ø 63 mm

b *Through hollow shaft*
- 2 = ø 1/4"
- 4 = ø 3/8"
- 3 = ø 10 mm [0.39"]
- 5 = ø 12 mm [0.47"]
- 6 = ø 1/2"
- 8 = ø 15 mm [0.59"]

c *Output circuit / power supply*
- 2 = push-pull (7272 compatible, with inverted signal) / 5 ... 30 V DC
- 5 = push-pull (with inverted signal) / 10 ... 30 V DC
- 4 = RS422 (with inverted signal) / 5 V DC

d *Type of connection*
- 2 = radial M12 connector, 8-pin

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates
- Ex 2/22
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)

V4A 1.4404 — 8.5026.18X2.XXXX-V4A

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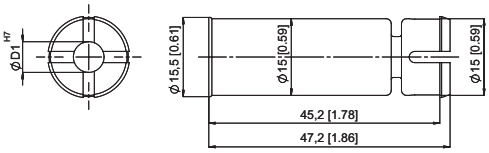
Standard
stainless steel, optical | **Sendix 5006 / 5026 (shaft / hollow shaft)** | **Push-pull / RS422**

Mounting accessory for hollow shaft encoders

Dimensions in mm [inch]

Isolation / adapter inserts for hollow shaft encoders

Thermal and electrical isolation of the encoders (Temperature range -40 ... +115°C [-40°F ... +239°F])
Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC vector motors and considerably shorten the service life of the encoder bearings. In addition the encoder is thermally isolated as the plastic does not transfer the heat to the encoder.



Tip:
By using these adapter inserts you can achieve six different hollow shaft diameters, all on the basis of the encoder 8.5026.X8X2.XXXX.

D1	Isolation insert Order no.
6 mm [0.24"]	**8.0010.4021.0000**
8 mm [0.32"]	**8.0010.4020.0000**
10 mm [0.39"]	**8.0010.4023.0000**
12 mm [0.47"]	**8.0010.4025.0000**
1/4"	**8.0010.4022.0000**
3/8"	**8.0010.4024.0000**
1/2"	**8.0010.4026.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Electrical characteristics

Output circuit	**RS422** (TTL compatible))	**Push-pull**	**Push-pull** (7272 compatible)
Power supply	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC
Current consumption with inverted signal (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. +/- 20 mA	max. +/- 20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level HIGH LOW	min. 2.5 V max. 0.5 V	min +V - 1.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs [1]	yes [2]	yes	yes
Reverse polarity protection of the power supply	no	yes	no
UL approval	file 224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Mechanical characteristics

Maximum speed [3]		6000 min^{-1}
Mass moment of inertia		approx. 1.8 x 10^{-6} kgm^2
Starting torque – at 20°C [68°F]		< 0.05 Nm
Weight		approx. 0.4 kg [14.11 oz]
Load capacity of shaft	radial axial	80 N 40 N
Protection acc. to EN 60529		IP66 / IP67

Working temperature		-40°C ... +85°C [-40°F ... +185°F]
Material	housing, flange, shaft connector	stainless steel, 1.4305 (V2A) stainless steel
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

1) If power supply correctly applied.
2) Only one channel allowed to be shorted-out:
at +V = 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V = 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.
3) For continuous operation max. 3000 min^{-1}.

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Standard stainless steel, optical | Sendix 5006 / 5026 (shaft / hollow shaft) | Push-pull / RS422

Terminal assignment

Output circuit	Type of connection	M12 connector, 8-pin									
2, 4, 5	5006: 4	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5026: 2	Pin:	1	2	3	4	5	6	7	8	PH [1]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

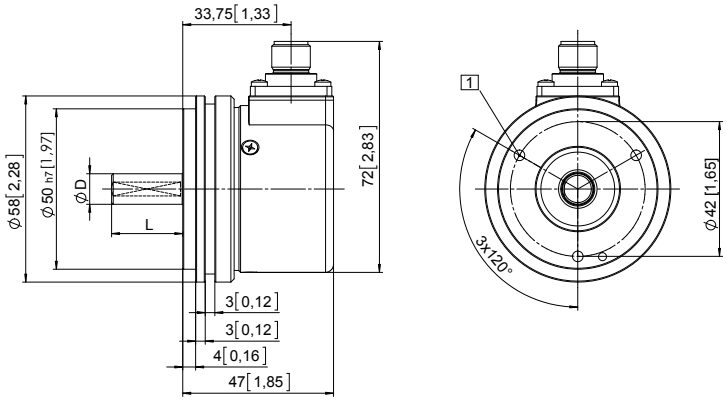
M12 connector, 8-pin

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type A

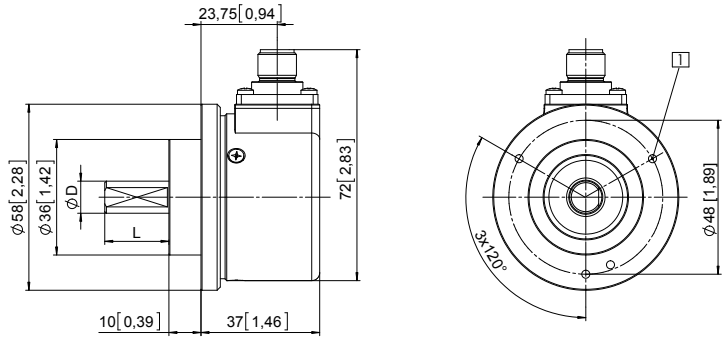
1 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h8	7/8"

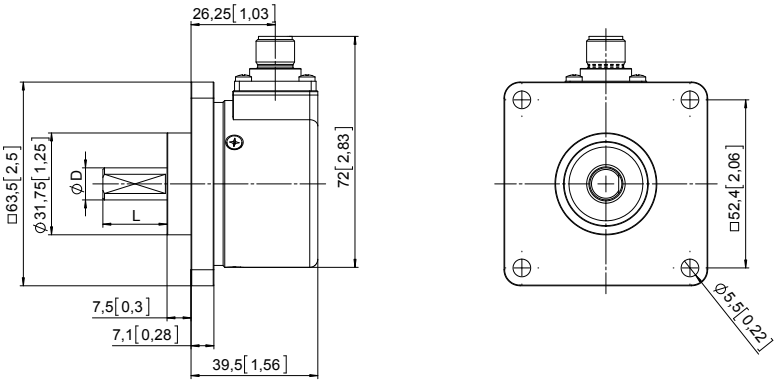
Clamping flange, ø 58 [2.28]
Flange type 7

1 3 x M3, 5.5 [0.22] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type C



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h8	7/8"

1) PH = shield is attached to connector housing.

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Standard stainless steel, optical | Sendix 5006 / 5026 (shaft / hollow shaft) | Push-pull / RS422

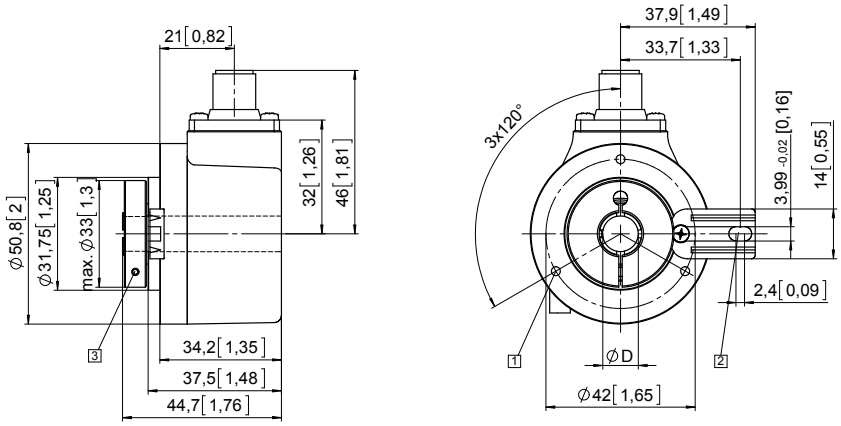
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1

1 3 x M3, 6 [0.24] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 0.6 Nm

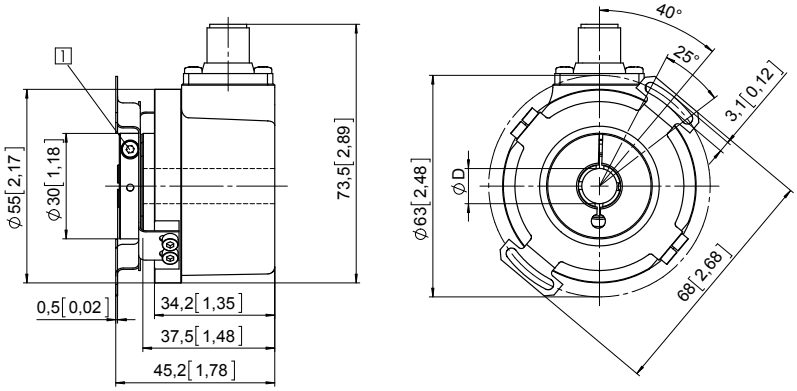
D	Fit
10 [0.39]	H7
12 [0.47]	H7
15 [0.99]	H7
1/4"	H7
3/8"	H7
1/2"	H7



Flange with stator coupling, ø 63 [2.48]
Flange type C

1 Recommended torque for the clamping ring 0.6 Nm

D	Fit
10 [0.39]	H7
12 [0.47]	H7
15 [0.99]	H7
1/4"	H7
3/8"	H7
1/2"	H7



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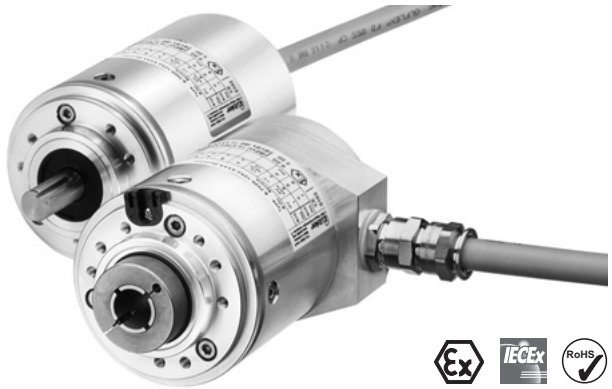
Standard, ATEX / IECEx – zone 1 / 21 optical | Sendix 7000 / 7020 (shaft / hollow shaft) | Push-pull / RS422



The Sendix 7000 / 7020 incremental encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing.

These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 pulses per rotation; they are also available with axial and radial cable outlets.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7000 . 1 X X X . XXXX . XXXX

Type | a | b | c | d | e | f

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

f *Cable length in dm* [1)]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- other pulse rates
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7000.12X1.XXXX-V4A
8.7000.12XA.XXXX.XXXX-V4A

1) Not applicable with connection types 1 and 2.

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Incremental encoders

Standard, ATEX / IECEx – zone 1 / 21 optical | Sendix 7000 / 7020 (shaft / hollow shaft) | Push-pull / RS422

Order code Hollow shaft

8.7020 . X X X X . XXXX . XXXX

Type | a | b | c | d | e | f

a *Flange*
1 = with spring element, short
5 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft*
(insertion depth max. 41.5 mm [1.63"])
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

f *Cable length in dm* [1)]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- other pulse rates
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7020.12X1.XXXX-V4A
8.7020.12XA.XXXX.XXXX-V4A

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7000

ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7020

ATEX	
EC type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2014

IECEx	
Certificate of Conformity (CoC)	IECEx IBE 15.0020 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEx – zone 1/21 optical | Sendix 7000 / 7020 (shaft / hollow shaft) | Push-pull / RS422

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Electrical characteristics

Output circuit	**RS422** (TTL compatible)	**RS422** (TTL compatible)	**Push-pull**	**Push-pull** (7272 compatible)
Order code	**1**	**4**	**5**	**2**
Power supply	5 ... 30 V DC	5 V DC (±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. +/- 20 mA	max. +/- 20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz [1]
Signal level HIGH	min. 2.5 V	min. 2.5 V	min +V - 1.0 V	min. +V - 2.0 V
LOW	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs [2]	yes [3]	yes [3]	yes	yes
Reverse polarity protection of the power supply	yes	no	yes	no
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU			

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2, 4, 5	1, 2, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	0 Vsens	+Vsens	⏚
		Cable marking:	1	2	3	4	5	6	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A / cosine signal
B, $\overline{B}$: Incremental output channel B / sine signal
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) Max. recommended cable length 30 m [98.43'].
2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.
3) Only one channel allowed to be shorted-out:
at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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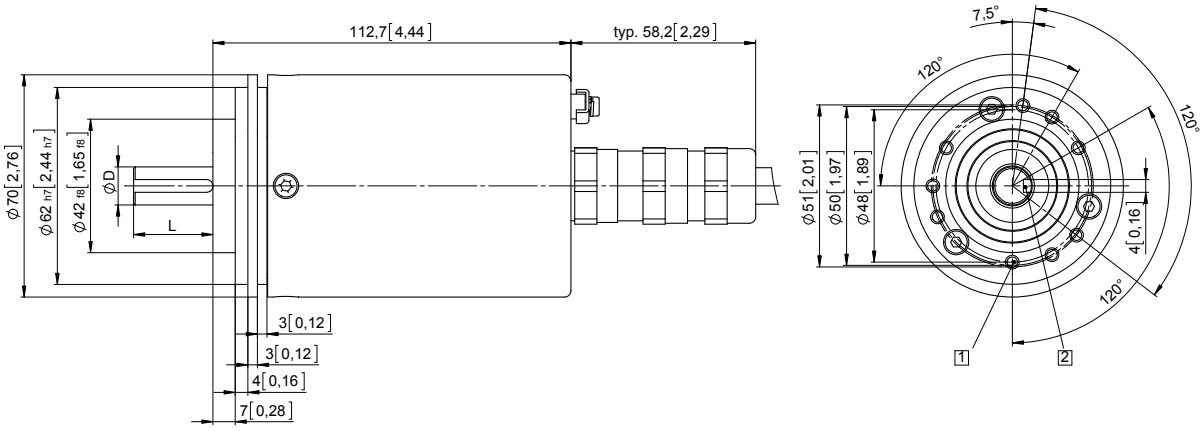
Standard, ATEX / IECEx – zone 1 / 21 optical | **Sendix 7000 / 7020 (shaft / hollow shaft)** | **Push-pull / RS422**

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

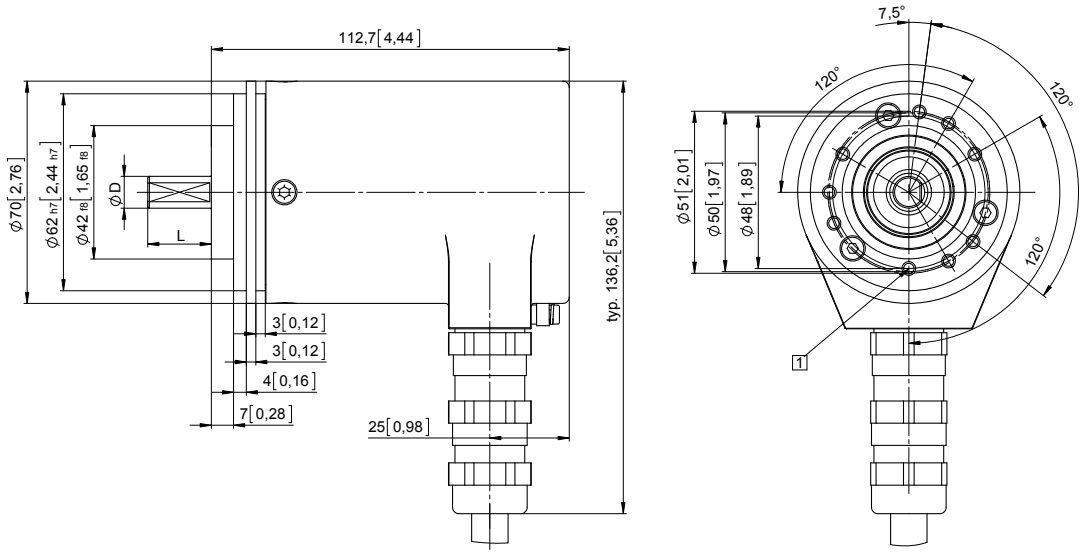
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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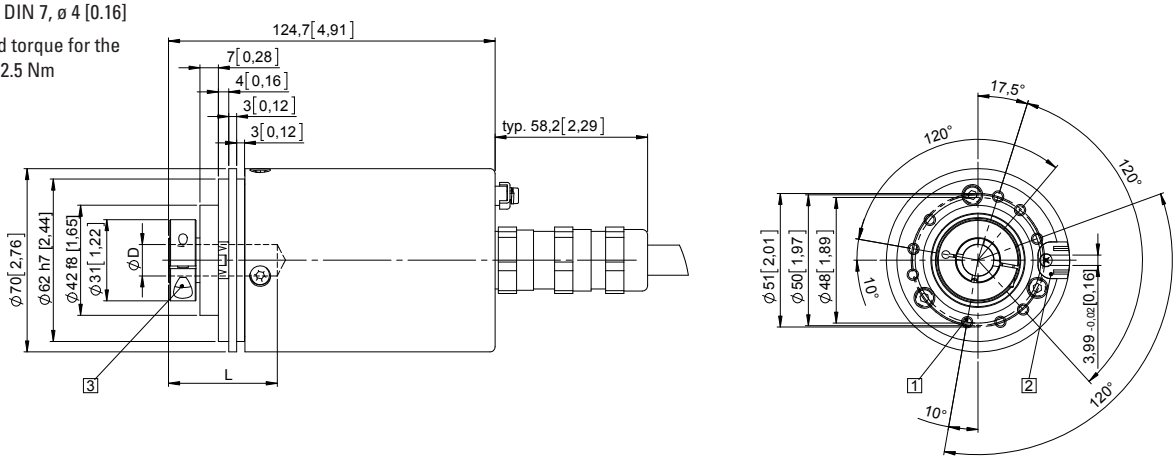
Standard, ATEX/IECEx – zone 1/21 optical | Sendix 7000 / 7020 (shaft / hollow shaft) | Push-pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

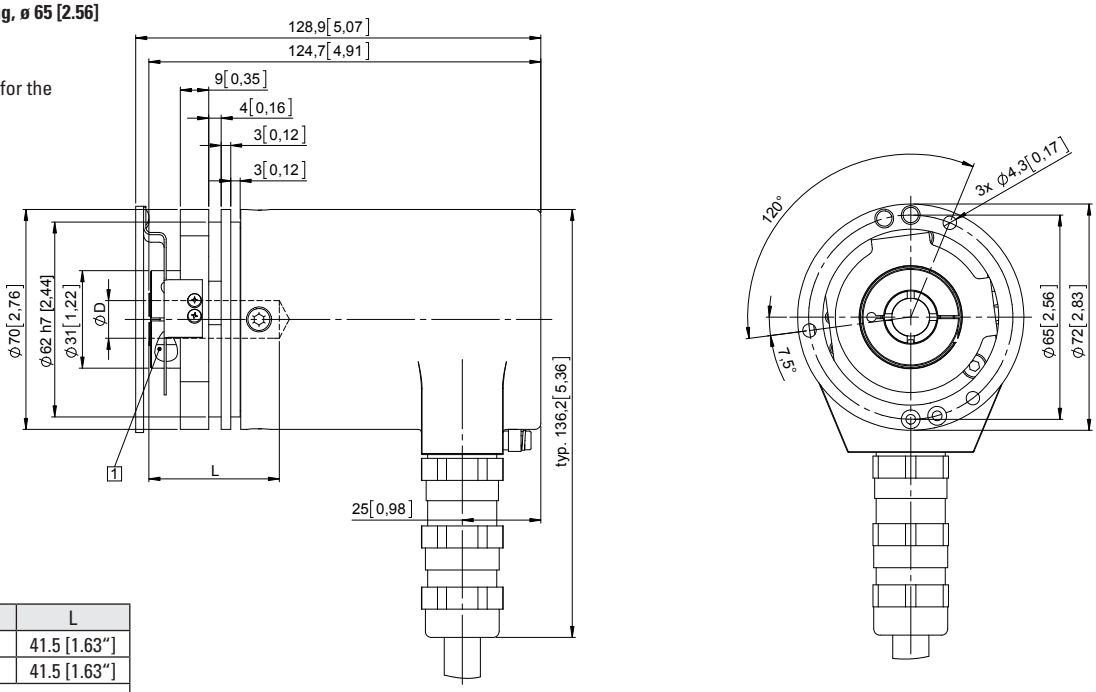
1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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Standard, ATEX/IECEx – zone 1/21 SIL2/PLd, optical | Sendix SIL 7014FS2 (shaft) | SinCos

Ex protection and Functional Safety in one device.

The incremental encoders 7014FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7014 FS2	.	1	X	X	X	.	XXXX	.	XXXX
Type		a	b	c	d		e		f

a *Flange*
1 = clamping / synchronous flange, IP67 ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Pulse rate*
1024, 2048

f *Cable length in dm* [1)]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7014FS2.12X1.XXXX-V4A
8.7014FS2.12XA.XXXX.XXXX-V4A

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEx – zone 1/21 SIL2/PLd, optical | Sendix SIL 7014FS2 (shaft) | SinCos

Technical data

Explosion protection

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes [2]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Safety characteristics

Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value [1]	2.16 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [2]
Pulse rate	1024 / 2048 ppr

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 2	1, 2, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable marking:	6	1	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Plug connector housing (shield)

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.
2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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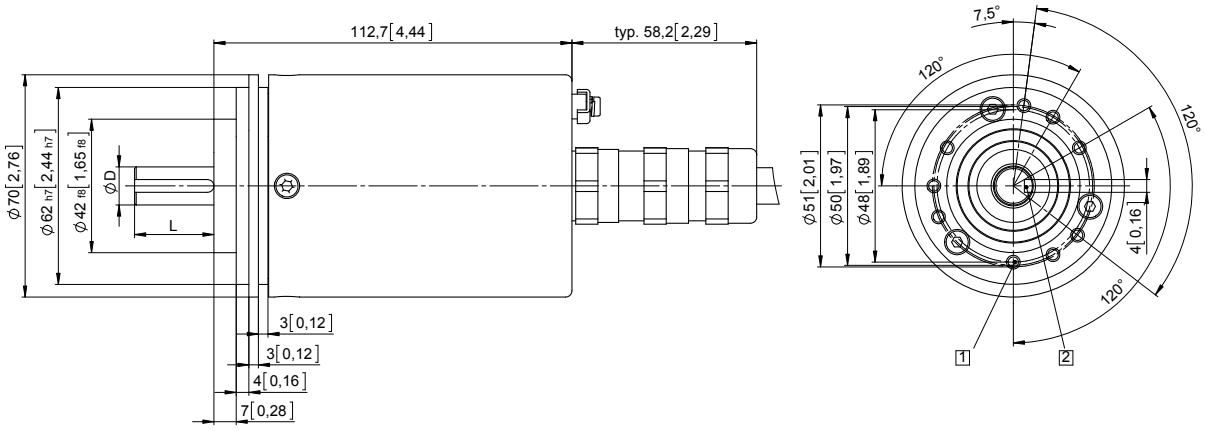
Standard, ATEX/IECEx – zone 1/21 SIL2/PLd, optical | Sendix SIL 7014FS2 (shaft) | SinCos

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

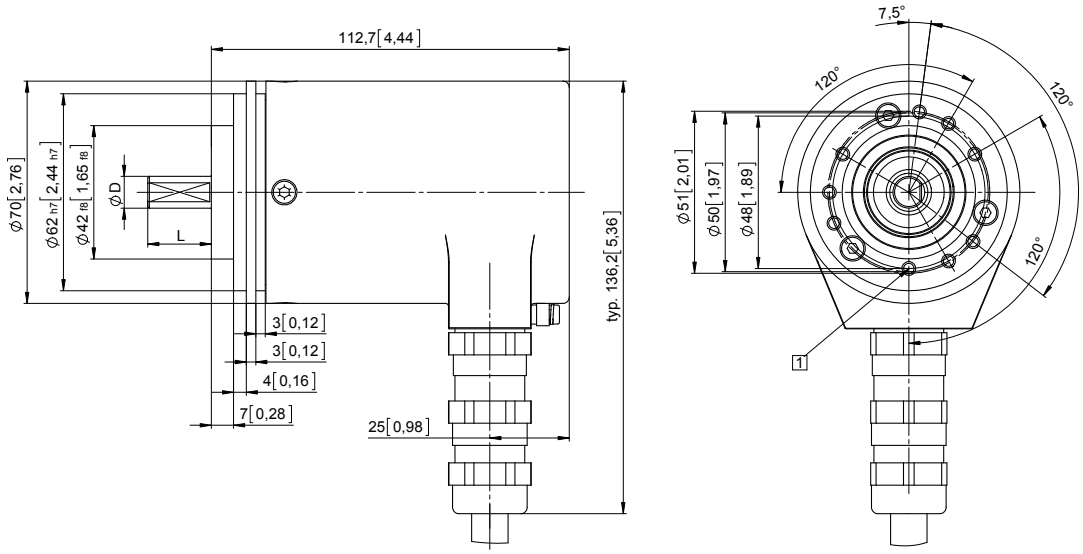
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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Standard, ATEX / IECEx – zone 1 / 21 SIL3/PLe, optical | Sendix SIL 7014FS3 (shaft) | SinCos

Ex protection and Functional Safety in one device.

The incremental encoders 7014FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- With incremental SinCos tracks.
- Certified mechanical mounting + electronic.

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7014 FS3	.	1	X	X	X	.	XXXX	.	XXXX
Type		a	b	c	d		e		f

a *Flange*
1 = clamping / synchronous flange, IP67 ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Output circuit / power supply*
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Pulse rate*
1024, 2048

f *Cable length in dm* [1)]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7014FS3.12X1.XXXX-V4A
8.7014FS3.12XA.XXXX.XXXX-V4A

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEx – zone 1/21 SIL3/PLe, optical | **Sendix SIL 7014FS3 (shaft)** | **SinCos**

Technical data

Explosion protection

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes [2]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Safety characteristics

Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value [1]	1.09 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [2]
Pulse rate	1024 / 2048 ppr

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 2	1, 2, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable marking:	6	1	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Plug connector housing (shield)

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.
2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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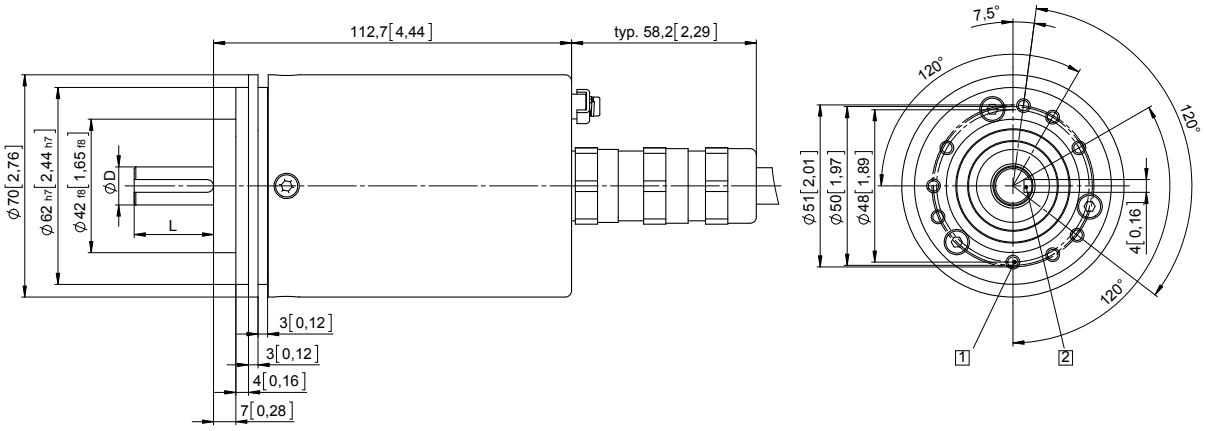
Standard, ATEX/IECEx – zone 1/21 SIL3/PLe, optical | Sendix SIL 7014FS3 (shaft) | SinCos

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

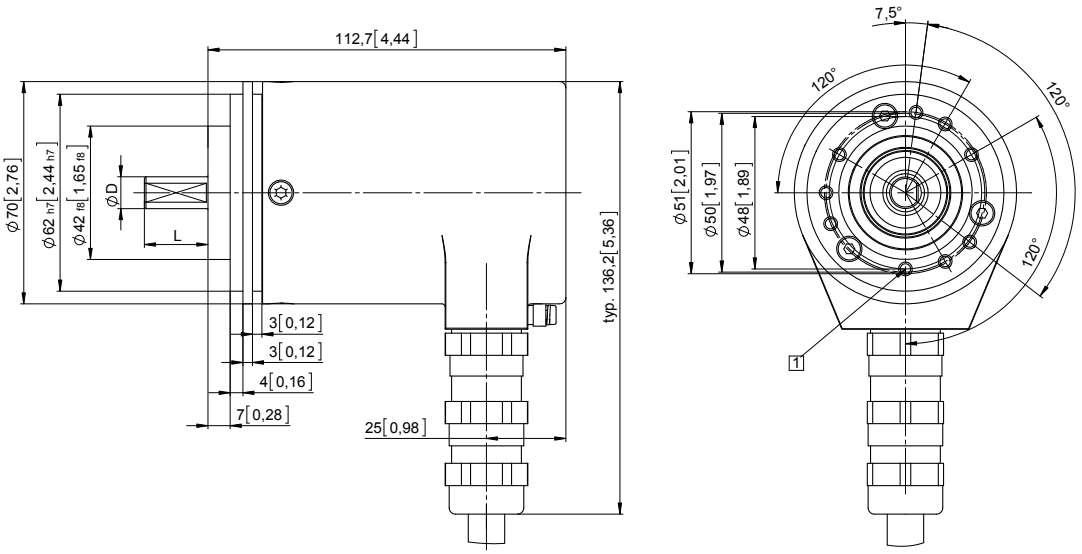
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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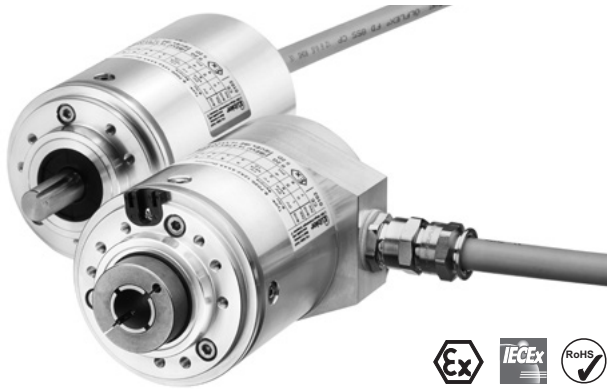
Standard, ATEX / IECEx – mining optical | Sendix 7100 / 7120 (shaft / hollow shaft) | Push-pull / RS422



The incremental encoders Sendix 7100 / 7120 in a compact 70 mm stainless steel housing have an ATEX/IECEx mining approval.

These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 pulses per revolution; they are also available with axial and radial cable outlets.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7100	.	2	X	X	X	.	XXXX	.	XXXX
Type		a	b	c	d		e		f

a *Flange*
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

f *Cable length in dm* [1)]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- other pulse rates
- special cable length

1) Not applicable with connection types 1 and 2.

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Standard, ATEX / IECEx – mining optical | Sendix 7100 / 7120 (shaft / hollow shaft) | Push-pull / RS422

Order code Hollow shaft

8.7120	.	X	X	X	X	.	XXXX	.	XXXX
Type		a	b	c	d		e		f

a *Flange*
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft*
(insertion depth max. 41.5 mm [1.63"])
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulses => 0100)

f *Cable length in dm* [1)]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- other pulse rates
- special cable length

Technical data

Explosion protection 7100

ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007
IECEx	
Certificate of Conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7120

ATEX	
EC type-examination certificate	IBExU 15 ATEX 1057 X
Category	Ex I M2 Ex d I/IIC T4 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2014
IECEx	
Certificate of Conformity (CoC)	IECEx IBE 15.0019 X
Category	Ex d I/IIC T4 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.

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Standard, ATEX / IECEx – mining optical | Sendix 7100 / 7120 (shaft / hollow shaft) | Push-pull / RS422

Electrical characteristics

Output circuit		**RS422** (TTL compatible)	**RS422** (TTL compatible)	**Push-pull**	**Push-pull** (7272 compatible)
	Order code	**1**	**4**	**5**	**2**
Power supply		5 ... 30 V DC	5 V DC (±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. +/- 20 mA	max. +/- 20 mA
Pulse frequency		max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz [1]
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. 2.5 V max. 0.5 V	min +V - 1.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Rising edge time t_r		max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs [2]		yes [3]	yes [3]	yes	yes
Reverse polarity protection of the power supply		yes	no	yes	no
CE compliant acc. to		EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU			

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)										
1, 2, 4, 5	1, 2, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	0 V_{sens}	+V_{sens}	⏚
		Cable marking:	1	2	3	4	5	6	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) Max. recommended cable length 30 m [98.43'].
2) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.
3) Only one channel allowed to be shorted-out:
at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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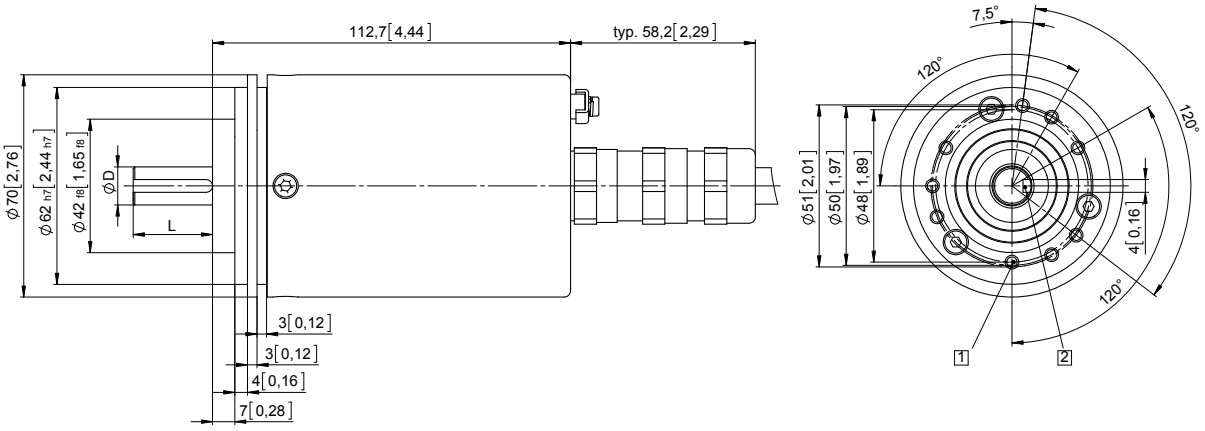
Standard, ATEX / IECEx – mining optical | Sendix 7100 / 7120 (shaft / hollow shaft) | Push-pull / RS422

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

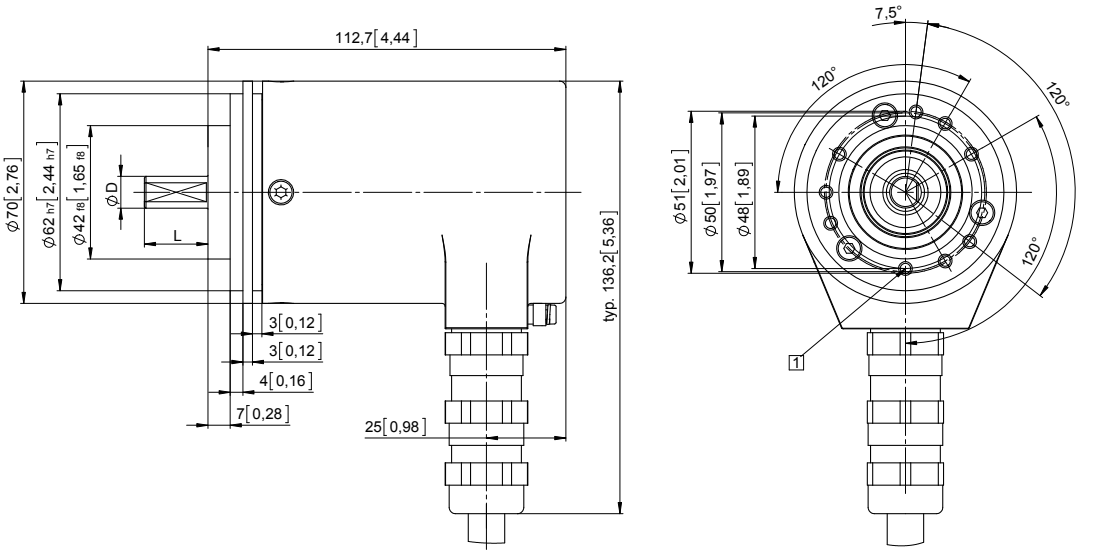
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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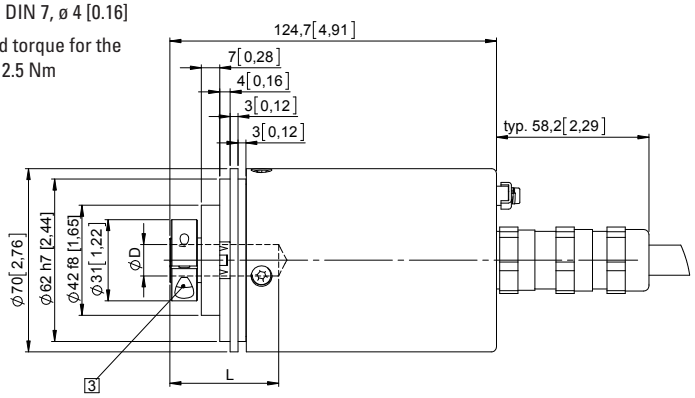
Standard, ATEX / IECEx – mining optical | Sendix 7100 / 7120 (shaft / hollow shaft) | Push-pull / RS422

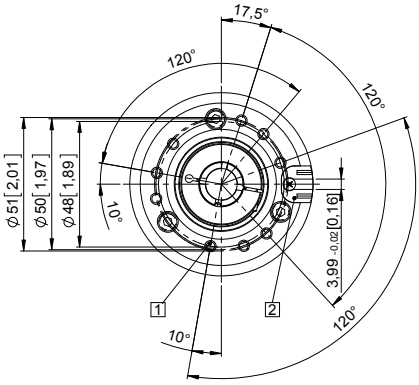
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

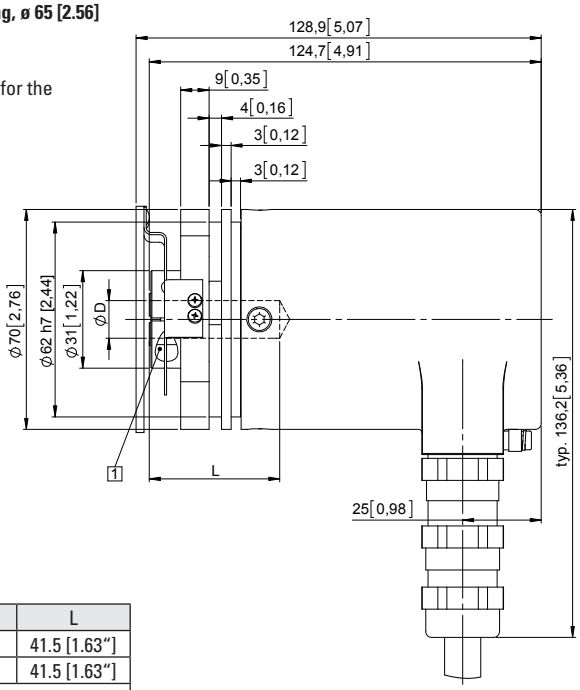


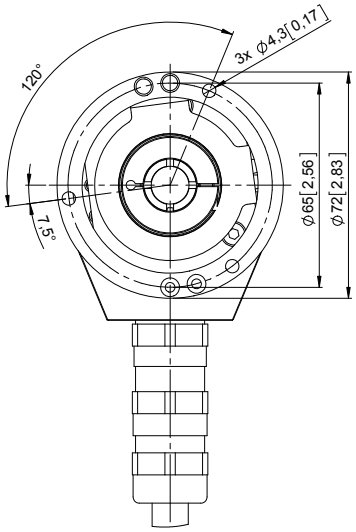


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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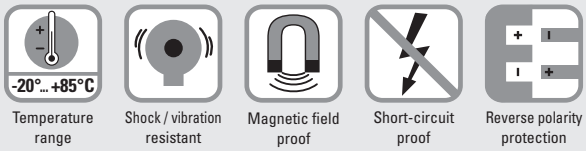
Large hollow shaft optical | 5821 (hollow shaft) | Push-pull / RS422

Optimized proportions, optimized costs:

With an overall diameter of just 58 millimeters the series 5821 boasts a hollow shaft of up to 28 millimeters diameter.



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

Adaptable

- Through hollow shaft from 16 mm up to 28 mm.
- With cable connection or M12 connector.
- High resolution up to 5000 pulses per revolution.

Order code Hollow shaft

8.5821 . 1 X X X . XXXX

Type | a | b | c | d | e

a *Flange*
1 = with spring element, ø 58 mm [2.28"]

b *Through hollow shaft*
K = ø 16 mm [0.63"]
C = ø 20 mm [0.79"]
6 = ø 24 mm [0.94"]
5 = ø 25 mm [0.98"]
3 = ø 28 mm [1.10"]

c *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 V DC
4 = RS422 (with inverted signal) / 8 ... 30 V DC
3 = Push-pull (with inverted signal) / 8 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
E = radial M12 connector, 8-pin

e *Pulse rate*
50, 60, 100, 125, 250, 400, 500, 512, 960, 1000, 1024, 2000, 2048, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates
- other hollow shaft diameters

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Large hollow shaft optical | 5821 (hollow shaft) | Push-pull / RS422

Technical data

Mechanical characteristics

Maximum speed	2500 min^{-1}
Mass moment of inertia	approx. 3.5 x 10^{-6} kgm^2
Starting torque – at 20°C [68°F]	< 0.1 Nm
Weight	approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	IP64
Working temperature range	
at max. speed 2000 min^{-1}	-20°C ... +70°C [-4°F ... +158°F]
at max. speed 2500 min^{-1}	-20°C ... +60°C [-4°F ... +140°F]
Material hollow shaft	steel
Shock resistance acc. to EN 60068-2-27	1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s^2, 35 ... 2000 Hz

Electrical characteristics

Output circuit	**RS422**	**Push-pull** (7272 compatible)
Power supply	5 V DC (±5 %) or 8 ... 30 V DC	8 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 100 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 40 mA
Pulse frequency	max. 300 kHz	max. 200 kHz
Signal level HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 3.0 V max. 2.5 V
Rising edge time t_r	max. 200 ns	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 1 µs
Short circuit proof outputs [1]	yes	yes
Reverse polarity protection of the power supply	yes	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 3, 4	1	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M12 connector, 8-pin									
1, 3, 4	E	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	1	2	3	4	5	6	7	8	PH [2]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

1) If power supply correctly applied.
2) PH = shield is attached to connector housing.

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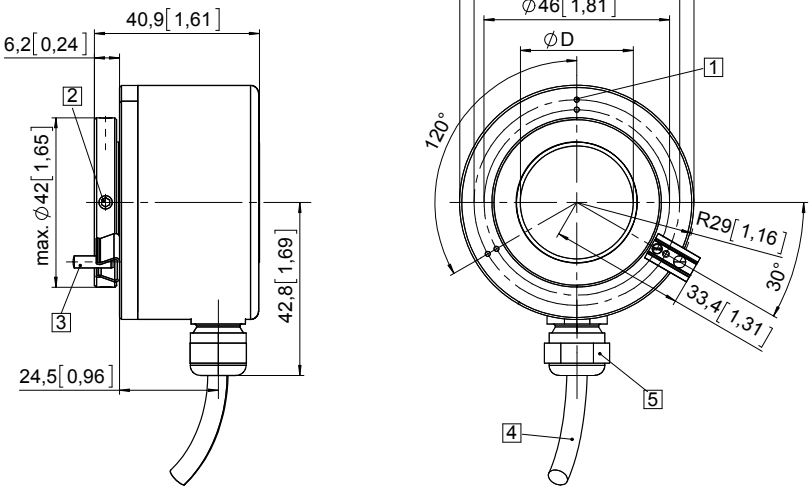
Large hollow shaft optical | 5821 (hollow shaft) | Push-pull / RS422

Dimensions

Dimensions in mm [inch]

Flange with spring element, ø 58 [2.28]
Cable version, connection type 1

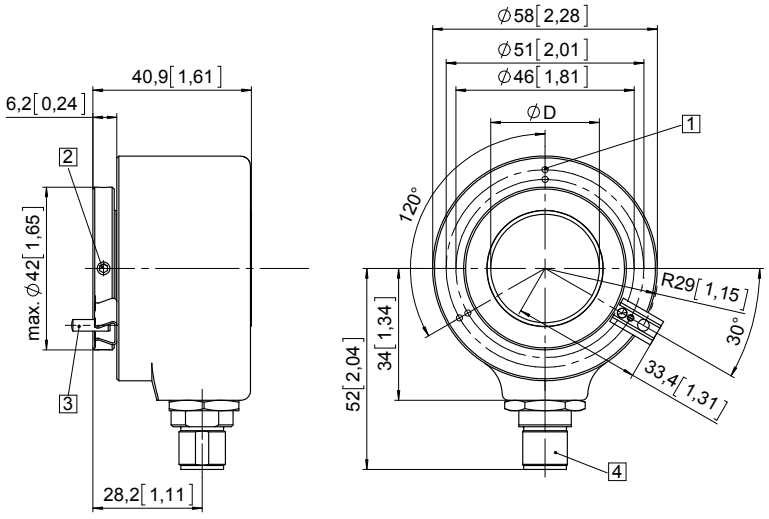
1 M1.6 / 5 [0.2] deep
2 4 x socket set screw M4x6 DIN 913
3 Cylindrical pin 3m6x12 DIN 6325 included
4 Cable length 1 m [3.28']
5 Cable gland PG7



D	Fit
16 [0.63]	F7
20 [0.79]	F7
24 [0.94]	F7
25 [0.98]	F7
28 [1.10]	F7

Flange with spring element, ø 58 [2.28]
M12 connector version, connection type E

1 M1.6 / 5 [0.2] deep
2 Cylindrical pin 3m6x12 DIN 6325 included
3 4 x socket set screw M4x6 DIN 913
4 Connector M12



D	Fit
16 [0.63]	F7
20 [0.79]	F7
24 [0.94]	F7
25 [0.98]	F7
28 [1.10]	F7

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Large hollow shaft optical | A020 (hollow shaft) | Push-pull / RS422 / SinCos

The incremental encoder type A020 with optical sensor technology is available with a through hollow shaft up to max. 42 mm diameter.

With an installation depth of just 43 mm it is optimally suited for mounting on large shafts, even where space is tight.

High rotational speed | High protection level | Shock / vibration resistant | Magnetic field proof | Optical sensor

Compact

- Minimal installation depth but large hollow shaft.
- Available with compact M12 connector.
- Torque stop can be implemented even with small radius.

Flexible

- With push-pull, RS422 or SinCos interface.
- Hollow shaft from 20 mm up to 42 mm as standard.
- With cable connection, M12 or M23 connectors.

Order code Hollow shaft

8.A020 . X X X X . XXXX
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = with spring element, short
3 = with spring element, long
5 = with torque stop, long

b *Through hollow shaft*
C = ø 20 mm [0.79“]
6 = ø 24 mm [0.94“]
5 = ø 25 mm [0.98“]
3 = ø 28 mm [1.10“]
A = ø 30 mm [1.18“]
2 = ø 38 mm [1.50“]
B = ø 40 mm [1.57“]
1 = ø 42 mm [1.65“]
4 = ø 1“

c *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 V DC
4 = RS422 (with inverted signal) / 10 ... 30 V DC
2 = Push-pull (without inverted signal) / 10 ... 30 V DC
5 = Push-pull (with inverted signal) / 5 ... 30 V DC
3 = Push-pull (with inverted signal) / 10 ... 30 V DC
A = Push-pull (7272 compatible) / 5 ... 30 V DC
8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
9 = SinCos, 1 Vpp (with inverted signal) / 10 .. 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28‘] PVC
A = radial cable, special length PVC *)
2 = radial M23 connector, 12-pin, without mating connector
E = radial M12 connector, 8-pin

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21‘]
order code expansion .XXXX = length in dm
ex.: 8.A020.351A.2048.0030 (for cable length 3 m)

e *Pulse rate*
50, 360, 512, 600, 1000, **1024**, 1500, 2000, **2048**, 2500, 4096, **5000**
(e.g. 360 pulses => 0360)

SinCos version only available with pulses ≥ 1024

Optional on request
- other pulse rates

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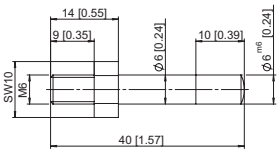
Large hollow shaft optical | A020 (hollow shaft) | Push-pull / RS422 / SinCos

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2 + 3)	with fixing thread 	**8.0010.4700.0003**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6201.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics	
Maximum speed	3000 min^{-1} 1)
Mass moment of inertia 2)	< 150 x 10^{-6} kgm^2
Starting torque with sealing at 20°C [68°F]	< 0.2 Nm
Weight	approx. 0.7 kg [24.69 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C 3) ... +70°C [-40°F 3) ... +158°F]
Material shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27	1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s^2, 10 ... 2000 Hz

Electrical characteristics SinCos output		
Output circuit	**SinCos U = 1 Vpp**	**SinCos U = 1 Vpp**
Power supply	5 V DC (±5 %)	10 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 65 mA max. 110 mA	typ. 65 mA max. 110 mA
-3 dB frequency	≤180 kHz	≤180 kHz
Signal level channels A/B channel 0	1 Vpp (±20 %) 0.1 ... 1.2 V	1 Vpp (±20 %) 0.1 ... 1.2 V
Short circuit proof outputs 4)	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	file 224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

1) Short term (app. 15 min. range) up to 3500 min^{-1}.
2) Depending on shaft diameter.
3) With connector: -40°C [-40°F], securely installed: -30°C [-22°F], flexibly installed: -20°C [-4°F].
4) If power supply correctly applied.

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Large hollow shaft optical	A020 (hollow shaft)	Push-pull / RS422 / SinCos

Electrical characteristics				
Output circuit		**RS422** (TTL compatible)	**Push-pull**	**Push-pull** (7272 compatible)
Power supply		5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)				
without inverted signal		–	typ. 55 mA/max. 125 mA	–
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 - 3.0 V	min. +V - 2.0 V
	LOW	max. 0.5 V	max. 2.5 V	max. 0.5 V
Rising edge time t_r		max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs [1]		yes [2]	yes	yes
Reverse polarity protection of the power supply		no, 10 ... 30 V DC: yes	yes	no
UL approval		file 224618		
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Terminal assignment

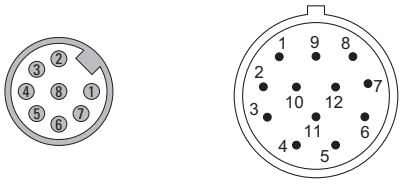
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)										
1 ... A	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M23 connector, 12-pin											
1 ... A	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	10	12	11	2	5	6	8	1	3	4	PH [3]

Output circuit	Type of connection	M12 connector, 8-pin											
1 ... A	E	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	1	2	–	–	3	4	5	6	7	8	PH [3]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin M23 connector, 12-pin

1) PH = shield is attached to connector housing.

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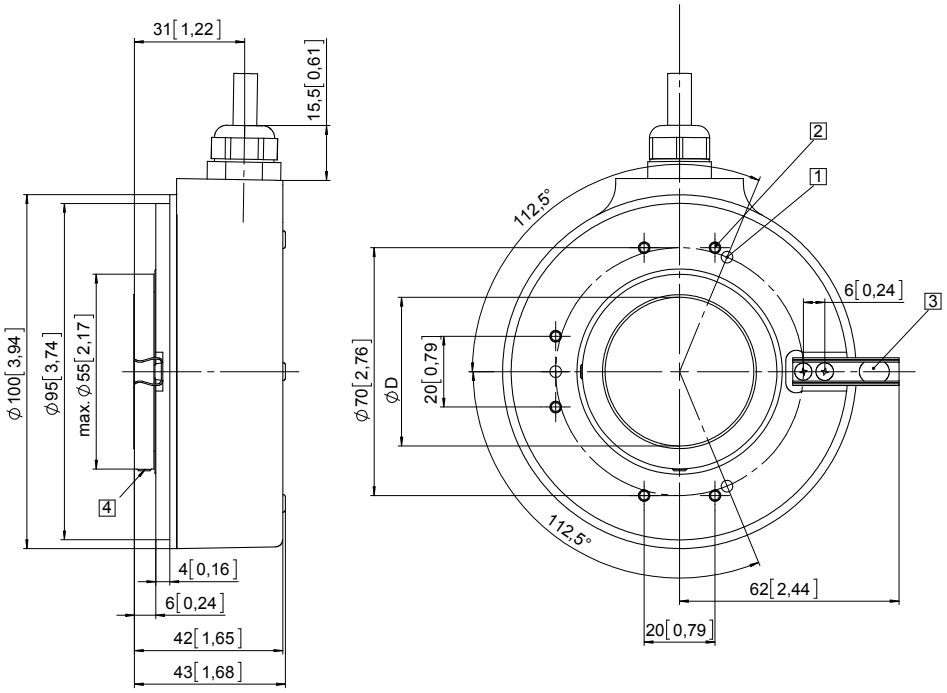
Large hollow shaft optical | A020 (hollow shaft) | Push-pull / RS422 / SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 3

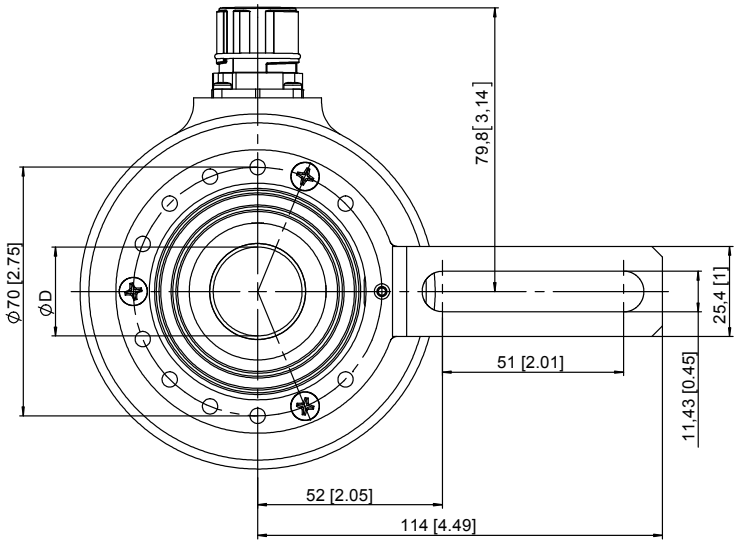
1 3 x M4, 7 [0.28] deep
2 6 x M3, 8 [0.31] deep
3 Cylindrical pin DIN 6325, ø 6 [0.24]
4 Recommended torque for the clamping ring 1.0 Nm



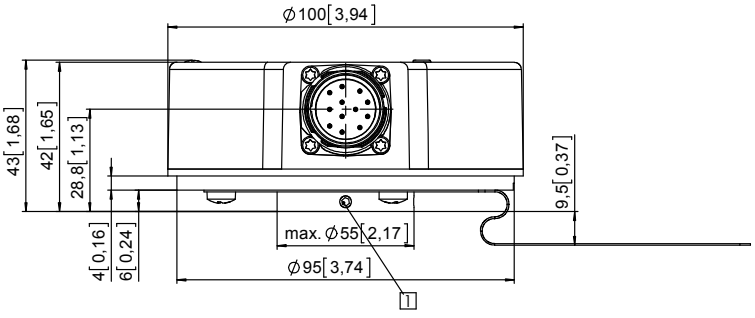
D	Fit
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
1''	H7
Typ. insertion depth: 1.5 x D up to L hollow shaft max.	

Flange with torque stop, long
Flange type 5

1 Recommended torque for the clamping ring 1.0 Nm



D	Fit
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
1''	H7
Typ. insertion depth: 1.5 x D up to L hollow shaft max.	



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Large hollow shaft robust, optical | A02H (hollow shaft) | Push-pull / RS422 / SinCos

The Heavy Duty incremental encoder type A02H boasts a high degree of ruggedness in a very compact design.

Its special construction makes it perfect for all applications in very harsh environments.

High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Optical sensor

Heavy Duty - robust

- Special shaft connection with interlocked bearings.
- Balanced stainless steel clamping ring.
- Optional isolation inserts available to protect against shaft currents.

Compact and versatile

- Only 49 mm installation depth.
- With cable connections, M12, M23 or MIL connectors.
- With push-pull, RS422 or SinCos interface.

Order code Hollow shaft

8.A02H . X X X X . XXXX
Type — a b c d — e

a *Flange*
1 = without mounting aid
2 = with spring element, short
3 = with spring element, long
5 = with torque stop, long

6 = with torque stop, short, 4.5" [1]

b *Through hollow shaft*
C = ø 20 mm [0.79"]
5 = ø 25 mm [0.98"]
3 = ø 28 mm [1.10"]
A = ø 30 mm [1.18"]
2 = ø 38 mm [1.50"]
B = ø 40 mm [1.57"]
1 = ø 42 mm [1.65"]
4 = ø 1"

E = ø 5/8" [1]
N = ø 1 1/4" [1]

c *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 V DC
4 = RS422 (with inverted signal) / 10 ... 30 V DC
2 = Push-pull (without inverted signal) / 10 ... 30 V DC
5 = Push-pull (with inverted signal) / 5 ... 30 V DC
3 = Push-pull (with inverted signal) / 10 ... 30 V DC
8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
9 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC
A = Push-pull (7272 compatible) / 5 ... 30 V DC

D = RS422 (with inverted signal) / 5 ... 30 V DC [1]

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
A = radial cable, special length PVC *)
2 = radial M23 connector, 12-pin, without mating connector
E = radial M12 connector, 8-pin

D = MIL connector, 10-pin [1]

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.A02H.111A.2048.0030 (for cable length 3 m)

e *Pulse rate*
50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000
(e.g. 360 pulses => 0360)

SinCos version only available with pulses ≥ 1024

Optional on request
- other pulse rates on request
- Ex 2/22 [2]

1) US version.
2) For the cable connection type, cable material PUR.

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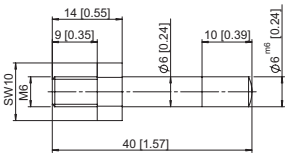
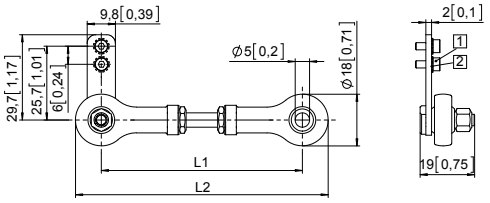
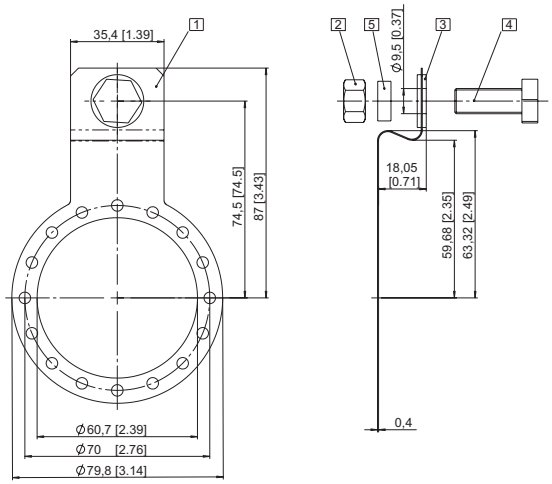
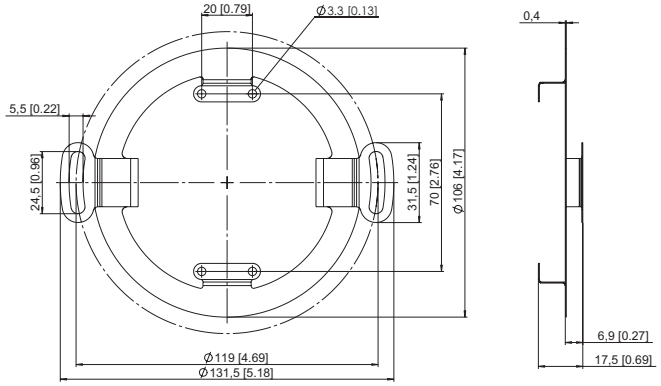
Large hollow shaft robust, optical | A02H (hollow shaft) | Push-pull / RS422 / SinCos

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2 + 3)	with fixing thread 	**8.0010.4700.0003**
Tether arm, flexible 		70 mm [2.76"] **8.0010.40S0.0000** 100 mm [3.94"] **8.0010.40T0.0000** 150 mm [5.91"] **8.0010.40U0.0000**
1 Socket screw M2.5 x 6 [0.24] 2 Lock washer		

Tether arm	L1	L2
70 mm [2.76"]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.94"]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91"]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

Torque stop, short 		**8.0010.4T00.0000**
1 Curved spring element 2 Hexagonal nut 3/8 - 16 UNC 3 Washer (isolating) 4 Hexagonal screw 3/8 16 UNC x 1" 5 Washer D10.4 x 15 x 15		
Stator coupling 		**8.0010.40V0.0000**

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Large hollow shaft robust, optical	A02H (hollow shaft)	Push-pull / RS422 / SinCos

Mounting accessory for hollow shaft encoders

Order no.

Protective cover

For applications with a very high degree of pollution, Kübler now offers a protective cover for
- Improved reliability
- Extension of the service life of the encoder

Scope of delivery:
- Protective cover
- Torque stop (8.0010.4T00.0000)
- 3 screws for fixing to the encoder

8.0010.40Y0.0001

Tapered shaft mounting kit

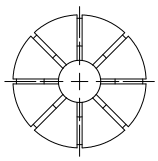
for A02H with hollow shaft, ø 38 mm [1.50"]

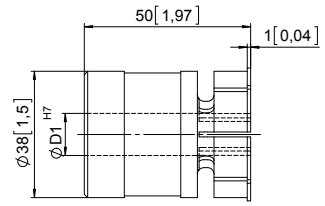
For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling.
An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.
Included in the set:
- Insert for cone blind hole, cone 1:10, 17 mm [0.67"] length
- Isolation insert
- Allen screw for central fixing

8.0010.4028.0000

Isolation insert for hollow shaft, ø 38 mm [1.50"]

Temperature range -40°C ... +115°C [-40°F ... +239°F]





Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC vector motors and considerably shorten the service life of the encoder bearings. For more details please call our technical hotline (+49 7720 3903 952) or send us an email (info@kuebler.com)

ø D1:	
12 mm [0.47"]	**8.0010.4091.0000**
14 mm [0.55"]	**8.0010.4027.0000**
15 mm [0.59"]	**8.0010.4038.0000**
16 mm [0.63"]	**8.0010.4019.0000**
18 mm [0.71"]	**8.0010.4080.0000**
20 mm [0.79"]	**8.0010.4011.0000**
25 mm [0.98"]	**8.0010.4012.0000**
30 mm [1.18"]	**8.0010.4016.0000**
32 mm [1.26"]	**8.0010.4015.0000**
1/2"	**8.0010.4013.0000**
5/8"	**8.0010.4070.0000**
3/4"	**8.0010.4090.0000**
1"	**8.0010.4050.0000**
1 1/4"	**8.0010.4060.0000**

Isolation insert for hollow shaft, ø 42 mm [1.65"]

external diameter 42 mm [1.65"] / internal diameter 38 mm [1.50"]	**8.0010.4017.0000**
external diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]	**8.0010.4029.0000**

Connection technology

Order no.

Cordset, pre-assembled

M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6201.0002**

Connector, self-assembly (straight)

M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Large hollow shaft robust, optical | **A02H (hollow shaft)** | **Push-pull / RS422 / SinCos**

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1} [1]
	at 60°C [140°F]	2500 min^{-1} [1]
Mass moment of inertia		< 220 x 10^{-6} kgm^2 [2]
Starting torque with sealing at 20°C [68°F]		< 0.2 Nm
Load capacity of shaft	radial	200 N
	axial	100 N
Weight		approx. 0.8 kg [28.22 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C [3] ... +80°C [-40°F [3] ... +176°F]
Materials	shaft	stainless steel, bore tolerance H7
Shock resistance acc. to EN 60068-2-27		2000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics SinCos output

Output circuit	**SinCos U = 1 Vpp**	**SinCos U = 1 Vpp**
Power supply	5 V DC (±5 %)	10 ... 30 V DC
Power consumption with inverted signal (no load)	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 Vpp (±20 %)	1 Vpp (±20 %)
channel 0	0.1 ... 1.2 V	0.1 .... 1.2 V
Short circuit proof outputs [4]	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	file 224618	
GL approval	letter of conformity No. 74130	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Electrical characteristics RS422 / Push-pull

Output circuit	**RS422** (TTL compatible)	**Push-pull**	**Push-pull** (7272 compatible)
Power supply	5 V DC (±5 %) 5 ... 30 V DC 10 ... 30 V DC	10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)			
without inverted signal	–	typ. 55 mA/max. 125 mA	–
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 [5]
Signal level HIGH	min. 2.5 V	min. +V – 3 V	min. +V - 2.0 V
LOW	max. 0.5 V	max. 2.5 V	max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs [4]	yes	yes	yes
Reverse polarity protection of the power supply	no, 10 ... 30 V DC: yes	yes	no
UL approval	file 224618		
GL approval	letter of conformity No. 74130		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) During the run-in-phase of approx. 2 hours, reduce the limits for working temperature$_{max}$ or speed max by 1/3.
2) Depending on shaft diameter.
3) With connector: -40°C [-40°F], securely installed: -30°C [-22°F], flexibly installed: -20°C [-4°F].
4) If power supply correctly applied.
5) Max. recommended cable length 30 m [98.43'].

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Large hollow shaft robust, optical | A02H (hollow shaft) | Push-pull / RS422 / SinCos

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1 ... D	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M23 connector, 12-pin											
1 ... D	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	10	12	11	2	5	6	8	1	3	4	PH [1]

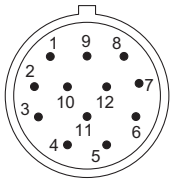
Output circuit	Type of connection	M12 connector, 8-pin											
1 ... D	E	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	1	2			3	4	5	6	7	8	PH [1]

Output circuit	Type of connection	MIL connector, 10-pin											
1 ... D	D	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	F	D			A	G	B	H	C	I	J

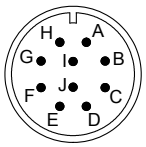
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin



MIL connector, 10-pin

1) PH = shield is attached to connector housing.

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Large hollow shaft robust, optical | A02H (hollow shaft) | Push-pull / RS422 / SinCos

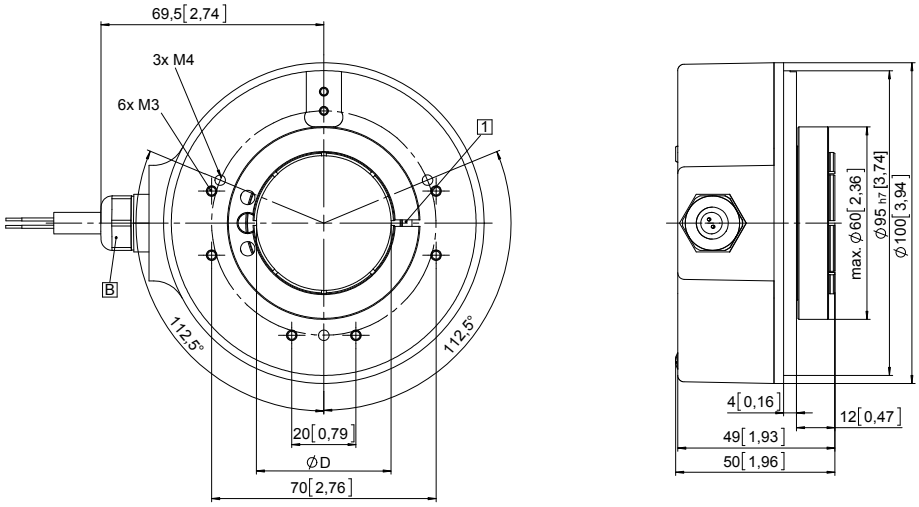
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange without mounting aid
Flange type 1

1 Recommended torque for the clamping ring 1.0 Nm

B Cable version



D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7

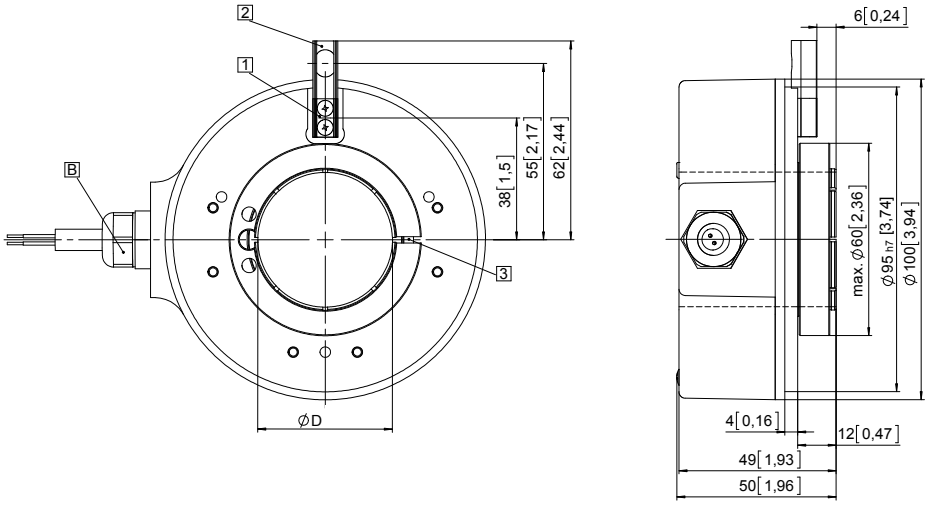
Flange with spring element
Flange type 2 and 3

1 Spring element, short (flange type 2)

2 Spring element, long (flange type 3)

3 Recommended torque for the clamping ring
flange type 2: 1.0 Nm
flange type 3: 2.0 Nm

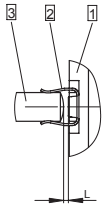
B Cable version



D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7

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.
Danger of mechanical seizure!



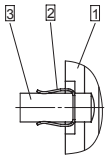
1 Flange

2 Spring element, short

3 Cylindrical pin

Mounting using the spring element, long

Cylindrical pin fed through the bore of the spring



1 Flange

2 Spring element, long

3 Cylindrical pin

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Large hollow shaft robust, optical | A02H (hollow shaft) | Push-pull / RS422 / SinCos

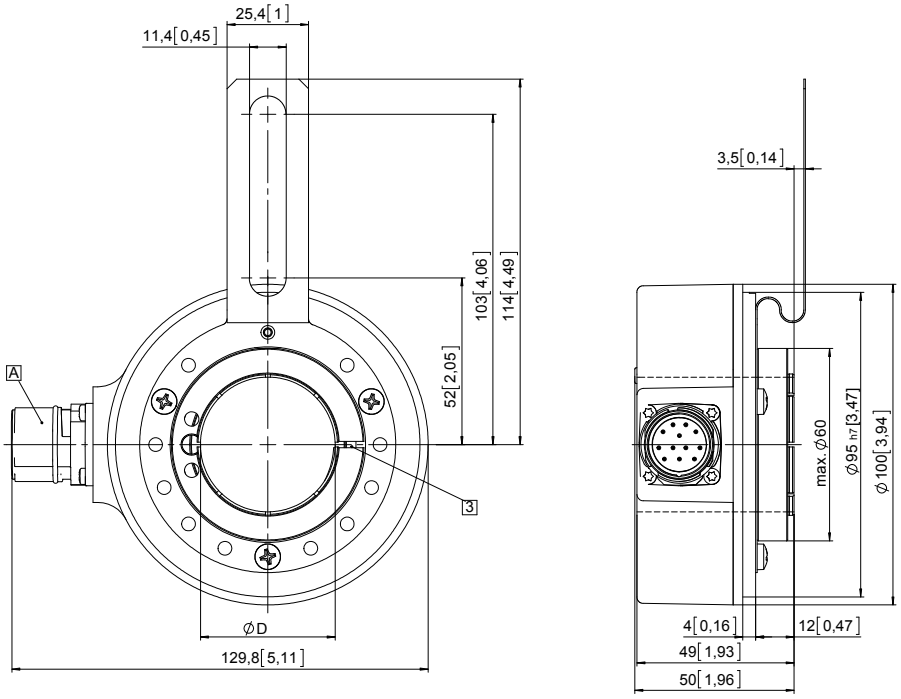
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with torque stop, long
Flange type 5

3 Recommended torque for the clamping ring 2.0 Nm

A Plug version

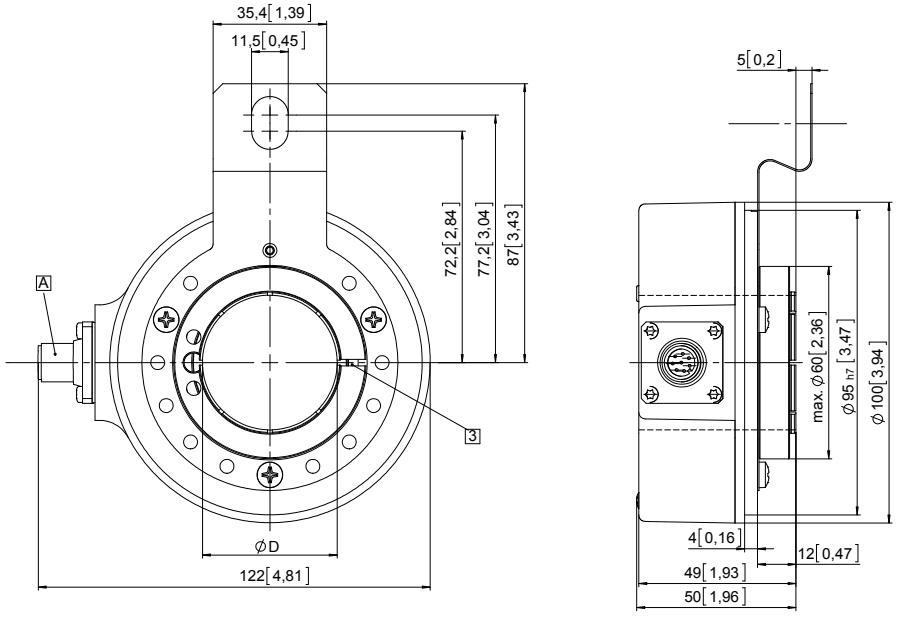


D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7

Flange with torque stop, short 4.5"
Flange type 6

3 Recommended torque for the clamping ring 2.0 Nm

A Plug version



D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7

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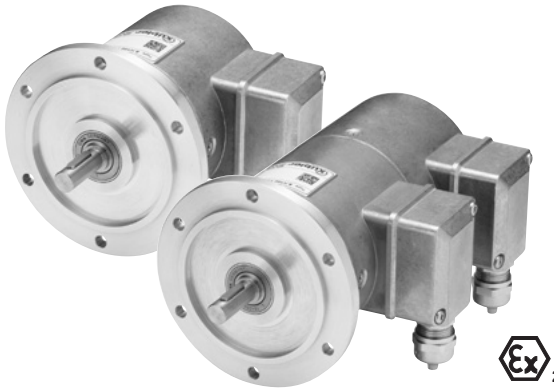
Heavy Duty shaft, optical | Sendix Heavy Duty H100 (shaft) | Push-pull / RS422 / speed switch



The Sendix Heavy Duty encoder H100 is an extremely rugged incremental encoder available in 3 versions: encoder with or without speed switch and double encoder.

Thanks to the special HD-Safety-Lock™ construction it is ideally suited for applications in heavy industry, such as steel works and cranes. Resistant materials, wide temperature ranges and a high protection level ensure it remains unaffected by the harshest environmental conditions. Its innovative connection technology enables simple quick installation.

HD-Safety-Lock™ | High rotational speed | Temperature range | High protection level | Shock/vibration resistant | Magnetic field proof | Plug-in cage-clamp connectors | Spring terminal connectors | Reverse polarity protection | Optical sensor | Seawater durable

Suitable for your Heavy Duty application

- HD-Safety-Lock™ bearing construction for an extremely high bearing load capacity of up to 300 N axial and 400 N radial.
- With a temperature range from -40°C up to +100°C, IP66 protection and seawater durable material the encoder is resistant to harsh environmental conditions.
- Feather key shaft slot ensures positive fitting to the application.
- Safe overspeed protection by means of mechanical speed switch.

Simple quick installation

- Innovative plug-in spring terminal connectors in the terminal box greatly simplify the cable connection and offer a very high level of safety.
- Various connection possibilities thanks to terminal box being rotatable through 180°.
- Large number of resolution and switching speed options available as standard.

Order code without speed switch

8.H100	.	1	1	1	X	.	XXXX
Type		a	b	c	d		e

a *Flange*
1 = Euro RE0444

b *Shaft (ø x L), with feather key shaft slot*
1 = ø 11 x 30 mm [0.43 x 1.18“]

c *Version*
1 = incremental encoder

d *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulse => 0100)

Optional on request
- other pulse rates
- Ex 2/22

Order code with speed switch

8.H100	.	1	1	2	X	.	XXXX	.	XXXX	.	1
Type		a	b	c	d		e		f		g

a *Flange*
1 = Euro RE0444

b *Shaft (ø x L), with feather key shaft slot*
1 = ø 11 x 30 mm [0.43 x 1.18“]

c *Version*
2 = incremental encoder with mech. speed switch

d *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC

e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulse => 0100)

f *Switching speed*
750, 1000, 2000, 3000, 4000

g *Switching accuracy*
1 = standard (±4 % at 100 rad/s²)

Optional on request
- other pulse rates
- other switching speeds
- other switching accuracies
- Ex 2/22

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Incremental encoders

Heavy Duty shaft, optical	Sendix Heavy Duty H100 (shaft)	Push-pull / RS422 / speed switch

Order code double encoder

8.H100	.	1	1	3	X	.	XXXX	.	XXXX
Type		a	b	c	d		e		f

a *Flange*
1 = Euro RE0444

b *Shaft (ø x L), with feather key shaft slot*
1 = ø 11 x 30 mm [0.43 x 1.18"]

c *Version*
3 = 2 x incremental encoder

d *Output circuit / power supply*
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC

e *Pulse rate encoder 1*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulse => 0100)

f *Pulse rate encoder 2*
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000
(e.g. 100 pulse => 0100)

Optional on request
- other pulse rates
- Ex 2/22

Mounting accessory		Order no.
Coupling	double loop coupling for shaft 12 mm [0.47"] with feather key shaft slot 4 mm [0.16"]	**8.0000.1L01.1112**

Accessories – connecting cable		Order no.
Encoder cable	PUR-trailing cable, shielded, halogen free, orange 4 x 2 x 0.25 mm² [AWG 23] + 2 x 1 mm² [AWG 17], twisted pair	**8.0000.6400.XXXX** [1]
Speed switch cable	TPE-trailing cable, shielded, halogen free, black – 5 x 0.75 mm² [AWG 18]	**8.0000.6600.XXXX** [1]

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1}
Starting torque with seal – at 20°C [68°F]		~ 2 Ncm
Load capacity of shaft	radial axial	400 N 300 N
Weight	H100 H100 + speed switch	~ 1.8 kg [63.49 oz] ~ 2.7 kg [95.24 oz]
Protection acc. to EN 60529		IP66
Working temperature range (surface of housing)		-40°C ... +100°C [-40°F ... + 212°F]
Materials	shaft housing flange	stainless steel aluminum die-cast (EN AC-44300), seawater durable coating seawater durable aluminum type Al Si Mg Mn (EN AW-6082)
Shock resistance acc. to EN 60068-2-27		3000 m/s² (1 ms)
Vibration resistance acc. to EN 60068-2-27		
	without speed switch	100 m/s², 10 ... 2000 Hz
	with speed switch, switching speed > 1000	100 m/s², 10 ... 400 Hz
	with speed switch, switching speed < 1000	50 m/s², 10 ... 400 Hz

Electrical characteristics

Output circuit		**RS422** (TTL compatible)	**Push-pull** (HTL) up to 150 m [492.13'] cable length
Power supply		5 ... 30 V DC	10 ... 30 V DC
Power consumption (no load) with inverted signal		typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA
Permissible load per channel	DC peak	max. +/- 20 mA max. +/- 30 mA	max. +/- 30 mA max. +/- 70 mA
Pulse frequency		max. 300 kHz	max. 300 kHz
Pulse frequency with 150 m [492.13'] cable length		max. 300 kHz	max. 80 kHz
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.5 V max. 0.5 V
Rising edge time t_r		max. 200 ns	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 1 µs
Short circuit proof outputs [2]		yes [3]	yes
Reverse polarity protection of the power supply		yes	yes
CE-compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

1) XXXX = cable length in meters.
2) If power supply +V correctly applied.
3) Only one channel allowed to be shorted-out:
At +V short circuit to channel or 0 V is permitted.

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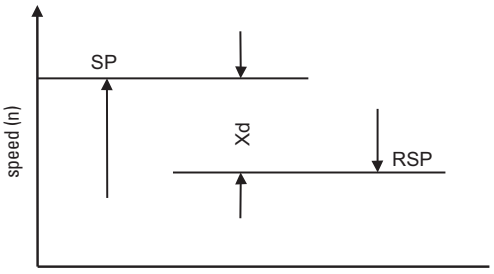
Heavy Duty shaft, optical | **Sendix Heavy Duty H100 (shaft)** | **Push-pull / RS422 / speed switch**

Speed switch	
Switching speed (ns)	750 ... 4000 min^{-1}
Max. rotational speed (mechanical)	1.25 x ns
Switching accuracy with acceleration α = 100 rad/s² (corresponds Δn = 955 min^{-1}/s)	±4 % of ns
Switching difference cw/ccw rotation	~ 3 %
Switching hysteresis (Xd)	~ 40 % up to 80 % of ns
Switching capacity	3 A / max. 50 V AC 1 A / max. 75 V DC

(more details see manual)

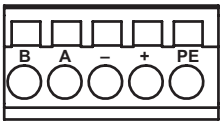
Definition switching hysteresis (Xd)



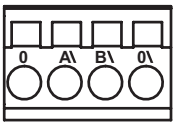
SP = switching point (for switching speed ns)
RSP = reset point
Xd = switching difference (hysteresis)

Terminal assignment terminal connections

Incremental encoders

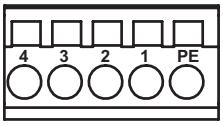


B	incremental track B
A	incremental track A
-	0 V
+	+V
PE	shield



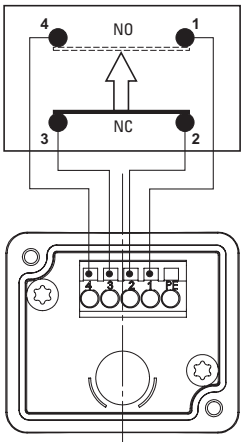
0	incremental track 0
$\overline{A}$	incremental track $\overline{A}$
$\overline{B}$	incremental track $\overline{B}$
$\overline{0}$	incremental track $\overline{0}$

Speed switch



4, 1	normally open (NO)
3, 2	normally closed (NC)
PE	shield

Jumper



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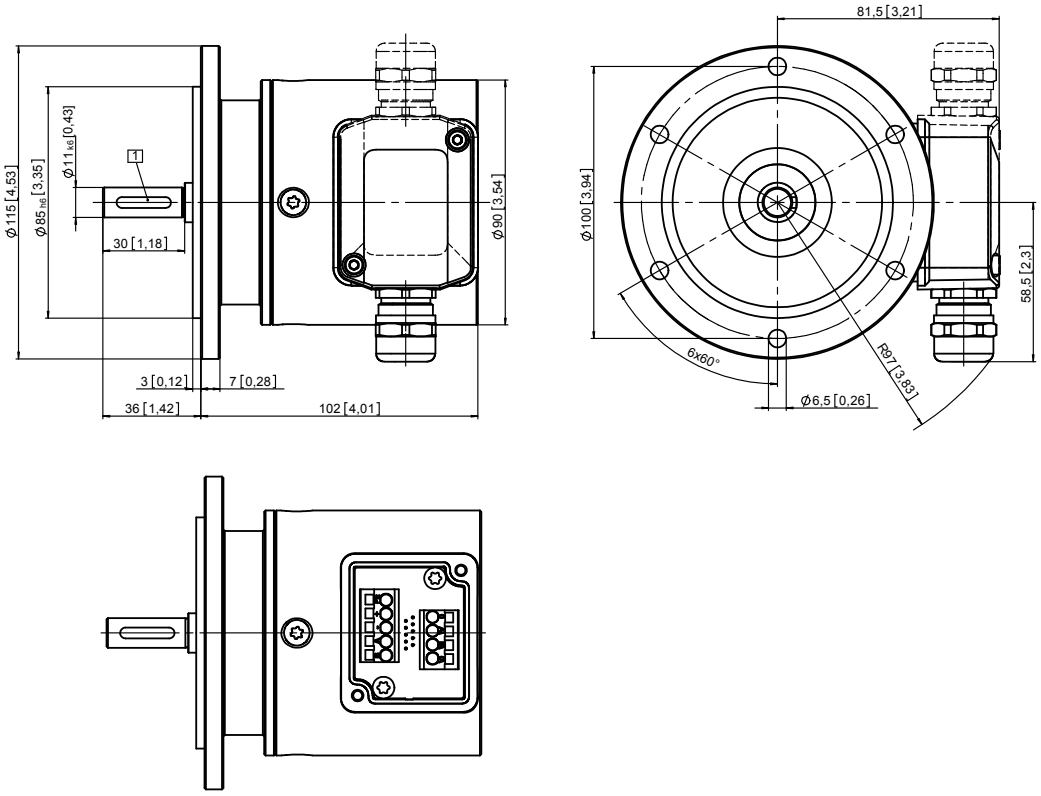
Heavy Duty shaft, optical | **Sendix Heavy Duty H100 (shaft)** | **Push-pull / RS422 / speed switch**

Dimensions

Dimensions in mm [inch]

Incremental encoder
Version 1

1 Feather key acc. to ISO 773
4 x 4 x 20 [0.16 x 0.16 x 0.79]



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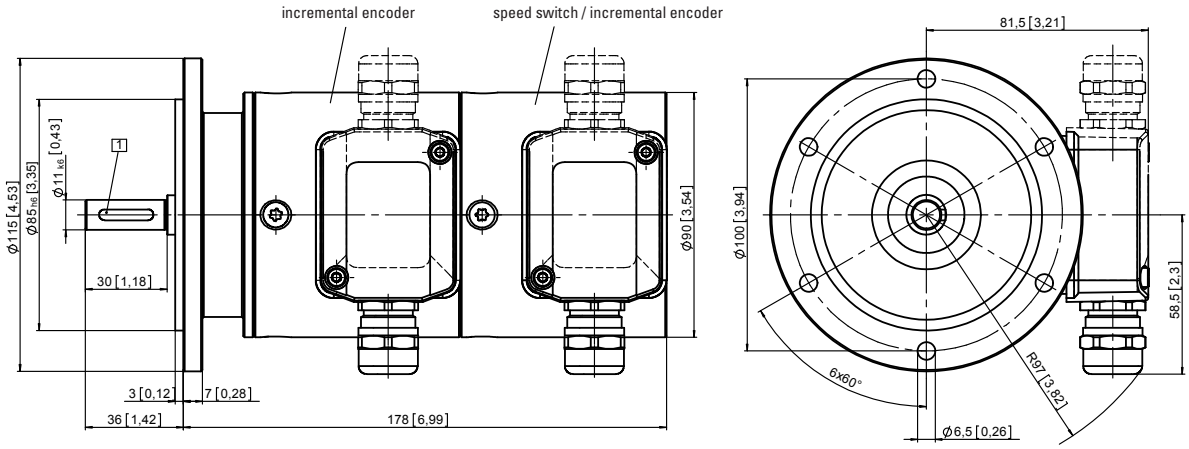
Heavy Duty shaft, optical | **Sendix Heavy Duty H100 (shaft)** | **Push-pull / RS422 / speed switch**

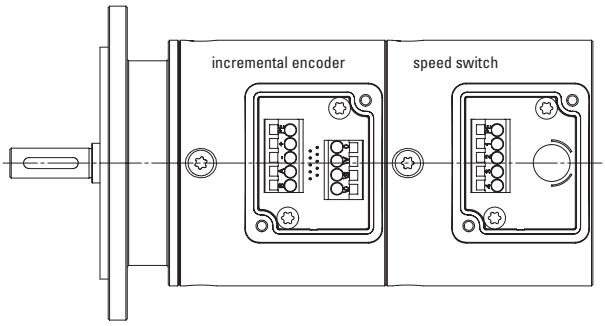
Dimensions

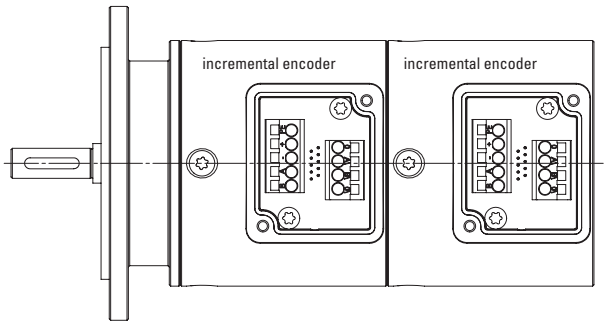
Dimensions in mm [inch]

Incremental encoder with mechanical speed switch or 2 x incremental encoder (double encoder)
Version 2 or 3

1 Feather key acc. to ISO 773
4 x 4 x 20 [0.16 x 0.16 x 0.79]







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Heavy Duty hollow shaft, optical | **Sendix Heavy Duty H120 (hollow shaft)** | **Push-pull / RS422 / optical fiber**

The Sendix Heavy Duty H120 were especially developed for large motors and generators. They are highly accurate and extremely robust thanks to HD-Safety-Lock™ – the Heavy Duty hollow shaft design of the latest generation with sturdy bearing construction and integrated bearing isolation. The dual protection of the shaft, the wide temperature range and the high protection level allow for use even under the harshest conditions.

The very large hollow shaft up to 28 mm plus the wide variety of mounting solutions and connection options offer the very highest degree of flexibility during installation.

HD-Safety-Lock™ | 2.5 kV bearing isolation | Dual protection of the shaft | Temperature range | High protection level | Shock/vibration resistant | Terminal box rotatable - 180° | Plug-in cage-clamp connectors | Hollow shaft up to ø 28 mm | Optical sensor | Seawater durable

Robust

- Integrated bearing isolation up to 2.5 kV for reliable shaft connection. [1)]
- Extremely high resilience as a result of dual protection of the shaft (shielding cover disk and radial shaft seal), protection levels IP66 and IP67 as well as a seawater durable housing.
- High shock (200 g) and vibration (15 g) resistance.
- High level of resistance to interference as a result of optical fiber technology.

Flexible

- 3 fixing solutions: conical central fastening, cylindrical central fastening or through hollow shaft.
- Connection via cable, M12 or M23 connector, terminal box or optical fiber.
- Torque stop on the flange or the cover – allows the device to be rotated as required during mounting.
- Through hollow shaft up to ø 28 mm.

Order code Hollow shaft version

8.H120	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

a *Flange*
1 = without mounting aid
2 = with fastening arm 70 mm [2.76"] [2)]
3 = with fastening arm 100 mm [3.93"] [2)]
4 = with fastening arm 150 mm [5.91"] [2)]
5 = with stator coupling, ø 119 mm [4.69"]

b *Through hollow shaft*
2 = ø 16 mm [0.63"]
3 = ø 20 mm [0.79"]
5 = ø 25 mm [0.98"]
7 = ø 28 mm [1.10"]
6 = ø 1"
Blind hollow shaft, with central fastening insertion depth max. 53 mm [2.09"]
A = ø 12 mm [0.47"]
B = ø 16 mm [0.63"]
Blind hollow shaft, cone with central fastening insertion depth max. 22.5 mm [0.89"]
K = ø 17 mm [0.67"], 1 : 10

c *Output circuit / power supply*
4 = RS422 (with inverted signal) / 5 V DC
1 = RS422 (with inverted signal) / 10 ... 30 V DC
5 = push-pull (with inverted signal) / 10 ... 30 V DC
6 = push-pull (with inverted signal) / 10 ... 30 V DC, power version up to 350 m
B = optical fiber + RS422 (with inverted signal) / 5 V DC [3)]
A = optical fiber + RS422 (with inverted signal) / 10 ... 30 V DC [3)]
C = optical fiber + push-pull (with inverted signal) / 10 ... 30 V DC [3)]

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
A = radial cable, special length PVC *)
2 = radial M12 connector, 8-pin, ccw
4 = radial M23 connector, 12-pin, ccw
D = radial M23 connector, 12-pin, cw
K = terminal box with plug-in spring terminal connectors, rotatable through 180°
L = optical fiber connector + radial M23 connector, 12-pin, cw [4)]

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.H120.121A.2048.0030 (for cable length 3 m)

e *Pulse rate*
50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000
(e.g. 360 pulses => 0360)

Optional on request
- other pulse rates
- Ex 2/22 [5)]

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.
2) Enclosed, not mounted.
3) Can only be ordered with connection type L.
4) Can only be ordered with output circuits A, B or C.
5) For the cable connection type, cable material PUR.

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Heavy Duty hollow shaft, optical | **Sendix Heavy Duty H120 (hollow shaft)** | **Push-pull / RS422 / optical fiber**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable [1]	**8.0000.6201.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin [1]	**8.0000.5012.0000**
Simplex patch cable, ST-ST-multimode	optical fiber, length 5 m [16.40']	**05.B09-B09-821-0005**
Cable gland for optical fiber version	for achieving protection IP66 and IP67 at the optical fiber connector	**8.0000.5000.0007**
Optical fiber receiver	HTL / 10 ... 30 V DC, plug-in connector HD-Sub D15	**6.LWLE.51**

Further accessories can be found in the Accessories section or in the Accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the Connection Technology section or in the Connection Technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1} 3500 min^{-1}
	at 60°C [140°F]	
Starting torque – at 20°C [68°F]		0.05 Nm
Load capacity of shaft	radial	475 N
	axial	375 N
Weight		1.6 ... 2.0 kg [56.44 ... 70.55 oz] (depending on version)
Protection acc. to EN 60529		IP66 + IP67
Working temperature range		-40°C [2] ... +100°C [3] [-40°F [3] ... +212°F [3]]
Materials	shaft	stainless steel, bore tolerance H7
	housing, flange	seawater durable
Shock resistance acc. to EN 60068-2-27		2000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		150 m/s^2, 10 ... 2000 Hz

Technical data for optical fiber connection

Power consumption per module	< 2 W
Input level optical fiber transmitter	10 ... 30 V DC or RS422
Optical wavelength	850 nm
Optical transmission rate	120 Mbit/s
Optical fiber synchronization display	LED on the receiver
Optical fiber connection	ST connector, ø 9 mm [0.35"]
Glass fiber	multimode fiber, 50/125 µm, 62.5/125 µm
Optical fiber transmission distance	max. 2000 m [6561.68']

Electrical characteristics

Output circuit		**RS422** (TTL-compatible))	**Push-pull**	**Push-pull (power version)**
Power supply		5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC	10 ... 30 V DC
Power consumption (no load)		max. 90 mA	max. 80 mA	max. 90 mA
Permissible load	DC	max. +/- 20 mA	max. +/- 30 mA	max. +/- 150 mA
per channel	peak	max. +/- 30 mA	max. +/- 70 mA	max. +/- 200 mA
Pulse frequency		max. 300 kHz	max. 300 kHz	max. 300 kHz
Max. cable length		550 m at 100 kHz	150 m at 80 kHz	350 m at 100 kHz
Signal level	HIGH	min. 2.5 V	min. +V - 3.0 V	min. +V - 4.0 V
	LOW	max. 0.5 V	max. 2.5 V	max. 3.0 V
Rising edge time t_r		max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs [4]		yes	yes	yes
Reverse polarity protection of the power supply		yes	yes	yes
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) Suitable for connection type 4.
2) With connector: -40°C [-40°F], with securely installed cable: -30°C [-22°F], with flexibly installed cable: -20°C [-4°F].
3) Measured at the flange.
4) If power supply correctly applied.

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Heavy Duty hollow shaft, optical | Sendix Heavy Duty H120 (hollow shaft) | Push-pull / RS422 / optical fiber

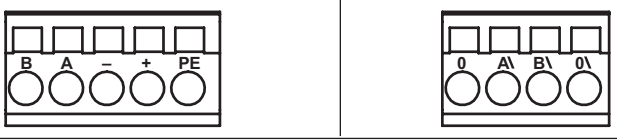
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)										
1, 4, 5, 6	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	Shield

Output circuit	Type of connection	M12 connector, 8-pin										
1, 4, 5, 6	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	1	2	–	–	3	4	5	6	7	8	PH [1]

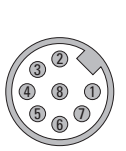
Output circuit	Type of connection	M23 connector, 12-pin										
1, 4, 5, 6, A, B, C	4, D, L	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	10	12	11	2	5	6	8	1	3	4	PH [1]

Output circuit	Type of connection	Terminal connections								
1, 4, 5, 6	K	Signal:	B	A	0 V	+V	⏚	0	$\overline{A}$	$\overline{B}$	$\overline{0}$
		Pin:	B	A	–	+	PE	0	$\overline{A}$	$\overline{B}$	$\overline{0}$

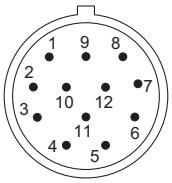


+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal
PH ⏚: Plug connector housing (shield)

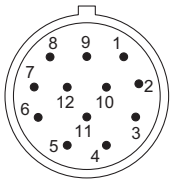
Top view of mating side, male contact base



M12 connector, 8-pin, ccw



M23 connector, 12-pin, ccw



M23 connector, 12-pin, cw

1) PH = shield is attached to connector housing.

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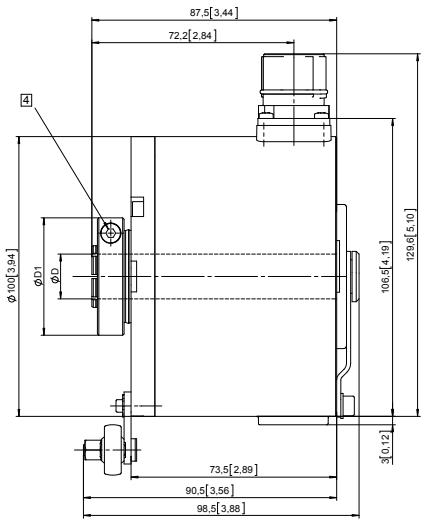
Heavy Duty hollow shaft, optical | Sendix Heavy Duty H120 (hollow shaft) | Push-pull / RS422 / optical fiber

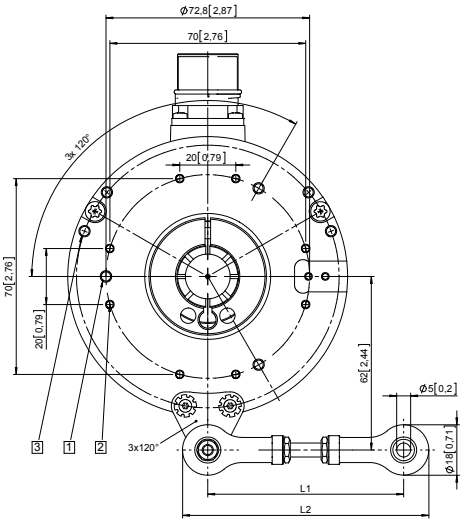
Dimensions

Dimensions in mm [inch]

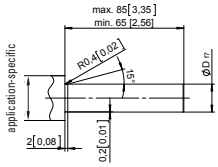
Flange with fastening arm
Through hollow shaft

1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep
3 6 x M4
4 Recommended torque for the clamping ring 2 Nm (SW3)





Shaft connection to the application

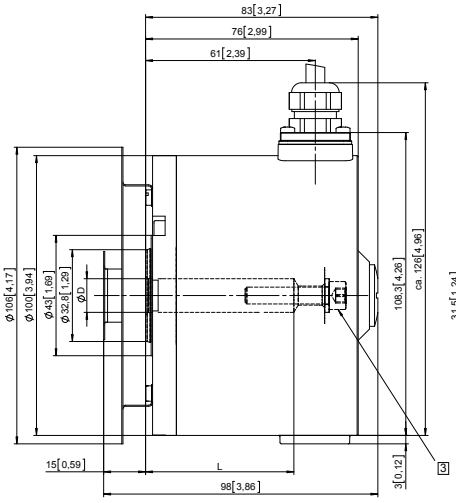


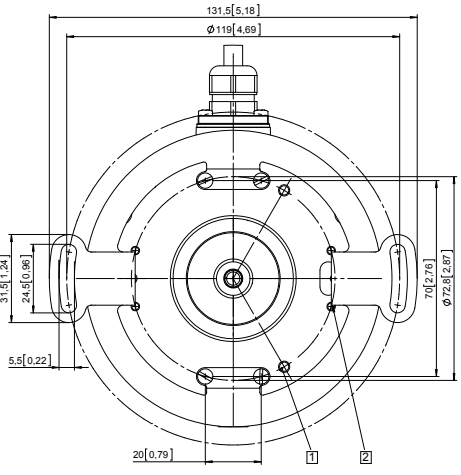
D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1''	H7	47.5 [1.87]

Fastening arm	L1		L2	
70 mm [2.76]	64 ... 74	[2.51 ... 2.91]	82 ... 92	[3.23 ... 3.62]
100 mm [3.93]	94 ... 104	[3.70 ... 4.09]	112 ... 122	[4.41 ... 4.80]
150 mm [5.91]	144 ... 154	[5.67 ... 6.06]	162 ... 172	[6.38 ... 6.77]

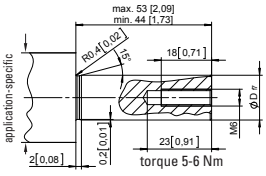
Flange with stator coupling, ø 119 [4.69]
Blind hollow shaft with central fastening

1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep
3 Recommended torque for M6 (SW5) 5 - 6 Nm





Shaft connection to the application



D	Fit	L
12 [0.47]	H7	53 [2.09]
16 [0.63]	H7	53 [2.09]
L = insertion depth blind hollow shaft		

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Heavy Duty hollow shaft, optical | Sendix Heavy Duty H120 (hollow shaft) | Push-pull / RS422 / optical fiber

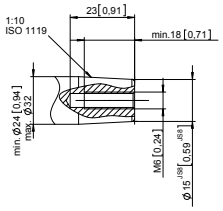
Dimensions

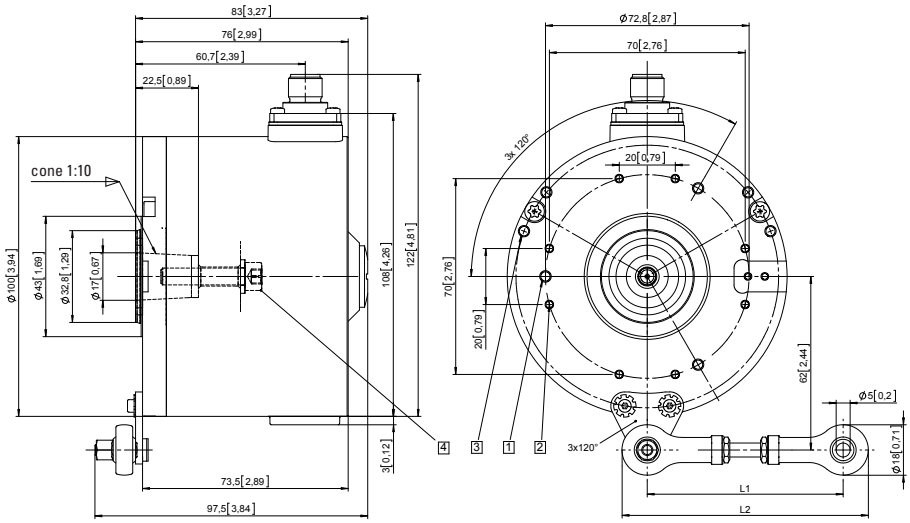
Dimensions in mm [inch]

Flange with fastening arm
Blind hollow shaft with central fastening, cone, ø 17 [0.67], 1 : 10

1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep
3 6 x M4
4 Recommended torque for M6 (SW5) 5 - 6 Nm

Shaft connection to the application



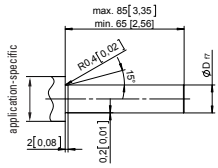


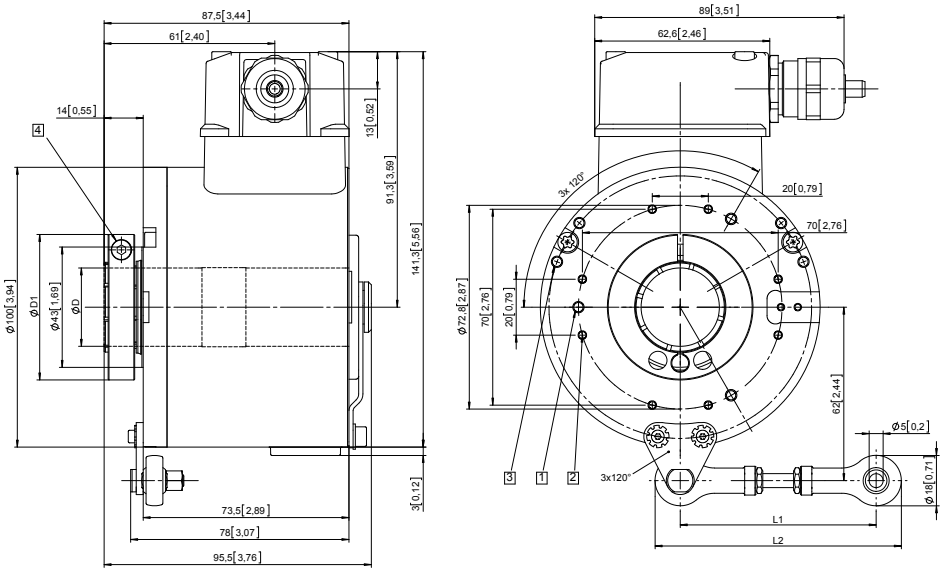
Fastening arm	L1		L2	
70 mm [2.76]	64 ... 74	[2.51 ... 2.91]	82 ... 92	[3.23 ... 3.62]
100 mm [3.93]	94 ... 104	[3.70 ... 4.09]	112 ... 122	[4.41 ... 4.80]
150 mm [5.91]	144 ... 154	[5.67 ... 6.06]	162 ... 172	[6.38 ... 6.77]

Flange with fastening arm
Through hollow shaft and terminal box (hollow shaft type K)

1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep
3 6 x M4
4 Recommended torque for the clamping ring 2 Nm (SW3)

Shaft connection to the application





D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1''	H7	47.5 [1.87]

Fastening arm	L1		L2	
70 mm [2.76]	64 ... 74	[2.51 ... 2.91]	82 ... 92	[3.23 ... 3.62]
100 mm [3.93]	94 ... 104	[3.70 ... 4.09]	112 ... 122	[4.41 ... 4.80]
150 mm [5.91]	144 ... 154	[5.67 ... 6.06]	162 ... 172	[6.38 ... 6.77]

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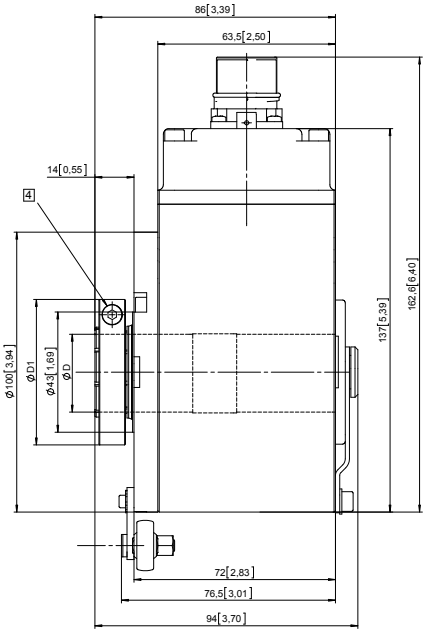
Heavy Duty hollow shaft, optical | **Sendix Heavy Duty H120 (hollow shaft)** | **Push-pull / RS422 / optical fiber**

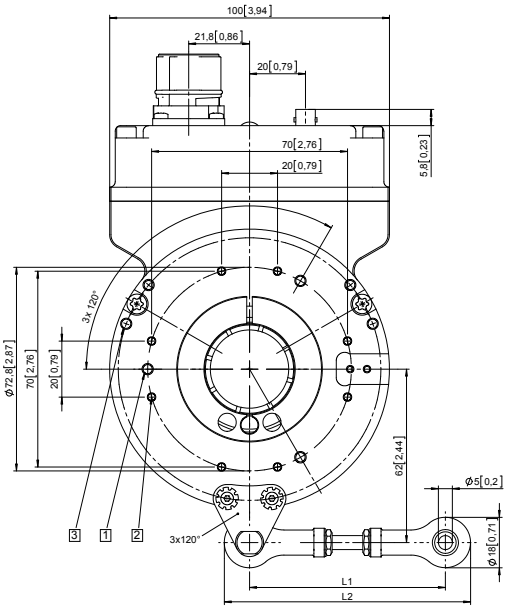
Dimensions

Dimensions in mm [inch]

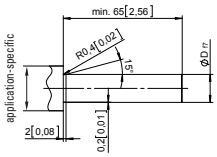
Flange with fastening arm through hollow shaft and optical fiber connection (type of connection L)

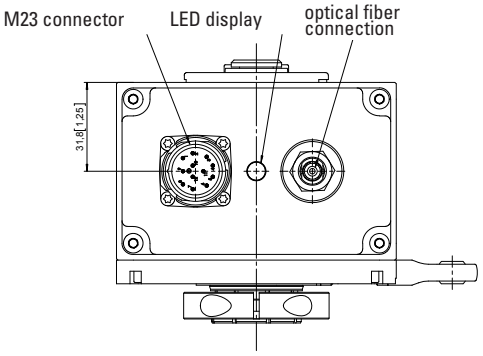
1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep
3 6 x M4
4 Recommended torque for the clamping ring 2 Nm (SW3)





Shaft connection to the application





D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1''	H7	47.5 [1.87]

Fastening arm	L1		L2	
70 mm [2.76]	64 ... 74	[2.51 ... 2.91]	82 ... 92	[3.23 ... 3.62]
100 mm [3.93]	94 ... 104	[3.70 ... 4.09]	112 ... 122	[4.41 ... 4.80]
150 mm [5.91]	144 ... 154	[5.67 ... 6.06]	162 ... 172	[6.38 ... 6.77]

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Absolute encoders - singleturn

Series			Type	Interface	Page
Miniature, magnetic			2450 / 2470 (shaft / hollow shaft)	SSI	**162**
Compact, magnetic			Sendix 3651 / 3671 (shaft / hollow shaft)	Analog	**165**
			Sendix M3658 / M3678 (shaft / hollow shaft)	CANopen	**170**
			Sendix M3658 / M3678 (shaft / hollow shaft)	SAE J1939	**175**
Compact, optical			Sendix F3653 / F3673 (shaft / hollow shaft)	SSI / BiSS + incremental	**180**
			Sendix F3658 / F3678 (shaft / hollow shaft)	CANopen	**186**
Standard, optical			5850 / 5870 (shaft / hollow shaft)	Parallel, analog	**191**
			5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed	**196**
			Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental	**200**
	Motor-Line	new	Sendix 5873 (tapered shaft)	SSI / BiSS + incremental	**208**
	SIL2/PLd		Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow s.)	SSI / BiSS + SinCos	**213**
	SIL3/PLe		Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow s.)	SSI / BiSS + SinCos	**220**
			Sendix 5858 / 5878 (shaft / hollow shaft)	PROFIBUS DP	**227**
			Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen	**232**
			Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT	**240**
			Sendix 5858 / 5878 (shaft / hollow shaft)	PROFINET IO	**245**
		new	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP	**250**
	Stainless steel		5876 (hollow shaft)	SSI, parallel	**255**
Standard, optical ATEX / IECEx – zone 1/21			Sendix 7053 / 7073 (shaft / hollow shaft)	SSI / BiSS	**259**
	SIL2/PLd		Sendix SIL 7053FS2 (shaft)	SSI / BiSS + SinCos	**264**
	SIL3/PLe		Sendix SIL 7053FS3 (shaft)	SSI / BiSS + SinCos	**268**
			Sendix 7058 / 7078 (shaft / hollow shaft)	PROFIBUS DP	**272**
			Sendix 7058 / 7078 (shaft / hollow shaft)	CANopen	**277**
Standard, optical ATEX / IECEx – mining			Sendix 7153 / 7173 (shaft / hollow shaft)	SSI / BiSS	**282**
			Sendix 7158 / 7178 (shaft / hollow shaft)	PROFIBUS DP	**287**
			Sendix 7158 / 7178 (shaft / hollow shaft)	CANopen	**291**

Miniature magnetic | 2450 / 2470 (shaft / hollow shaft) | SSI

The absolute singleturn encoders 2450 and 2470 with SSI interface and magnetic sensor technology are the specialists when space is tight.

Because of their high 12 bit resolution with 4096 different positions for 360° they offer exceptional repeat accuracy.

RoHS SSI

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

Minimal space requirement

- The outer diameter measures 24 mm; the shaft diameter up to max. 6 mm.
- Flexible connection with radial or axial cable outlet.

Durable and accurate

- Long service life and freedom from wear due to non-contact measuring system.
- Wide temperature range from -20°C up to +85°C.
- High 12 bit resolution with 4096 different positions for 360°.

Order code Shaft version

8.2450	.	X	X	1	X	.	G121
Type		a	b	c	d		e

a *Flange*
1 = ø 24 mm [0.94“]
3 = ø 28 mm [1.10“]
2 = ø 30 mm [1.18“]

b *Shaft (ø x L)*
1 = ø 4 x 10 mm [0.16 x 0.39“]
3 = ø 5 x 10 mm [0.20 x 0.39“], with flat
2 = ø 6 x 10 mm [0.24 x 0.39“]

c *Interface / power supply*
1 = SSI / 5 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56‘] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [6.56‘] PVC
B = radial cable, special length PVC *)
*) Available special lengths (connection types A, B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21‘]
order code expansion .XXXX = length in dm
ex.: 8.2450.111A.G121.0030 (for cable length 3 m)

e *Gray-code*
12 bit resolution

Order code Hollow shaft

8.2470	.	1	X	1	X	.	G121
Type		a	b	c	d		e

a *Flange*
1 = ø 24 mm [0.94“]

b *Blind hollow shaft*
(insertion depth max. 14 mm [0.55“])
1 = ø 4 mm [0.16“]
2 = ø 6 mm [0.24“]

c *Interface / power supply*
1 = SSI / 5 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56‘] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [6.56‘] PVC
B = radial cable, special length PVC *)
*) Available special lengths (connection types A, B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21‘]
order code expansion .XXXX = length in dm
ex.: 8.2470.111A.G121.0030 (for cable length 3 m)

e *Gray-code*
12 bit resolution

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Absolute encoders - singleturn

Miniature magnetic	2450 / 2470 (shaft / hollow shaft)	SSI

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 15 mm [0.59"] for shaft 4 mm [0.16"]	**8.0000.1202.0404**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Mass moment of inertia		approx. 0.1 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial	10 N
	axial	20 N
Weight		approx. 0.06 kg [2.11 oz]
Protection	housing side	IP65 (IP67 on request)
acc. to EN 60529	flange side	IP50 (IP67 on request)
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]
Material	shaft / hollow shaft	stainless steel
	clamping ring	MS58
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply		5 (+0.4) V DC [1]
Power consumption (no load)		< 40 mA
Reverse polarity protection of the power supply		yes
Short circuit proof output		yes [2]
Measuring range		360°
Linearity, 25°C [77°F]		< 1.5°
Repeat accuracy		≤ 0.4°
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485
Permissible load / channel		typ. 60 Ohm (acc. to RS485)
Resolution		12 bit
Code		gray
SSI clock speed		100 kHz ... 750 kHz
Monoflop time	typ. / max.	16 µs / 20 µs
Data refresh rate		typ. 100 µs

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)						
2	1, 2, A, B	Signal:	0 V	+V	C+	C-	D+	D-
		Cable color:	WH	BN	GN	YE	GY	PK

+V : Encoder power supply +V DC
0 V : Encoder power supply ground GND (0 V)
C+, C- : Clock signal
D+, D- : Data signal

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

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Miniature magnetic | **2450 / 2470 (shaft / hollow shaft)** | **SSI**

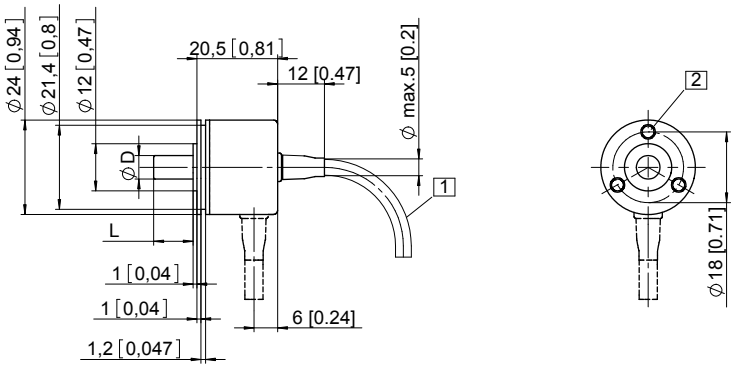
Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 min. R50 [1.97]

2 3 x M3, 4 [0.16] deep

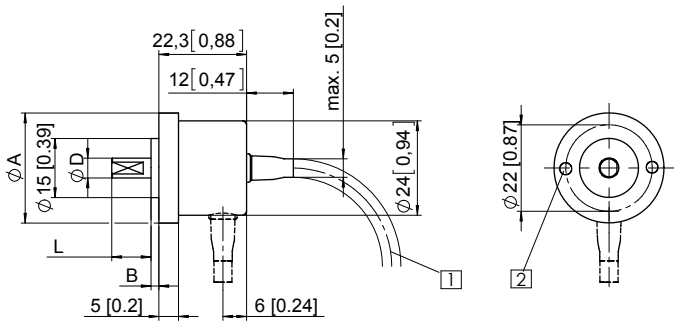


D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4“	f7	10 [0.39]

Flange type 2, ø 30 [1.18]
Flange type 3, ø 28 [1.10]

1 min. R50 [1.97]

2 2 x M3, 4 [0.16] deep



D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4“	f7	10 [0.39]

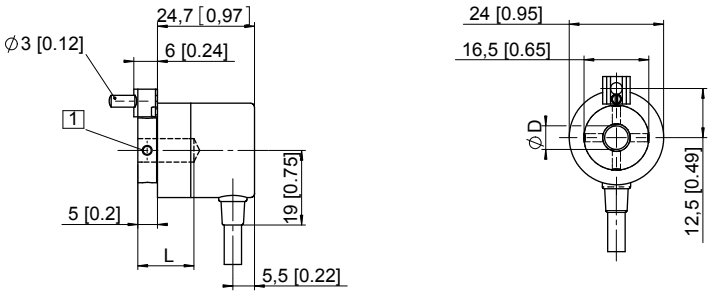
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 4 x M3 DIN 915 - SW1.5



D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4“	H7	14 [0.55]
L = insertion depth max. blind hollow shaft		

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Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analog**

Thanks to their different interfaces and measurement ranges, the Sendix 3651 and Sendix 3671 singleturn encoders with analog interface, in shaft and hollow shaft versions, are particularly flexible in use. A green and a red LED, acting as reference point and fault indicators, ensure easy installation and troubleshooting.

Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix are suitable even for demanding outdoor applications.

These encoders have an e1-approval from the German Federal Motor Transport Authority.

Safety-Lockplus™ | High rotational speed | Temperature range -40°...+85°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic sensor | Surface protection salt spray-tested optional

Safe operation

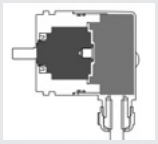
- Non-contact measuring system for long-life non-wear applications.
- Rugged die-cast-housing and protection up to IP69k for an exceptional tightness.
- High shock and vibration resistance for an exceptional robustness.

Compact and powerful

- Outer diameter of only 36 mm.
- The hollow shaft version is fitted with a blind hole with a diameter of up to 10 mm. It can be mounted as required with either a torque stop pin or a stator coupling.
- 360° with 12 bit resolution (4096 positions).
- For use in 12 V or 24 V vehicle electrical systems.

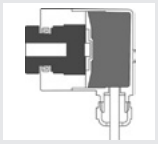
Safety-Lockplus™

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.



Order code Shaft version

8.3651	.	2	X	X	X	.	X	X	X	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = synchro flange, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
3 = ø 6 x 12.5 mm [0.24 x 0.49"]
6 = ø 8 x 12.5 mm [0.32 x 0.49"]
5 = ø 1/4" x 12.5 mm [0.49"]

c *Output circuit* [1]
3 = current output
4 = voltage output

d *Type of connection*
1 = axial cable, 1 m [3.28'] PUR
A = axial cable, special length PUR *)
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
3 = axial M12 connector, 5-pin
4 = radial M12 connector, 5-pin
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.3651.233A.1311.0030 (for cable length 3 m)

e *Measuring range*
1 = 1 x 360°
2 = 1 x 180°
3 = 1 x 90°
4 = 1 x 45°

f *Interface / power supply*
3 = 4 ... 20 mA / 10 ... 30 V DC
4 = 0 ... 10 V / 15 ... 30 V DC
5 = 0 ... 5 V / 10 ... 30 V DC

g *Option 1*
1 = count direction cw [2]
2 = count direction ccw [3]

h *Option 2*
1 = IP67
2 = IP69k

Optional on request
- Ex 2/22 (only for type of connection 3 + 4)
- surface protection salt spray tested

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".
2) cw = Increasing code values when shaft turning clockwise (cw). Top view on shaft.
3) ccw = Increasing code values when shaft turning counterclockwise (ccw). Top view on shaft.

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Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analog**

Order code Hollow shaft

8.3671 . X X X X . X X X X
Type — a b c d — e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = with spring element, long
5 = with stator coupling, ø 46 mm [1.81"]

b *Blind hollow shaft (insertion depth max. 18 mm [0.71"])*
2 = ø 6 mm [0.24"]
4 = ø 8 mm [0.32"]
6 = ø 10 mm [0.39"]
3 = ø 1/4"

c *Output circuit* [1)]
3 = current output
4 = voltage output

d *Type of connection*
1 = axial cable, 1 m [3.28'] PUR
A = axial cable, special length PUR *)
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
3 = axial M12 connector, 5-pin
4 = radial M12 connector, 5-pin
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.3671.523A.1311.0030 (for cable length 3 m)

e *Measuring range*
1 = 1 x 360°
2 = 1 x 180°
3 = 1 x 90°
4 = 1 x 45°

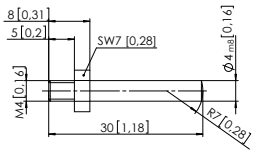
f *Interface / power supply*
3 = 4 ... 20 mA / 10 ... 30 V DC
4 = 0 ... 10 V / 15 ... 30 V DC
5 = 0 ... 5 V / 10 ... 30 V DC

g *Option 1*
1 = count direction cw [2)]
2 = count direction ccw [3)]

h *Option 2*
1 = IP67
2 = IP69k

Optional on request
- Ex 2/22 (only for type of connection 3 + 4)
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1}
Starting torque at 20°C [68°F]		< 0.06 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529		IP67 / IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR

Shock resistance acc. to EN 60068-2-27	5000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s^2, 10 ... 2000 Hz
Permanent shock resistance acc. to EN 60068-2-27	1000 m/s^2, 2 ms
Vibration (broad-band random) acc. to EN 60068-2-64	5 ... 2500 Hz, 100 m/s^2 - rms

General electrical characteristics

e1 compliant acc. to	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

2) cw = increasing code values when shaft turning clockwise (cw). Top view on shaft.
3) ccw = increasing code values when shaft turning counterclockwise (ccw). Top view on shaft.

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Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analog**

Electrical characteristics current interface 4 ... 20 mA

Sensor

Power supply		10 ... 30 V DC
Current consumption (no load)		max. 38 mA
Reverse polarity protection of the power supply		yes
Measuring range		45°, 90°, 180° or 360°
Resolution		12 bit
Absolute accuracy, 25°C [77°F]		±1°
Repeat accuracy, 25°C [77°F]		±0.2°
Status LED	red	break in current loop, input load too high.
	green	reference point display turns ON at cw: betw. 0° and 1° at ccw: betw. 0° and -1°

Current loop

Output load	max. 200 Ohm at 10 V DC max. 900 Ohm at 24 V DC
Setting time	< 1 ms R_{load} = 400 Ohm, 25°C [77°F]

Short-circuit proof outputs
When the power supply is correctly applied. But not output to +V.
Power supply and sensor output signal are not galvanically isolated.

Electrical characteristics voltage interface

Sensor

Power supply	output 0 ... 5 V	10 ... 30 V DC
	output 0 ... 10 V	15 ... 30 V DC
Current consumption (no load)		max. 35 mA
Reverse polarity protection of the power supply		yes
Measuring range		45°, 90°, 180° or 360°
Resolution		12 bit
Linearity, 25°C [77°F]		± 1°
Repeat accuracy, 25°C [77°F]		± 0.2°

Voltage output

Current output	max. 10 mA
Setting time	< 1 ms R_{load} ≥ 1 KOhm, 25°C [77°F]

Short-circuit proof outputs
When the power supply is correctly applied. But not output to +V.
Power supply and sensor output signal are not galvanically isolated.

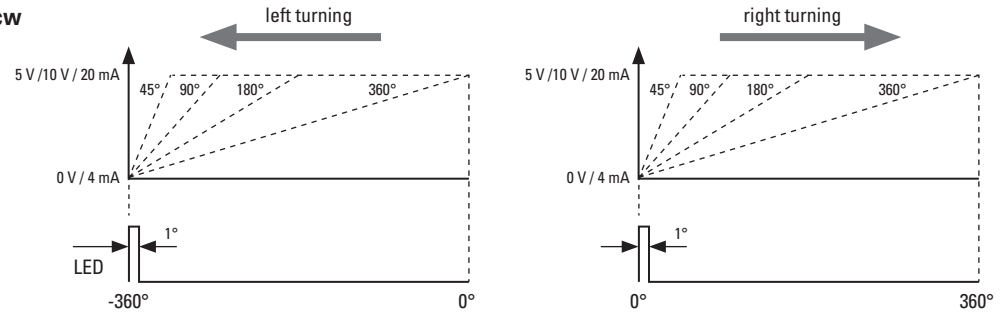
Status LED (green)

Status LED	green	reference point display turns ON at cw: betw. 0° and 1° at ccw: betw. 0° and -1°

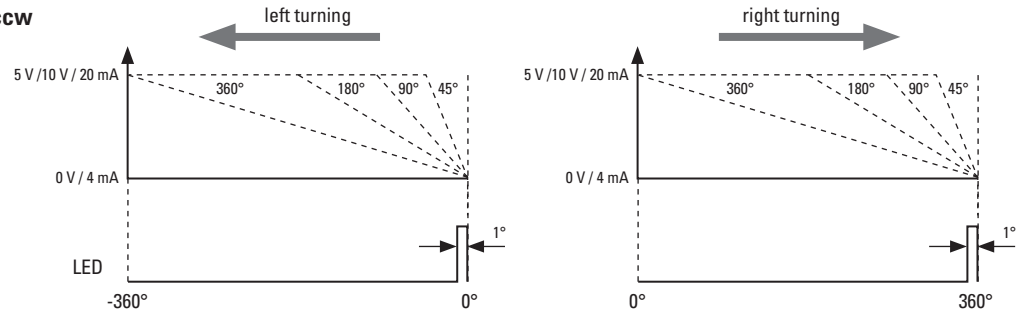
Example (output signal profile)

Measurement range 45° / 90° / 180° / 360°

Version cw



Version ccw



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Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analog**

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)				
3 (current)	1, 2, A, B	Signal:	0 V	+V	+I	-I
		Cable color:	WH	BN	GN	YE

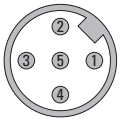
Interface	Type of connection	M12 connector, 5-pin				
3 (current)	3, 4	Signal:	0 V	+V	+I	-I
		Pin:	3	2	4	5

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)				
4, 5 (voltage)	1, 2, A, B	Signal:	0 V	+V	+U	-U
		Cable color:	WH	BN	GN	YE

Interface	Type of connection	M12 connector, 5-pin				
4, 5 (voltage)	3, 4	Signal:	0 V	+V	+U	-U
		Pin:	3	2	4	5

+V : Encoder power supply +V DC
0 V : Encoder power supply ground GND (0 V)
+U / -U : Voltage + / voltage -
+I / -I : Current + / current -

Top view of mating side, male contact base



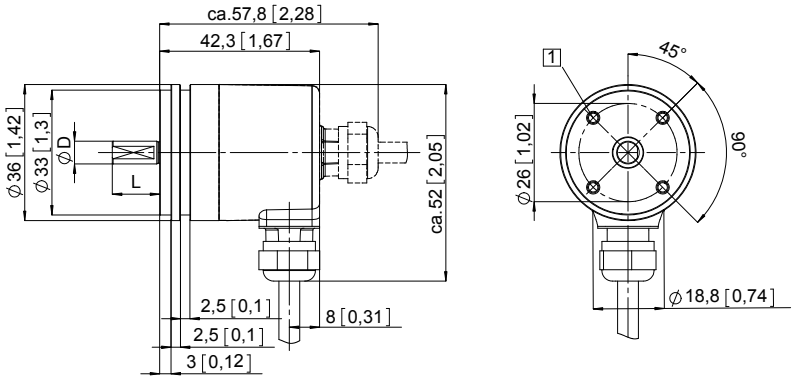
M12 connector, 5-pin

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with cable)

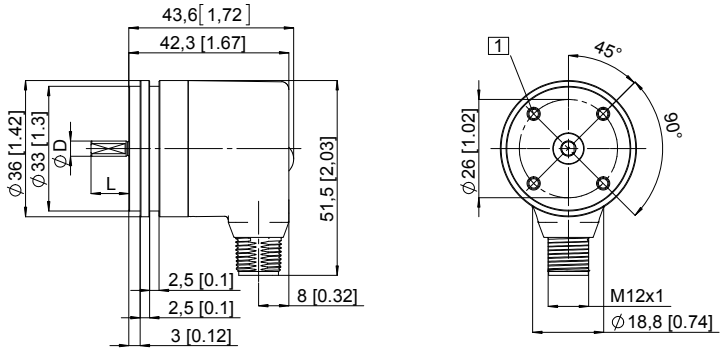
1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4“	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4“	h7	12.5 [0.49]

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Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analog**

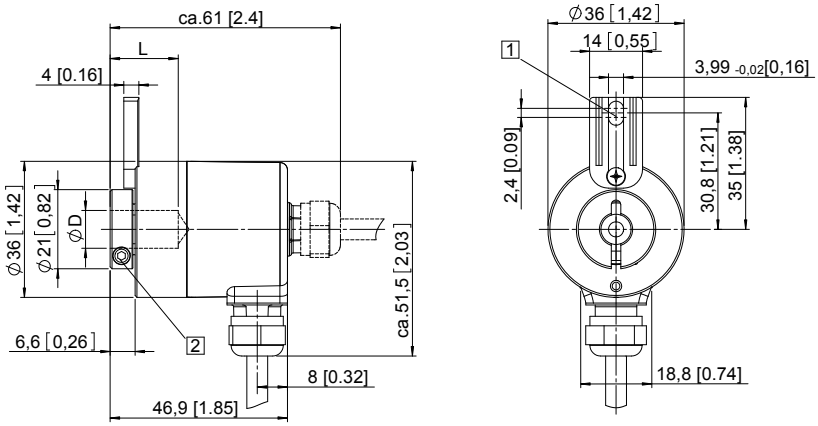
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 2

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

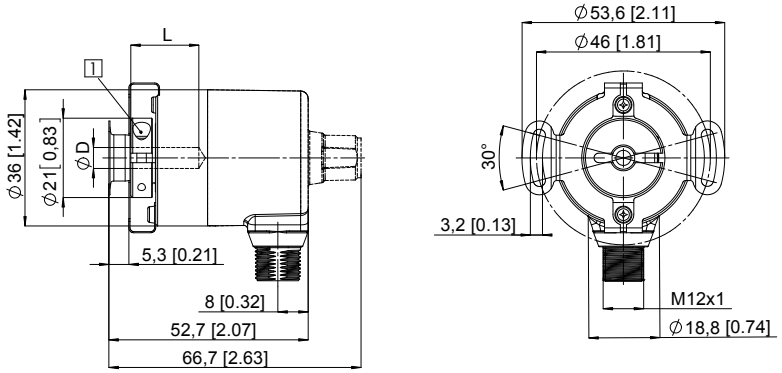
2 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]
L = insertion depth blind hollow shaft		

Flange with stator coupling, ø 46 [1.81]
Flange type 5

1 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]
L = insertion depth blind hollow shaft		

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Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **CANopen**

The Sendix M3658 and Sendix M3678 absolute encoders - singleturn with CANopen interface and magnetic sensor technology boast a resolution of 14 bits.

With a protection rating of up to IP69k, these encoders are resistant to shock and to extreme fluctuations in temperature, making them ideal for use in the most demanding outdoor applications.

Ex 2/22 | RoHS | CANopen

Safety-Lockplus™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic sensor | Surface protection salt spray-tested optional

Robust technology

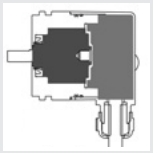
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety-Lockplus™ design.
- Resistant die-cast-housing and protection up to IP69k.

Versatile applications

- CANopen encoder profile DS406 V3.2.
- Fast determination of the operating status via two-color LED.
- With M12 connector or cable connection.

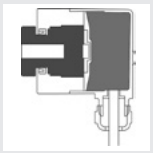
Safety-Lockplus™

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.



Order code shaft version

8.M3658	.	2	X	C	X	.	21	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = synchro flange, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
3 = ø 6 x 12.5 mm [0.24 x 0.49"]
6 = ø 8 x 12.5 mm [0.32 x 0.49"]
5 = ø 1/4" x 12.5 mm [0.49"]

c *Interface / power supply*
C = CANopen DS301 V4.02 / 8 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 5-pin

*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3658.23CB.2111.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

f *Protection*
1 = IP67
2 = IP69k

Optional on request
- Ex 2/22 (only for type of connection 4)
- surface protection salt spray tested

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Absolute encoders - singleturn

Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **CANopen**

Order code hollow shaft

8.M3678	.	X	X	C	X	.	21	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = with spring element, long
5 = with stator coupling, ø 46 mm [1.81"]

b *Blind hollow shaft (insertion depth max. 18 mm [0.71"])*
2 = ø 6 mm [0.24"]
4 = ø 8 mm [0.32"]
6 = ø 10 mm [0.39"]
3 = ø 1/4"

c *Interface / power supply*
C = CANopen DS301 V4.02 / 8 ... 30 V DC

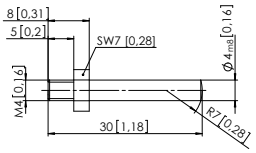
d *Type of connection*
2 = radial cable, 1 m [3.28] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 5-pin
*) Available special lengths (connection type B): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3678.52CB.2111.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

f *Protection*
1 = IP67
2 = IP69k

Optional on request
- Ex 2/22 (only for type of connection 4)
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1}
Starting torque at 20°C [68°F]		< 0.06 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP67 / IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz
Permanent shock resistance acc. to EN 60068-2-27		1000 m/s^2, 2 ms
Vibration (broad-band random) acc. to EN 60068-2-64		5 ... 2500 Hz, 100 m/s^2 - rms

Electrical characteristics

Power supply	8 ... 30 V DC
Current consumption (no load)	max. 25 mA
Reverse polarity protection of the power supply	yes
Measuring range	360°
Absolute accuracy, 25°C [77°F]	±1°
Repeat accuracy, 25°C [77°F]	±0.2°
Data refresh rate	400 µs
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Diagnostic LED (two-color, red/green)

LED ON or blinking	red	error display
	green	status display

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Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **CANopen**

Interface characteristics CANopen	
Resolution	1 ... 16384 (14 bit), scalable default: 16384 (14 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 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	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

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.2.

In addition, device specific profiles like the encoder profile DS406 V3.2 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 are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two color LED located on the back indicates the operating or fault status of the CANbus, as well as the status of the internal diagnostics.

CANopen communication profile DS301 V4.02

Among others, 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 CAN bus / programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 1 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.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific memory - 16 Bytes.
- Customer-specific protocol.
- "Watchdog controlled" device.

LSS protocol profile DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length Lu.

Lu < 5 m [16.40'] cable length for 125 Kbit.

Lu < 2 m [6.56'] cable length for 250 Kbit.

Lu < 1 m [3.28'] cable length for 1 Mbit.

When used as a drop line, the termination resistor should not be activated.

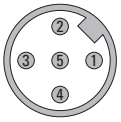
For a network with 3 encoders and 250 Kbit the maximum length of the drop line/ encoder must not exceed 70 cm.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
C	2, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
C	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

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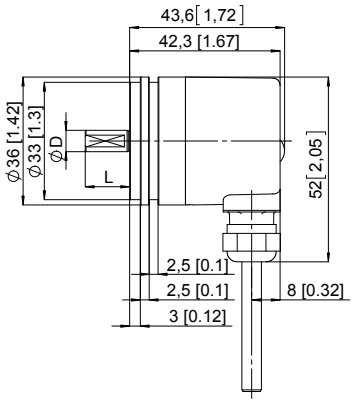
Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **CANopen**

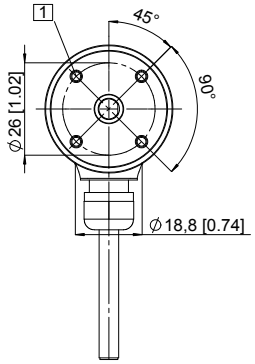
Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with cable)

1 4 x M3, 6 [0.24] deep

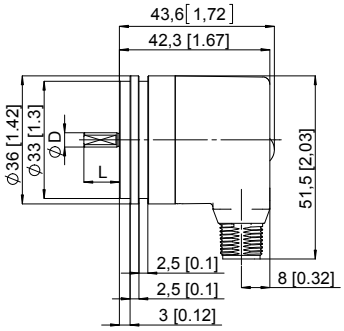


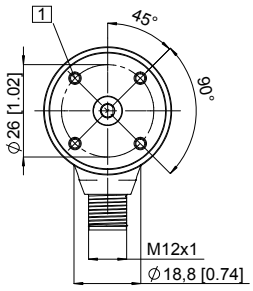


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep





D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

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Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **CANopen**

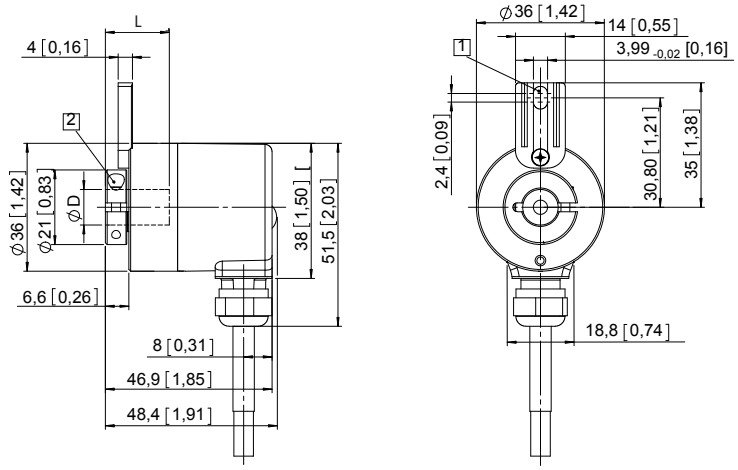
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 2

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

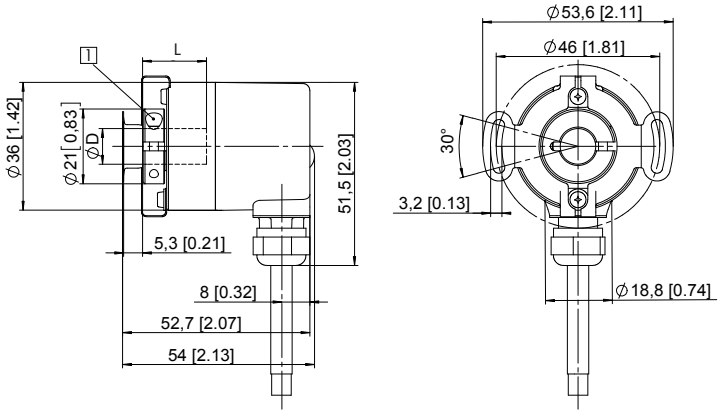
2 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4“	H7	18 [0.71]
L = insertion depth blind hollow shaft		

Flange with stator coupling, ø 46 [1.81]
Flange type 5

1 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4“	H7	18 [0.71]
L = insertion depth blind hollow shaft		

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Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **SAE J1939**

The absolute Sendix encoders M3658 and M3678 with SAE J1939 interface support all common requirements of the special protocol for utility vehicles and make a considerable contribution to the comprehensive system diagnostics or to fast fault localization.

The encoders offer fast, error-free start-up with no need to set switches; the encoder address is assigned automatically via Address Claiming (ACL).

Ex 2/22 RoHS SAE J1939

Safety-Lockplus™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection | Magnetic sensor | Surface protection salt spray-tested optional

Robust technology

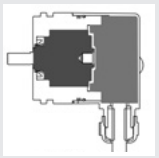
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety-Lockplus™ Design.
- Resistant die cast housing and protection up to IP69k.

Versatile applications

- Up-to-the-minute fieldbus performance in the application: SAE J1939 with CAN-highspeed to ISO 11898.
- Fast determination of the operating status via two-color LED.
- Fast, error-free start up with no need to set switches; with automatic address claiming (ACL).

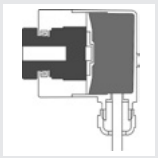
Safety-Lockplus™

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.



Order code Shaft version

8.M3658	.	2	X	C	X	.	32	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = synchro flange, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
3 = ø 6 x 12.5 mm [0.24 x 0.49"]
6 = ø 8 x 12.5 mm [0.32 x 0.49"]
5 = ø 1/4" x 12.5 mm [0.49"]

c *Interface / Power supply*
C = CAN Highspeed / 8 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 5-pin

*) Available special lengths (connection type B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3658.23CB.3211.0030 (for cable length 3 m)

e *Fieldbus profile*
32 = J1939

f *Protection*
1 = IP67
2 = IP69k

Optional on request
- Ex 2/22 (only for type of connection 4)
- surface protection salt spray tested

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Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **SAE J1939**

Order code Hollow shaft

8.M3678	.	X	X	C	X	.	3 2	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = with spring element, long
5 = with stator coupling, ø 46 mm [1.81"]

b *Blind hollow shaft (insertion depth max. 18 mm [0.71"])*
2 = ø 6 mm [0.24"]
4 = ø 8 mm [0.32"]
6 = ø 10 mm [0.39"]
3 = ø 1/4"

c *Interface / Power supply*
C = CAN Highspeed / 8 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 5-pin

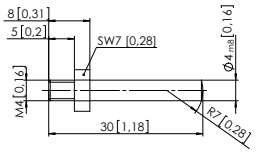
*) Available special lengths (connection type B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3678.52CB.3211.0030 (for cable length 3 m)

e *Fieldbus profile*
32 = J1939

f *Protection*
1 = IP67
2 = IP69k

Optional on request
- Ex 2/22 (only for type of connection 4)
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1}
Starting torque at 20°C [68°F]		< 0.06 Nm
Shaft load capacity	radial axial	40 N 20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP67 / IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft flange housing cable	stainless steel aluminum zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz
Permanent shock resistance acc. to EN 60068-2-27		1000 m/s^2, 2 ms
Vibration (broad-band random) acc. to EN 60068-2-64		5 ... 2500 Hz, 100 m/s^2 - rms

Electrical characteristics

Power supply	8 ... 30 V DC
Current consumption (no load)	max. 25 mA
Reverse polarity protection of the power supply	yes
Measuring range	360°
Absolute accuracy, 25°C [77°F]	±1°
Repeat accuracy, 25°C [77°F]	±0.2°
Data refresh rate	400 µs
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Diagnostic LED (two-color, red/green)

LED ON or blinking	red green	error display status display

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Absolute encoders - singleturn

Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **SAE J1939**

Interface characteristics CANopen	
Resolution	1 ... 16384 (14 bit), scalable default: 16384 (14 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	SAE J1939
Node address	1 ... 255 via address claiming
Baud rate	250 kbit/s
Termination	software configurable

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. Type 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.

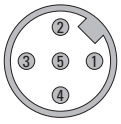
A two-color LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
C	2, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
C	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

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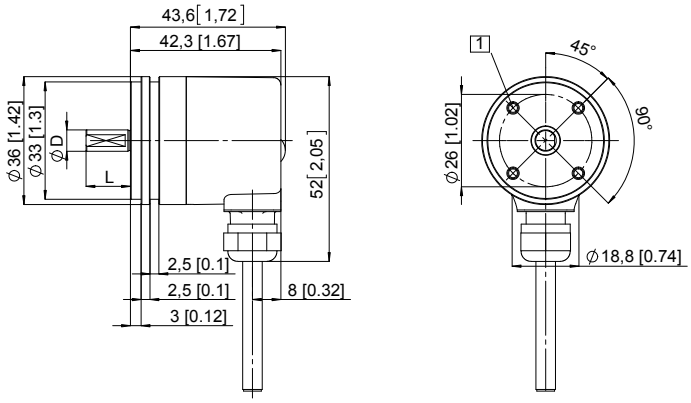
Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **SAE J1939**

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with cable)

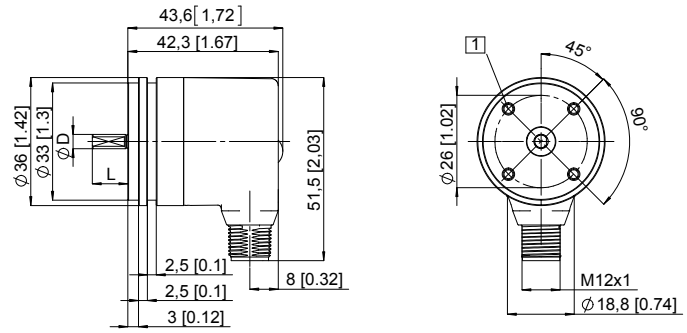
1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

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Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **SAE J1939**

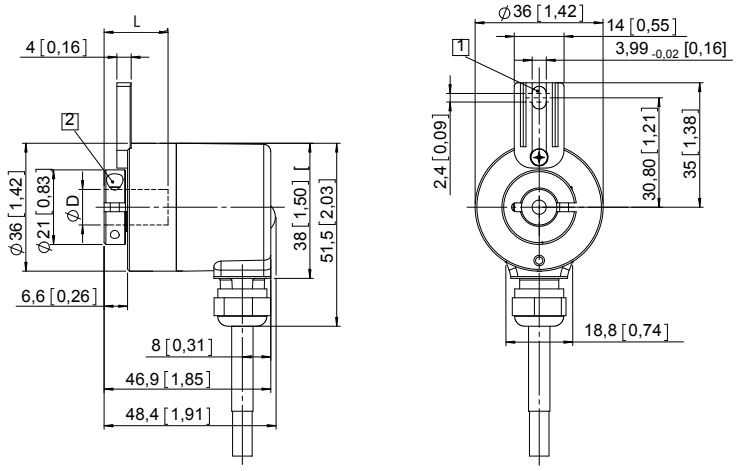
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 2

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

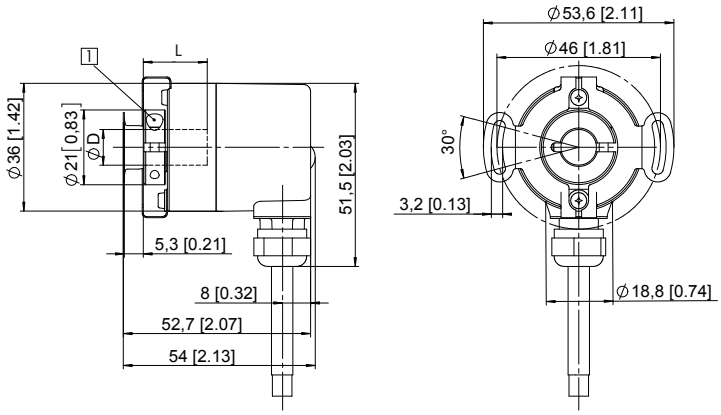
2 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]
L = insertion depth blind hollow shaft		

Flange with stator coupling, ø 46 [1.81]
Flange type 5

1 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]
L = insertion depth blind hollow shaft		

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Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS interface boasts exceptional ruggedness and compact dimensions.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm. Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.

Safety-Lock™ | Temperature range

High protection level

High shaft load capacity

Shock / vibration resistant

Magnetic field proof

Short-circuit proof

Reverse polarity protection

SinCos

Intelligent Scan Technology™

Surface protection salt spray-tested optional

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +90°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 17 bits and 100 % magnetic field insensitiveness.

Optimized performance

- High-precision with a data refresh rate of the position value ≤ 1µs.
- High-resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Shaft version

8.F3653	.	X	X	X	X	.	X	X	12
Type		a	b	c	d		e	f	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
4 = ø 3/8" x 5/8"

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28] PUR
3 = tangential cable, 5 m [16.40] PUR
F = tangential cable, special length PUR *)
8 = axial M12 connector, 8-pin [1)]

*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3653.432F.G312.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution*
A = 10 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

Optional on request
- surface protection salt spray tested
- other resolutions

1) Only with output circuits 1 and 2.

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Absolute encoders - singleturn

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Order code Hollow shaft

8.F3673 . X X X X . X X 12
Type
a b c d e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, short, IP65
3 = with spring element, long, IP65
2 = with stator coupling, IP65, ø 46 mm [1.81"]

b *Through hollow shaft*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
2 = ø 1/4"
Blind hollow shaft (insertion depth max. 14.5 mm [0.57"])
4 = ø 10 mm [0.39"]

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28] PUR
3 = tangential cable, 5 m [16.40] PUR
F = tangential cable, special length PUR *)
8 = axial M12 connector, 8-pin [1)]

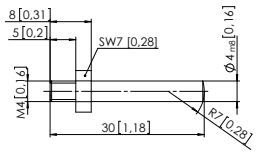
*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3673.242F.G312.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution*
A = 10 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

Optional on request
- surface protection salt spray tested
- other resolutions

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 3)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PUR cable	**05.00.6051.8211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
shaft version without shaft seal (IP65)		12000 min^{-1}
or blind hollow shaft version		10000 min^{-1} (continuous)
shaft version with shaft seal (IP67)		10000 min^{-1}
or hollow shaft version		8000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		
without shaft seal		< 0.007 Nm
with shaft seal (IP67		< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]

Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65 (solid shaft version opt. IP67)
Working temperature range		-40°C ... +90°C [-40°F ... +194°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

1) Only with interfaces 1 and 2 in combination with blind hollow shaft 10 mm [0.39"].

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Absolute encoders - singleturn

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 60 mA
	10 ... 30 V DC	max. 30 mA
Reverse polarity protection of the power supply		yes (only with 10 ... 30 V DC)
Short-circuit proof outputs		yes [1]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ. 3.8 V
	LOW with I_{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

BiSS interface

Resolution	10 ... 17 bit
Code	binary
BiSS clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Status output

Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active		LOW

The status output serves to display various alarm or error messages.
In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).

An active status output (LOW) displays:
LED fault (failure or ageing) – over-temperature – undervoltage
In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.

Incremental outputs (A/B)

	SinCos	RS422 TTL compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (±20 %)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes [1]	yes [1]
Pulse rate	2048 ppr	2048 ppr

SET input

Input		active HIGH
Input type		comparator
Signal level	HIGH	min. 60 % of +V, max: +V
(+V = power supply)	LOW	max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction 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 status output will switch to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

1) Short circuit proof to 0 V or to output when power supply correctly applied.

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Absolute encoders - singleturn

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)										
1, 2	1, 3, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	shield

Interface	Type of connection	Features	M12 connector, 8-pin									
1, 2	8	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)												
3, 4	1, 3, F	SET, DIR, 2048 SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)										
5	1, 3, F	SET, DIR, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 V_{sens}	+V_{sens}	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6	1, 3, F	2048 SinCos, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
7, 8	1, 3, F	2048 incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

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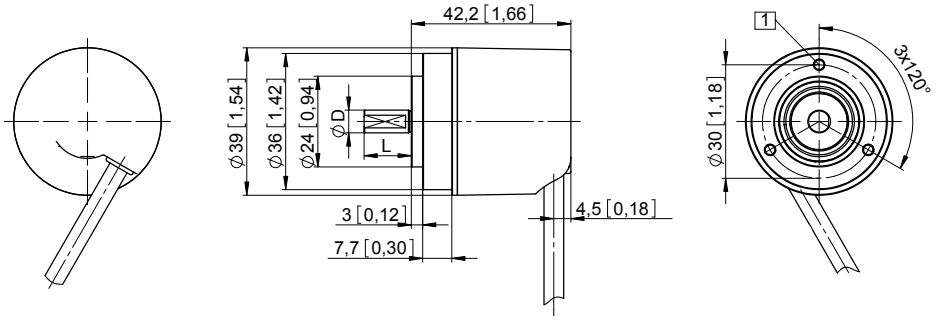
Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

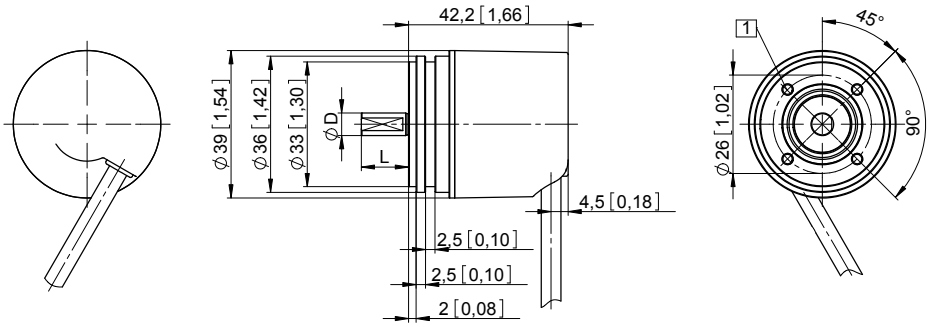
1 3 x M3, 6 [0.24] deep



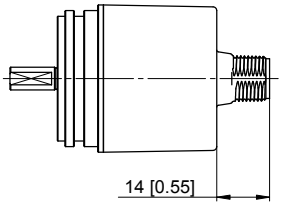
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Synchro flange, ø 36 [1.42]
Flange type 2 and 4
(drawing with cable)

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"



Drawing with M12 connector and type of connection 8

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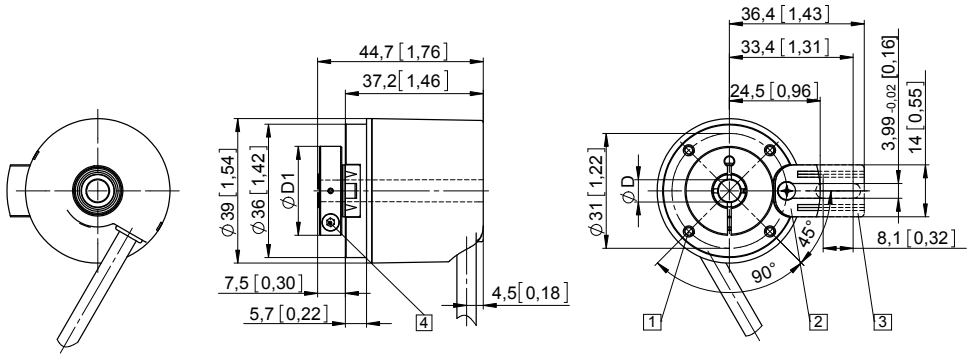
Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

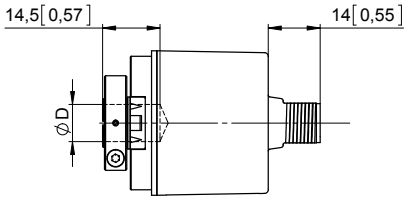
Flange with spring element
Flange type 1 and 3
(drawing with spring element short, spring element long is shown dashed)

1 4 x M2.5, 5 [0.2] deep
2 Spring element, short recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Spring element, long recommendation: cylindrical pin DIN 7, ø 4 [0.16]
4 Recommended torque for the clamping ring 0.7 Nm



D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

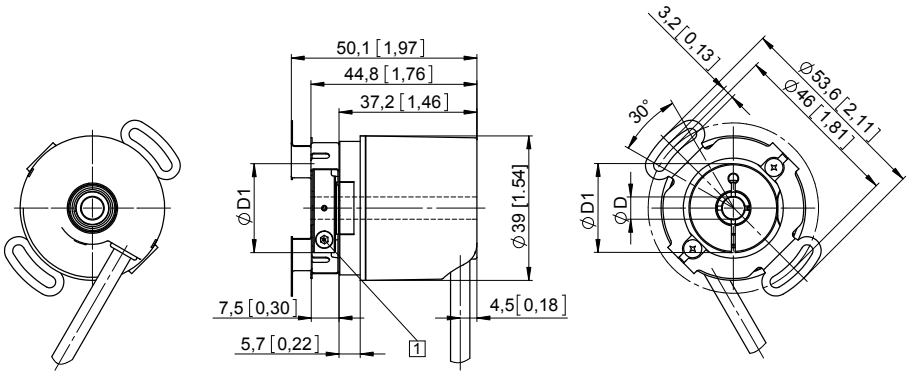
*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]



Blind hollow shaft for D = ø 10
drawing with M12 connector and type of connection 8

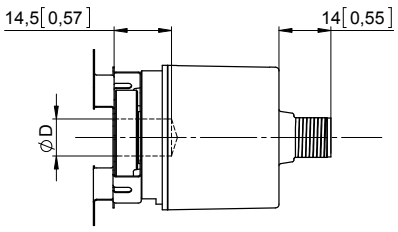
Flange with stator coupling, ø 46 [1.81"]
Flange type 2

1 Recommended torque for the clamping ring 0.7 Nm



D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]



Blind hollow shaft for D = ø 10
drawing with M12 connector and type of connection 8

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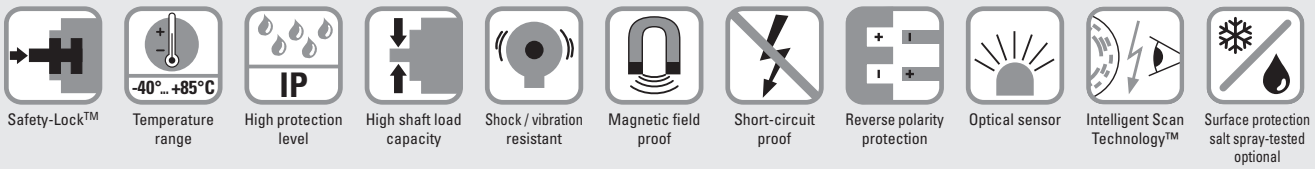
Compact optical | Sendix F3658 / F3678 (shaft / hollow shaft) | CANopen

The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and CANopen interface boasts exceptional ruggedness and compact dimensions.

With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm. Its high-precision optical sensor technology can achieve a resolution of up to 16 bits.



Safety-Lock™ | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 16 bits and 100 % magnetic field insensitiveness.

Up-to-the-minute fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.

Order code Shaft version

8.F3658 . X X 2 X . 21 1 2
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.49"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
4 = ø 3/8" x 5/8"

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
F = tangential cable, special length PUR *)

*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3658.432F.2112.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- surface protection salt spray tested

Order code Hollow shaft

8.F3678 . X X 2 X . 21 1 2
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, short, IP65
3 = with spring element, long, IP65
2 = with stator coupling, IP65, ø 46 mm [1.81"]

b *Blind hollow shaft*
(insertion depth max. 14.5 mm [0.57"])
5 = ø 6 mm [0.24"]
7 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"]
6 = ø 1/4"

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
F = tangential cable, special length PUR *)

*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3678.242F.2112.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- surface protection salt spray tested

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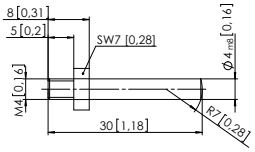
Absolute encoders - singleturn

Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 3)	with fixing thread 	**8.0010.4700.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed shaft version without shaft seal (IP65) or blind hollow shaft version		12000 min^{-1} 10000 min^{-1} (continuous)
shaft version with shaft seal (IP67)		10000 min^{-1} 8000 min^{-1} (continuous)
Starting torque at 20°C [68°F] without shaft seal with shaft seal (IP67)		 < 0.007 Nm < 0.01 Nm
Shaft load capacity	radial axial	40 N 20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	housing side shaft side	IP67 IP65 (solid shaft version opt. IP67)
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft flange housing cable	stainless steel aluminum zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply	ja
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen

Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 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	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

Diagnostic LED (two-color, red/green)

LED ON or blinking	red green	error display status display

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Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2 and DS305 (LSS) 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.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

CANopen communication profile DS301 V4.02

Among others, 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 V3.2

The following parameters can be programmed:

- Event mode.
- 1 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.
- User interface with visual display of bus and failure status – 1 LED two colors.
- Customer-specific memory 16 Bytes.
- Customer-specific protocol.
- "Watchdog controlled" device.

LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

CANbus connection

The CANopen encoders are equipped with a Bus trunk line in various lengths and can be terminated in the device. The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length Lu.

Lu < 5 m [16.40'] cable length for 125 Kbit
Lu < 2 m [6.56'] cable length for 250 Kbit
Lu < 1 m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

For a network with 3 encoders and 250 Kbit the maximum length of the drop line/ encoder must not exceed 70 cm.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
2	1, 3, F	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

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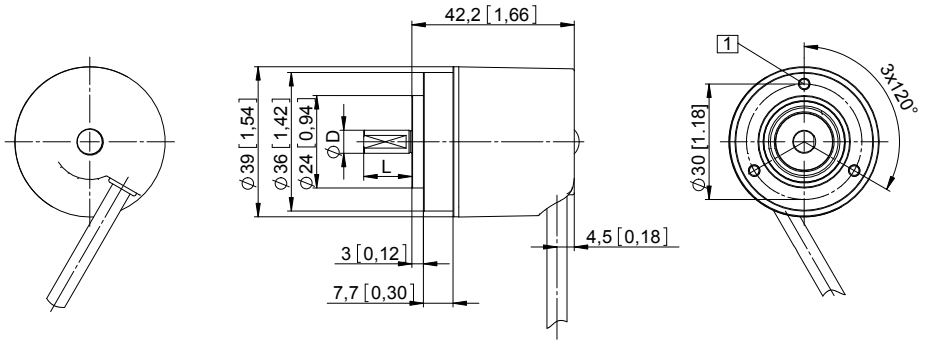
Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

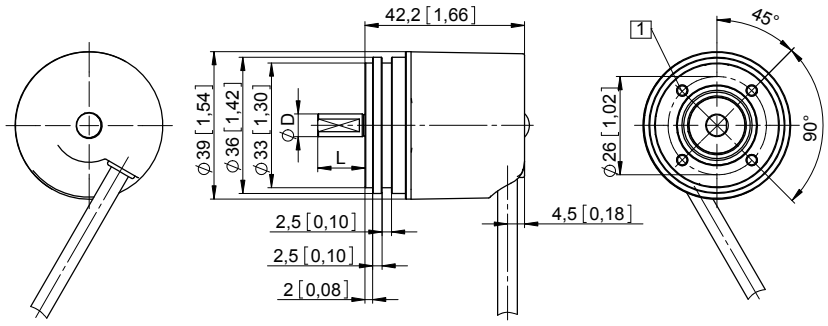
1 3 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

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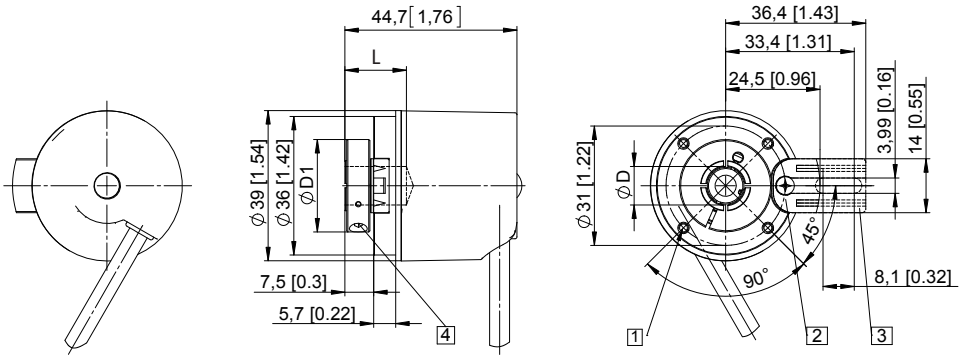
Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element
Flange type 1 and 3
(drawing with spring element short, spring element long is shown dashed)

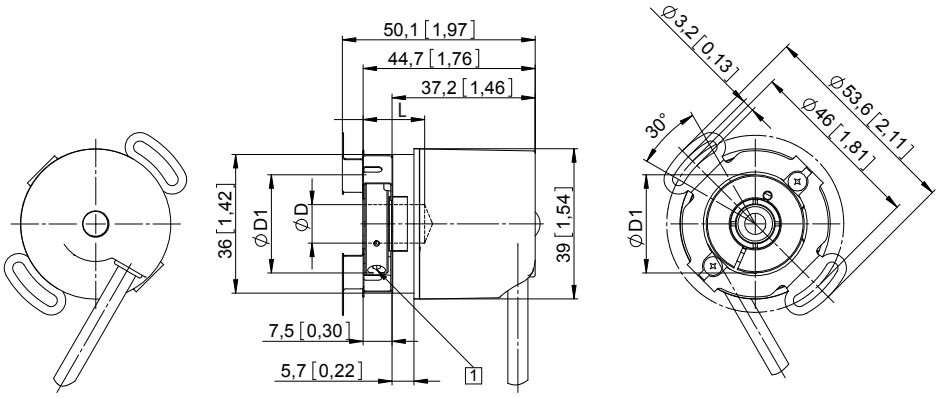
1 4 x M2.5, 5 [0.2] deep
2 Slot spring element, short recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Slot spring element, long recommendation: cylindrical pin DIN 7, ø 4 [0.16]
4 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81"]
Flange type 2

1 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]
L = insertion depth max. blind hollow shaft			

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Absolute encoders - singleturn

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analog**

The singleturn encoders 5850 and 5870 with parallel or analog interface and optical sensor technology feature a refresh rate of the position data of 1.6 kHz.

With the parallel output a resolution of max. 14 bit can be achieved – with the analog output the 4 ... 20 mA signals can achieve a resolution of 13 bits.

High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Optical sensor

Adaptable

- Power supply 5 V DC or 10 ... 30 V DC.
- Cable or connector.
- Gray code, binary code or BCD code.

Robust

- High shock resistance.
- Temperature range from -20°C up to +85°C.
- Protection rating up to max. IP66.

Order code Shaft version

8.5850 . X X X X . XXX X
Type — a b c d — e — f

a *Flange*
1 = clamping flange, ø 58 mm [2.28"]
2 = synchro flange, ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39"]
2 = 10 x 20 mm [0.39 x 0.79"]

c *Interface / power supply*
3 = parallel / 5 V DC
4 = parallel / 10 ... 30 V DC
7 = 4 ... 20 mA / 5 V DC
8 = 4 ... 20 mA / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
2 = radial cable, 1 m [3.28'] PVC
3 = axial M23 connector, without mating connector
5 = radial M23 connector, without mating connector

e *Code type and division*
G13 = 13 bit (for interface 7 and 8, 4 ... 20 mA)
see table 1 (for interface 3 and 4, parallel)

f *Options*
2 = SET [1] and V/R
3 = SET and Latch [1]
4 = V/R [1] and Latch

Order code Hollow shaft

8.5870 . X X X X . XXX X
Type — a b c d — e — f

a *Flange*
1 = hollow shaft with spring element, short
2 = blind hollow shaft with spring element, short
3 = hollow shaft with stator coupling, ø 65 mm [2.56"]
4 = blind hollow shaft with stator coupling, ø 65 mm [2.56"]

b *Hollow shaft*
(insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])
6 = ø 10 mm [0.39"]
8 = ø 12 mm [0.47"]

c *Interface / power supply*
3 = parallel / 5 V DC
4 = parallel / 10 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
2 = radial M23 connector, without mating connector

e *Code type and division*
see table 1 (for interface 3 and 4, parallel)

f *Options*
2 = SET [1] and V/R
3 = SET and Latch [1]
4 = V/R [1] and Latch

1) For parallel version, 14 bit and 17-pin connector.

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Absolute encoders - singleturn

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analog**

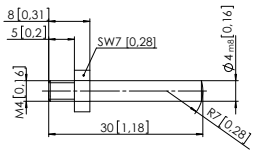
Table 1: Code type and divisions for encoders with parallel output — Interface and power supply, version 3 or 4 (parallel)

Division	250	360	500	720	900	1000	1024 10 bit	1250	1440	1800	2000	2500	2880	3600	4000	4096 12 bit	5000	7200	8192 13 bit	16384 14 bit
Order code Gray / Gray-Excess	E02	E03	E05	E07	E09	E01	G10	E12	E14	E18	E20	E25	E28	E36	E40	G12	E50	E72	G13	G14
Order code Binary	B02	B03	B05	B07	B09	B01	B10	BA2	BA1	B18	B20	B25	B28	B36	B40	B12	B50	B72	B13	B14
Order code BCD	D02	D03	D05	D07	D09	D01	D10	DA2	DA1	D18	D20									

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders

	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology

		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut for analog interface, 12-pin 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, for parallel interface, 17-pin 2 m [6.56'] PVC cable	**8.0000.6741.0002**
Connector, self-assembly (straight)	M23 female connector with coupling nut for analog interface, 12-pin	**8.0000.5012.0000**
	M23 female connector with coupling nut for parallel interface, 17-pin	**8.0000.5042.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	shaft version	12000 min^{-1}
	hollow shaft version	6000 min^{-1} 1)
Mass moment of inertia	shaft version	approx. 1.8 x 10^{-6} kgm^2
	hollow shaft version	approx. 6 x 10^{-6} kgm^2
Starting torque at 20°C [68°F]	shaft version	< 0.01 Nm
	hollow shaft version	< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.4 kg [14.11 oz]

Protection acc. to EN 60529	shaft version	IP65
	hollow shaft version	IP66
Working temperature range		-20°C ... +85°C 2) 3) [-4°F ... +185°F] 2) 3)
Material	shaft / hollow shaft	stainless steel
Shock resistance acc. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

1) For continuous operation max. 1500 min^{-1}.
2) 80°C [176°F] for shaft version and cable connection.
3) 70°C [158°F] for hollow shaft version and cable connection.

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Absolute encoders - singleturn

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analog**

Electrical characteristics parallel interface

Power supply (+V)		5 V DC (±5 %)	10 ... 30 V DC
Output driver		Push-pull	Push-pull
Power consumption (no load)	typ.	109 mA	109 mA
	max.	169 mA	169 mA
Permissible load / channel		max. +/- 10 mA	max. +/- 10 mA
Refresh rate of the position data		1600/s	1600/s
Signal level	HIGH	min. 3.4 V	min. +V - 2.8 V
	LOW (I_{Load} = 10 mA)	max. 1.5 V	max. 1.8 V
	LOW (I_{Load} = 1 mA)	max. 0.3 V	-
Rising edge time t_r (without cable)		max. 0.2 µs	max. 1 µs
Falling edge time t_f (without cable)		max. 0.2 µs	max. 1 µs
Short circuit proof outputs		no	no
Reverse polarity protection of the power supply		no	yes
UL approval		file 224618	
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Electrical characteristics voltage interface 4 ... 20 mA

(only shaft version)

Sensor

Interface type		4 ... 20 mA	4 ... 20 mA
Power supply (+V)		10 ... 30 V DC	5 V DC
Power consumption (no load)	typ.	70 mA	70 mA
	max.	84 mA	84 mA

Current loop

Power supply (+V)	10 ... 30 V DC
Analog signal	4 ... 20 mA
Max. input resistance of the input circuit	200 Ohm (Us = 10 V), 1 kOhm (Us = 30 V)
Measuring range	0 ... 360°
Max. error, 25°C [77°F]	0.2°
Resolution	13 bit
Setting time	max. 2 ms
Temperature coefficient	0.1°/10 K
Current with scan error	≤ 3.5 mA
Sensor component and current loop are galvanically isolated	
UL-certified	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Control inputs

Switching levels of the control inputs

Power supply		5 V DC	10 ... 30 V DC
Switching level	LOW	≤ 1.7 V	≤ 4.5 V
	HIGH	≥ 3.4 V	≥ 8.7 V

Up/Down input to switch the counting direction

As a standard, absolute encoders deliver increasing code values when the shaft rotates clockwise (cw), when looking from the shaft side. When the shaft rotates counter-clockwise (ccw), the output delivers accordingly 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. As long as the Up/Down input receives the corresponding signal (HIGH), this feature is reversed. Clockwise rotation will deliver decreasing code/current values while counter-clockwise rotation will deliver increasing code/current values.

The response time is: for 5 V DC power supply, 0.4 ms
for 10 ... 30 V DC power supply, 2 ms

SET input

This input is used to reset (zero) the encoder. A control pulse (HIGH) sent to this input allows the current position value to be saved as the 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 : After applying power to the encoder and before activating the SET input, a count direction (cw or ccw) must be clearly defined on the Up/Down input!

The response time is: for 5 V DC power supply, 0.4 ms
for 10 ... 30 V DC power supply, 2 ms

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 remains active (HIGH).

The response time is: for 5 V DC power supply, 140 µs,
for 10 ... 30 V DC power supply, 200 µs

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Absolute encoders - singleturn

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analog**

Terminal assignment

max. 13 bit, max. 2 options

Interface	Type of connection		Cable (isolate unused wires individually before initial start-up)																		
3, 4	5850:	1, 2	Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	⏚
(parallel)	5870:	1	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT PK	GY BU	RD GN	WH GN	BN YE	WH BN	YE GY	WH	

14 bit, max. 2 options

Interface	Type of connection		Cable (isolate unused wires individually before initial start-up)																			
3, 4	5850:	1, 2	Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	14	⏚
(parallel)	5870:	1	Cable 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	

max. 13 bit, max. 2 options

Interface	Type of connection		M23 connector, 17-pin																		
3, 4	5850:	3, 5	Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH		⏚
(parallel)	5870:	2	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		

14 bit, max. 1 option

Interface	Type of connection		M23 connector, 17-pin																		
3, 4	5850:	3, 5	Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR/LH	14		⏚
(parallel)	5870:	2	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		

13 bit

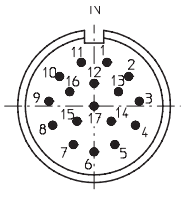
Interface	Type of connection		Cable (isolate unused wires individually before initial start-up)														
7, 8	5850:	1, 2	Signal	0 V	+V	-	-	+I	-I	ST	VR						
(4 ... 20 mA)			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU		

13 bit

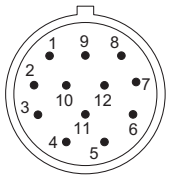
Interface	Type of connection		M23 connector, 12-pin													
7, 8	5850:	3, 5	Signal	0 V	+V	-	-	+I	-I	ST	VR					⏚	
(4 ... 20 mA)			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH	

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
Sig.: 1 =MSB; 2 = MSB-1; 3 = MSB-2 etc.
ST: SET input
Parallel: The current position value is stored as new zero position.
4 ... 20 mA: measured value set to 4 mA
VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
+I: Current loop input
-I: Current loop output
LH: LATCH input. Active HIGH. The current position is saved and is statically available at the output.
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base:



M23 connector, 17-pin (parallel)



M12 connector, 12-pin (4 ... 20 mA)

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Absolute encoders - singleturn

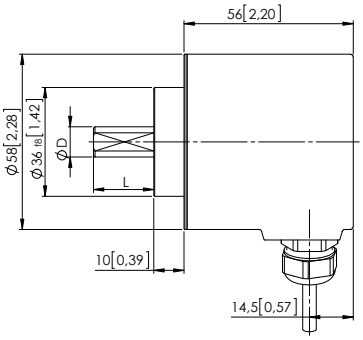
Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analog**

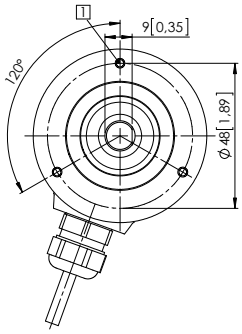
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
with shaft, ø 10 [0.39]
Flange type 1

[1] 3 x M3, 5 [0.20] deep

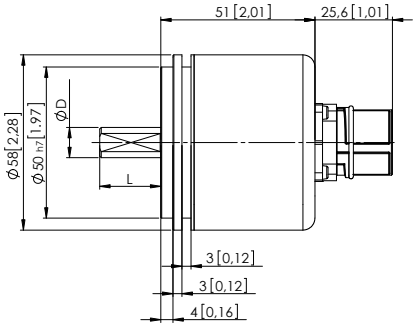


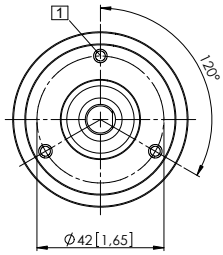


D	Fit	L
6 [0.24]	h8	10 [0.39]
10 [0.39]	f7	20 [0.79]

Synchro flange, ø 58 [2.28]
with shaft, ø 6 [0.24]
Flange type 2

[1] 3 x M4, 10 [0.39] deep





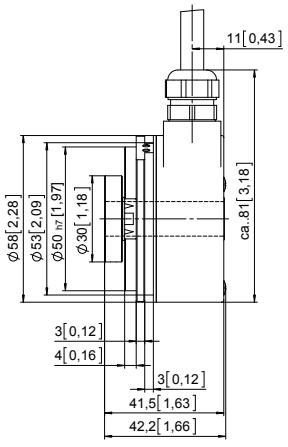
D	Fit	L
6 [0.24]	h8	10 [0.39]
10 [0.39]	f7	20 [0.79]

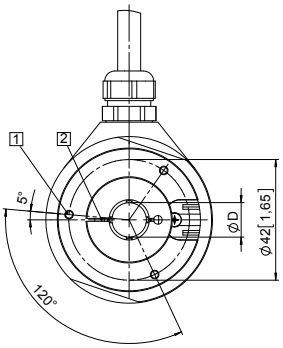
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1 and 2

[1] 3 x M3, 5 [0.20] deep
[2] Recommended torque for the clamping ring 0.6 Nm

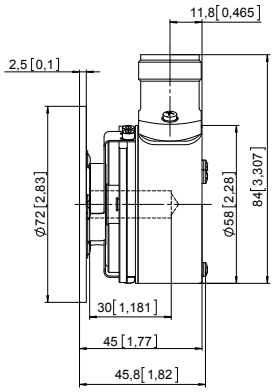


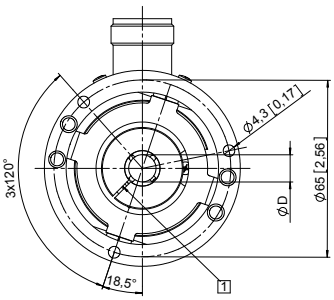


D	Fit
10 [0.39]	H7
12 [0.47]	H7
Insertion depth blind hollow shaft with flange 2: max. 30 mm [1.18"]	

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

[1] Recommended torque for the clamping ring 0.6 Nm





D	Fit
10 [0.39]	H7
12 [0.47]	H7
Insertion depth blind hollow shaft with flange 4: max. 30 mm [1.18"]	

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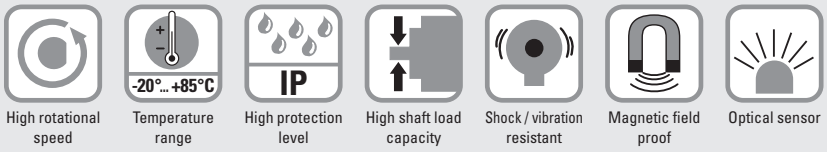
Absolute encoders - singleturn

Standard optical | **5852 / 5872 (shaft / hollow shaft)** | **Parallel, highspeed**

The singleturn encoders 5852 and 5872 with parallel interface and optical technology achieve a very high refresh rate of the position data of 40 kHz with a resolution of max. 14 bits.



High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Optical sensor

Adaptable

- Power supply 5 V DC or 10 ... 30 V DC.
- Cable or connector M23.

Fast

- Refresh rate of the position data 40 kHz.

Order code Shaft version

8.5852	.	XX	X	X	.	XXX	1
Type		a	b	c		d	

a *Flange, shaft*
12 = clamping flange, ø 58 mm [2.28"] with shaft 10 x 20 mm [0.39 x 0.79"]
21 = synchro flange, ø 58 mm [2.28"] with shaft 6 x 10 mm [0.24 x 0.39"]

b *Interface / power supply*
1 = parallel (CMOS-TTL) / 5 V DC
3 = parallel / 10 ... 30 V DC

c *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
2 = radial cable, 1 m [3.28'] PVC
3 = axial M23 connector, 17-pin, without mating connector
5 = radial M23 connector, 17-pin, without mating connector

d *Code type and division*
E03 = 360 gray-excess
E01 = 1000 gray-excess
E14 = 1440 gray-excess
E20 = 2000 gray-excess
G10 = 1024 (10 bit) gray
G12 = 4096 (12 bit) gray
G13 = 8192 (13 bit) gray
G14 = 16384 (14 bit) gray

Optional on request
- other code types
- other divisions

Order code Hollow shaft

8.5872	.	X	X	X	X	.	XXX	1
Type		a	b	c	d		e	

a *Flange*
1 = with spring element, short
3 = with stator coupling, ø 65 mm [2.56"]

b *Through hollow shaft*
6 = ø 10 mm [0.39"]
8 = ø 12 mm [0.47"]

c *Interface / power supply*
1 = parallel (CMOS-TTL) / 5 V DC
3 = parallel / 10 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
2 = radial M23 connector, 17-pin, without mating connector

e *Code type and division*
E03 = 360 gray-excess
E01 = 1000 gray-excess
E14 = 1440 gray-excess
E20 = 2000 gray-excess
G10 = 1024 (10 bit) gray
G12 = 4096 (12 bit) gray
G13 = 8192 (13 bit) gray
G14 = 16384 (14 bit) gray

Optional on request
- other code types
- other divisions

Reverse count direction

(Only with output type 3 and up to 13 bit gray code available)

Normal operation:

Rising code values when shaft turning clockwise (cw). Falling code values when shaft turning counterclockwise (ccw), top view of shaft.

Reverse operation:

Output MSB inverted (pin 16) instead of output MSB (pin 3) connected. Falling code values when shaft turning clockwise (cw). Rising code values when shaft turning counterclockwise (ccw), top view of shaft.

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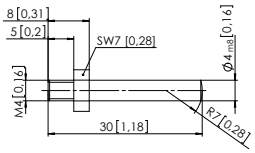
Absolute encoders - singleturn

Standard optical	5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 17-pin 2 m [6.56‘] PVC cable	**8.0000.6741.0002**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 17-pin	**8.0000.5042.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	shaft version	12000 min^{-1}
	hollow shaft version	6000 min^{-1} [1)]
Mass moment of inertia	shaft version	approx. 1.8 x 10^{-6} kgm^2
	hollow shaft version	approx. 6 x 10^{-6} kgm^2
Starting torque at 20°C [68°F]	shaft version	< 0.01 Nm
	hollow shaft version	< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	shaft version	IP65
	hollow shaft version	IP66
Working temperature range		-20°C ... +85°C [2)] [-4°F ... +185°F] [2)]
Material	shaft / hollow shaft	stainless steel
Shock resistance acc. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics (parallel interface)

Power supply (+V)		5 V DC (±5 %)	10 ... 30 V DC
Output driver		CMOS-TTL	Push-pull
Power consumption (no load)	typ.	40 mA	100 mA
	max.	75 mA	159 mA
Permissible load / channel		max. +0.5 / -2.0 mA	max. +/- 10 mA
Refresh rate of the position data		40000/s	40000/s
Signal level	HIGH	min. 3.4 V	min. +V - 2.8 V
	LOW	max. 0.3 V	max. 1.8 V
Rising edge time t_r (without cable)		max. 0.2 µs	max. 1µs
Falling edge time t_f (without cable)		max. 0.2 µs	max. 1µs
Short circuit proof outputs [3)]		yes	yes
Reverse polarity protection of the power supply		no	yes
UL approval		file 224618	
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

1) For continuous operation max. 1500 min^{-1}.
2) 70°C [158°F] for 14 bit version.
3) If power supply +V correctly applied.

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Absolute encoders - singleturn

Standard optical | **5852 / 5872 (shaft / hollow shaft)** | **Parallel, highspeed**

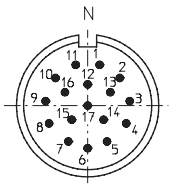
Terminal assignment

Interface	Type of connection		Cable (isolate unused wires individually before initial start-up)																	
1, 3	5852:	1, 2	Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	14 (V/R) [4]	
	5872:	1	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU	WH GN	BN GN	WH YE	YE BN	

Interface	Type of connection		M23 connector, 17-pin																		
1, 3	5852:	3, 5	Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	1 (V/R) [4]		⏚
	5872:	2	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
Signal : 1 = MSB; 2 = MSB-1; 3 = MSB-2 usw.
VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



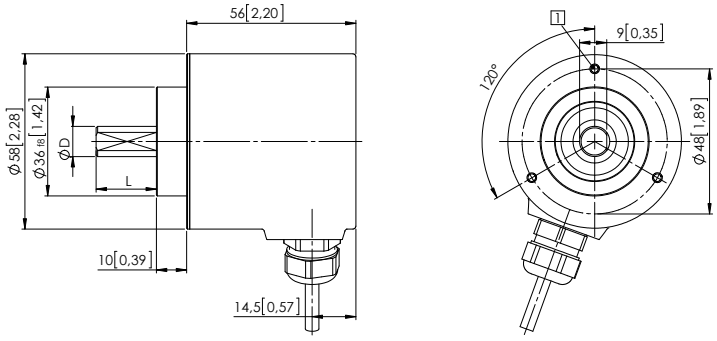
M23 connector, 17-pin (parallel)

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
with shaft, ø 10 [0.39]
Flange type 12

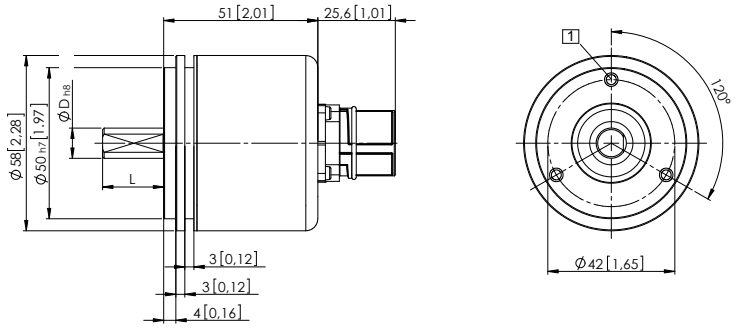
1 3 x M3, 5 [0.20] deep



D	Fit	L
6 [0.24]	h8	10 [0.39]
10 [0.39]	f7	20 [0.79]

Synchro flange, ø 58 [2.28]
with shaft, ø 6 [0.24]
Flange type 21

1 3 x M4, 10 [0.39] deep



D	Fit	L
6 [0.24]	h8	10 [0.39]
10 [0.39]	f7	20 [0.79]

1) V/R only with output circuit 3 up to max. 13 bit. MSB to change the count direction.

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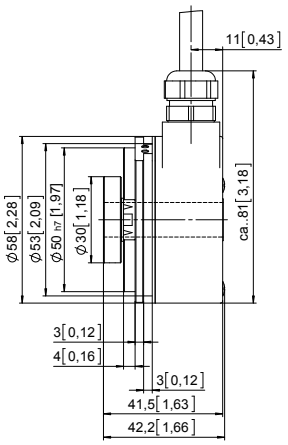
Standard optical | **5852 / 5872 (shaft / hollow shaft)** | **Parallel, highspeed**

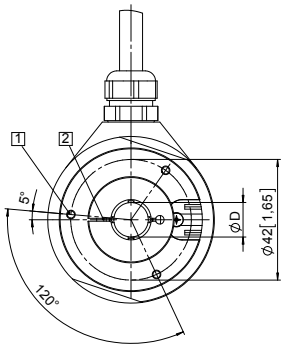
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

1 3 x M3, 5 [0.20] deep
2 Recommended torque for the clamping ring 0.6 Nm

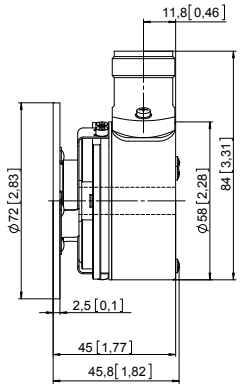


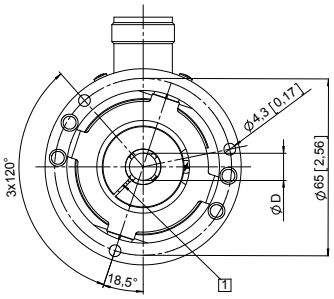


D	Fit
10 [0.39]	H7
12 [0.47]	H7

Flange with stator coupling, ø 65 [2.56]
Flange type 3

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit
10 [0.39]	H7
12 [0.47]	H7

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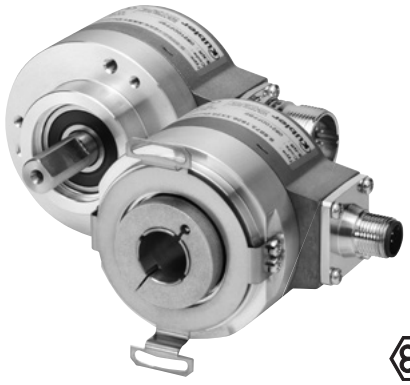
Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**



The Sendix 5853 and Sendix 5873 singleturn encoders with optical sensor technology can achieve a resolution of max. 21 bits.

Easy integration in the application thanks to the BiSS interface, with electronic data sheet.

This series offers special versions for use on direct drives for the lift technology.

Electronic data sheet | Safety-Lock™ | Temperature range -40°... +90°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SinCos | Optical sensor

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +90°C.

Versatile

- High-precision with a data refresh rate of the position value ≤ 1µs.
- High-resolution feedback in real-time via 21 bit fully digital or incremental outputs SinCos and RS422.
- BiSS-C BP3 encoder profile.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Shaft version

8.5853 . X X X X . X X 2 X
Type — a b c d — e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
- **1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- **2 = synchro flange, IP65 ø 58 mm [2.28"]**
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □63.5 mm [2.5"]
- 7 = square flange, IP67 □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
- **1 = 6 x 10 mm [0.24 x 0.39"]** 1)
- **2 = 10 x 20 mm [0.39 x 0.79"]** 2)
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c *Interface / power supply*
- 1 = SSI, BiSS / 5 V DC
- **2 = SSI, BiSS / 10 ... 30 V DC**
- 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
- 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
- 5 = SSI, BiSS / 5 V DC, with sensor output
- 6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
- 7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
- 8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC
- 9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output

d *Type of connection*
- 1 = axial cable, 1 m [3.28'] PVC
- A = axial cable, special length PVC *)
- **2 = radial cable, 1 m [3.28'] PVC**
- B = radial cable, special length PVC *)
- 3 = axial M23 connector, 12-pin
- **4 = radial M23 connector, 12-pin**
- 5 = axial M12 connector, 8-pin 3)
- 6 = radial M12 connector, 8-pin 3)

*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5853.112A.G323.0030 (for cable length 3 m)

e *Code*
- B = SSI, binary
- C = BiSS, binary
- **G = SSI, gray**

f *Resolution* 4)
- A = 10 bit
- 1 = 11 bit
- 2 = 12 bit
- **3 = 13 bit**
- 4 = 14 bit
- 7 = 17 bit
- C = 21 bit 5)

g *Inputs / outputs* 4)
- **2 = SET, DIR input** additional status output

h *Options (service)*
- 1 = no option
- 2 = status LED
- **3 = SET button and status LED**

Optional on request
- Ex 2/22 6)
- surface protection salt spray tested
- other resolutions

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.
3) Can be combined only with interface 1 and 2.
4) Resolution, preset value and counting direction factory-programmable.
5) Only in conjunction with interface 1 or 2 and code C.
6) For the cable connection type, cable material PUR.

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Absolute encoders - singleturn

Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Order code Hollow shaft

8.5873 . X X X X . X X 2 X
Type — a b c d — e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]
E = with stator coupling, IP65 mounting without screws [1]
F = with stator coupling, IP67 mounting without screws [1]
G = with stator coupling, IP65 ø 72 mm [2.83"] [1]
H = with expanding coupling, IP65 ø 65 mm [2.56"] [1]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"
Tapered shaft
K = ø 10 mm [0.39"]

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC
9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin
6 = radial M12 connector, 8-pin [2]

*) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5873.542B.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [3]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit
C = 21 bit [4]

g *Inputs / outputs* [3]
2 = SET, DIR input additional status output

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

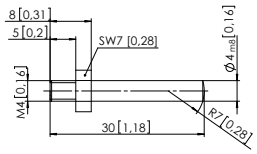
Optional on request
- Ex 2/22 (not with type of connection E or F) [5]
- surface protection salt spray tested
- other resolutions

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders

	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread	**8.0010.4700.0000**



Connection technology

		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Can be combined only with shaft K and type of connection E or F.
2) Can be combined only with interface 1 and 2.
3) Resolution, preset value and counting direction factory-programmable.
4) Only in conjunction with interface 1 or 2 and code C.
5) For the cable connection type, cable material PUR.

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Absolute encoders - singleturn

Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Technical data

Mechanical characteristics

Maximum speed shaft version		
	IP65 up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	IP65 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	11000 min^{-1}, 9000 min^{-1} (continuous)
	IP67 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	IP65 up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to T_{max}	4000 min^{-1}, 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.35 kg [12.35 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] [1]
Materials	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply		5 V DC (+5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes [2]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit; 17, 19 and 21 bit
Code		binary
Clock rate		50 kHz ... 10 MHz
Max. update rate		< 15 µs, depends on the clock rate and the data length
Data refresh rate		< 1 µs
Protocol		BiSS-C BP3 encoder profile

Note:
- Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification
- EDS (electronic data sheet)

Status output and LED

Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active		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 22 kOhm).

An active status output (LOW) displays:
- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or ageing)
- over- or under-temperature

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

Option incremental outputs (A/B), 2048 ppr

	SinCos	RS422 TTL compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (±20 %)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes	yes

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Absolute encoders - singleturn

Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

SET input or SET button

Input		active HIGH
Input type		comparator
Signal level	HIGH	min: 60 % of +V (power supply) max: +V
	LOW	max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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 button (with a pencil, ball-point pen or similar).
Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction 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 status output will switch to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

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Absolute encoders - singleturn

Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
1, 2	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
5	1, 2, A, B, E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
		sensor output	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
5	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
3, 4, 7, 8	1, 2, A, B, E, F	SET, DIR, SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		or incr. RS422	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
3, 4, 7, 8	3, 4	SET, DIR, SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		or incr. RS422	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6, 9	1, 2, A, B, E, F	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
		sensor output	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

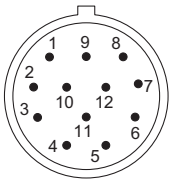
Interface	Type of connection	Features	M23 connector, 12-pin													
6, 9	3, 4	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	M12 connector, 8-pin								
1, 2	5, 6	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

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Absolute encoders - singleturn

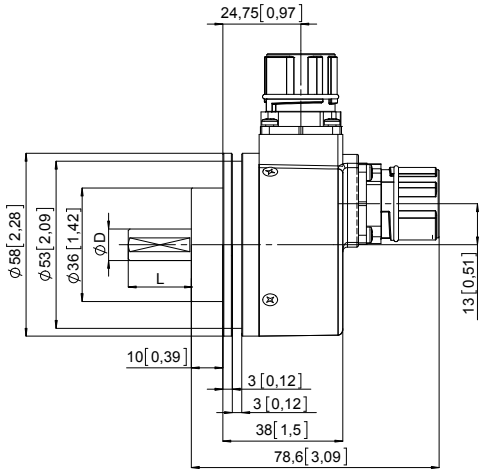
Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

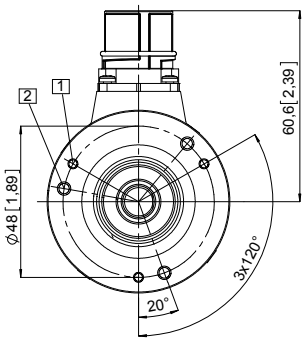
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

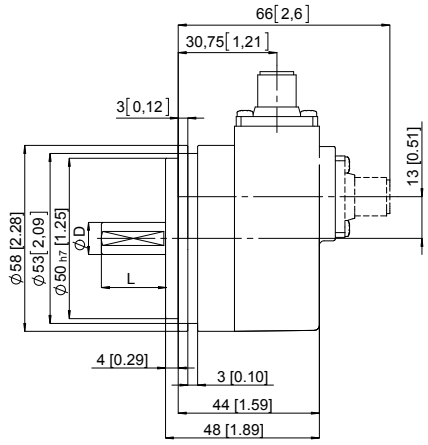


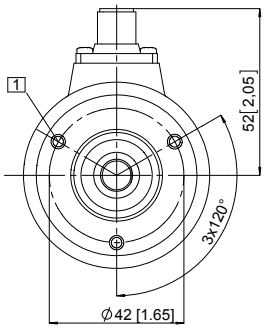


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

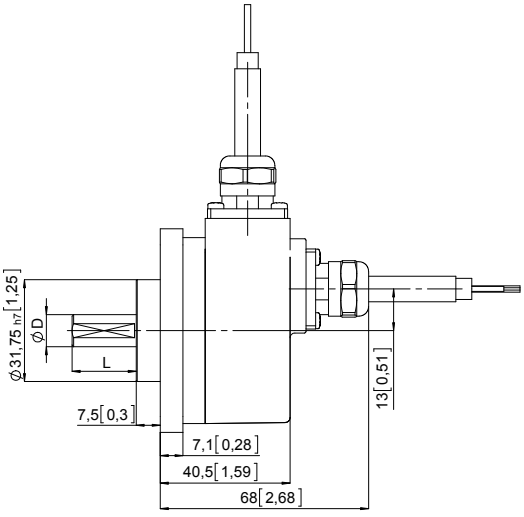
1 3 x M4, 6 [0.24] deep

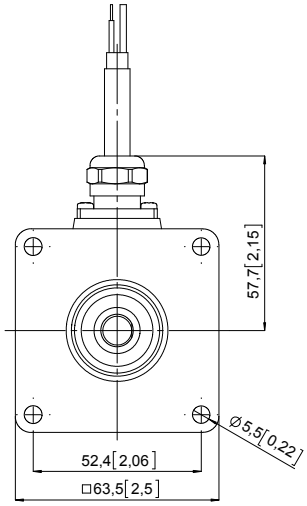




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

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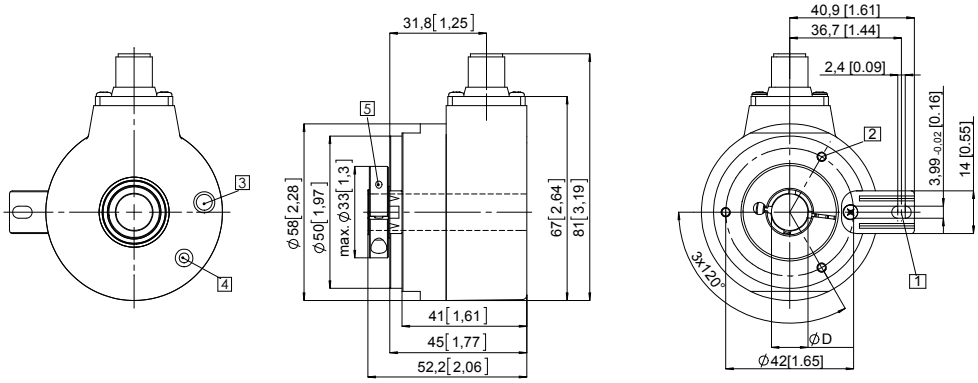
Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with M12 connector)

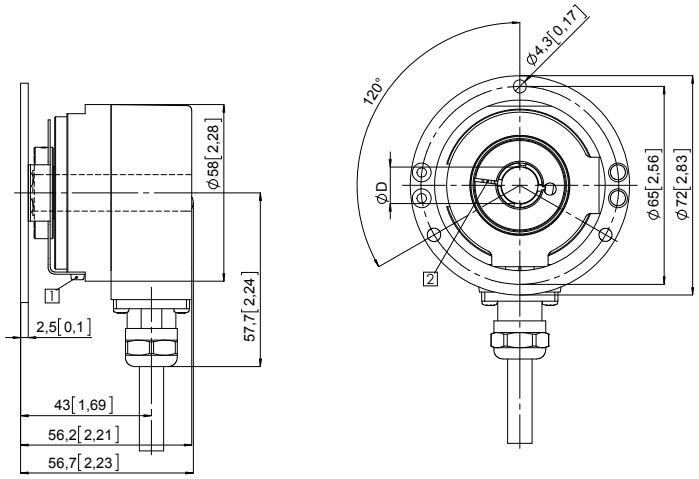
1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Status-LED
4 SET button
5 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with cable)

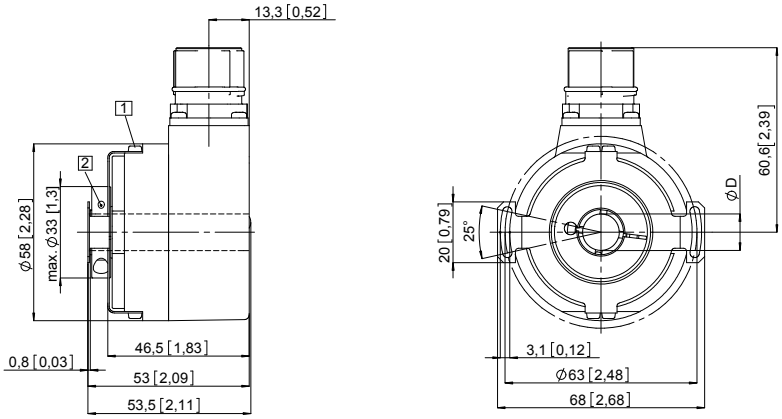
1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with M23 connector)

1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7

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Absolute encoders - singleturn

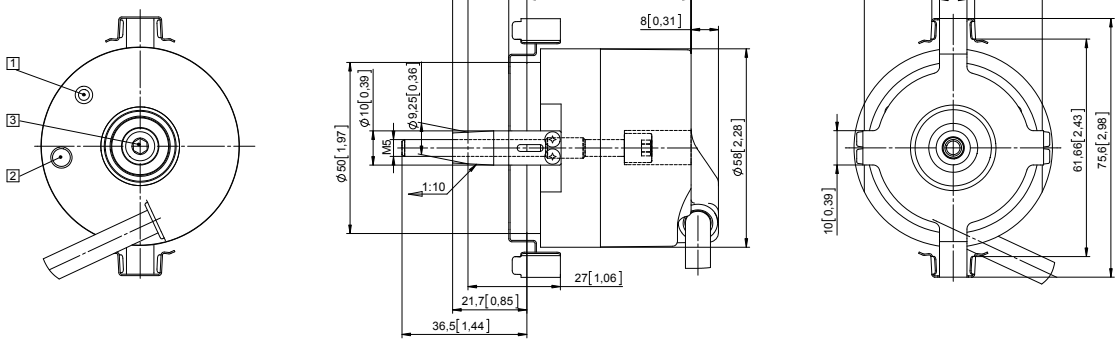
Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

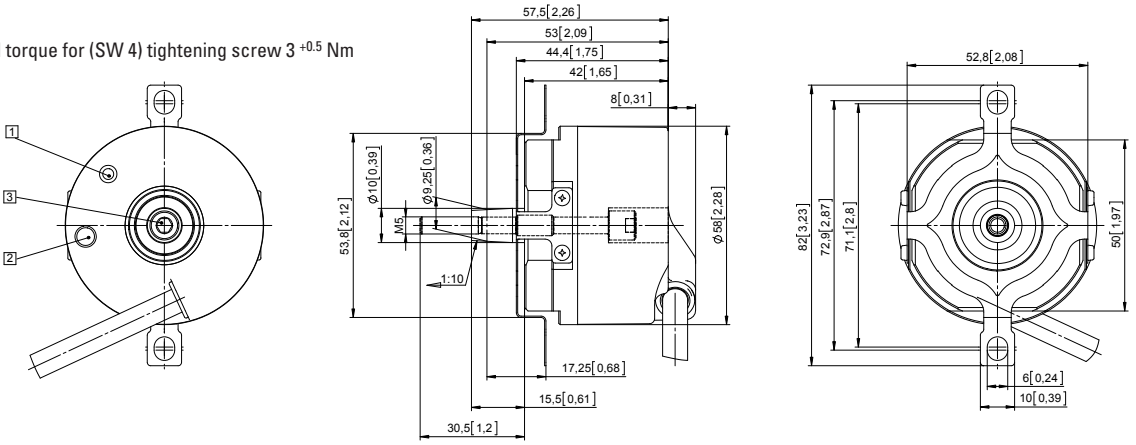
Flange with stator coupling, mounting without screws
Flange type E and F
(with tapered shaft K and tangential cable)

1 Status LED
2 SET button
3 Recommended torque for (SW 4) tightening screw 3 $^{+0.5}$ Nm



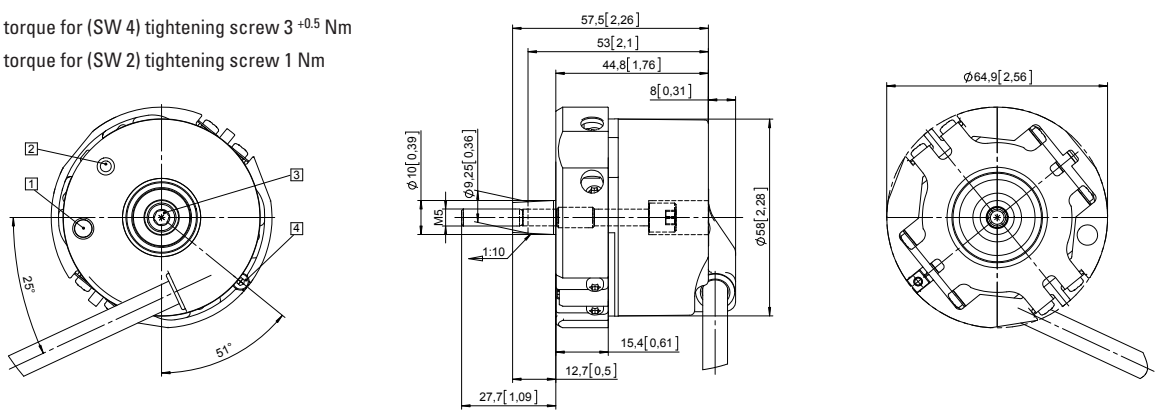
Flange with stator coupling, ø 72 [2.83]
Flange type G
(with tapered shaft K and tangential cable)

1 Status LED
2 SET Button
3 Recommended torque for (SW 4) tightening screw 3 $^{+0.5}$ Nm



Flange with expanding coupling, ø 65 [2.56"]
Flange type H

1 Status-LED
2 SET button
3 Recommended torque for (SW 4) tightening screw 3 $^{+0.5}$ Nm
4 Recommended torque for (SW 2) tightening screw 1 Nm



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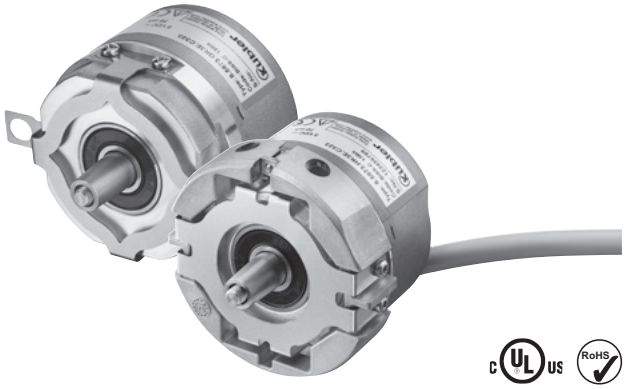
Standard
Motor-Line, optical

Sendix 5873 (tapered shaft)

SSI / BiSS + incremental



The optical Sendix 5873 singleturn encoders with SSI or BiSS interface and optional 2048 ppr SinCos incremental track reach a resolution of up to 21 bits.

Advantages: Plug-and-Play for commissioning, including electronic data sheet and possibility to set the absolute measuring system to a predefined position value.

Specially designed for mounting on direct drives in the elevator technology.

Electronic data sheet | Safety-Lock™ | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | SinCos | Optical sensor

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Encoder specially designed for mounting on direct drives in the elevator technology.

Versatile

- High-precision with a data refresh rate of the position value ≤ 1 µs.
- High-resolution feedback in real-time via 21 bit fully digital or incremental outputs SinCos and RS422.
- BiSS-C BP3 encoder profile.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Tapered shaft

8.5873	.	X	K	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

a *Flange*
G = with stator coupling, IP65, ø 72 mm [2.83"]
H = with expanding coupling, IP65, ø 65 mm [2.56"]

b *Tapered shaft*
K = ø 10 mm [0.39"]

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output
E = SSI, BiSS + 2048 ppr. SinCos / 4.5 ... 5.5 V DC, with sensor output [1]

d *Type of connection*
E = tangential cable, 1 m PVC
F = tangential cable, length PVC see below *)
G = tangential cable, with Sub-D connector (male contact, 15-pin, double-row), length PVC s. below *) [2]
H = tangential cable, with Phoenix Contact connector (MC1.5/16-STF-3.81), length PVC s. below *) [2]
L = with PCB connector [3] [6]
(without cable, including sealing cap for tangential cable outlet)

*) Available lengths (connection types F, G, H):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5873.GK2E.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [4]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit
C = 21 bit [5]

g *Inputs / outputs* [4]
2 = SET, DIR input
additional status output

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

1) Without reverse polarity protection.
2) Can be combined as a standard only with interface E (other variants on request).
3) IP40, only available without SET button and status LED, not available with interface 9, see the Accessories for the suitable connection cable.
4) Resolution, preset value and counting direction factory-programmable.
5) Only in conjunction with interface 1 or 2 and code C.
6) Series availability as from April 2017.

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Absolute encoders - singleturn

Standard Motor-Line, optical	Sendix 5873 (tapered shaft)	SSI / BiSS + incremental

Connection technology		Order no.
Cordset, pre-assembled (suitable for type of connection L)	PCB connector (female contacts), 12-pin 2 m [6.56'] PVC cable	**8.0000.6D91.0002** 3)

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
	IP65 up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	IP65 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Mass moment of inertia		3.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.35 kg [12.35 oz]
Protection	housing side	IP67
acc. to EN 60529	shaft side	IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] (+105°C [+212°F] with interface E) 1)
Materials	tapered shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC
Shock resistance acc. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply		5 V DC (+5 %) 4.5 ... 5.5 V DC or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes (not for interface E)
Short circuit proof outputs		yes 2)
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit; 17, 19 and 21 bit
Code		binary
Clock rate		50 kHz ... 10 MHz
Max. update rate		< 15 µs, depends on the clock rate and the data length
Data refresh rate		< 1 µs
Protocol		BiSS-C BP3 encoder profile

Note:
- Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification
- EDS (electronic data sheet)

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
3) Series availability as from April 2017.

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Absolute encoders - singleturn

Standard
Motor-Line, optical

Sendix 5873 (tapered shaft)

SSI / BiSS + incremental

Status output and LED

Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active		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 22 kOhm).

An active status output (LOW) displays:
- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or ageing)
- over- or under-temperature

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

Option incremental outputs (A/B), 2048 ppr

	SinCos	**RS422 TTL compatible**
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (±20 %)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes	yes

SET input or SET button

Input		active HIGH
Input type		comparator
Signal level	HIGH	min: 60 % of +V (power supply) max: +V
	LOW	max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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 button (with a pencil, ball-point pen or similar).
Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Note: In case of use of the BiSS interface, the SET function is carried out through BiSS.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

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Absolute encoders - singleturn

Standard Motor-Line, optical | **Sendix 5873 (tapered shaft)** | **SSI / BiSS + incremental**

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
5	E, F	SET, DIR, Status sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
3, 4	E, F	SET, DIR, SinCos or incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6, 9, E	E, F	SinCos or incr. RS422 sensor output	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Tangential cable, with Phoenix Contact connector (MC1.5/16-STF-3.81), 16-pin														
E	H	SinCos sensor output	Signal:	+V	+Vsens	0 V	0Vsens	N/C	A	$\overline{A}$	B	$\overline{B}$	C+	C-	D+	D-	N/C	N/C	N/C
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Interface	Type of connection	Features	Tangential cable, with Sub-D connector (male contact), 15-pin														
E	G	SinCos sensor output	Signal:	A	0 V	B	+V	D+	–	–	C+	$\overline{A}$	0Vsens	$\overline{B}$	+Vsens	D-	–	C-	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

Interface	Type of connection	Features	PCB connector (male contact), 12-pin											
E	L	SinCos sensor output	Signal:	D-	+V	A	C+	0Vsens	$\overline{B}$	B	0 V	C-	$\overline{A}$	+Vsens	D+	
			Pin:	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	

Interface	Type of connection	Features	PCB connector (male contact), 12-pin											
1, 2	L	SET, DIR	Signal:	D-	+V	–	C+	DIR	–	–	0 V	C-	–	SET	D+	
			Pin:	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	

Interface	Type of connection	Features	PCB connector (male contact), 12-pin											
3, 4	L	SET, DIR, SinCos	Signal:	D-	+V	A	C+	DIR	$\overline{B}$	B	0 V	C-	$\overline{A}$	SET	D+	
			Pin:	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	

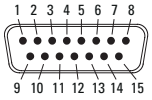
Interface	Type of connection	Features	PCB connector (male contact), 12-pin											
5	L	SET, DIR, sensor output	Signal:	D-	+V	–	C+	0Vsens	–	–	0 V	C-	–	+Vsens	D+	
			Pin:	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
Stat: Status output
PH ⏚: Plug connector housing (shield)

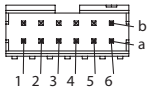
Top view of mating side, male contact base

Type of connection H
Phoenix Contact connector
(MC1.5/16-STF-3.81), 16-pin

Type of connection G
Sub-D connector (male contact),
double-row, 15-pin



Type of connection L
FCI Minitek connector (male contact),
double-row, 12-pin (98424-F52-12-LF)



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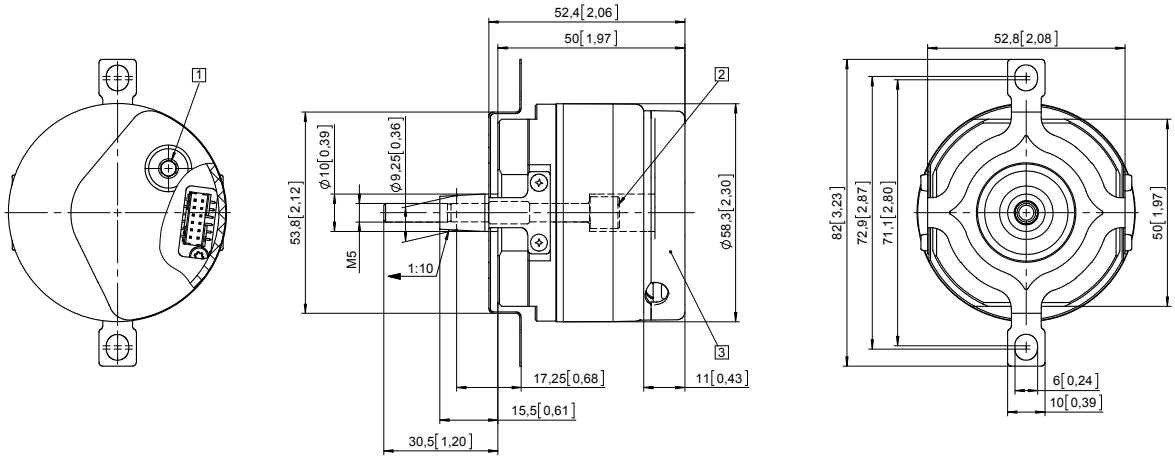
Standard
Motor-Line, optical | **Sendix 5873 (tapered shaft)** | **SSI / BiSS + incremental**

Dimensions tapered shaft version

Dimensions in mm [inch]

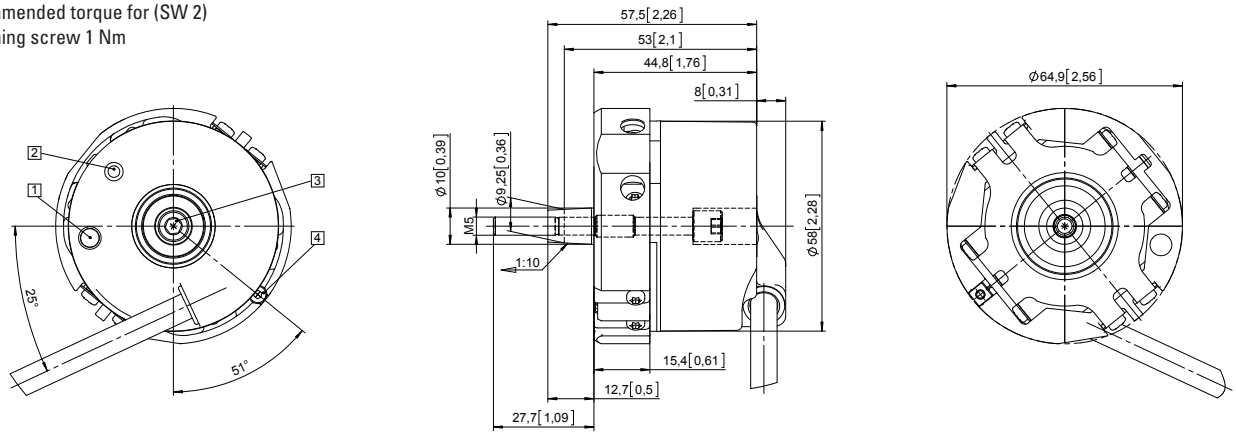
Flange with stator coupling, ø 72 [2.83]
Flange type G
(with tapered shaft K and tangential cable)

1 Recommended torque for screw M6 (SW 4) 2.0 $^{+0.5}$ Nm
2 Recommended torque for tightening screw M6 (SW 4) 3.0 $^{+0.5}$ Nm
3 Sealing cap for tangential cable outlet



Flange with expanding coupling,
ø 65 [2.56"]
Flange type H

1 Status-LED
2 SET button
3 Recommended torque for (SW 4) tightening screw 3 $^{+0.5}$ Nm
4 Recommended torque for (SW 2) tightening screw 1 Nm



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Absolute encoders - singleturn

Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

SSI / BiSS + SinCos

The absolute singleturn encoders 5853FS2 and 5873FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

The extra strong Safety-Lock™ design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.

Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Order code Shaft version

8.5853FS2 . 1 X X X . X X 2 X
Type — a b c d — e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin

*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5853FS2.124A.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Input / output* [1]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 [2]
- other resolutions

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.

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Absolute encoders - singleturn

Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

SSI / BiSS + SinCos

Order code Hollow shaft

8.5873FS2	.	X	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
9 = with torque stop, flexible, IP65
A = with torque stop set, rigid, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
Tapered shaft
K = ø 10 mm [0.39"]

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5873FS2.B44B.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Input / output* [1]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 (not for type of connection E, F) [2]
- other resolutions

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable [3]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable [3]	**8.0000.6905.0002.0032**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

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Absolute encoders - singleturn

Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

SSI / BiSS + SinCos

Technical data

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value [1]	2.16 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes [2]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics

Maximum speed shaft version		
	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]		
	shaft version	< 0.01 Nm
	hollow shaft version	< 0.03 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.0 x 10^{-6} kgm^2
Insertion depth for shaft		
	hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] [3]
Material	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

EMC

Relevant standards	EN 55011 class B :2009 / A1:2010 EN 61000-6-3:2007 / A1:2011 EN 61000-6-2:2005

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Resolution	10 ... 14 bit and 17 bit
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [2]
Pulse rate	2048 ppr

LED

The optional LED (red) serves to display various alarm or error messages.
In normal operation the LED is OFF.

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

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

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

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Absolute encoders - singleturn

Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

SSI / BiSS + SinCos

SET input or SET button

Input		HIGH active
Input type		comparator
Signal level	HIGH LOW	min: 60 % of +V, max: +V max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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 button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed.
The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

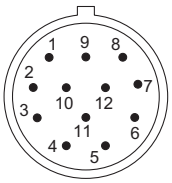
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
3, 4	1, 2, A, B, E, F	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	M23 connector, 12-pin													
3, 4	3, 4	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

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Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

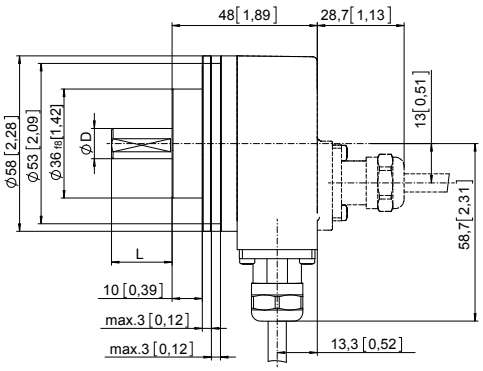
SSI / BiSS + SinCos

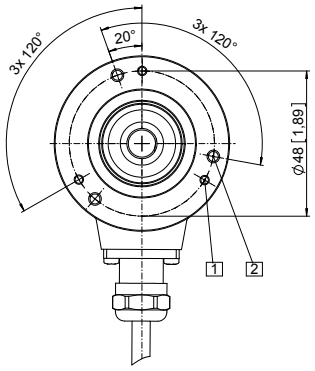
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

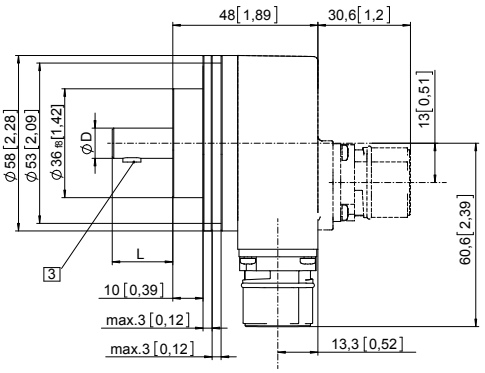


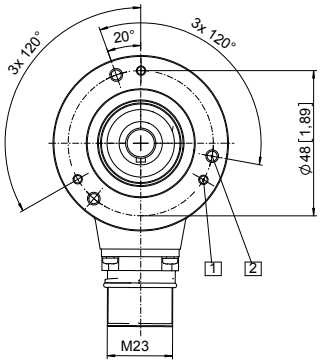


D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6





D	Fit	L
10 [0.39]	f7	20 [0.79]

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Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

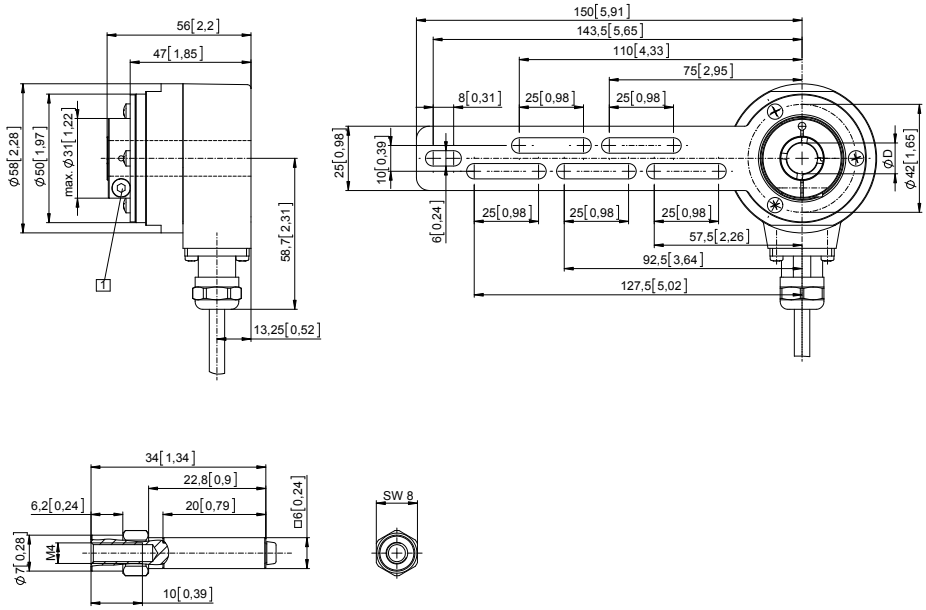
SSI / BiSS + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with torque stop set, rigid
Flange type A
Through hollow shaft
(drawing with cable)

1 SW 3, recommended torque for the clamping ring 2.5 Nm

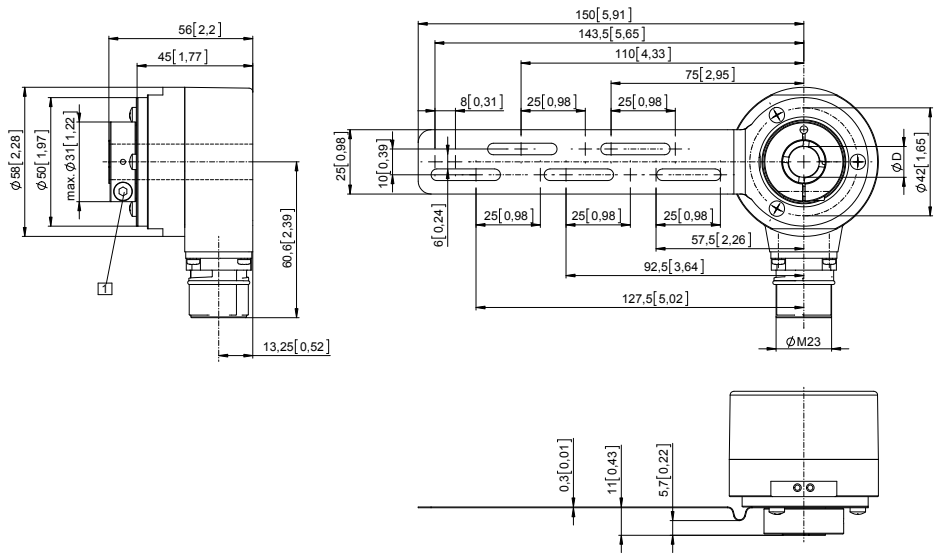


D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Torque pin with rectangular sleeve with M4 thread

Flange with torque stop, flexible
Flange type 9
Through hollow shaft
(drawing with M23 connector)

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

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Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

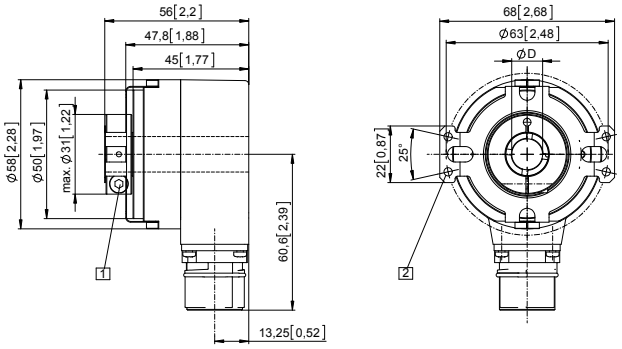
SSI / BiSS + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type B
Through hollow shaft
(drawing with M23 connector)

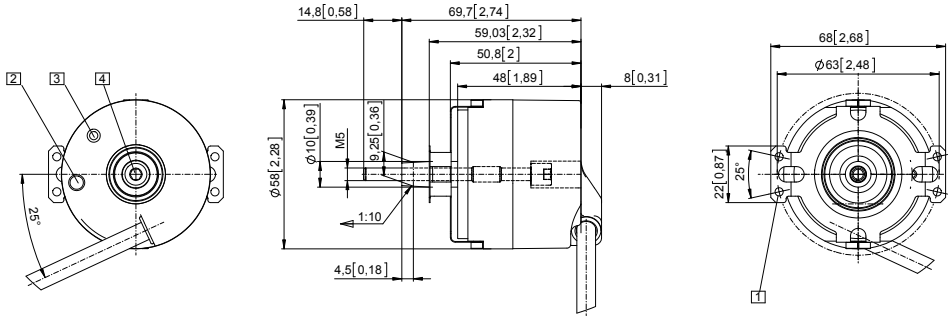
1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Tapered shaft
(drawing with tangential cable outlet)

1 For (4x) M3 screw
2 Status LED
3 SET button
4 SW 4



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Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

The absolute singleturn encoders 5853FS3 and 5873FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

The extra strong Safety-Lock™ Design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.

Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Order code Shaft version

8.5853FS3	.	1	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5853FS3.124A.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Input / output* [1]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 [2]
- other resolutions

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.

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Absolute encoders - singleturn

Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

Order code Hollow shaft

8.5873FS3	.	X	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
9 = with torque stop, flexible, IP65
A = with torque stop set, rigid, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
Tapered shaft
K = ø 10 mm [0.39"]

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5873FS3.B44B.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1)]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Input / output* [1)]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 (not for type of connection E, F) [2)]
- other resolutions

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable [3)]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable [3)]	**8.0000.6905.0002.0032**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

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Absolute encoders - singleturn

Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

Technical data

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value [1]	1.09 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes [2]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics

Maximum speed shaft version		
	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]		
	shaft version	< 0.01 Nm
	hollow shaft version	< 0.03 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.0 x 10^{-6} kgm^2
Insertion depth for shaft		
	hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] [3]
Material	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

EMC

Relevant standards	EN 55011 class B :2009 / A1:2010 EN 61000-6-3:2007 / A1:2011 EN 61000-6-2:2005

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Resolution	10 ... 14 bit and 17 bit
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [2]
Pulse rate	2048 ppr

LED

The optional LED (red) serves to display various alarm or error messages.
In normal operation the LED is OFF.

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

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

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

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Absolute encoders - singleturn

Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

SET input or SET button

Input		HIGH active
Input type		comparator
Signal level	HIGH LOW	min: 60 % of +V, max: +V max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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 button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed.
The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input) 1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

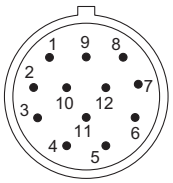
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
3, 4	1, 2, A, B, E, F	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	M23 connector, 12-pin													
3, 4	3, 4	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

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Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

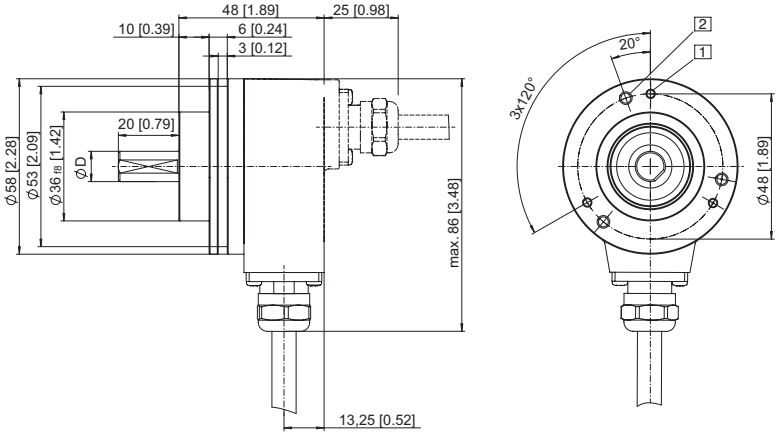
SSI / BiSS + SinCos

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

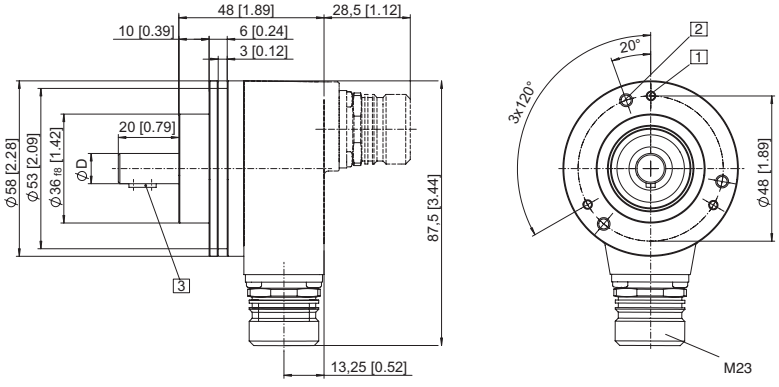
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6



D	Fit	L
10 [0.39]	f7	20 [0.79]

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Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

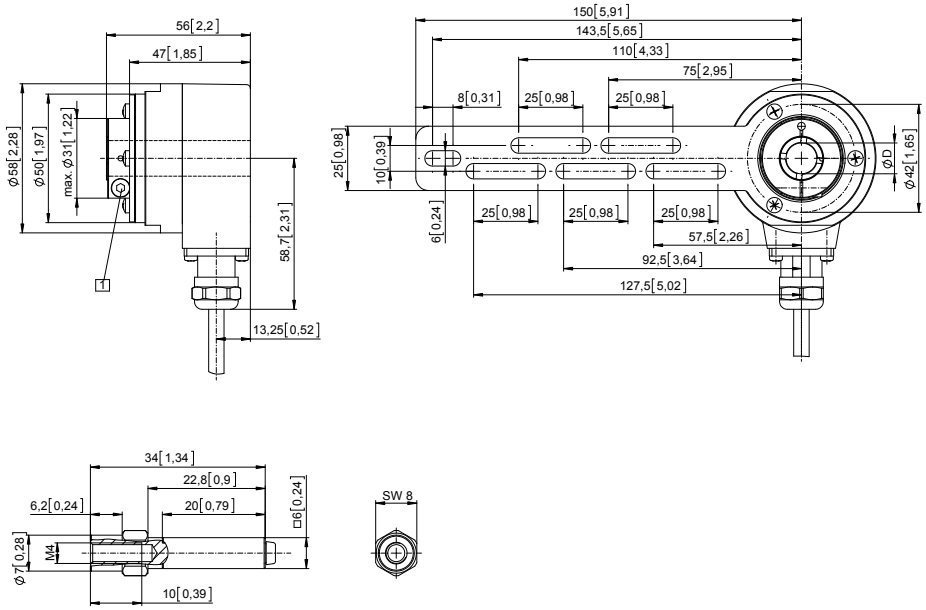
SSI / BiSS + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with torque stop set, rigid
Flange type A
Through hollow shaft
(drawing with cable)

1 SW 3, recommended torque for the clamping ring 2.5 Nm


56[2,2]
47[1,85]
Ø58[2,28]
Ø50[1,97]
max. Ø31[1,22]
58,7[2,31]
13,25[0,52]
150[5,91]
143,5[5,65]
110[4,33]
75[2,95]
8[0,31]
25[0,98]
25[0,98]
25[0,98

Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

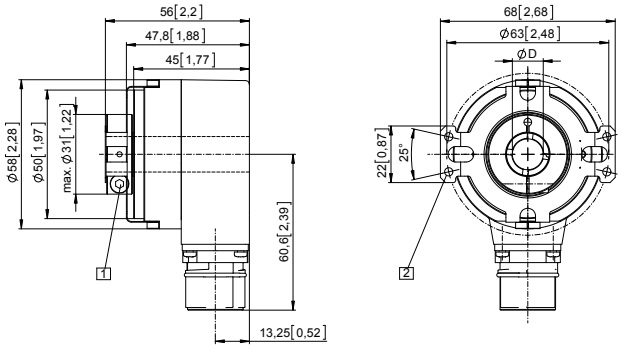
SSI / BiSS + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type B
Through hollow shaft
(drawing with M23 connector)

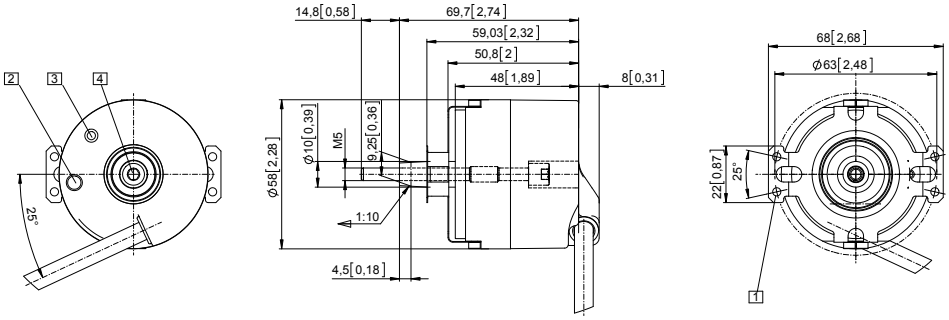
1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Tapered shaft
(drawing with tangential cable outlet)

1 For (4x) M3 screw
2 Status LED
3 SET button
4 SW 4



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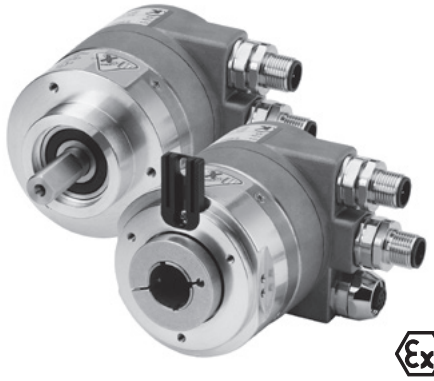
Absolute encoders - singleturn

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**



The singleturn encoders 5858 and 5878 with Profibus interface and optical sensor technology are the ideal solution for all Profibus applications.

They offer a maximum resolution of 16 bits, divided over 360°. These encoders are available with blind hollow shaft up to 15 mm.

Ex 2/22 | cULus | RoHS | PROFIBUS

Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional

Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.

Flexible

- Fast, simple, error-free connection using versions with M12 connector.
- Wide-ranging programming options thanks to latest encoder profile.

Order code Shaft version

8.5858 . X X 3 X . 31 1 X
Type — a b c d — e — f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28"]
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]
5 = square flange, IP65 □63.5 mm [2.5"]
7 = square flange, IP67 □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39"] 1)
2 = 10 x 20 mm [0.39 x 0.79"] 2)
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / power supply*
3 = PROFIBUS DP V0
encoder profile V 1.1, 10 ... 30 V DC

d *Type of connection*
removable bus terminal cover
1 = with radial cable gland fitting
2 = with 3 x radial M12 connectors

e *Fieldbus profile*
31 = PROFIBUS DP V0
encoder profile class 2

f *Options (Service)*
2 = no option
3 = SET button

Optional on request
- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.5878 . X X 3 X . 31 1 X
Type — a b c d — e — f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft*
(insertion depth max. 30 mm [1.18"])
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"

c *Interface / power supply*
3 = PROFIBUS DP V0
encoder profile V 1.1, 10 ... 30 V DC

d *Type of connection*
removable bus terminal cover
1 = with radial cable gland fitting
2 = with 3 x radial M12 connectors

e *Fieldbus profile*
31 = PROFIBUS DP V0
encoder profile class 2

f *Options (Service)*
2 = no option
3 = SET button

Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2
2) Preferred type only in conjunction with flange type 1

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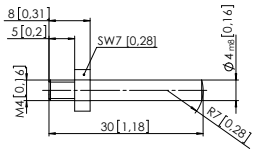
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in , 5-pin 5 m [16.40‘] PUR cable	**05.00.6011.3211.005M**
	M12 male connector with external thread for bus out, 5-pin 5 m [16.40‘] PUR cable	**05.00.6011.3411.005M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56‘] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in , 5-pin	**05.BMWS 8151-8.5**
	M12 male connector with external thread for bus out, 5-pin	**05.BMSWS 8151-8.5**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0,05 Nm
Mass moment of inertia		
	shaft version	3,0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	with bus terminal cover	approx. 0.53 kg [18.69 oz]
	with fixed connection	approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 110 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SET button (zero or defined value, option)

Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)

LED is ON with following errors	sensor error (Profibus error)

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Absolute encoders - singleturn

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**

Interface characteristics PROFIBUS DP	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	interface specification acc. 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 add-ons
Baud rate	max. 12 Mbit/s
Device address	1 ... 127 set by rotary switches
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 field bus 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 can be used now with the guarantee that they are ready for the future too.

The following parameters can be programmed

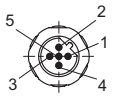
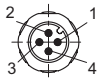
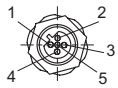
- Direction of rotation.
- Scaling (Number of steps per revolution).
- Preset value.
- Diagnostics mode.

The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter .
- Line driver acc. to RS485 max. 12 MB.
- Address programmable via DIP switches.
- Diagnostics LED.
- Full Class 1 and Class 2 functionality.

Terminal assignment terminal box

Interface	Type of connection		BUS IN				BUS OUT				
3	1 (terminal box)	Signal:	B	A	0 V	+V	0 V	+V	B	A	The shield of the connection cable must be connected over a large area via the cable gland.
		Terminal:	1	2	3	4	5	6	7	8	

Interface	Type of connection	Funktion	3 x M12 connector						
3	2 (3 x M12 connector)	Bus in	Signal:	–	PB_A	–	PB_B	Shield	
			Pin:	1	2	3	4	5	
		Power supply	Signal:	+V	–	0 V	–		
			Pin:	1	2	3	4		
		Bus out	Signal:	BUS_VDC [1]	PB_A	BUS_GND [1]	PB_B	Shield	
			Pin:	1	2	3	4	5	

1) For supplying an external Profibus termination resistor.

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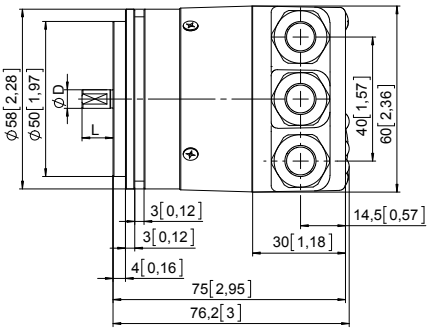
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**

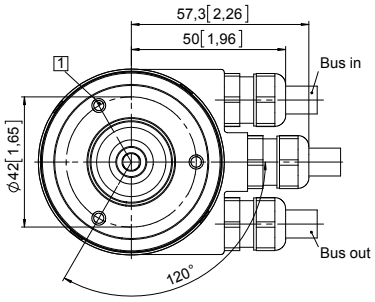
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with cable)

1 3 x M4, 6 [0.24] deep

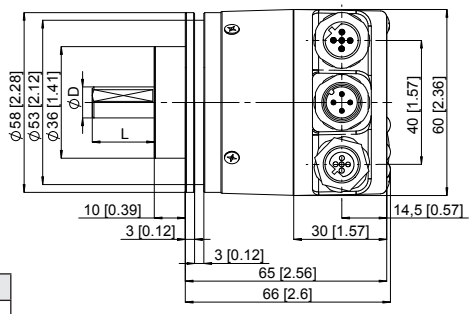


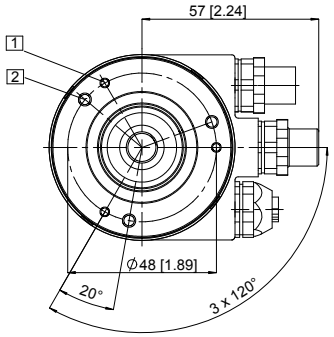


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with 3 x M12 connector)

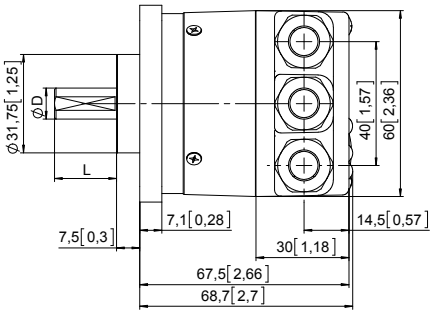
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

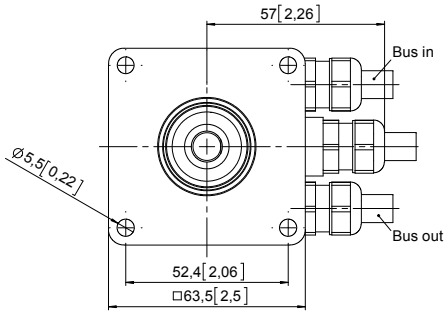




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**

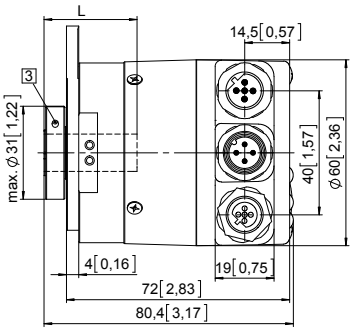
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

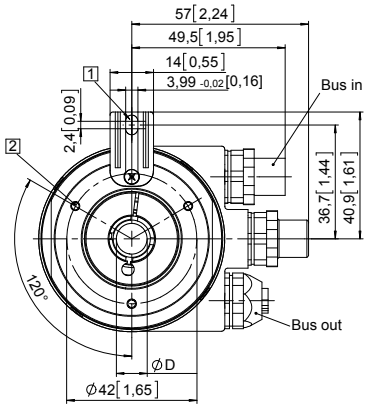
Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 3 x M12 connector)

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

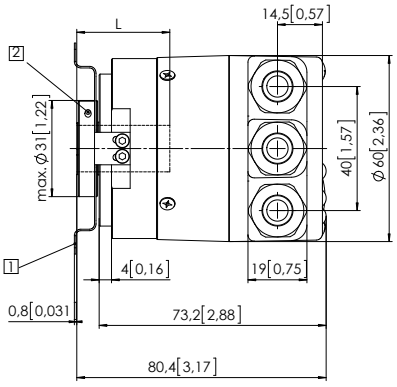


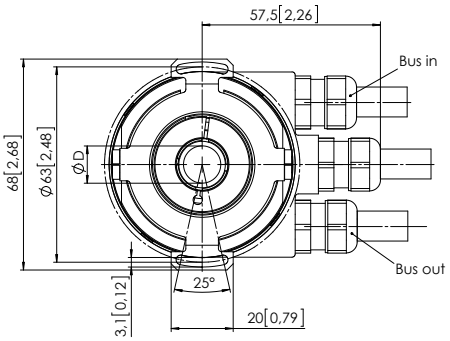


Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with cable)

1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

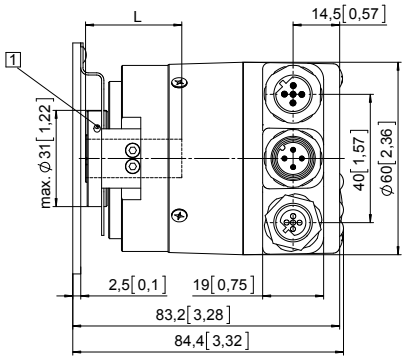


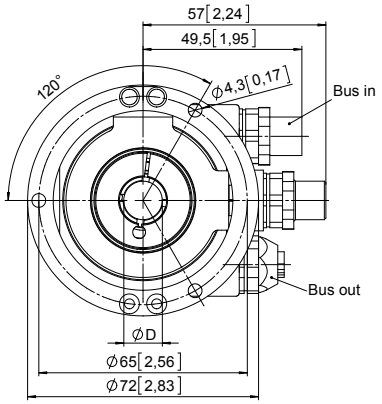


Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws, 65 [2.56]
(drawing 3 x M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		





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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

The singleturn encoders 5858 and 5878 with CANopen interface and optical sensor technology are ideal for use in all CANopen applications.

They offer a maximum resolution of 16 bits, divided over 360°. These encoders are available with blind hollow shaft up to 15 mm.

Ex 2/22 · cULus · RoHS · CANopen

Safety-Lock™ · High rotational speed · Temperature range · High protection level · High shaft load capacity · Shock / vibration resistant · Magnetic field proof · Magnetic field proof · Reverse polarity protection · Optical sensor · Surface protection salt spray-tested optional

Reliable

- Tried-and-tested in applications with the highest demands, such as in mobile automation or medical technology.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.

Flexible

- Node address can be set via rotary switches or software.
- Baud rate and termination can be set via DIP switches or software.
- With bus terminal cover or fixed connection, as well as M12 connectors or cable connection.

Order code Shaft version

8.5858	.	X	X	2	X	.	21	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*

1 = clamping flange, IP65 ø 58 mm [2.28"]
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]
5 = square flange, IP65 □63.5 mm [2.5"]
7 = square flange, IP67 □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*

1 = 6 x 10 mm [0.24 x 0.39"] 1)
2 = 10 x 20 mm [0.39 x 0.79"] 2)
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / power supply*

2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
removable bus terminal cover
1 = radial cable gland
2 = 2 x M12 connector, 5-pin
Fixed connection without bus terminal cover
A = radial cable, 2 m [6.56'] PVC
B = radial cable, special length PVC *)
E = 1 x radial M12 connector, 5-pin
F = 2 x radial M12 connector, 5-pin
I = 1 x radial M23 connector, 12-pin
J = 2 x radial M23 connector, 12-pin

*) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5858.112B.2113.0030 (for cable length 3 m)

e *Fieldbus profile*

21 = CANopen

f *Options (service)*

2 = no options
3 = SET button

Optional on request
- Ex 2/22 3)
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.
3) For the cable connection type, cable material PUR.

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Absolute encoders - singleturn

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

Order code Hollow shaft

8.5878	.	X	X	2	X	.	2	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft*
(insertion depth max. 30 mm [1.18"])
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
removable bus terminal cover
1 = radial cable gland
2 = 2 x M12 connector, 5-pin
Fixed connection without bus terminal cover
A = radial cable, 2 m [6.56'] PVC
B = radial cable, special length PVC *)
E = 1 x radial M12 connector, 5-pin
F = 2 x radial M12 connector, 5-pin
I = 1 x radial M23 connector, 12-pin
J = 2 x radial M23 connector, 12-pin

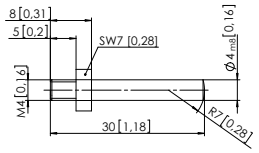
*) Available special lengths (connection type B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5878.542B.2113.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

f *Options (service)*
2 = no options
3 = SET button

Optional on request
- Ex 2/22 [1)]
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in , 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
	M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A411.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in , 5-pin	**8.0000.5116.0000**
	M12 male connector with external thread for bus out, 5-pin	**8.0000.5111.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) For the cable connection type, cable material PUR.

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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

Technical data

Mechanical characteristics

Maximum speed		
	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	with bus terminal cover	approx. 0.53 kg [18.69 oz]
	with fixed connection	approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F] 1)
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 90 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen

Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s can be set via DIP switches, software configurable
Node address	1 ... 127 can be set via rotary switches, software configurable
Termination switchable	can be set via DIP switches, software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device specific profiles such as encoder profile DS406 V3.2 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 can be programmed via the CAN bus.
When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed**, **acceleration** as well as the **status of the working area**.

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

CANopen communication profile DS301 V4.02

Among others, 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), 3 Sending PDO's.
- Node address, baud rate and CANbus.
- Programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:
- Event mode.
- Units for speed selectable (steps/sec or min^{-1}).
- Factor for speed calculation (e.g. circumference of measuring wheel).
- Integration time for the speed value from 1 ... 32.
- 2 working areas with 2 upper and lower limits 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 - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.
- "Watchdog controlled" device.

All profiles stated here: key-features
The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

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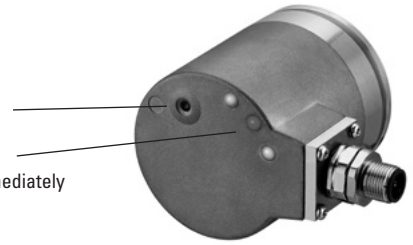
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

SET button (zero or defined value, option)

Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)

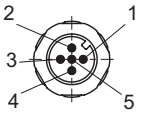
LED is ON with the following fault conditions sensor error (internal code or LED error), voltage too low, over-temperature

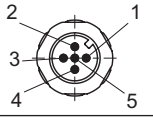


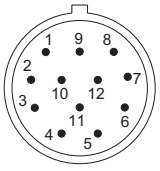
Terminal assignment

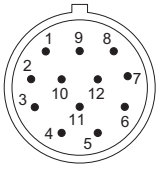
Interface	Type of connection	Cable gland (bus terminal cover with terminal box)										
			Bus OUT					Bus IN				
2	1	Signal:	CAN_GND	CAN_L	CAN_H	0 V power supply	+V power supply	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Abbreviation:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)						
			Bus IN					
2	A, B	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Cable color:	WH	BN	YE	GN	GY	

Interface	Type of connection	2 x M12 connector, 5-pin						
			Bus OUT					
2	2, F	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	3	2	5	4	1	
			Bus IN					
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	3	2	5	4	1	

Interface	Type of connection	1 x M12 connector, 5-pin						
			Bus IN					
2	E	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	3	2	5	4	1	

Interface	Type of connection	2 x M23 connector, 12-pin						
			Bus OUT					
2	J	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	2 x 
		Pin:	10	12	2	7	3	
			Bus IN					
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	10	12	2	7	3	

Interface	Type of connection	1 x M23 connector, 12-pin						
			Bus IN					
2	I	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	10	12	2	7	3	

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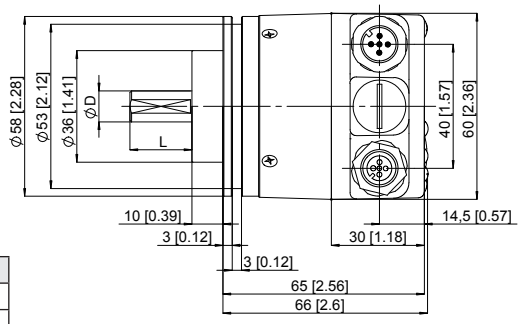
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

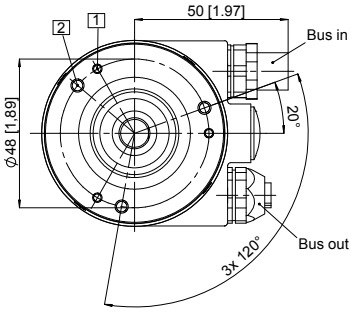
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with 2 x M12 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

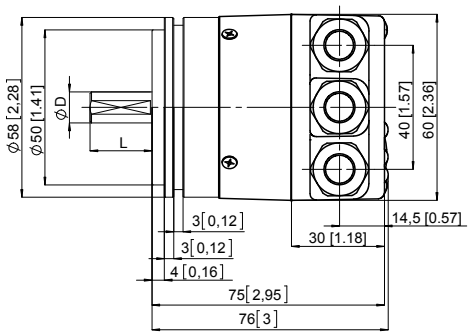


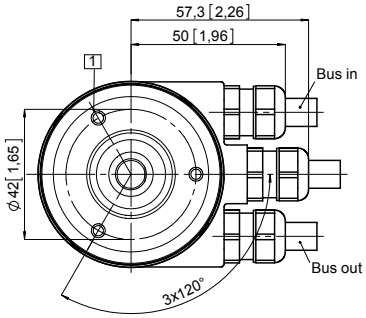


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with cable)

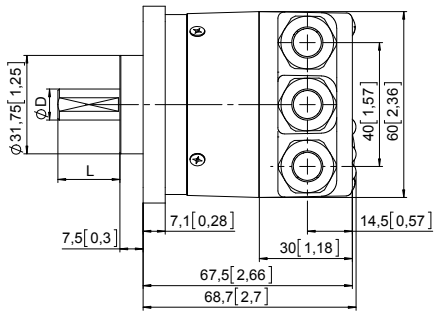
1 3 x M4, 6 [0.24] deep

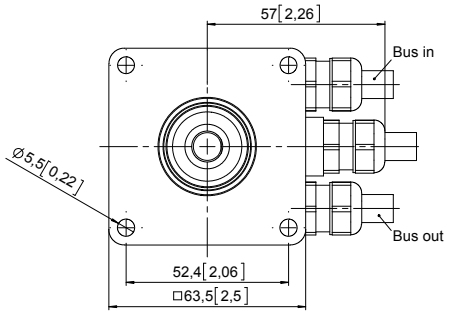




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

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Absolute encoders - singleturn

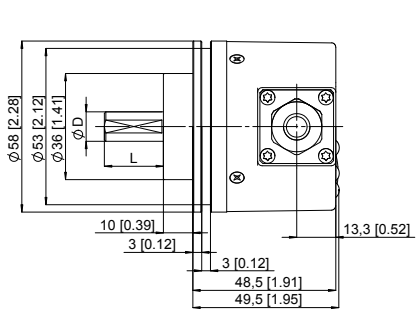
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

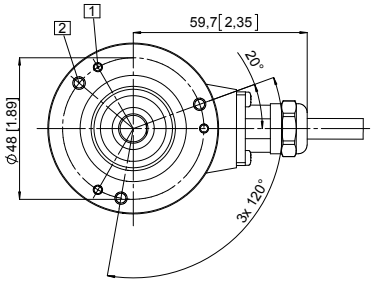
Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with cable)

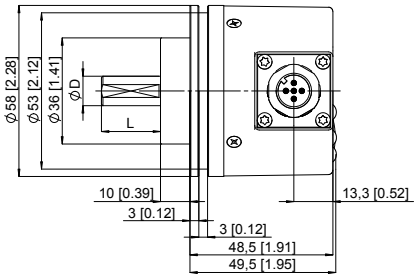
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

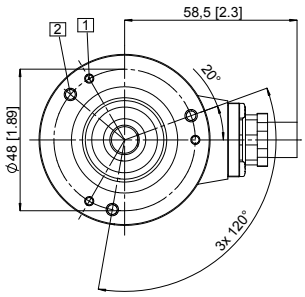




(drawing with M12 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

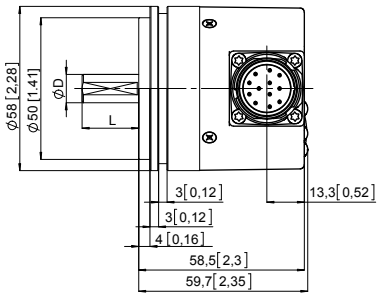


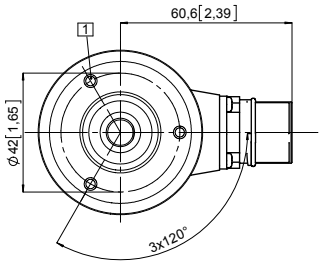


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M23 connector)

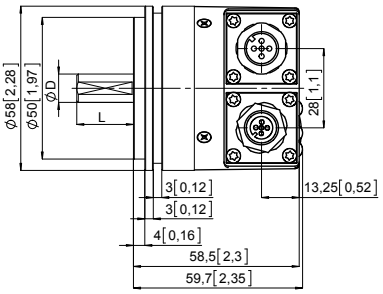
1 3 x M4, 6 [0.24] deep

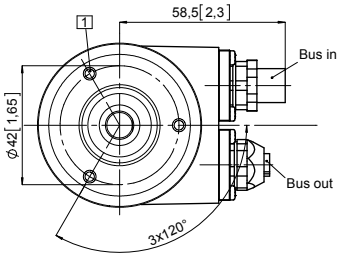




(drawing with M12 connector)

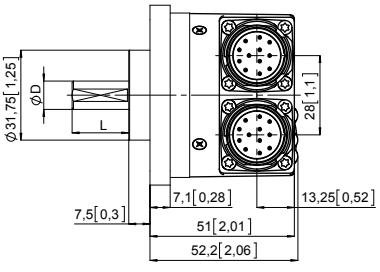
1 3 x M4, 6 [0.24] deep

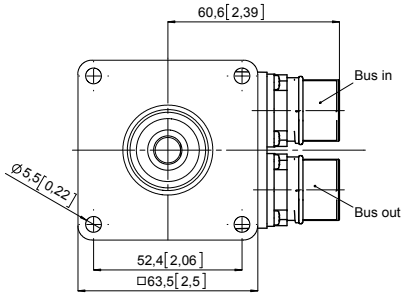




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with 2 x M23 connector)





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

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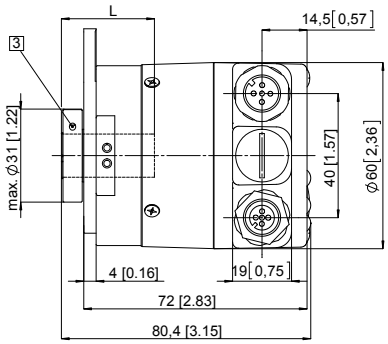
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

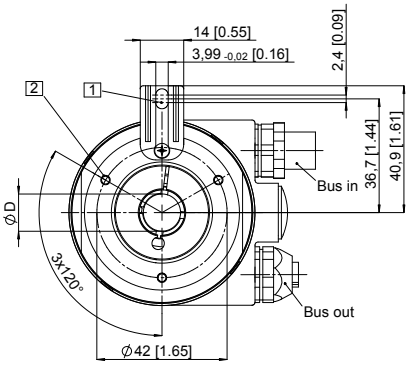
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

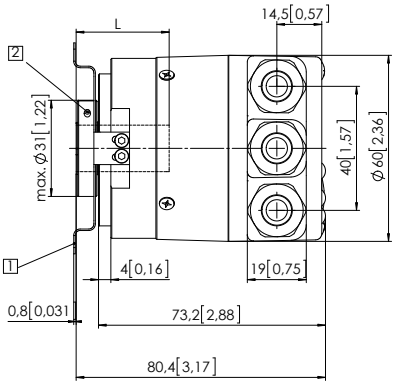


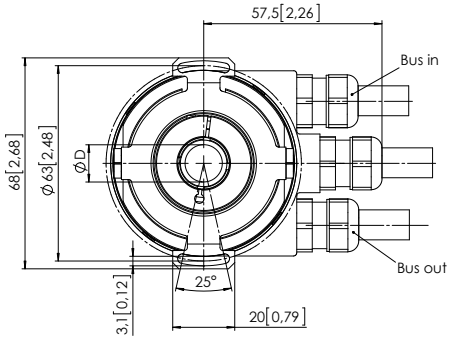


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with cable)

1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm

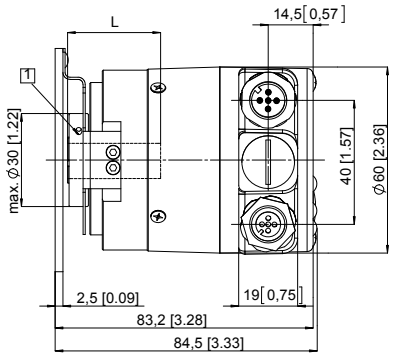


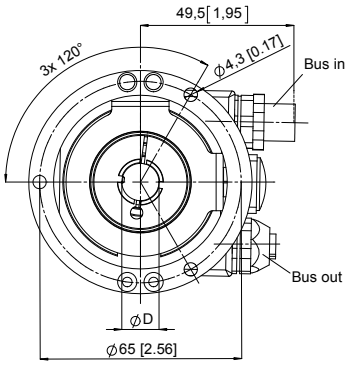


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with 2 x M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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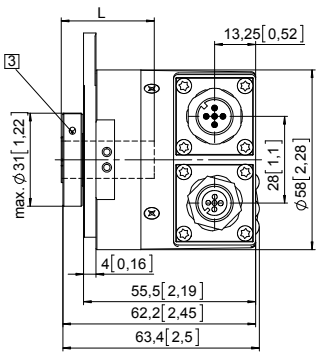
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

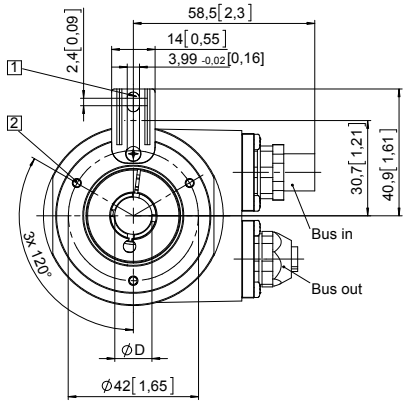
Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

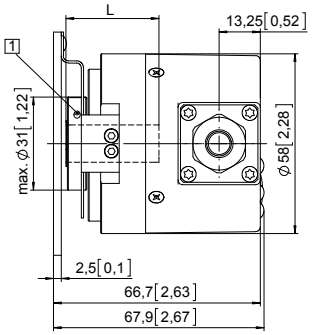


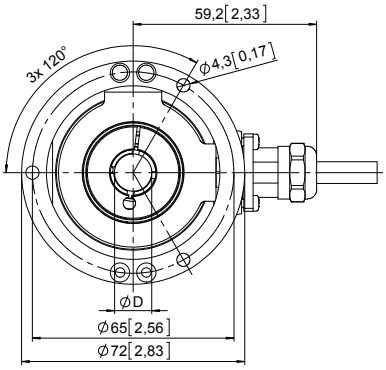


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **EtherCAT**

The singleturn encoders 5858 and 5878 with second-generation EtherCAT interface and optical sensor technology are ideal for use in all applications with an EtherCAT interface.

The data communication is based on CAN over EtherNet and ideally suited for use in real time applications.

These encoders are available with a solid shaft up to a maximum of 10 mm or a blind hollow shaft up to 15 mm.

Ex 2/22 | cULus | RoHS | EtherCAT Conformance tested

Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional

Reliable

- EtherCAT conformance tested.
- Integration of the latest slave – EtherCAT stack from Beckhoff, version 5.01.
- Ideally suited for use in harsh outdoor environments, thanks to IP67 protection and rugged housing construction.

Flexible

- Use of CoE (CAN over EtherNet).
- Genuine new position information as a result of minimal cycle time of 62.5 µs in the DC mode.
- Faster, easier error-free connection thanks to M12 connectors.
- Supports Hot-Connect.

Order code Shaft version

8.5858	.	X	X	B	2	.	B2	12
Type		a	b	c	d		e	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
- **1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- **2 = synchro flange, IP65 ø 58 mm [2.28"]**
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □63.5 mm [2.5"]
- 7 = square flange, IP67 □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
- **1 = 6 x 10 mm [0.24 x 0.39"]** 1)
- **2 = 10 x 20 mm [0.39 x 0.79"]** 2)
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c *Interface / power supply*
- **B = EtherCAT / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Fieldbus profile*
- **B2= EtherCAT with CoE (CAN over EtherNet)**

Optional on request
- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.5878	.	X	X	B	2	.	B2	12
Type		a	b	c	d		e	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- **5 = with stator coupling, IP65 ø 63 mm [2.48"]**
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18"])*
- 3 = ø 10 mm [0.39"]
- **4 = ø 12 mm [0.47"]**
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

c *Interface / power supply*
- **B = EtherCAT / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Fieldbus profile*
- **B2= EtherCAT with CoE (CAN over EtherNet)**

Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

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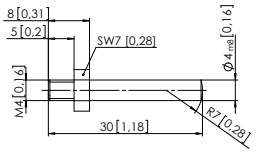
Absolute encoders - singleturn

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **EtherCAT**

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port IN and port OUT, 4-pin 2 m [6.56’] PUR cable	**05.00.6031.4411.002M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56’] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 male connector with external thread for port IN and port OUT, 4-pin	**05.WASCSY4S**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.9 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 110 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics EtherCAT

Resolution	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Code	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:
Preop-, Safeop and Op-State (EtherCAT status machine)

2 x Link LEDs (yellow)

LED is ON with the following conditions (port IN and port OUT):
Link detected

Modes

Freerun, Distributed Clock

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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **EtherCAT**

General information about CoE (CAN over EtherNet)

The EtherCAT encoders support the CANopen communication profile according to DS301. In addition device-specific profiles like the encoder profile DS406 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 are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

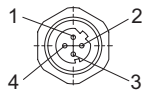
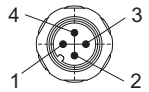
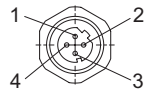
The following output values may be combined as PDO (PDO mapping): **position, speed, temperature values** and **working area state** as well as other process values.

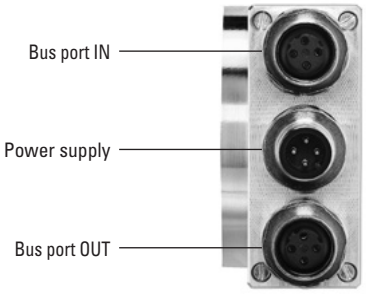
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

The following parameters are programmable:

- Position update time of 62.5 µs.
- EtherCAT certificate of conformity.
- Speed with sign.
- Four units for speed calculation: steps/sec, steps/100 ms, steps/10 ms, rotation/min.
- Time stamp as system time at the point in time when the position is read out.
- Two working area state registers.
- Along with the scaled position, the raw data – position as process value – is also mappable.
- Dynamic mapping.
- Gating time: setting of the time interval, via which the speed value can be interpolated.
- Sensor temperature in degrees Celsius.
- Comprehensive plausibility test when downloading parameters to the encoder.
- Alarm and warning messages.
- User interface with visual display of bus and fault status – 4 LEDs.
- Extended error management for position sensing with integrated temperature control.
- Implementation of the latest CANopen profile 3.2.10 from the 18th February 2011.
- Hot-Connect – Support for rapid change of Bus-topology.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					
B	2 (3 x M12 connector)	Bus port IN	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus port OUT	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **EtherCAT**

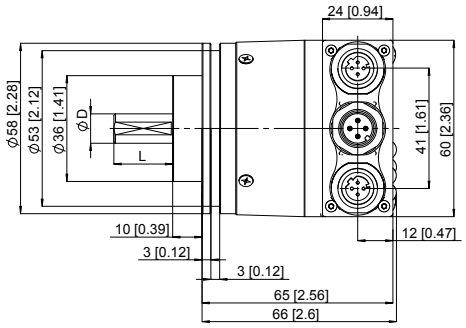
Dimensions shaft version, with removable bus terminal cover

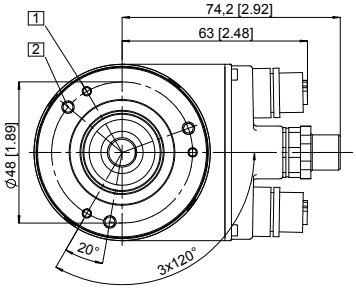
Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

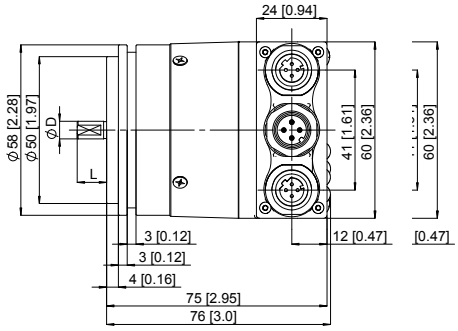


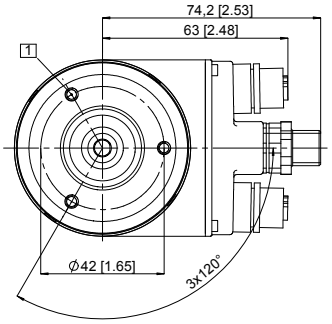


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

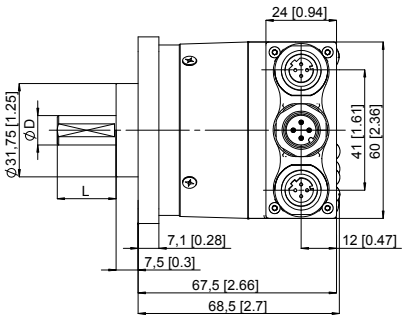
1 3 x M4, 6 [0.24] deep

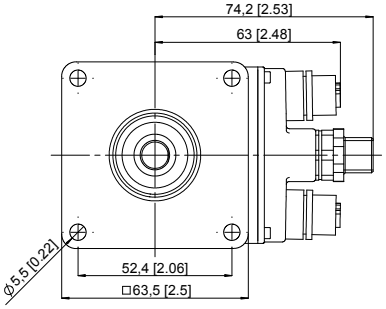




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

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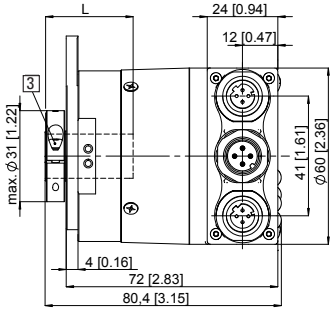
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **EtherCAT**

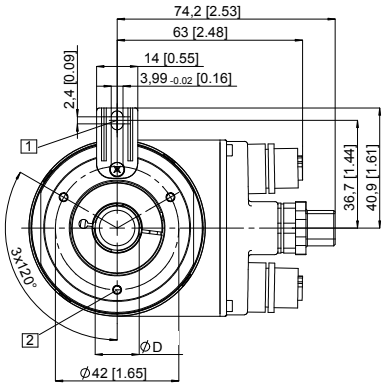
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

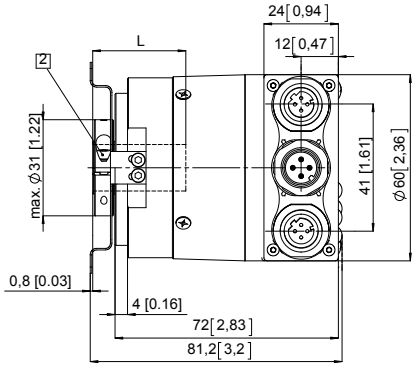


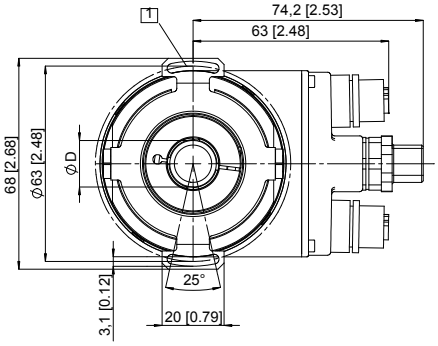


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm

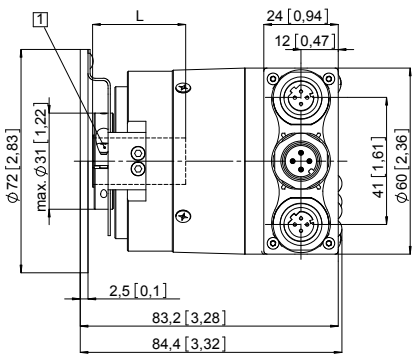


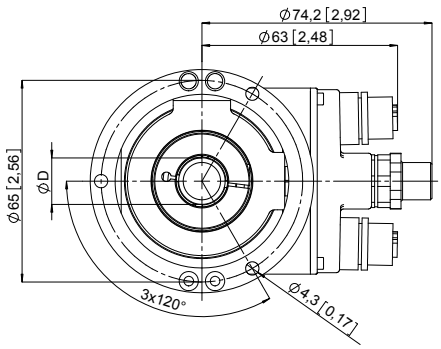


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFINET IO**

The singleturn encoders 5858 and 5878 with PROFINET interface and optical sensor technology are ideal for use in all applications with a PROFINET interface.

The encoder supports the IRT mode and is therefore ideal for real-time applications.

Safety-Lock™ | High rotational speed | Temperature range -40°...+85°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional

Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1.
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction.

Flexible

- Easy setting of a preset value using a control bit (telegram 860).
- IRT-Mode.
- Cycle time ≤ 1 ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.

Order code Shaft version

8.5858	.	X	X	C	2	.	C2	12
Type		a	b	c	d		e	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
- **1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- **2 = synchro flange, IP65 ø 58 mm [2.28"]**
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]
- 7 = square flange, IP67 □ 63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
- **1 = 6 x 10 mm [0.24 x 0.39"]** 1)
- **2 = 10 x 20 mm [0.39 x 0.79"]** 2)
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c *Interface / power supply*
- **C = PROFINET IO / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Field bus profile*
- **C2= PROFINET IO**

Optional on request
- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.5878	.	X	X	C	2	.	C2	12
Type		a	b	c	d		e	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- **5 = with stator coupling, IP65 ø 63 mm [2.48"]**
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18"])*
- 3 = ø 10 mm [0.39"]
- **4 = ø 12 mm [0.47"]**
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

c *Interface / power supply*
- **C = PROFINET IO / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Field bus profile*
- **C2= PROFINET IO**

Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

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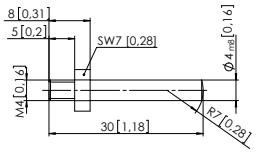
Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	PROFINET IO

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders

	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology

		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56‘] PUR cable	**05.00.6031.4411.002M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56‘] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin	**05.WASCSY4S**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 200 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics PROFINET IO

Resolution	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Protocol	PROFINET IO

Link 1 and 2, LED (green / yellow)

Two colored	green	active link
	yellow	data transfer

Error LED (red) / PWR LED (green)

Functionality see manual

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Absolute encoders - singleturn

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFINET IO**

General information about PROFINET IO

The PROFINET encoder implements the encoder profile 4.1. (according to the specification Encoder Version 4.1 Dec 2008“)

It permits scaling and preset values, as well as many other additional parameters to be programmed via the PROFINET bus.

When switching on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure, or taken over by the controller in the start-up phase.

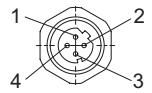
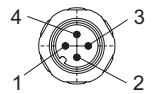
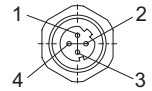
Position, speed and many other states of the encoder can be transmitted.

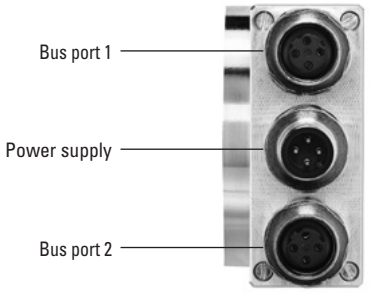
PROFINET IO

The complete encoder profile according to profile encoder version 4.1 as well as the identification & maintenance functionality version 1.16 has been implemented. IM blocks 0, 1, 2, 3 and 4 are supported.

The **M**edia **R**edundancy **P**rotocol is implemented here.
Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					
C	2 (3 x M12 connector)	Bus port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus port 2	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFINET IO**

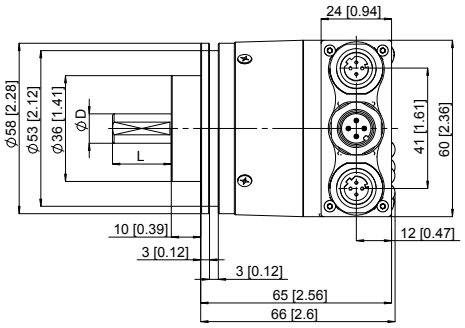
Dimensions shaft version, with removable bus terminal cover

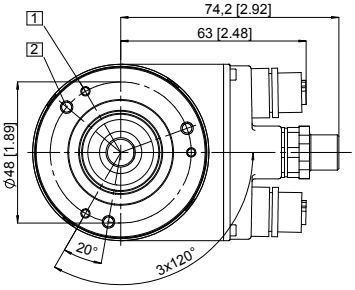
Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

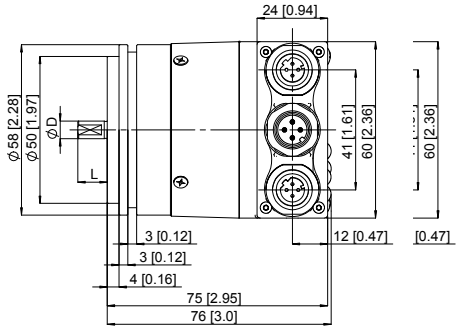


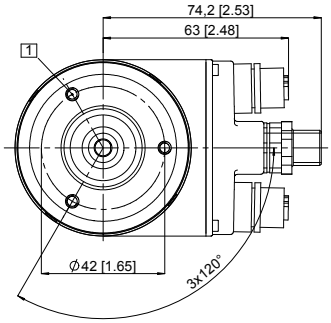


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

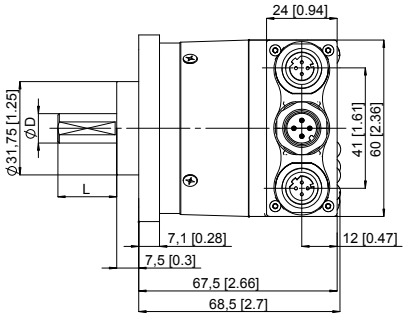
1 3 x M4, 6 [0.24] deep

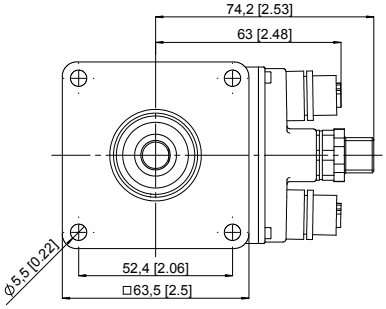




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

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Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFINET IO**

Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

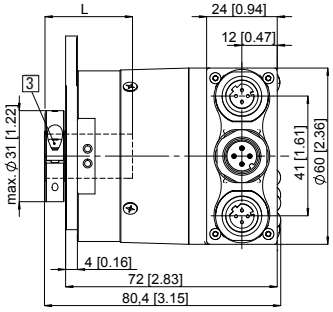
Dimensions in mm [inch]

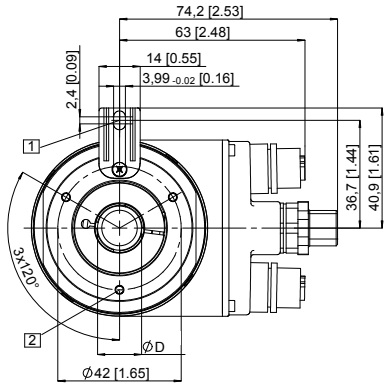
Flange with spring element, long
Flange type 1 and 2

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 3 x M3, 5.5 [0.22] deep

3 Recommended torque for the clamping ring 0.6 Nm



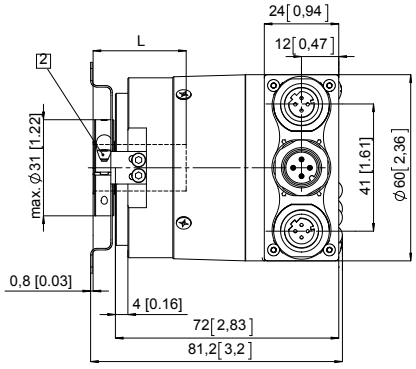


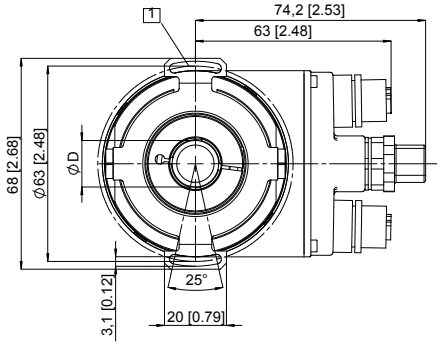
D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)

2 Recommended torque for the clamping ring 0.6 Nm

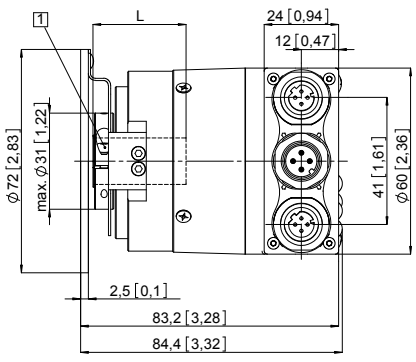


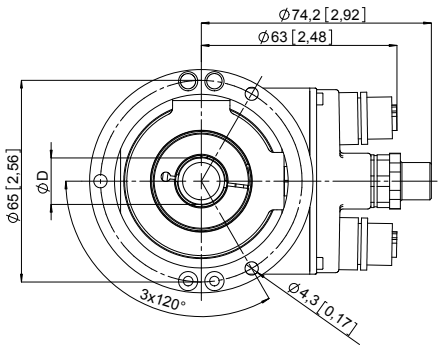


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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Standard optical | **Sendix F5858 / F5878 (shaft / hollow shaft)** | **EtherNet/IP**

The Sendix F58 singleturn is a particularly high resolution optical encoder without gears and with 100 percent magnetic insensitivity.

16 bits total resolution, shaft up to 10 mm, blind hollow shaft up to 15 mm and certified EtherNet/IP functionality.

Ex 2/22 pending | cULus | RoHS | EtherNet/IP™

Safety-Lock™ | High rotational speed | Temperature range -40°... +80°C | High protection level IP65 | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor

Up-to-the-minute EtherNet/IP functionality

- Fast, easy commissioning and configuration possible thanks to cyclic services.
- Low RPI time, of 1 ms minimum – makes the encoder suitable for time-critical applications up to an update frequency of 1000 Hz.
- Faster encoder start after applying the power – increases plant performance.

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- Thanks to the implementation of DLR (Device Level Ring) a single cable break does not lead to plant stoppage.
- Wide temperature range, -40°C ... +80°C.

Order code Shaft version

8.F5858	.	X	X	A	N	.	A2	2	2
Type		a	b	c	d		e		

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28“]
2 = synchro flange, IP65 ø 58 mm [2.28“]
5 = square flange, IP65 □63.5 mm [2.5“]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39“]
2 = 10 x 20 mm [0.39 x 0.79“]
3 = 1/4“ x 7/8“
4 = 3/8“ x 7/8“

c *Interface / Power supply*
A = EtherNet IP / 10 ... 30 V DC

d *Type of connection*
N = 3 x axial M12 connector, 4-pin

e *Fieldbus profile*
A2 = EtherNet/IP

Optional on request
- Ex 2/22

Order code Hollow version

8.F5878	.	X	X	A	N	.	A2	2	2
Type		a	b	c	d		e		

a *Flange*
1 = with spring element long, IP65
3 = with stator coupling, IP65 ø 65 mm [2.56“]
5 = with stator coupling, IP65 ø 63 mm [2.48“]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18“])*
A = ø 10 mm [0.39“]
B = ø 12 mm [0.47“]
C = ø 14 mm [0.55“]
D = ø 15 mm [0.59“]
E = ø 3/8“
F = ø 1/2“

c *Interface / Power supply*
A = EtherNet IP / 10 ... 30 V DC

d *Type of connection*
N = 3 x axial M12 connector, 4-pin

e *Fieldbus profile*
A2 = EtherNet/IP

Optional on request
- Ex 2/22

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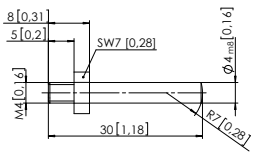
Absolute encoders – singleturn

Standard optical	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56'] PUR cable	**05.00.6031.4411.002M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin	**05.WASCSY4S**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Max. speed shaft version		
	IP65 up to 70°C	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 4000 min^{-1} (continuous)
Max. speed hollow shaft version		
	IP65 up to 70°C	6000 min^{-1}, 4000 min^{-1} (continuous)
	IP65 up to T_{max}	4000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	aluminum
Shock resistance acc. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 250 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics EtherNet/IP

Resolution	1 ... 65.536 (16 bit), scalable default: 65.536 (16 bit)
Code	binary
Protocol	EtherNet/IP

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Standard optical | **Sendix F5858 / F5878 (shaft / hollow shaft)** | **EtherNet/IP**

General information about EtherNet/IP

EtherNet/IP conformance tested acc. to	version CT-12 of 11. Dez. 2014
EtherNet/IP specification	Vol 2, Ed 1.17
CIP specification	Vol 1, Ed 3.16

The following functionalities are integrated

Adjustable parameters

- Preset
- Count direction
- Resolution
- Unity of speed
- IP address
- Position
- Diagnosis
- Position limit
- Warning messages

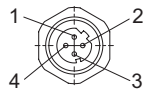
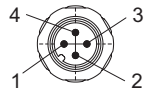
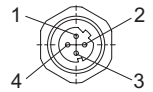
Objects (CIP Objects)

- Identity Object
- Message Router
- Assembly Object
- Connection Manager
- Parameter Object
- Position Sensor Object
- Qos Object
- Port Object
- TCP / IP Interface Object
- EtherNet Link Object

EtherNet/IP features

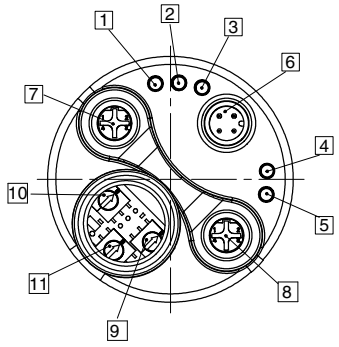
- DLR (Device Level Ring) possible
- Qos (Quality of Service) possible
- ACD (Address Conflict Detection)
- Multicast and unicast capability

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					
A	N (3 x M12 connector)	Bus Port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus Port 2	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	

Rear side connections and display elements

1 LED: Link 1
2 LED: Mod.
3 LED: Net.
4 LED: Encoder
5 LED: Link 2
6 Power
7 Port 1
8 Port 2
9 Switch: x1
10 Switch: x100
11 Switch: x10



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Absolute encoders – singleturn

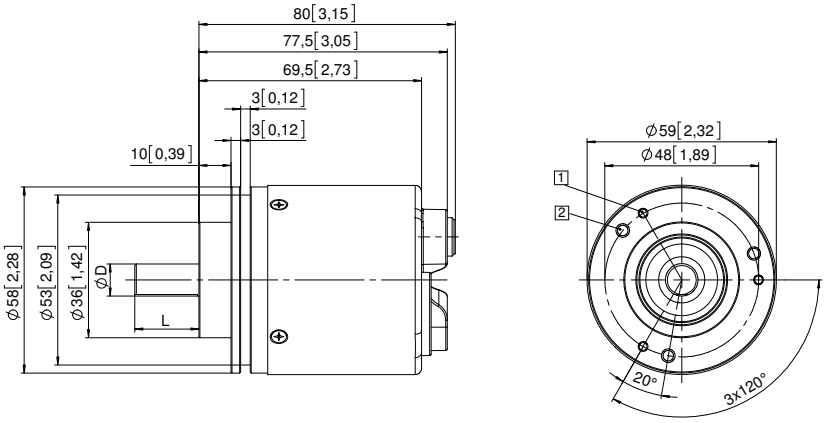
Standard optical | **Sendix F5858 / F5878 (shaft / hollow shaft)** | **EtherNet/IP**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

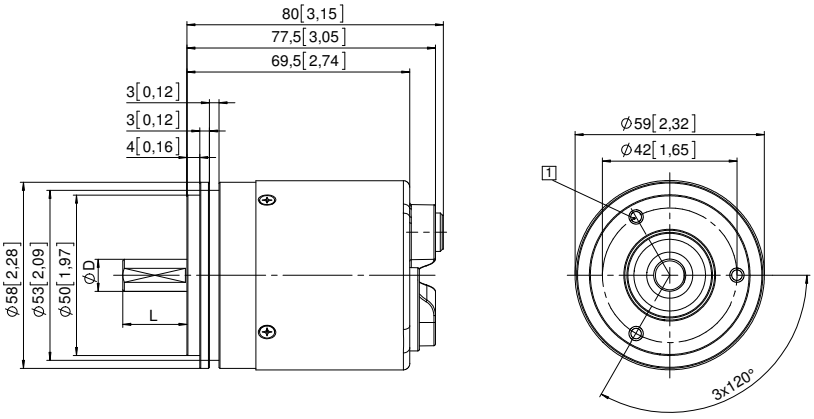
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.31] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

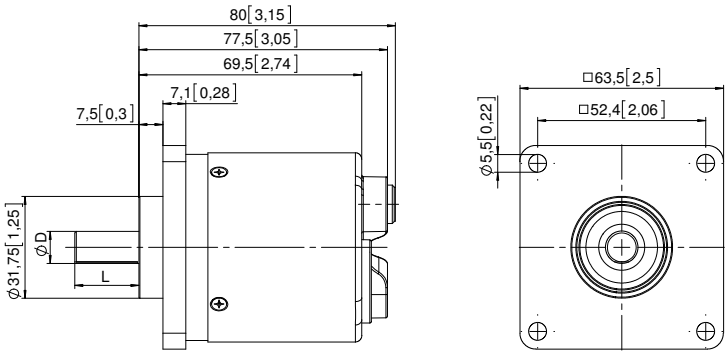
Synchro flange, ø 58 [2.28]
Flange type 2

1 3 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

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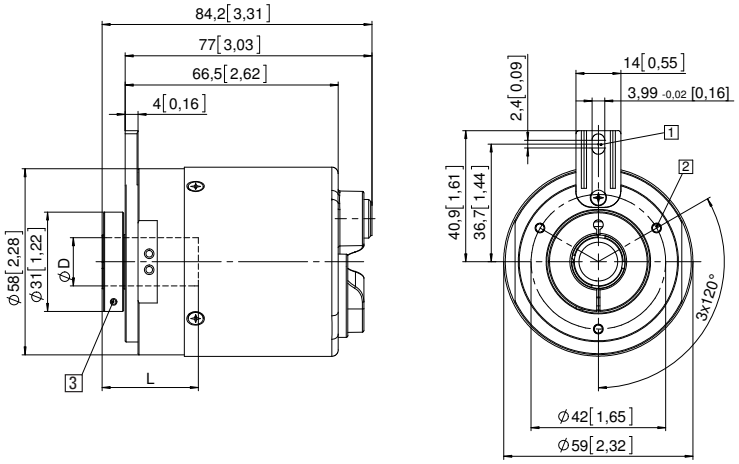
Standard optical | **Sendix F5858 / F5878 (shaft / hollow shaft)** | **EtherNet/IP**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1

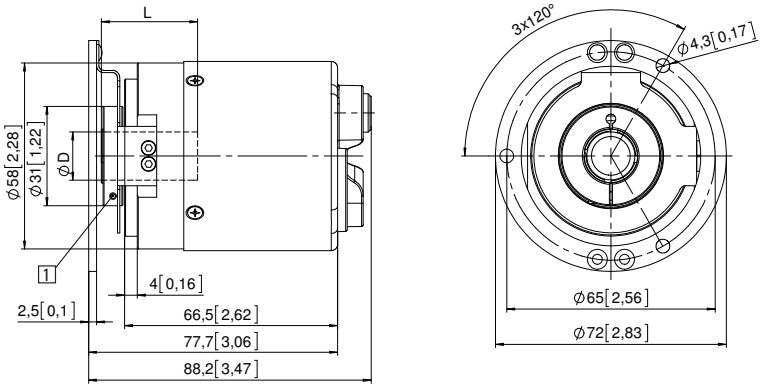
1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3

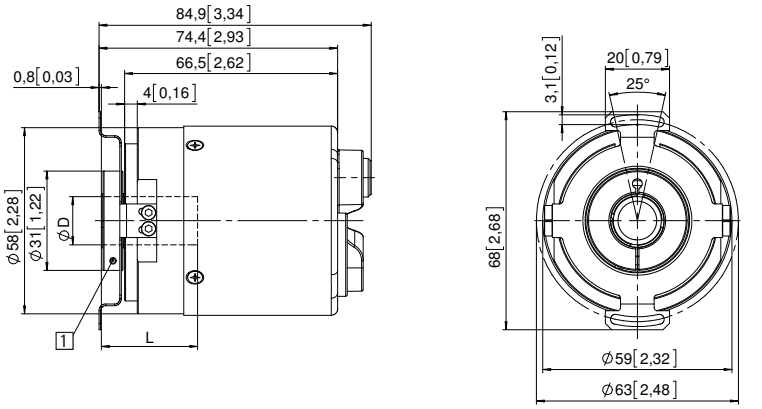
1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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Absolute encoders - singleturn

Standard stainless steel, optical | **5876 (hollow shaft)** | **SSI, parallel**

The singleturn encoder 5876 with SSI or parallel interface and optical sensor technology boasts a hollow shaft of up to 12 mm.

It offers a maximum resolution of 14 bits, divided over 360°.

-20°... +80°C
Temperature range

Shock / vibration resistant

Short-circuit proof

Reverse polarity protection

Optical sensor

Safe

- A protection level of IP67 as well as the wide temperature range of -20°C to +80°C allow error-free operation even under the toughest working conditions.
- The stainless-steel (1.4305) housing withstands even the most extreme external influences.

Adaptable

- Available with a choice of M12 connector or as cable version.
- Gray, binary or BCD code for parallel interface.
- Wide range of possible applications thanks to numerous input options.

Order code hollow shaft

8.5876	.	X	X	X	X	.	XXX	X
Type		a	b	c	d		e	f

a *Flange*
1 = with through hollow shaft, ø 58 mm [2.28"]
2 = with blind hollow shaft, ø 58 mm [2.28"]

b *Hollow shaft*
(insertion depth blind hollow shaft with flange 2 max. 30 mm [1.18"])
6 = ø 10 mm [0.39"]
8 = ø 12 mm [0.47"]

c *Interface / power supply*
1 = SSI / 5 V DC
2 = SSI / 10 ... 30 V DC
3 = parallel / 5 V DC
4 = parallel / 10 ... 30 V DC

d *Type of connection*
1 = radial cable, 1 m [3.28] PVC
2 = radial M12 connector, 8-pin, without mating connector [1]

e *Code type and division*
see table 1 (at interface 3 and 4, parallel)
see table 2 (at interface 1 and 2, SSI)

f *Options*
2 = SET and V/R
3 = SET and Latch [2]
4 = V/R and Latch [2]

Optional on request
- Ex 2/22 [3]

Table 1: Code type and divisions for encoders with parallel output

Interface and power supply, version 3 or 4 (parallel)

Division	250	360	500	720	900	1000	1024 10 bit	1250	1440	1800	2000	2500	2880	3600	4000	4096 12 bit	5000	7200	8192 13 bit	16384 14 bit
Order code gray / gray-excess	E02	E03	E05	E07	E09	E01	G10	E12	E14	E18	E20	E25	E28	E36	E40	G12	E50	E72	G13	G14
Order code binary	B02	B03	B05	B07	B09	B01	B10	BA2	BA1	B18	B20	B25	B28	B36	B40	B12	B50	B72	B13	B14
Order code BCD	D02	D03	D05	D07	D09	D01	D10	DA2	DA1	D18	D20									

Table 2: Code type and SSI output

Interface / power supply, version 1 or 2

Division	1024 10 bit	4096 12 bit	8192 13 bit	16384 14 bit
Order code gray	G10	G12	G13	G14
Order code binary	B10	B12	B13	B14

1) Only in conjunction with SSI output.
2) Not with SSI interface.
3) For the cable connection type, cable material PUR.

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Absolute encoders - singleturn

Standard
stainless steel, optical | **5876 (hollow shaft)** | **SSI, parallel**

Technical data

Mechanical characteristics

Maximum speed [1]	6000 min^{-1}
Mass moment of inertia	approx. 6 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]	< 0.05 Nm
Weight	approx. 0.6 kg [21.16 oz]
Protection acc. to EN 60529	IP67

Working temperature range		-20°C ... +80°C [2] [-4°F ... +176°F] [2]
Material	shaft / housing	stainless steel
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Interface type		**Synchronous serial** (SSI)	**Synchronous serial** (SSI)	**Parallel**	**Parallel**
Power supply (+V)		5 V DC (±5 %)	10 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC
Output driver		RS485	RS485	Push-pull	Push-pull
Power consumption (no load)	typ. 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
Update rate		max. 15000/s	max. 15000/s	40000/s	40000/s
SSI clock rate min./max.		100 kHz / 500 kHz	100 kHz / 500 kHz	–	–
Signal level HIGH		typ. 3.8 V	typ. 3.8 V	min. 3.4 V	min. +V - 2.8 V
Signal level LOW	(I_{Load} = 20 mA)	typ. 1.3 V	typ. 1.3 V	–	–
	(I_{Load} = 10 mA)	–	–	max. 1.5 V	max. 1.8 V
	(I_{Load} = 1 mA)	–	–	max. 0.3 V	–
Rising edge time t_r (without cable)		max. 100 ns	max. 100 ns	max. 0.2 µs	max. 1 µs
Falling edge time t_f (without cable)		max. 100 ns	max. 100 ns	max. 0.2 µs	max. 1 µs
Short circuit proof outputs [3]		yes	yes [4]	yes	yes
Reverse polarity protection of the power supply		no	yes	no	yes
UL approval		file 224618			
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU			

Control inputs

Switching levels of the control inputs

Power supply		5 V DC	10 ... 30 V DC
Switching level	LOW	≤ 1.7 V	≤ 4.5 V
	HIGH	≥ 3.4 V	≥ 8.7 V

Up/Down input to switch the counting direction

As a standard, absolute encoders deliver increasing code values when the shaft rotates clockwise (cw), when looking from the shaft side. When the shaft rotates counter-clockwise (ccw), the output delivers accordingly decreasing code values.

As long as the Up/Down input receives the corresponding signal (HIGH), this feature is reversed. Clockwise rotation will deliver decreasing code/current values while counter-clockwise rotation will deliver increasing code/current values.

The response time is :

for 5 V DC power supply	0.4 ms
for 10 ... 30 V DC power supply	2 ms

SET input

This input is used to reset (zero) the encoder. A control pulse (HIGH) sent to this input allows the current position value to be saved as the new zero position in the encoder.

Note : After applying power to the encoder and before activating the SET input, a count direction (cw or ccw) must be clearly defined on the Up/Down input!

The response time is :

for 5 V DC power supply	0.4 ms
for 10 ... 30 V DC power supply	2 ms

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 remains active (HIGH).

The response time is :

for 5 V DC power supply	140 µs
for 10 ... 30 V DC power supply	200 µs

1) For continuous operation max. 1500 min^{-1}.
2) 70°C [158°F] cable version.
3) If power supply +V correctly applied.
4) Only one channel allowed to be shorted-out:
at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.
at +V = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

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Absolute encoders - singleturn

Standard stainless steel, optical | **5876 (hollow shaft)** | **SSI, parallel**

Terminal assignment

SSI interface

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
1, 2	1	Signal	0V	+V	C+	C-	D+	D-	ST	VR
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD

Interface	Type of connection	M12 connector, 8-pin								
1, 2	2	Signal	0V	+V	C+	C-	D+	D-	ST	VR
		Pin:	1	2	3	4	5	6	7	8

Top view of mating side, male contact base

M12 connector, 8-pin

Parallel interface up to max. 14 bit and max. 2 options

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)																			
3, 4	1	Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	14	⏚
		Cable 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	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
Sig.: 1 =MSB; 2 = MSB-1; 3 = MSB-2 etc.
C+, C-: Clock signal
D+, D-: Data signal
ST: Set input. The current position becomes defined as position zero.
VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning.
LH: LATCH input. Active HIGH. The current position is saved and is statically available at the output.
PH ⏚: Plug connector housing (shield)

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Standard stainless steel, optical	5876 (hollow shaft)	SSI, parallel

Dimensions

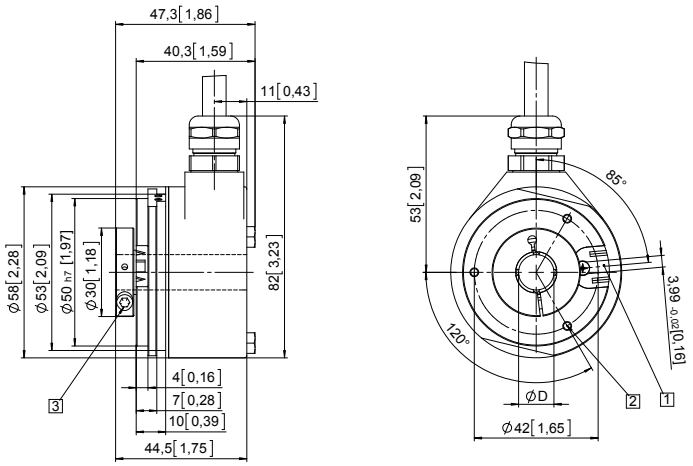
Dimensions in mm [inch]

Flange with through hollow shaft, ø 58 [2.28"]
Flange type 1

1 Slot spring element
recommendation:
cylindrical pin DIN 7, ø 4 [0.16]

2 3 x M3, 5 [0.2] deep

3 Recommended torque for the clamping ring
shaft version 6: 0.7 Nm
shaft version 8: 1.0 Nm



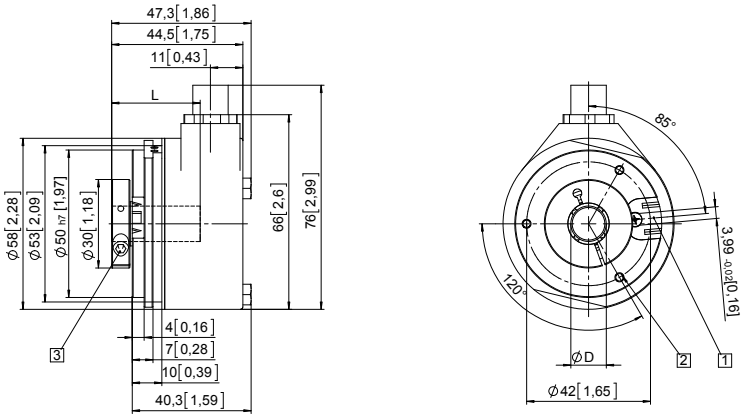
D	Fit
10 [0.39]	H7
12 [0.47]	H7

Flange with blind hollow shaft, ø 58 [2.28"]
Flange type 2

1 Slot spring element
recommendation:
cylindrical pin DIN 7, ø 4 [0.16]

2 3 x M3, 5 [0.2] deep

3 Recommended torque for the clamping ring
shaft version 6: 0.7 Nm
shaft version 8: 1.0 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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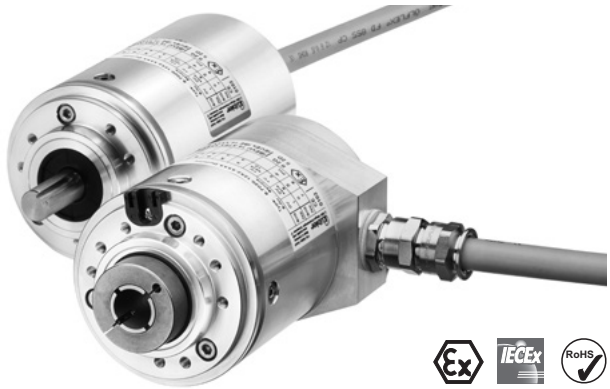
Absolute encoders - singleturn

Standard, ATEX / IECEx – zone 1 / 21 optical | **Sendix 7053 / 7073 (shaft / hollow shaft)** | **SSI / BiSS**



The Sendix 7053 / 7073 absolute encoders – singleturn offer Ex protection in a compact 70 mm seawater durable aluminum housing, with an SSI or BiSS interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 17 bits; they are also available with axial and radial cable outlets.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7053	.	1	X	2	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i [1]

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [2]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Inputs / outputs* [2]
2 = SET, DIR input additional status output

h *Options*
1 = no option

i *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7053.1221.XX21.V4A
8.7053.122A.XX21.XXXX-V4A

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Standard, ATEX / IECEx – zone 1/21 optical | Sendix 7053 / 7073 (shaft / hollow shaft) | SSI / BiSS

Order code Hollow shaft

8.7073 . X X 2 X . X X 2 1 . XXXX
Type — a b c d — e f g h — i [1]

a *Flange*
1 = with spring element, short
5 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [2]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Inputs / outputs* [2]
2 = SET, DIR input
additional status output

h *Options*
1 = no option

i *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7073.1221.XX21-V4A
8.7073.122A.XX21.XXXX-V4A

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7053

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7073

ATEX

EC type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0020 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes [3]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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Absolute encoders - singleturn

Standard, ATEX / IECEx – zone 1 / 21 optical | **Sendix 7053 / 7073 (shaft / hollow shaft)** | **SSI / BiSS**

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft flange / housing cable	stainless steel seawater durable Al, type AlSiMgMn (EN AW-6082) PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH LOW at I_{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit resolution ≥ 15 bit	< 1 µs 4 µs
Monoflop time		≤ 15 µs

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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution	10 ... 14 bit and 17 bit
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Status output

Output driver		open collector, internal pull-up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH LOW	+V < 1 V
Active at		LOW

The status output serves to display various alarm or error messages.
The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation.

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = power supply)	HIGH LOW	min. 60% of +V max. +V max. 25% of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction 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 reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)										
2	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚	⏚
			Cable marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
Stat: Status output
⏚: Protective earth

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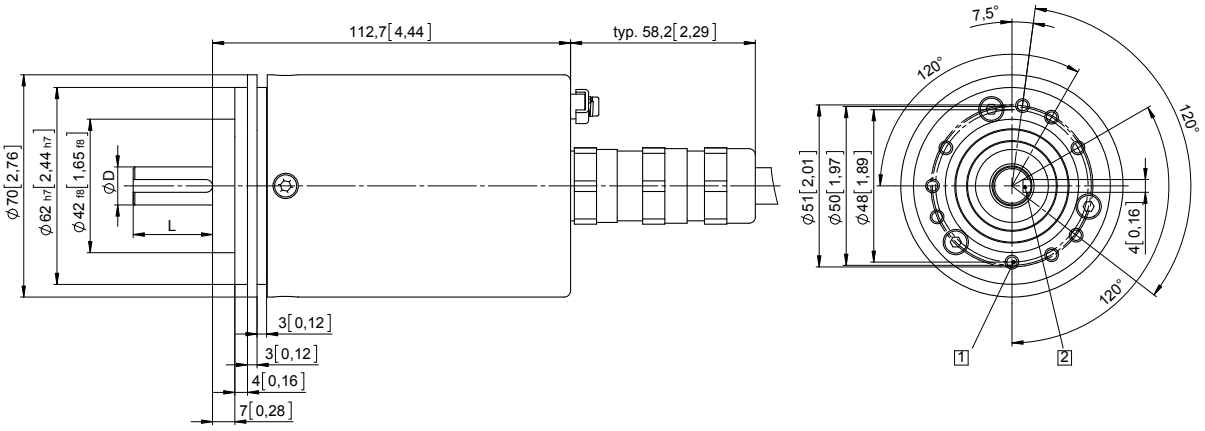
Standard, ATEX/IECEx – zone 1/21 optical | Sendix 7053 / 7073 (shaft / hollow shaft) | SSI / BiSS

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

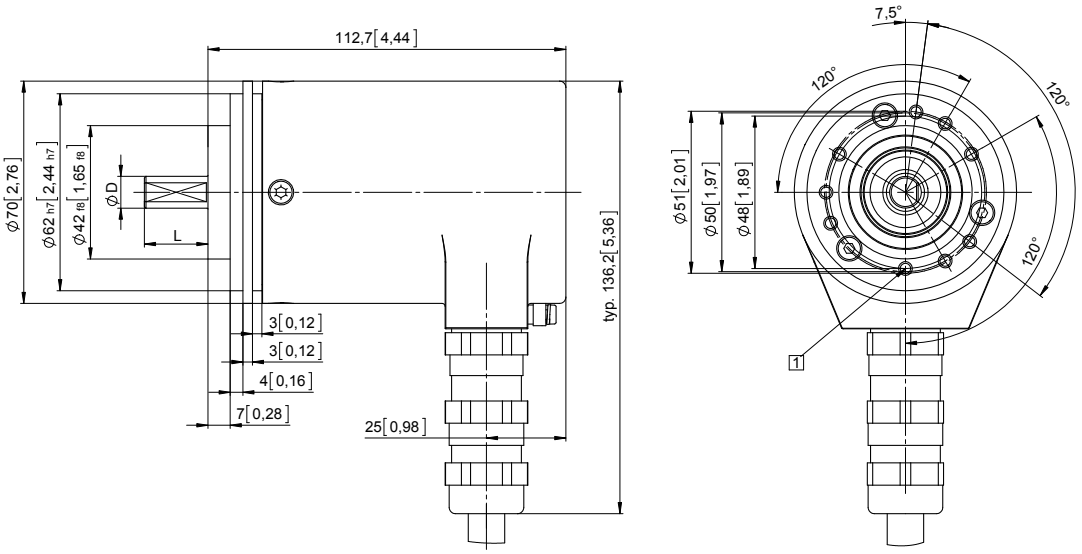
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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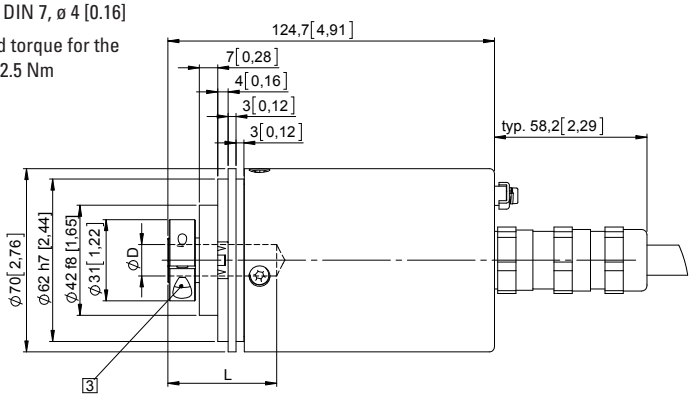
Standard, ATEX/IECEx – zone 1/21 optical | **Sendix 7053 / 7073 (shaft / hollow shaft)** | **SSI / BiSS**

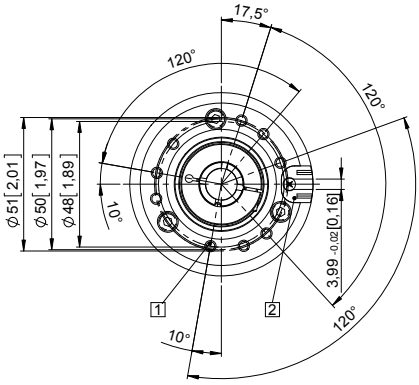
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

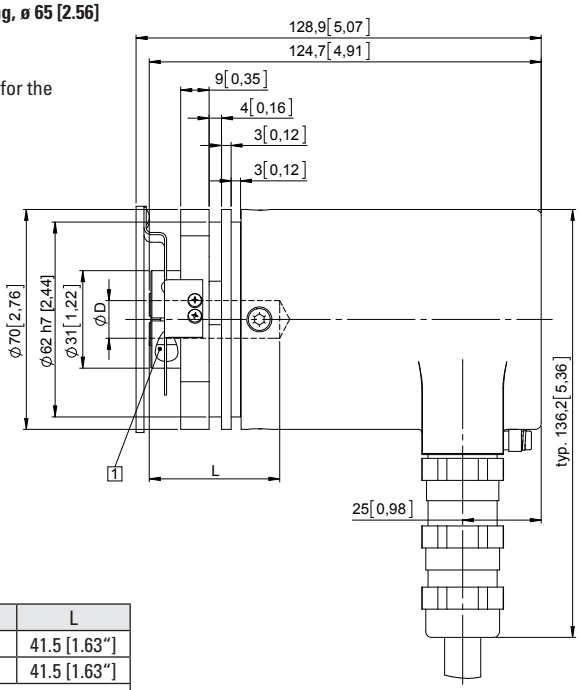


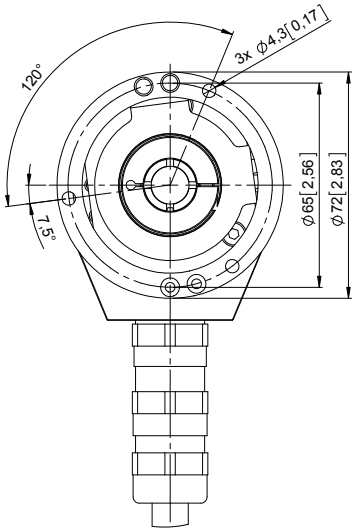


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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Standard, ATEX/IECEx – zone 1/21
SIL2/PLd, optical

Sendix SIL 7053FS2 (shaft)

SSI/BiSS+SinCos

Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7053FS2	.	1	X	4	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see **i**, e. g.: 0100 = 10 m [32.81']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* 2)
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Inputs / outputs* 2)
2 = SET input

h *Options*
1 = no option

i *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7053FS2.1241.XX21.V4A
8.7053FS2.124A.XX21.XXXX-V4A

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Absolute encoders - singleturn

Standard, ATEX / IECEx – zone 1 / 21 SIL2/PLd, optical | **Sendix SIL 7053FS2 (shaft)** | **SSI / BiSS + SinCos**

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.
Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value [1]	2.16×10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes [2]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0×10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEx – zone 1/21 SIL2/PLd, optical | Sendix SIL 7053FS2 (shaft) | SSI/BiSS+SinCos

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution	10 ... 14 bit and 17 bit
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [1]
Pulse rate	2048 ppr

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = Power supply)	HIGH	min. 60 % of +V max. +V
	LOW	max. 25 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
4	1, 2, A, B	SET	Signal:	0 V	+V	C+	C-	D+	D-	SET	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable marking:	6	1	2	3	4	5	11	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: SET input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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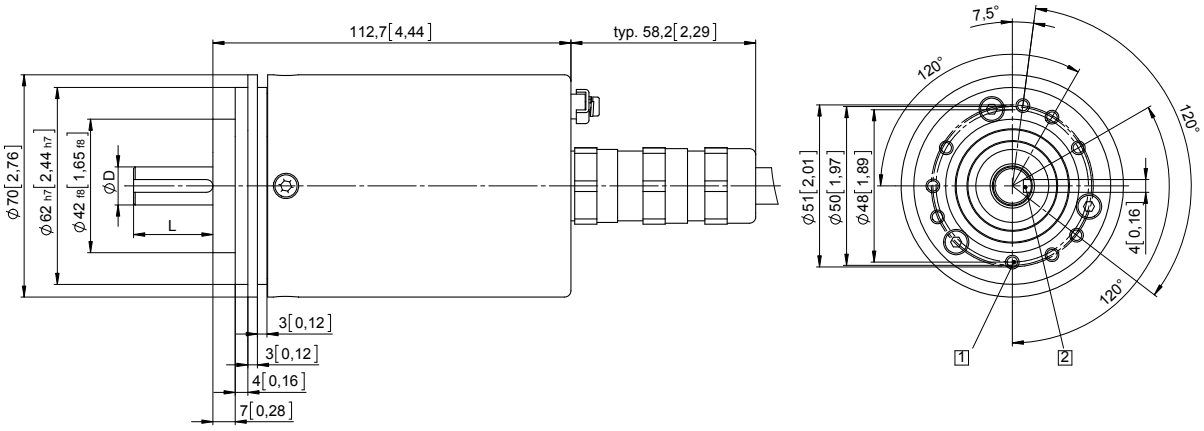
Standard, ATEX / IECEx – zone 1 / 21 SIL2/PLd, optical | **Sendix SIL 7053FS2 (shaft)** | **SSI / BiSS + SinCos**

Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

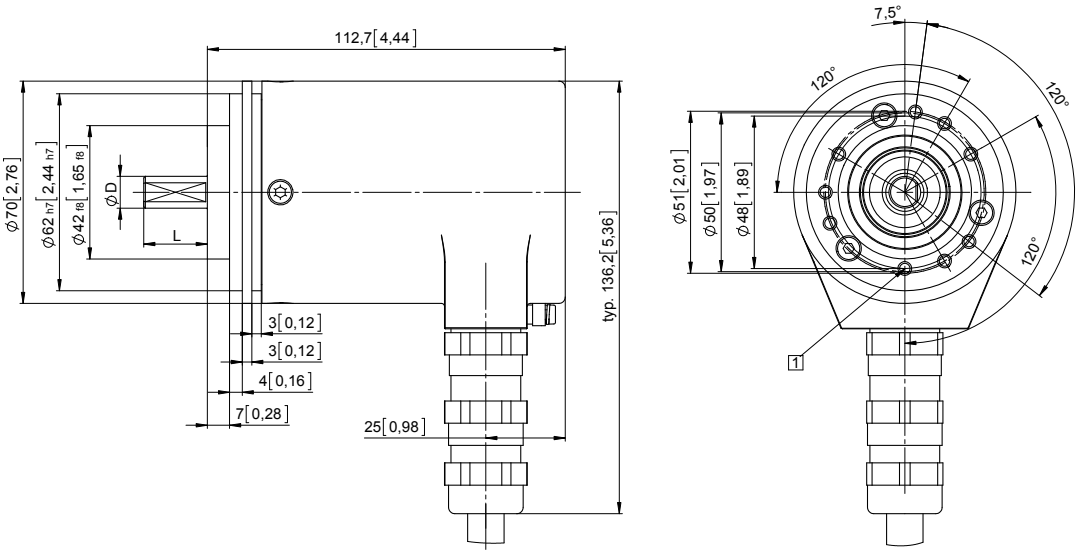
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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Standard, ATEX/IECEx – zone 1/21
SIL3/PLe, optical

Sendix SIL 7053FS3 (shaft)

SSI/BiSS+SinCos

Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7053FS3	.	1	X	4	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see **i**, e. g.: 0100 = 10 m [32.81']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* 2)
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Inputs / outputs* 2)
2 = SET input

h *Options*
1 = no option

i *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7053FS3.1241.XX21.V4A
8.7053FS3.124A.XX21.XXXX-V4A

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Absolute encoders - singleturn

Standard, ATEX / IECEx – zone 1 / 21 SIL3/PLe, optical | **Sendix SIL 7053FS3 (shaft)** | **SSI / BiSS + SinCos**

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.
Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value [1]	1.09×10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes [2]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0×10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Standard, ATEX / IECEx – zone 1 / 21 SIL3/PLe, optical | Sendix SIL 7053FS3 (shaft) | SSI / BiSS + SinCos

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH LOW at I_{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit resolution ≥ 15 bit	≤ 1 µs 4 µs
Monoflop time		≤ 15 µs

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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution	10 ... 14 bit and 17 bit
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [1]
Pulse rate	2048 ppr

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = Power supply)	HIGH LOW	min. 60 % of +V max. +V max. 25 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
4	1, 2, A, B	SET	Signal:	0 V	+V	C+	C-	D+	D-	SET	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable marking:	6	1	2	3	4	5	11	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: SET input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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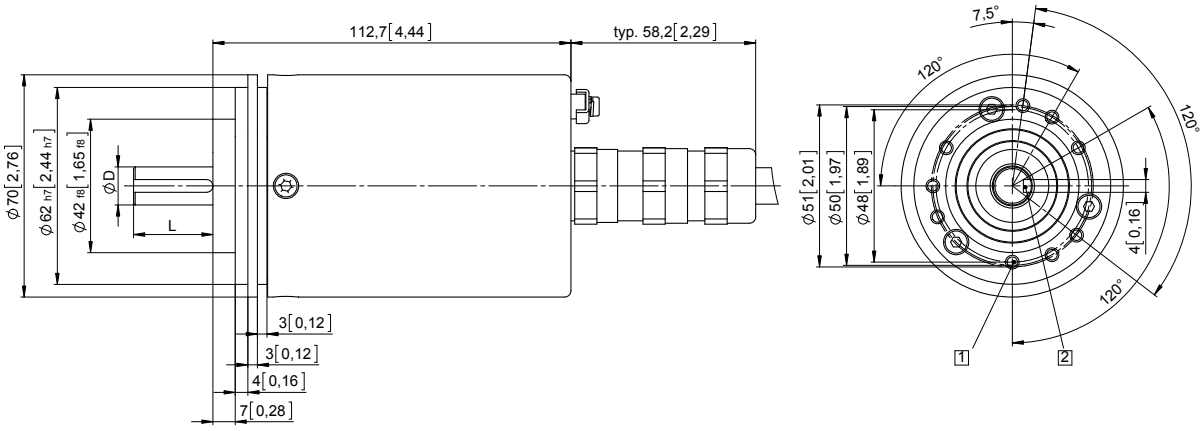
Standard, ATEX / IECEx – zone 1 / 21 SIL3/PLe, optical | Sendix SIL 7053FS3 (shaft) | SSI / BiSS + SinCos

Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

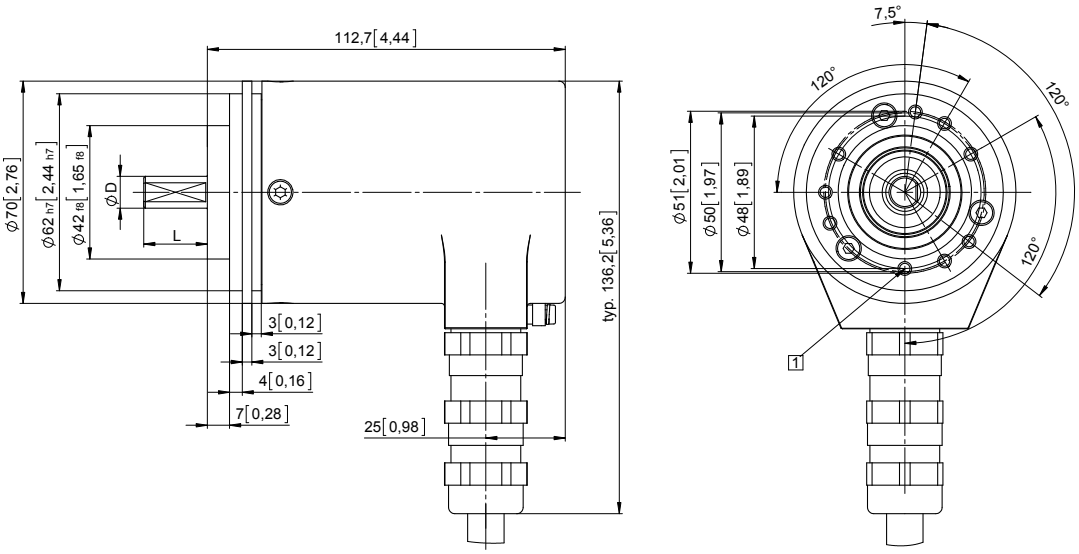
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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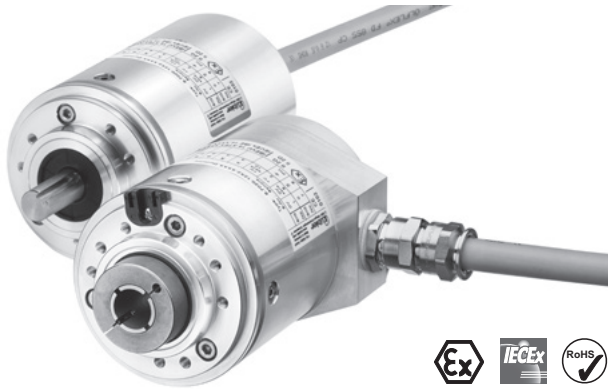
Standard, ATEX/IECEx – zone 1/21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **PROFIBUS DP**



The Sendix 7058 / 7078 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a Profibus interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7058	.	1	X	3	X	.	31	11	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / Power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7058.1231.3111.V4A
8.7058.123A.3111.XXXX-V4A

1) Not applicable with connection types 1 and 2.

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Absolute encoders - singleturn

Standard, ATEX / IECEx – zone 1 / 21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **PROFIBUS DP**

Order code Hollow shaft

8.7078	.	X	X	3	X	.	31	11	.	XXXX
Type		a	b	c	d		e			f [1]

a *Flange*
1 = with spring element, short
5 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / Power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7078.1231.3111.V4A
8.7078.123A.3111.XXXX-V4A

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7058

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7078

ATEX

EC type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0020 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft flange / housing cable	stainless steel seawater durable Al, type AlSiMgMn (EN AW-6082) PUR
Shock resistance acc. to. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 110 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEx – zone 1/21 optical | Sendix 7058 / 7078 (shaft / hollow shaft) | PROFIBUS DP

Interface characteristics PROFIBUS DP	
Resolution	1 ... 65536 (16 bit), behavior default: 8192 (13 bit)
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 add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA service with a class 2 master; default address: 125
Termination	active termination can only be switched on externally

Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. 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 use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of 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 acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

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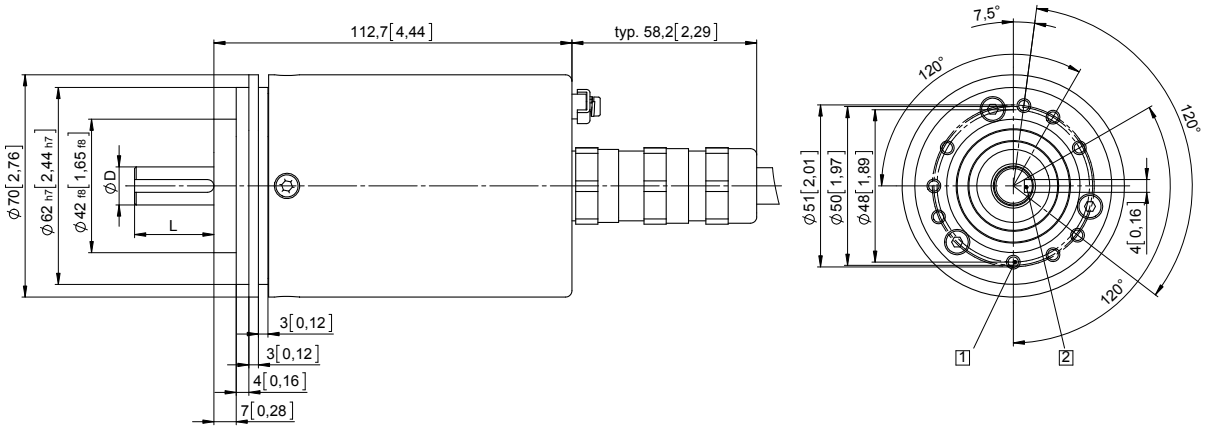
Standard, ATEX/IECEx – zone 1/21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **PROFIBUS DP**

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

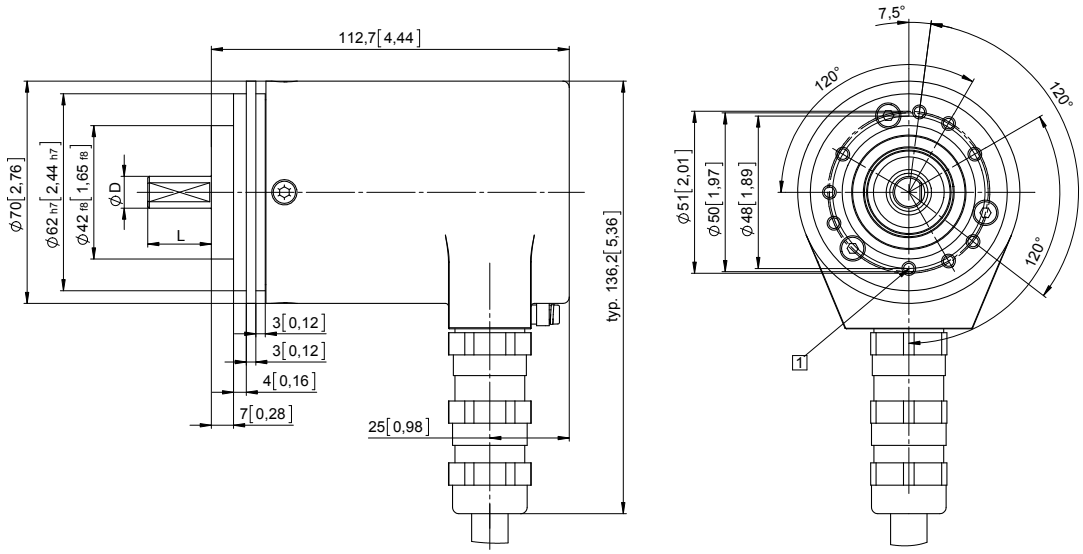
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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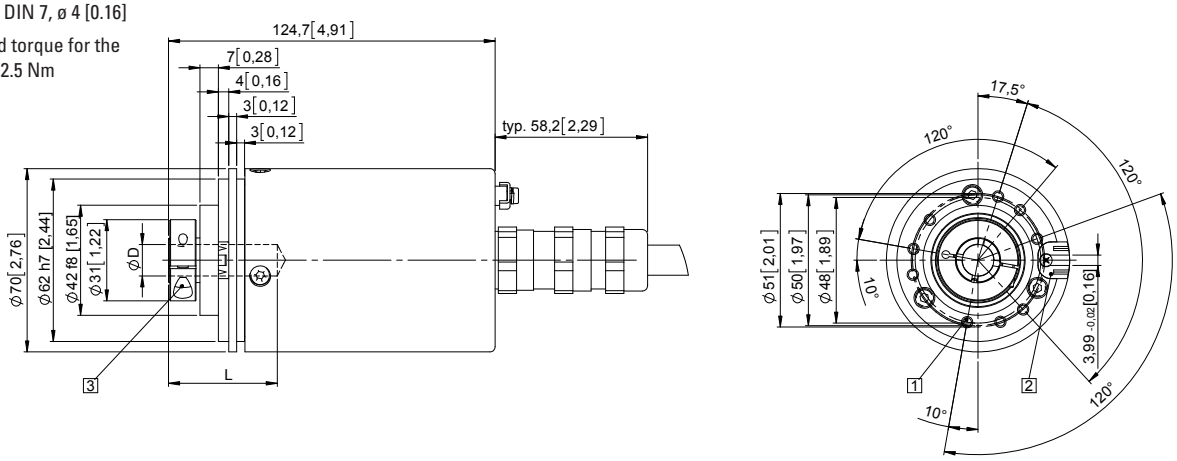
Standard, ATEX/IECEx – zone 1/21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **PROFIBUS DP**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

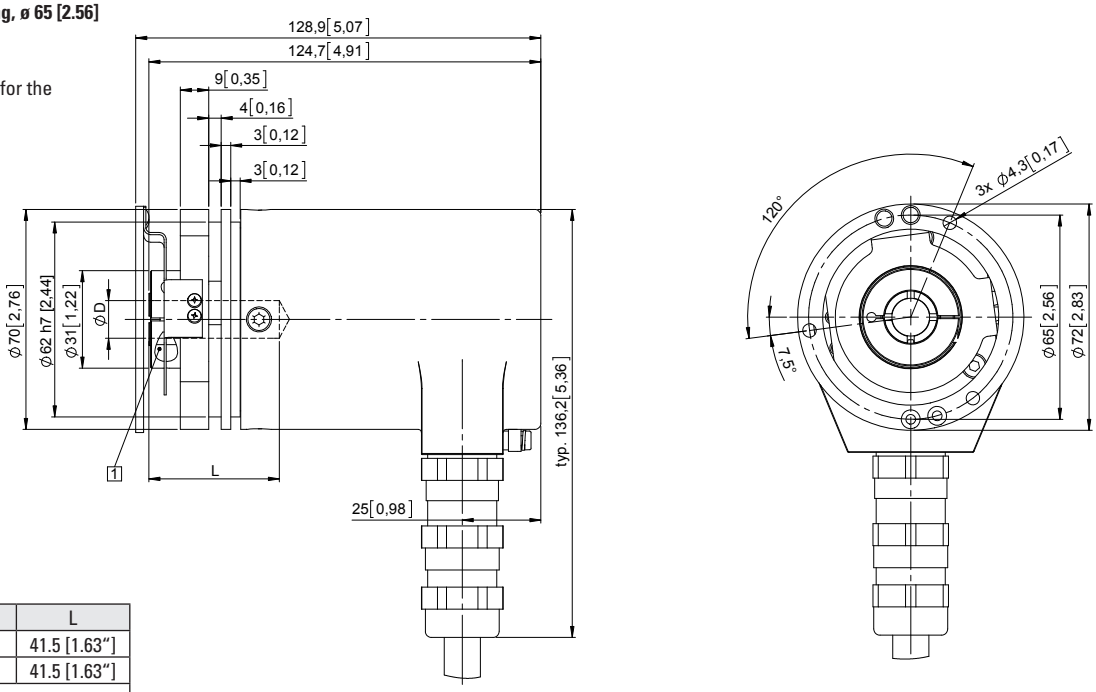
1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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Standard, ATEX / IECEx – zone 1 / 21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **CANopen**

The Sendix 7058 / 7078 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a CANopen interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7058	.	1	X	2	X	.	21	11	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7058.1221.2111.V4A
8.7058.122A.2111.XXXX-V4A

1) Not applicable with connection types 1 and 2.

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Absolute encoders - singleturn

Standard, ATEX/IECEx – zone 1/21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **CANopen**

Order code Hollow shaft

8.7078	.	X	X	2	X	.	21	11	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
1 = with spring element, short
5 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7078.1221.2111.V4A
8.7078.122A.2111.XXXX-V4A

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7058

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7078

ATEX

EC type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0020 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 90 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.

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Standard, ATEX / IECEx – zone 1 / 21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **CANopen**

Interface characteristics CANopen	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02.

In addition, device-specific profiles like the encoder profile DS406 V3.2 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 can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position**, **speed**, **acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, 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), 3 Sending PDO's.
- Node address, baud rate and CANbus termination programmable.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:
- Event mode.
- Units for speed selectable (steps/sec or min^{-1}).
- Factor for speed calculation (e.g. measuring wheel circumference) Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working 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 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

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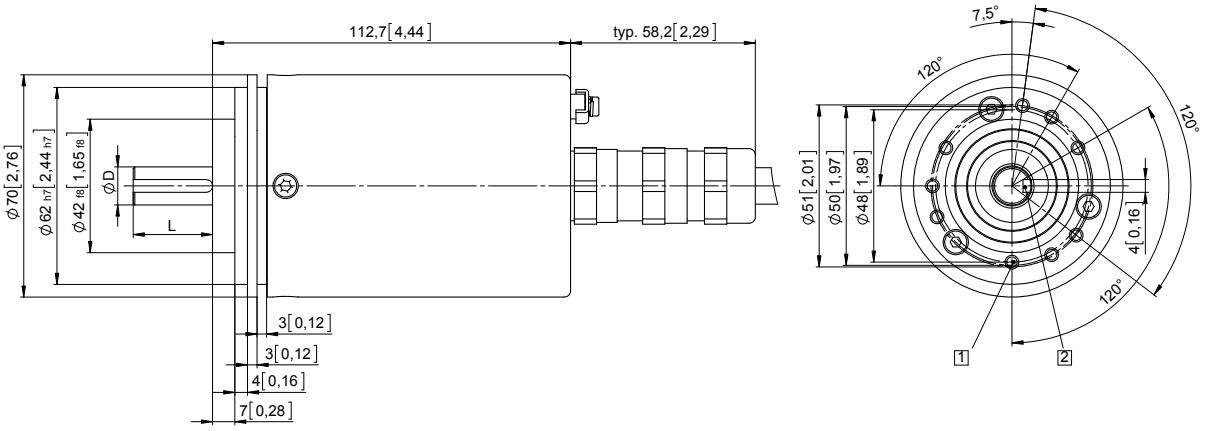
Standard, ATEX/IECEx – zone 1/21 optical | Sendix 7058 / 7078 (shaft / hollow shaft) | CANopen

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

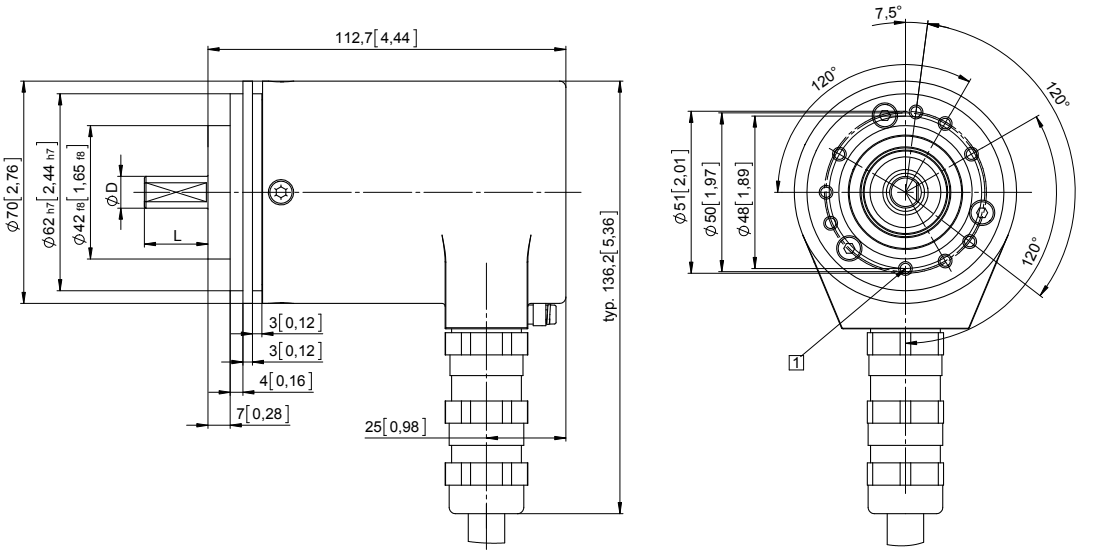
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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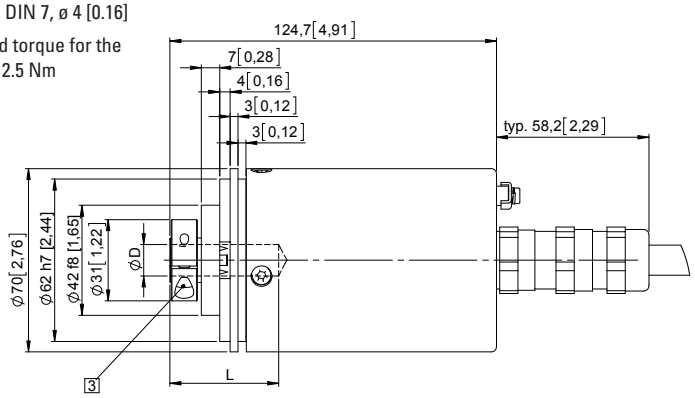
Standard, ATEX/IECEx – zone 1/21 optical | **Sendix 7058 / 7078 (shaft / hollow shaft)** | **CANopen**

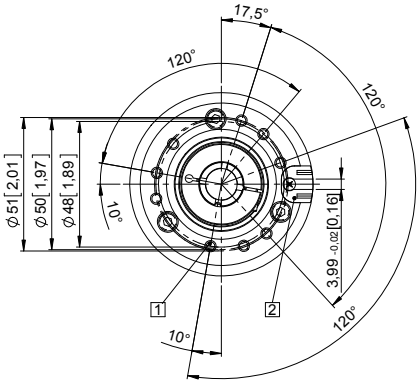
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

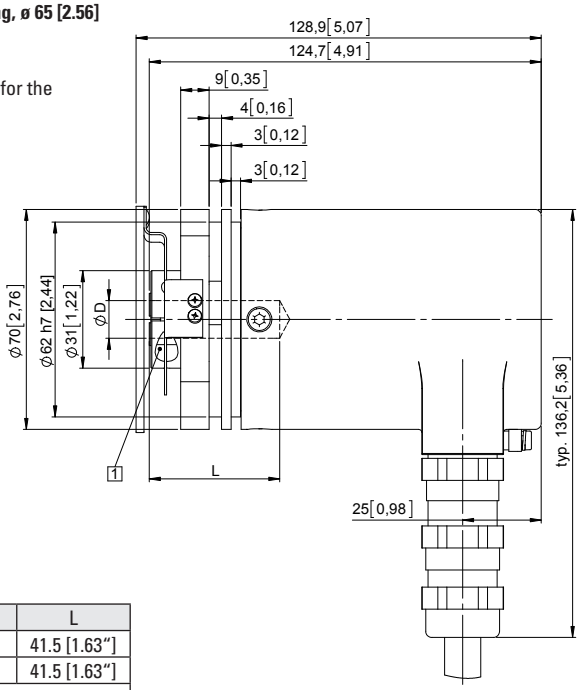


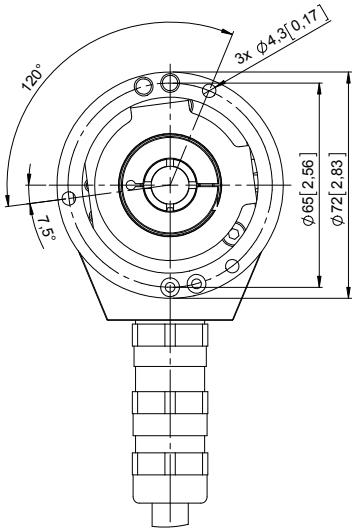


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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Standard, ATEX/IECEx – mining optical | **Sendix 7153 / 7173 (shaft / hollow shaft)** | **SSI / BiSS**

The Sendix 7153 / 7173 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with a an SSI or BiSS interface and optical sensor technology have an ATEX/IECEx mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 17 bits; they are also available with axial and radial cable outlets.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7153	.	2	X	2	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i 1)

a *Flange*
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* 2)
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Inputs / outputs* 2)
2 = SET, DIR input
additional status output

h *Options*
1 = no option

i *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions

1) Not applicable with connection types 1 and 2
2) Resolution, preset value and counting direction factory-programmable.

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Absolute encoders - singleturn

Standard, ATEX / IECEx – mining optical | **Sendix 7153 / 7173 (shaft / hollow shaft)** | **SSI / BiSS**

Order code Hollow shaft

8.7173 . X X 2 X . X X 2 1 . XXXX
Type — a b c d — e f g h — i 1)

a *Flange*
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* 2)
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Inputs / outputs* 2)
2 = SET, DIR input
additional status output

h *Options*
1 = no option

i *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions

Technical data

Explosion protection 7153

ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007

IECEx

Certificate of Conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7173

ATEX

EC type-examination certificate	IBExU 15 ATEX 1057 X
Category	Ex I M2 Ex d I/IIC T4 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0019 X
Category	Ex d I/IIC T4 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes 3)
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEx – mining optical | Sendix 7153 / 7173 (shaft / hollow shaft) | SSI / BiSS

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution	10 ... 14 bit and 17 bit
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Status output

Output driver		open collector, internal pull-up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active at		LOW

The status output serves to display various alarm or error messages.
The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation.

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = power supply)	HIGH	min. 60% of +V
		max. +V
	LOW	max. 25% of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction 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 reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
2	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚	⏚
			Cable marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
Stat: Status output
⏚: Protective earth

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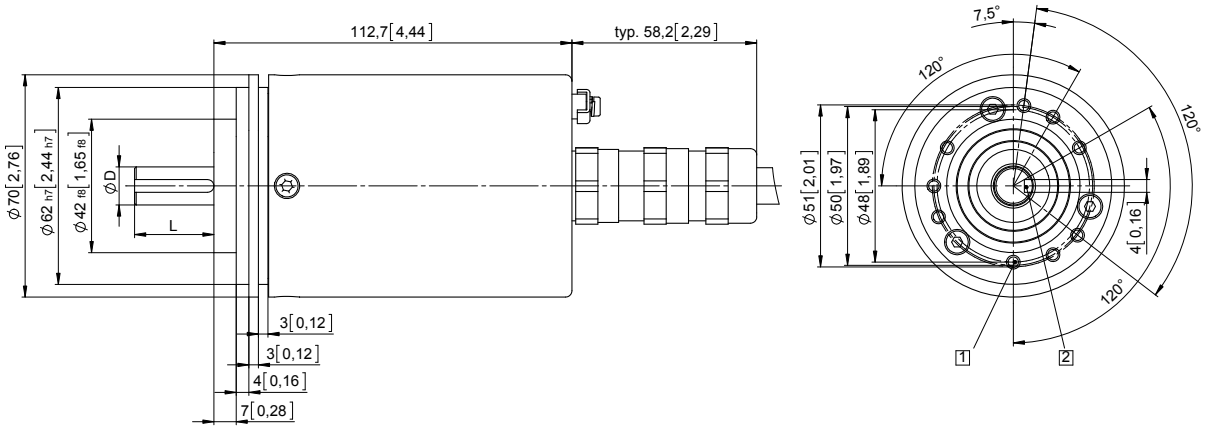
Standard, ATEX / IECEx – mining optical | **Sendix 7153 / 7173 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

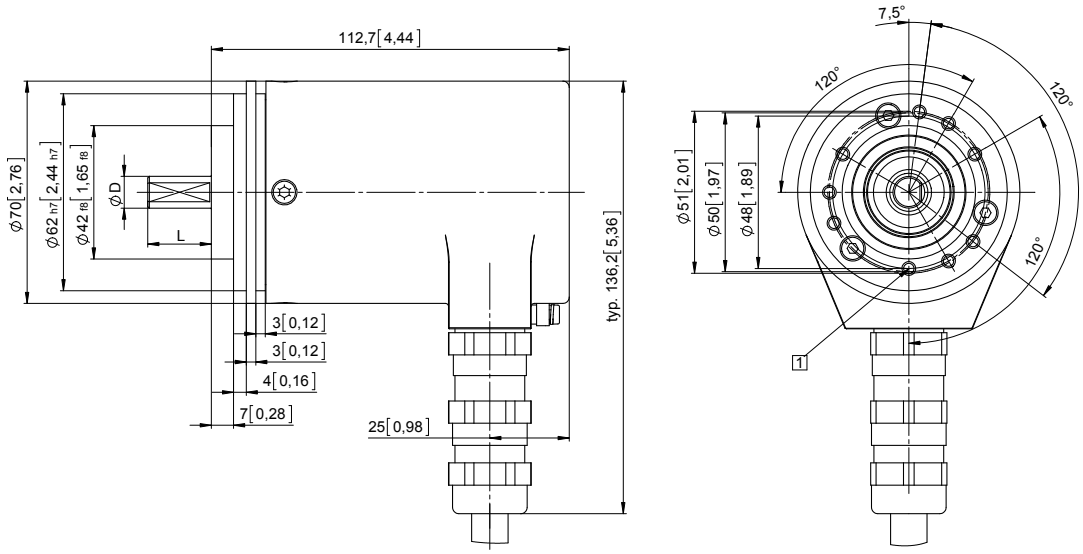
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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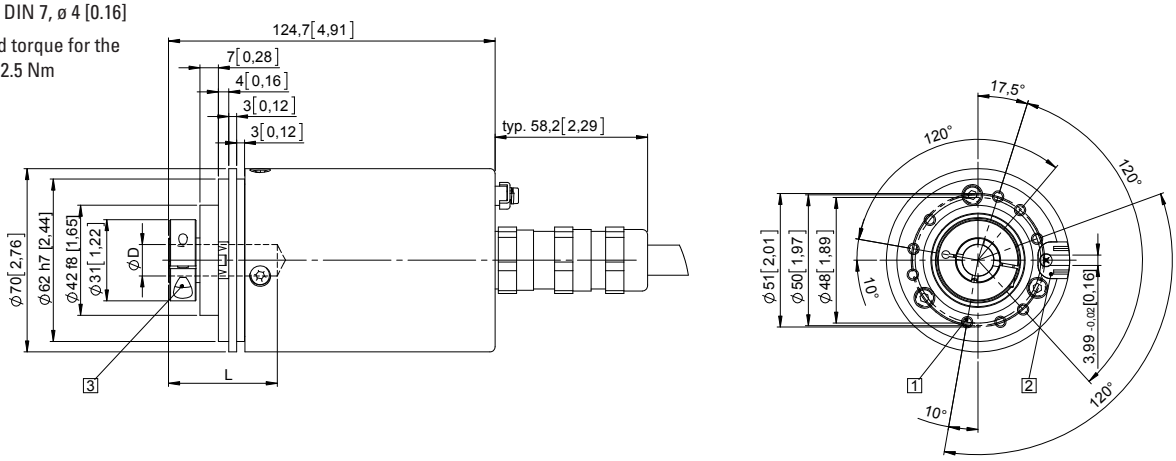
Standard, ATEX/IECEx – mining optical | **Sendix 7153 / 7173 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

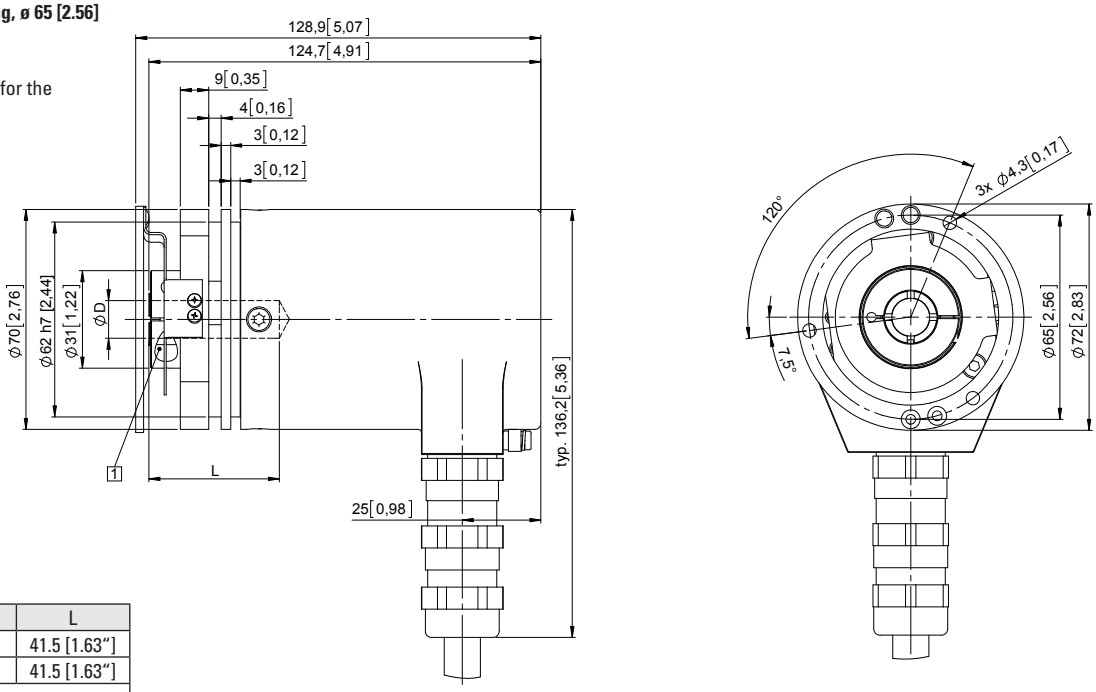
1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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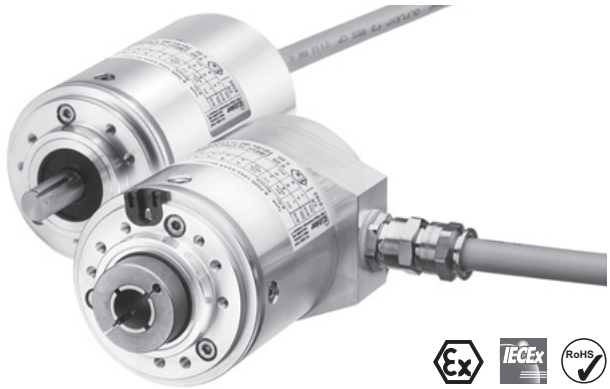
Standard, ATEX / IECEx – mining optical | Sendix 7158 / 7178 (shaft / hollow shaft) | PROFIBUS DP



The Sendix 7158 / 7178 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with a PROFIBUS interface and optical sensor technology have an ATEX/IECEx mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7158	.	2	X	3	X	.	31	11	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

Order code Hollow shaft

8.7178	.	X	X	3	X	.	31	11	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEx – mining optical | **Sendix 7158 / 7178 (shaft / hollow shaft)** | **PROFIBUS DP**

Technical data

Explosion protection 7158

ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007

IECEx

Certificate of Conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7178

ATEX

EC type-examination certificate	IBExU 15 ATEX 1057 X
Category	Ex I M2 Ex d I/IIC T4 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0019 X
Category	Ex d I/IIC T4 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 110 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Interface characteristics PROFIBUS DP

Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
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 add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a class 2 master; default address: 125
Termination	active termination can only be switched on externally

Profibus encoder-profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. 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 use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of 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 acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

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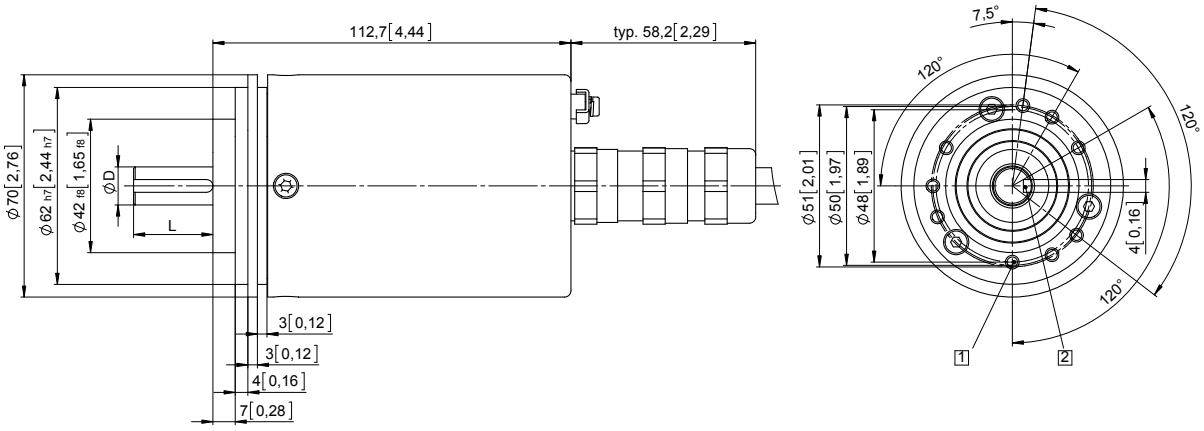
Standard, ATEX / IECEx – mining optical | **Sendix 7158 / 7178 (shaft / hollow shaft)** | **PROFIBUS DP**

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

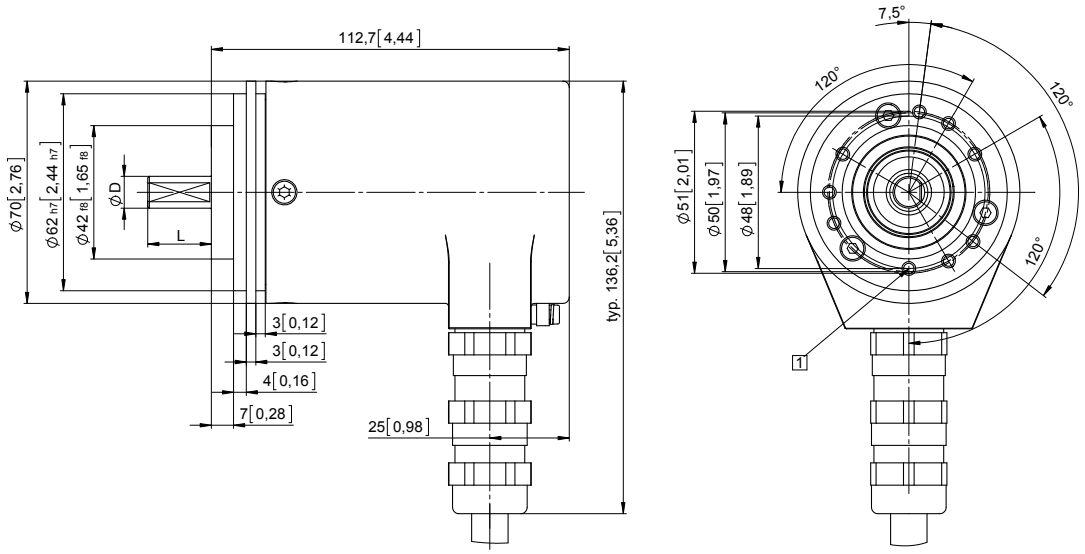
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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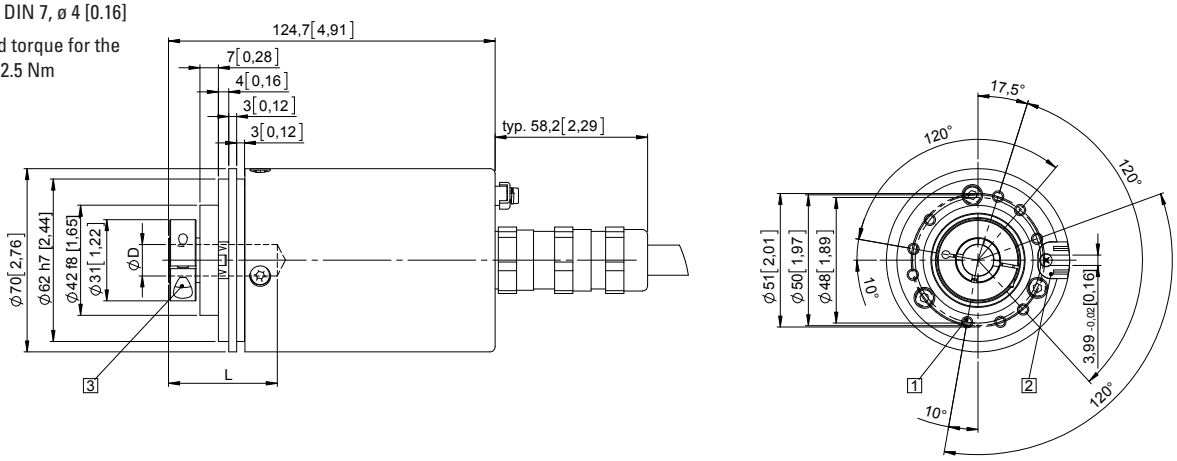
Standard, ATEX/IECEx – mining optical | **Sendix 7158 / 7178 (shaft / hollow shaft)** | **PROFIBUS DP**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

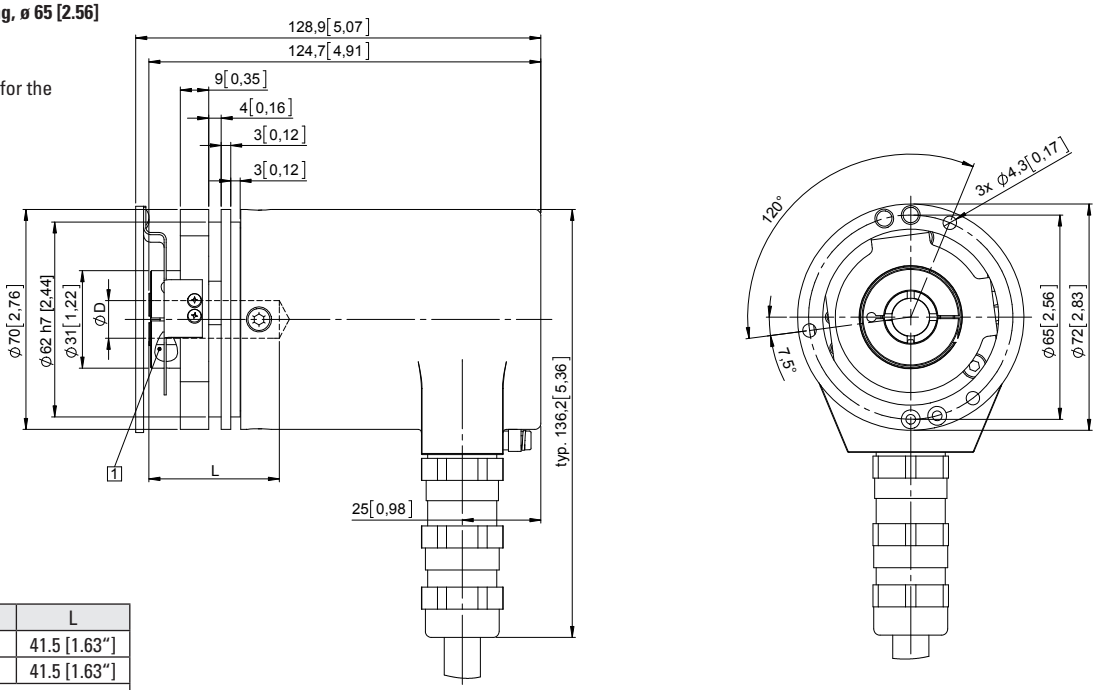
1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]
L = insertion depth max. blind hollow shaft		

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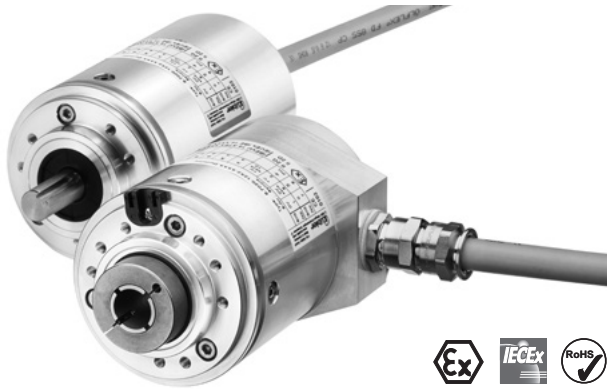
Standard, ATEX / IECEx – mining optical | **Sendix 7158 / 7178 (shaft / hollow shaft)** | **CANopen**



The Sendix 7158 / 7178 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with a CANopen interface and optical sensor technology have an ATEX/IECEx mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7158 . 2 X 2 X . 21 11 . XXXX
Type — a b c d — e — f 1)

a *Flange*
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

Order code Hollow shaft

8.7178 . X X 2 X . 21 11 . XXXX
Type — a b c d — e — f 1)

a *Flange*
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft*
(insertion depth max. 41.5 mm [1.63"])
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

1) Not applicable with connection types 1 and 2.

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Standard, ATEX / IECEx – mining optical | **Sendix 7158 / 7178 (shaft / hollow shaft)** | **CANopen**

Technical data

Explosion protection 7158

ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007

IECEx

Certificate of Conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7178

ATEX

EC type-examination certificate	IBExU 15 ATEX 1057 X
Category	Ex I M2 Ex d I/IIC T4 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0019 X
Category	Ex d I/IIC T4 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 90 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Standard, ATEX / IECEx – mining optical | Sendix 7158 / 7178 (shaft / hollow shaft) | CANopen

Interface characteristics CANopen	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 .

In addition, device-specific profiles like the encoder profile DS406 V3.2 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 can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position**, **speed**, **acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, 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), 3 Sending PDO's.
- Node address, baud rate and CANbus termination programmable.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:
- Event mode.
- Units for speed selectable (steps/sec or min^{-1}).
- Factor for speed calculation (e.g. measuring wheel circumference) Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working 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 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

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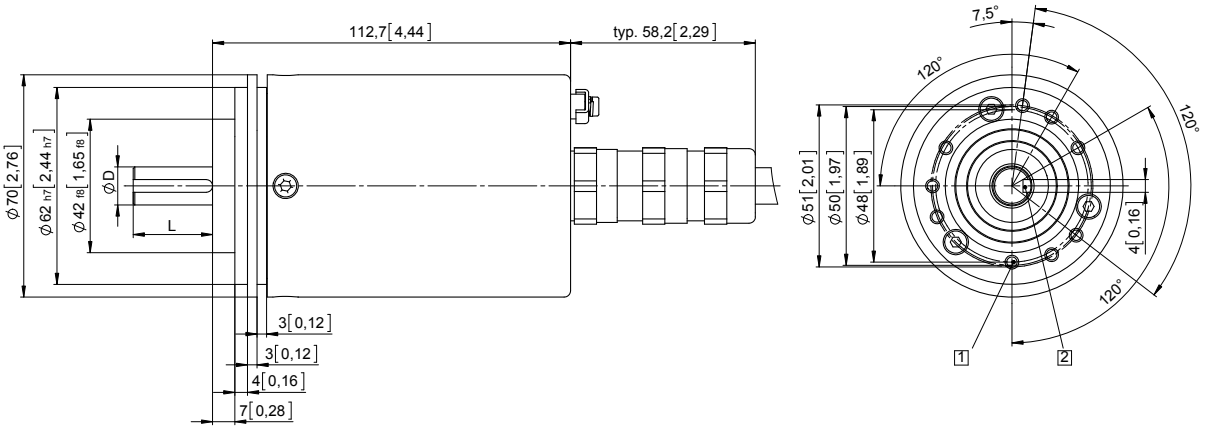
Standard, ATEX/IECEx – mining optical | Sendix 7158 / 7178 (shaft / hollow shaft) | CANopen

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

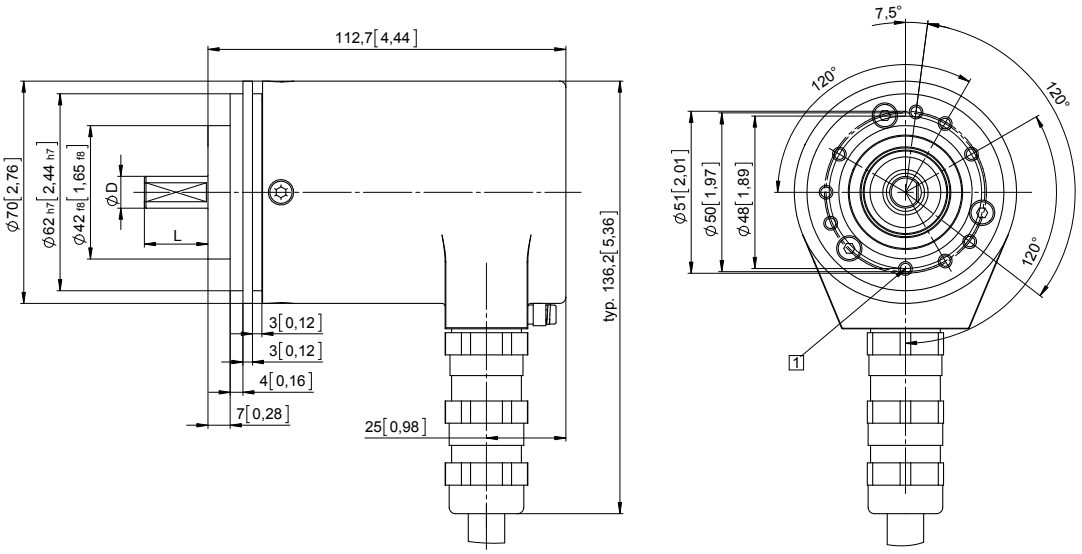
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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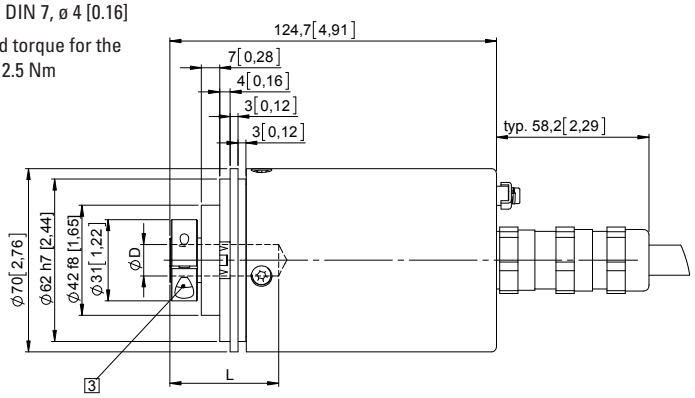
Standard, ATEX / IECEx – mining optical | **Sendix 7158 / 7178 (shaft / hollow shaft)** | **CANopen**

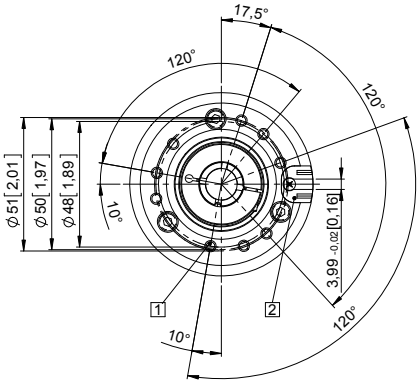
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

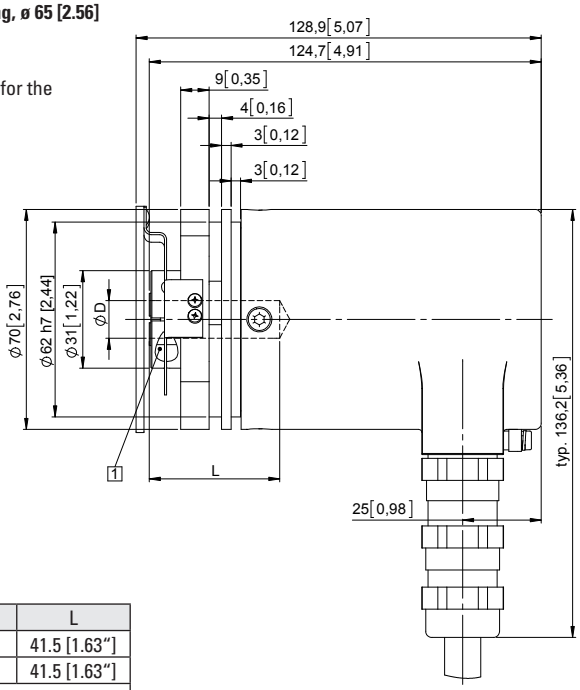


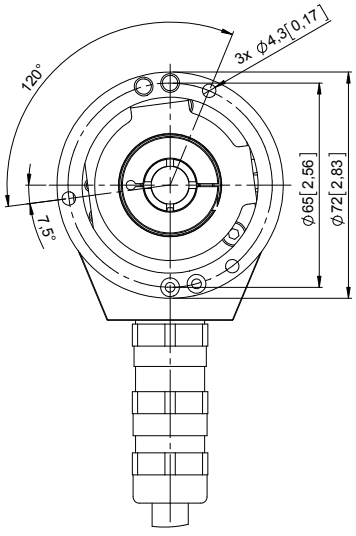


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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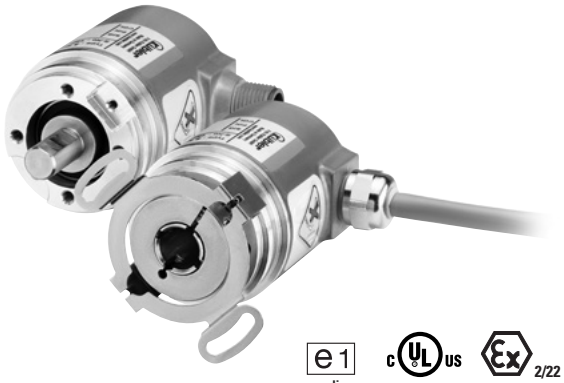
Type: 8.F3683.1421.G222
10-30 VDC 50 mA
S-Nr: xxxxxxxxxx
Fritz Kübler GmbH
Made in Germany
www.kuebler.com
Kübler
GND WH
+V BN
DIR RD
SET BU

Absolute encoders – multiturn

Series			Type	Interface	Page
Compact, magnetic	Electronic multiturn	new	Sendix M3661 / M3681 (shaft / hollow shaft)	Analog	**298**
	Electronic multiturn	new	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI	**304**
	Electronic multiturn	new	Sendix M3668 / M3688 (shaft / hollow shaft)	CANopen	**309**
	Robust, electr. multiturn	new	Sendix M3661R (shaft)	Analog	**314**
	Robust, electr. multiturn	new	Sendix M3663R (shaft)	SSI	**318**
	Robust, electr. multiturn	new	Sendix M3668R (shaft)	CANopen	**321**
Compact, optical	Electronic multiturn		Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS + incremental	**325**
	Electronic multiturn		Sendix F3668 / F3688 (shaft / hollow shaft)	CANopen	**331**
Standard, magnetic	Electronic multiturn	new	Sendix M5861 (shaft)	Analog	**336**
	Electronic multiturn	new	Sendix M5863 (shaft)	SSI	**340**
	Electronic multiturn	new	Sendix M5868 (shaft)	CANopen	**343**
Standard, optical	Electronic multiturn		Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS + incremental	**347**
	Motor-Line, electr. multiturn	new	Sendix F5883M (hollow shaft)	SSI / BiSS + incremental	**354**
	Mechanical multiturn		Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS + incremental	**358**
	SIL2/PLd, mech. multiturn		Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow s.)	SSI / BiSS + SinCos	**366**
	SIL3/PLe, mech. multiturn		Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow s.)	SSI / BiSS + SinCos	**373**
	Electronic multiturn		Sendix F5868 / F5888 (shaft / hollow shaft)	CANopen	**380**
	Motor-Line, electr. multiturn	new	Sendix F5888M (hollow shaft)	CANopen	**386**
	Electronic multiturn	new	Sendix F5868 / F5888 (shaft / hollow shaft)	EtherNet/IP	**390**
	Electronic multiturn		Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus	**395**
	Mechanical multiturn		Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP	**400**
	Mechanical multiturn		Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen / CANopenLift	**405**
	Mechanical multiturn		Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT	**416**
	Mechanical multiturn		Sendix 5868 / 5888 (shaft / hollow shaft)	PROFINET IO	**421**
Standard, optical ATEX / IECEx – zone 1/21	Mechanical multiturn		Sendix 7063 / 7083 (shaft / hollow shaft)	SSI / BiSS	**426**
	SIL2/PLd, mech. multiturn		Sendix SIL 7063FS2 (shaft)	SSI / BiSS + SinCos	**431**
	SIL3/PLe, mech. multiturn		Sendix SIL 7063FS3 (shaft)	SSI / BiSS + SinCos	**435**
	Mechanical multiturn		Sendix 7068 / 7088 (shaft / hollow shaft)	PROFIBUS DP	**439**
	Mechanical multiturn		Sendix 7068 / 7088 (shaft / hollow shaft)	CANopen	**444**
Standard, optical ATEX / IECEx – mining	Mechanical multiturn		Sendix 7163 / 7183 (shaft / hollow shaft)	SSI / BiSS	**449**
	Mechanical multiturn		Sendix 7168 / 7188 (shaft / hollow shaft)	PROFIBUS DP	**454**
	Mechanical multiturn		Sendix 7168 / 7188 (shaft / hollow shaft)	CANopen	**459**
Large hollow shaft, optical / magnetic			9080 (hollow shaft)	PROFIBUS DP	**464**
			9080 (hollow shaft)	CANopen / DeviceNet	**467**
			9081 (hollow shaft)	SSI	**471**

Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analog**



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. With a size of just 36 x 53 mm it offers a blind hollow shaft of up to 10 mm.

e1 pending | cULus | Ex 2/22 | RoHS

Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Surface protection salt spray tested optional | Energy Harvesting

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

Order code Shaft version

8.M3661 . X X X X . X X 1 2
Type — a b c d — e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]

c *Output circuit* [1)]
3 = current output
4 = voltage output

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M12 connector, 5-pin
4 = radial M12 connector, 5-pin
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3661.433A.3112.0030 (for cable length 3 m)

e *Interface / resolution / power supply*
3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f *Measuring range*
1 = 16 revolutions / cw
2 = 16 revolutions / ccw
3 = scalable up to 65,536 revolutions, with limit switch function / cw
4 = scalable up to 65,536 revolutions, without limit switch function / cw
5 = scalable up to 65,536 revolutions, with limit switch function / ccw
6 = scalable up to 65,536 revolutions, without limit switch function / ccw

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

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Absolute encoders – multiturn

Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analog**

Order code Hollow shaft

8.M3681 . X X X X . X X 1 2
Type
a b c d e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = with stator coupling, IP65, ø 46 mm [1.81"]
3 = with spring element, long, IP65
5 = with stator coupling, IP67, ø 46 mm [1.81"]
6 = with spring element, long, IP67

b *Blind hollow shaft (insertion depth max. 18.5 mm [0.73"])*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"]
2 = ø 1/4"

c *Output circuit* [1)]
3 = current output
4 = voltage output

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M12 connector, 5-pin
4 = radial M12 connector, 5-pin

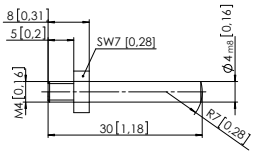
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm
Ex.: 8.M3681.243A.3112.0030 (for cable length 3 m)

e *Interface / resolution / power supply*
3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f *Measuring range*
1 = 16 revolutions / cw
2 = 16 revolutions / ccw
3 = scalable up to 65,536 revolutions, with limit switch function / cw
4 = scalable up to 65,536 revolutions, without limit switch function / cw
5 = scalable up to 65,536 revolutions, with limit switch function / ccw
6 = scalable up to 65,536 revolutions, without limit switch function / ccw

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 3 + 6)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	without shaft seal	< 0.007 Nm
	with shaft seal (IP67	< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N

Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

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Compact electronic multiturn, magnetic | Sendix M3661 / M3681 (shaft / hollow shaft) | Analog

Electrical characteristics current interface 4 ... 20 mA

Power supply		10 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes [1]
Measuring range	factory setting optionally scalable	2^4 revolutions up to 2^{16} revolutions
DA converter resolution		12 bit
Singleturn accuracy, at 25°C [77°F]		±1°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Output load	at 10 V DC at 24 V DC at 30 V DC	max. 200 Ohm max. 900 Ohm max. 1200 Ohm
Setting time		< 1 ms, R_{Burden} = 900 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - current loop interruption – input load too high - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options		- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs		level = +V for 1 s min.
PowerON Time		< 1 s
Update rate		1 ms
e1 compliant acc. to (pending)		EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V

Power supply	output 0 ... 5 V output 0 ... 10 V	10 ... 30 V DC 15 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes [1]
Measuring range	factory setting optionally scalable	2^4 revolutions up to 2^{16} revolutions
DA converter resolution	0 ... 10 V 0 ... 5 V	12 bit 11 bit
Singleturn accuracy, at 25°C [77°F]		±1°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Current output		max. 10 mA
Setting time		< 1 ms, R_{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options		- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs		level = +V for 1 s min.
PowerON Time		< 1 s
Update rate		1 ms
e1 compliant acc. to (pending)		EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

1) When the power supply is correctly applied.
But not output to +V. Power supply and sensor output signal are not galvanically isolated.

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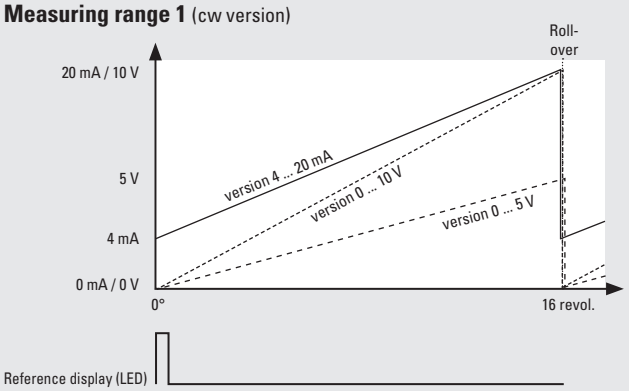
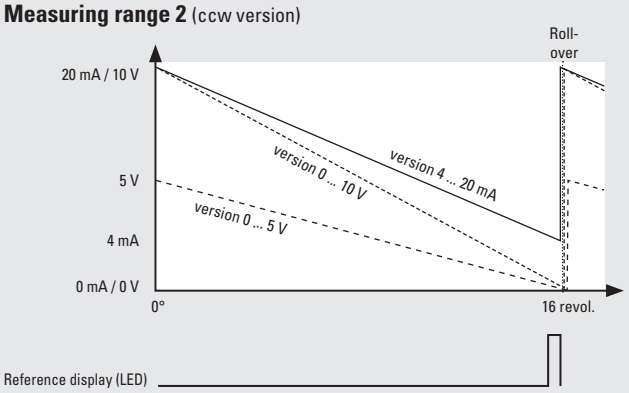
Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analog**

Example (output signal evolution) – factory setting

Measuring range 1 (cw version)

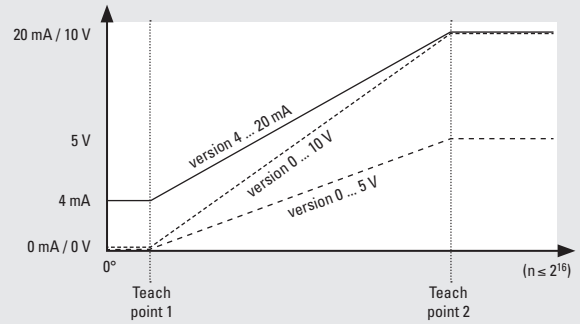


Measuring range 2 (ccw version)



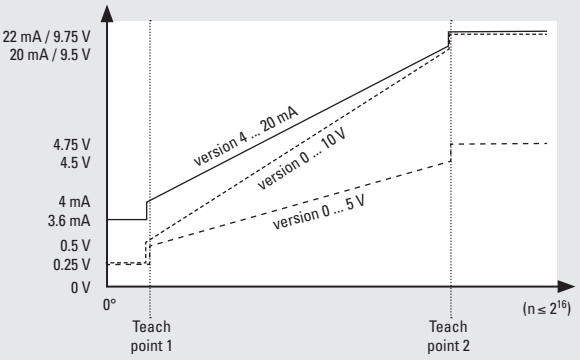
Example (output signal evolution) – option: scalable

Measuring range 4, 6 (scalable version without limit switch function)



no reference point display!

Measuring range 3, 5 (scalable version with limit switch function)



no reference point display!

Factory-set measuring range 2^4 revolutions with roll-over

Limit switch function	version	**0 ... 10 V**	**0 ... 5 V**	**4 ... 20 mA**
	limit switch low	0.25 V	0.25 V	3.6 mA
	limit switch high	9.75 V	4.75 V	22.0 mA

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
3 (current)	1, 2, A, B	Signal:	0 V	+V	+I	SET 1 [1]	SET 2 [1]
		Cable color:	WH	BN	GN	GY	PK

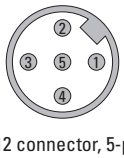
Interface	Type of connection	M12 connector, 5 pin					
3 (current)	3, 4	Signal:	0 V	+V	+I	SET 1 [1]	SET 2 [1]
		Pin:	3	2	1	5	4

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
4, 5 (current)	1, 2, A, B	Signal:	0 V	+V	+U	SET 1 [1]	SET 2 [1]
		Cable color:	WH	BN	GN	GY	PK

Interface	Type of connection	M12 connector, 5 pin					
4, 5 (current)	3, 4	Signal:	0 V	+V	+U	SET 1 [1]	SET 2 [1]
		Pin:	3	2	1	5	4

+V : encoder power supply +V DC
0 V : encoder power supply ground GND (0 V)
+U : voltage
+I : current
SET 1 : set input for teachpoint 1
SET 2 : set input for teachpoint 2

Top view of mating side, male contact base



M12 connector, 5-pin

1) For scalable version.

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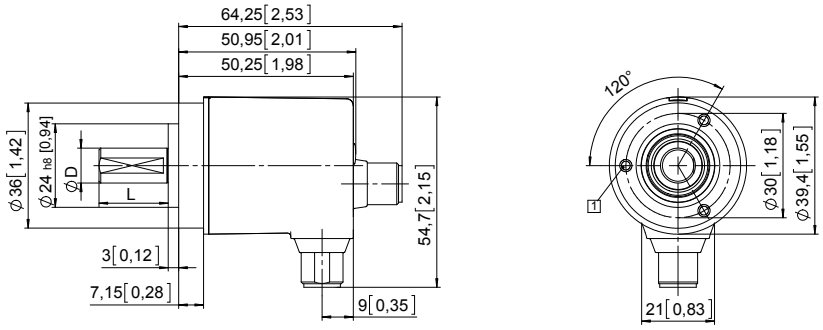
Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analog**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

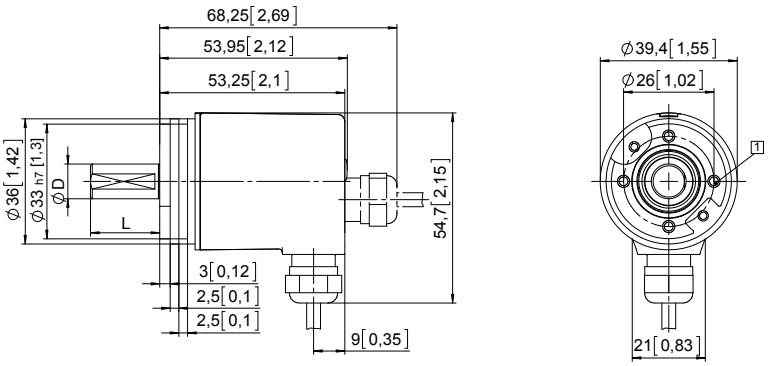
1 3 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]

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Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analog**

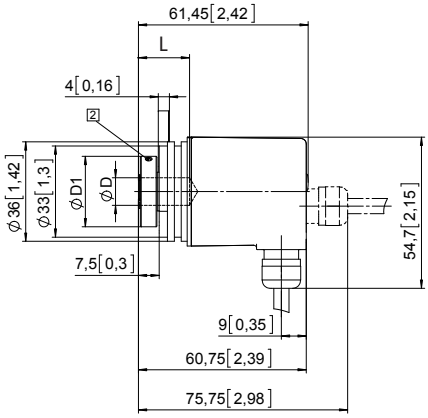
Dimensions hollow shaft version

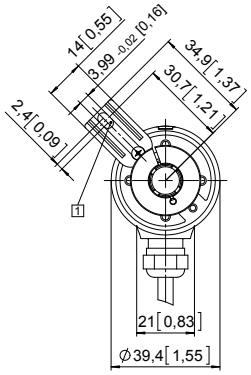
Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

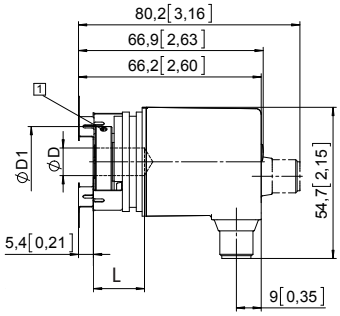


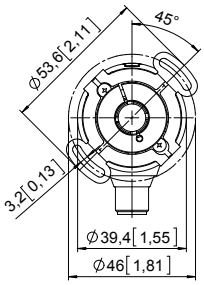


D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm





D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

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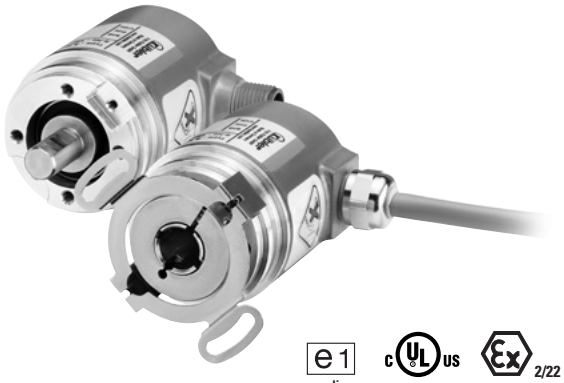
Compact electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. With a size of just 36 x 53 mm it offers a blind hollow shaft of up to 10 mm.

e1 pending · cULus · Ex 2/22 · RoHS · SSI

Safety-Lock™ · High rotational speed · Temperature range · High protection level · High shaft load capacity · Shock / vibration resistant · Reverse polarity protection · Surface protection salt spray tested optional · Energy Harvesting

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Absolute accuracy ±1°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

Order code Shaft version

8.M3663	.	X	X	2	X	.	X	X	X	2
Type		a	b	c	d		e	f	g	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]

c *Interface / power supply*
2 = SSI / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PUR
A = axial cable, special length PUR *)
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-pin

*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3663.432A.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
G = SSI, gray

f *Resolution (singleturn)*
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST

g *Resolution (multiturn)*
2 = 12 bit MT
6 = 16 bit MT
A = 20 bit MT
4 = 24 bit MT

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

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Compact electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

Order code Hollow shaft

8.M3683 . X X 2 X . X X X 2
Type
a b c d e f g

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
2 = with stator coupling, IP65, ø 46 mm [1.81"]
3 = with spring element, long, IP65
5 = with stator coupling, IP67, ø 46 mm [1.81"]
6 = with spring element, long, IP67

b *Blind hollow shaft (insertion depth max. 18.5 mm [0.73"])*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"]
2 = ø 1/4"

c *Interface / power supply*
2 = SSI / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PUR
A = axial cable, special length PUR *)
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-pin
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3683.242A.G322.0030 (for cable length 3 m)

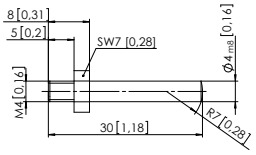
e *Code*
B = SSI, binary
G = SSI, gray

f *Resolution (singleturn)*
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST

g *Resolution (multiturn)*
2 = 12 bit MT
6 = 16 bit MT
A = 20 bit MT
4 = 24 bit MT

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 3 + 6)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6051.8211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		
without shaft seal		< 0.007 Nm
with shaft seal (IP67		< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N

Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

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Compact electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 40 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes [1]
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW with I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit
Absolute accuracy [2]		±1°
Repeat accuracy		±0.2°
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate		2 ms
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = power supply)	HIGH	min. 60 % of +V, max: +V
	LOW	max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

The number of preset value writing cycles is limited to 10,000.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)									
2	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Interface	Type of connection	Features	M12 connector, 8-pin									
2	3, 4	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

1) Short circuit proof to 0 V or to output when power supply correctly applied.
2) Over the whole temperature range.

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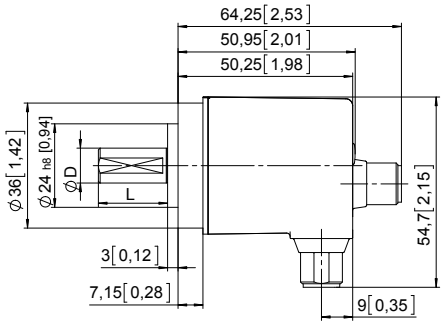
Compact electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

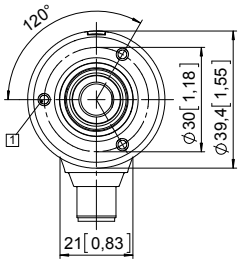
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

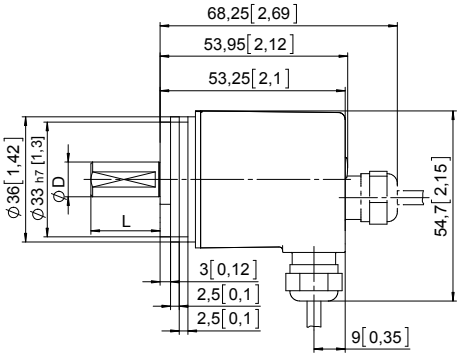


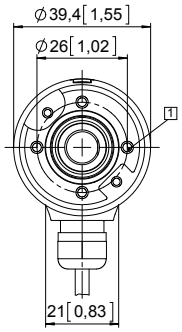


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 4 x M3, 6 [0.24] deep





D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

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Compact electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

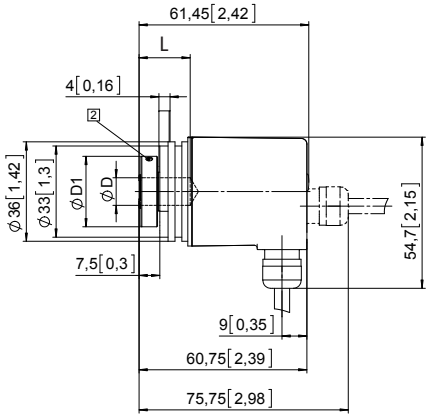
Dimensions hollow shaft version

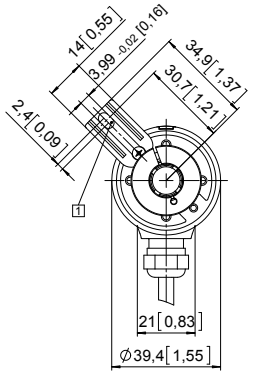
Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

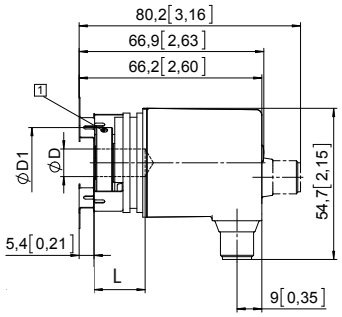


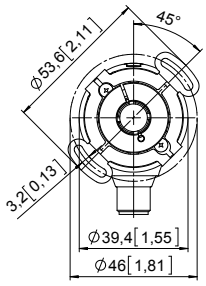


D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm





D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

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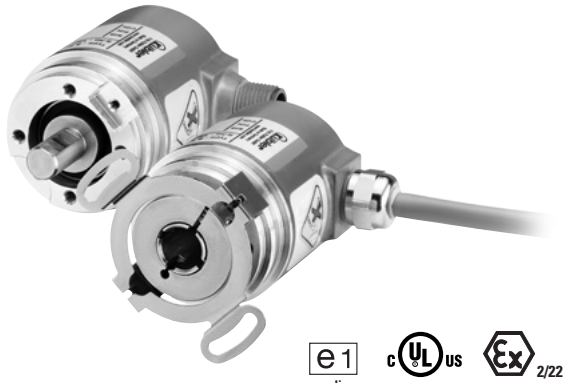
Compact electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

It is characterized by robustness, reliability and cost-efficiency.

e1 pending | c UL us | Ex 2/22 | RoHS | CANopen

Safety-Lock™ | High rotational speed | Temperature range -40° ... +85°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Surface protection salt spray-tested optional | Energy Harvesting

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

Order code Shaft version

8.M3668	.	X	X	2	X	.	21	2	2
Type		a	b	c	d		e		

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]

c *Interface / power supply*
2 = CANopen DS301 V4.2 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M12 connector, 5-pim
4 = radial M12 connector, 5-pin

*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3668.432A.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

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Compact electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**

Order code Hollow shaft

8.M3688.XX2X.2122

Type: 8.M3688 | a: X | b: X | c: 2 | d: X | e: 21 | 22

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
- **2 = with stator coupling, IP65, ø 46 mm [1.81"]**
- 3 = with spring element, long, IP65
- 5 = with stator coupling, IP67, ø 46 mm [1.81"]
- 6 = with spring element, long, IP67

b *Blind hollow shaft (insertion depth max. 18.5 mm [0.73"])*
- 1 = ø 6 mm [0.24"]
- 3 = ø 8 mm [0.32"]
- **4 = ø 10 mm [0.39"]**
- 2 = ø 1/4"

c *Interface / power supply*
- **2 = CANopen DS301 V4.2 / 10 ... 30 V DC**

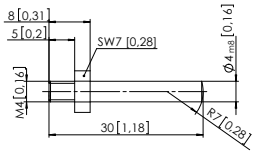
d *Type of connection*
- 1 = axial cable, 1 m [3.28'] PVC
- A = axial cable, special length PVC *)
- 2 = radial cable, 1 m [3.28'] PVC
- B = radial cable, special length PVC *)
- 3 = axial M12 connector, 5-pin
- **4 = radial M12 connector, 5-pin**

*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3688.242A.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
- **21 = CANopen**

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 3 + 6)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
shaft or blind hollow shaft version without shaft seal (IP65)		6000 min^{-1} 3000 min^{-1} (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		
	without shaft seal	< 0.007 Nm
	with shaft seal (IP67	< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529		IP65 or IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC

Shock resistance acc. to EN 60068-2-27	2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes [1]
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

1) Short circuit proof to 0 V or to output when power supply correctly applied.

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Absolute encoders – multiturn

Compact
electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**

Interface characteristics CANopen	
Resolution singleturn	1 ... 16384 (14 bit), scalable default: 8192 (13 bit)
Absolute accuracy [1]	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 16.777.216 (24 bit) scalable only via the total resolution
Total resolution	1 ... 274.877.906.944 (38 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader

Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	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
Bootloader	configuration management CIA DS 302-3

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) 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.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed**, **acceleration** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

LSS layer setting services DS305 V2.0

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

CANopen communication profile DS301 V4.2

Among others, 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 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

1) Over the whole temperature range.

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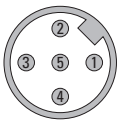
Compact electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
2	1, 2, A, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
2	3, 4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



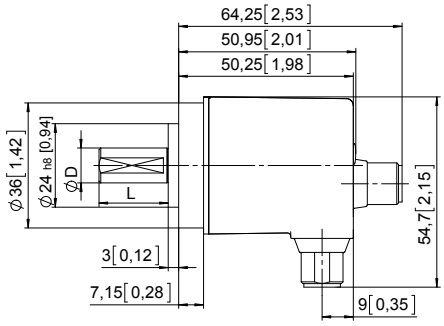
M12 connector, 5-pin

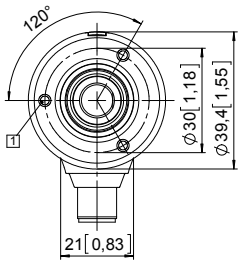
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

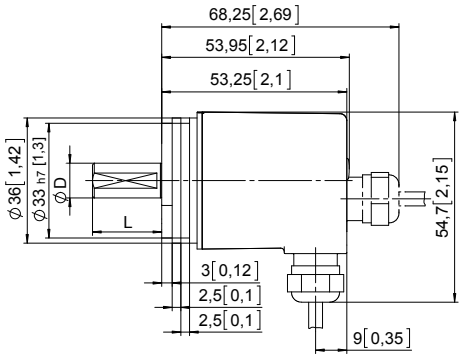


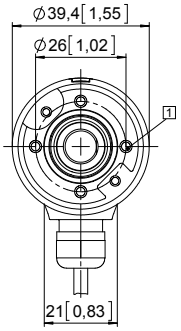


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 4 x M3, 6 [0.24] deep





D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]

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Compact electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**

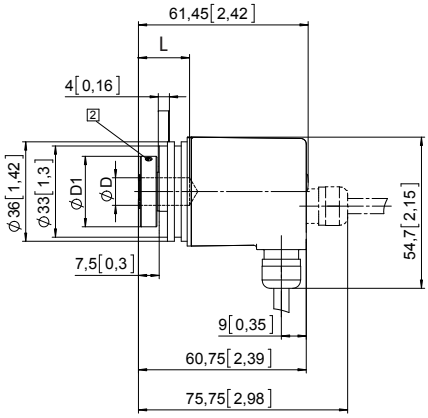
Dimensions hollow shaft version

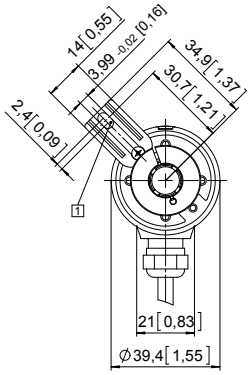
Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

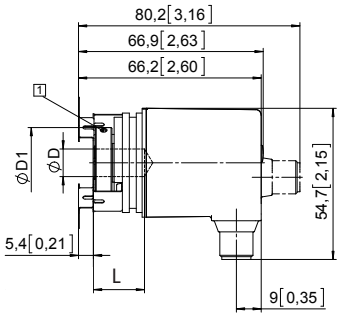


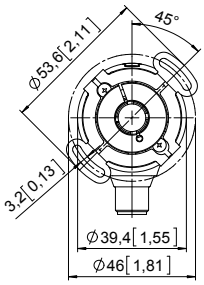


D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm





D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]
L = insertion depth max. blind hollow shaft			

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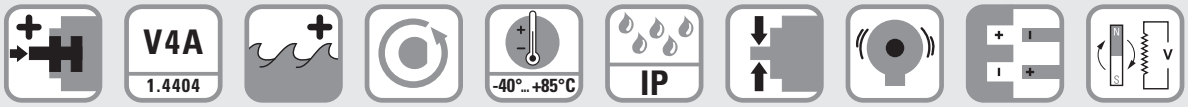
Compact, robust electronic multiturn, magnetic | **Sendix M3661R (shaft)** | **Analog**

The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.

e1 pending · cULus · Ex 2/22 pending · RoHS



Safety-Lockplus™ · Standard option stainless steel · Standard option seawater resistant · High rotational speed · Temperature range · High protection level · High shaft load capacity · Shock / vibration resistant · Reverse polarity protection · Energy Harvesting

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

Order code Shaft version

8.M3661R . X X X X . X X 1 2
Type — a b c d — e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Version*
1 = standard [1]
clamping flange ø 42 mm [1.65"]
7 = stainless steel V4A [2]
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

c *Output circuit* [3]
3 = current output
4 = voltage output

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 5-pin
*) Available special lengths (connection types B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3661R.133B.3112.0030 (for cable length 3 m)

e *Interface / resolution / power supply*
3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f *Measuring range*
1 = 16 revolutions / cw
2 = 16 revolutions / ccw
3 = scalable up to 65,536 revolutions, with limit switch function
4 = scalable up to 65,536 revolutions, without limit switch function

Optional on request
- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4" .
3) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

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Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic | **Sendix M3661R (shaft)** | **Analog**

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808** [1]

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M** [1]
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000** [1]

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Electrical characteristics current interface 4 ... 20 mA

Power supply		10 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes [2]
Measuring range	factory setting optionally scalable	2^4 revolutions up to 2^{16} revolutions
DA converter resolution		12 bit
Singleturn accuracy, at 25°C [77°F]		±1°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Output load	at 10 V DC at 24 V DC at 30 V DC	max. 200 Ohm max. 900 Ohm max. 1200 Ohm
Setting time		< 1 ms, R_{Burden} = 900 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - current loop interruption – input load too high - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options		- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms
e1 compliant acc. to (pending)		EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval		File 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V

Power supply	output 0 ... 5 V output 0 ... 10 V	10 ... 30 V DC 15 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes [2]
Measuring range	factory setting optionally scalable	2^4 revolutions up to 2^{16} revolutions
DA converter resolution	0 ... 10 V 0 ... 5 V	12 bit 11 bit
Singleturn accuracy, at 25°C [77°F]		±1°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Current output		max. 10 mA
Setting time		< 1 ms, R_{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options		- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms
e1 compliant acc. to (pending)		EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval		File 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

1) Not for version "7" (V4A stainless steel)
2) When the power supply is correctly applied.
But not output to +V. Power supply and sensor output signal are not galvanically isolated.

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Compact, robust electronic multiturn, magnetic | **Sendix M3661R (shaft)** | **Analog**

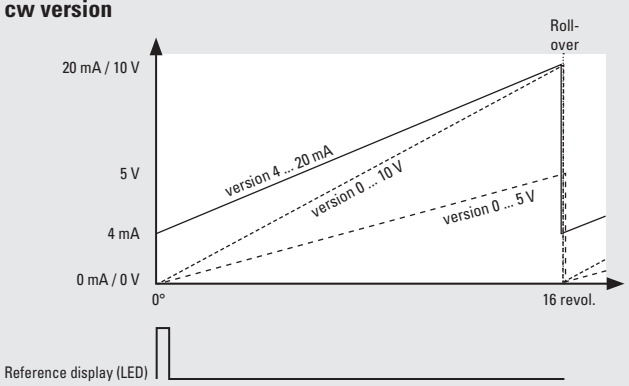
Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial	80 N
	axial	40 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP66, IP67, IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]

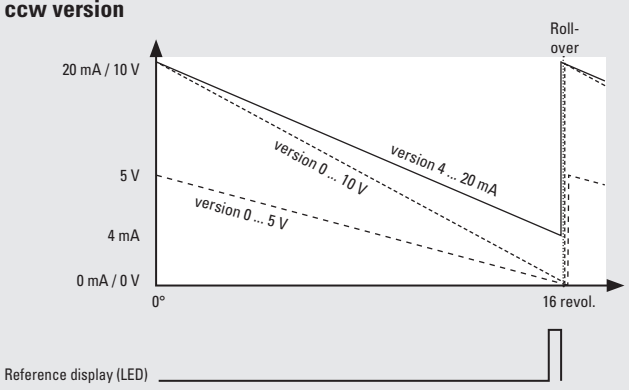
Materials	**version "1"** (standard)	**version "7"** (stainless steel)
shaft	V2A	V4A
flange	aluminum	V4A
housing	zinc die-cast	V4A
cable	PVC	–
Shock resistance acc. to EN 60068-2-27	5000 m/s^2, 4 ms	
Vibration resistance acc. to EN 60068-2-6	300 m/s^2, 10 ... 2000 Hz	

Example (output signal evolution) – factory setting

cw version

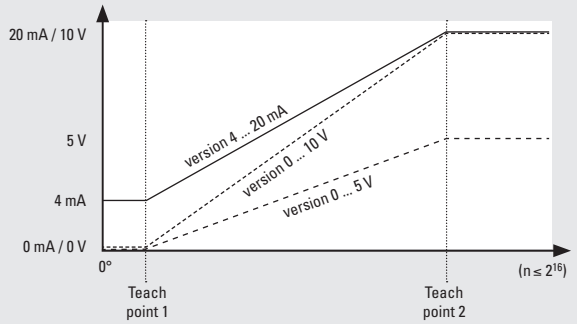


ccw version



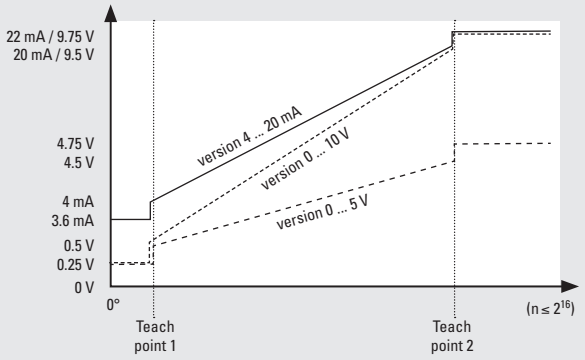
Example (output signal evolution) – option: scalable

Scalable version without limit switch function



no reference point display!

Scalable version with limit switch function



no reference point display!

Factory-set measuring range 2^4 revolutions with roll-over

Limit switch function	version	**0 ... 10 V**	**0 ... 5 V**	**4 ... 20 mA**
	limit switch low	0.25 V	0.25 V	3.6 mA
	limit switch high	9.75 V	4.75 V	22.0 mA

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Compact, robust electronic multiturn, magnetic | **Sendix M3661R (shaft)** | **Analog**

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
3 (current)	2, B	Signal:	0 V	+V	+I	SET 1 [1]	SET 2 [1]
		Cable color:	WH	BN	GN	GY	PK

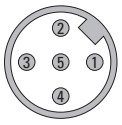
Interface	Type of connection	M12 connector, 5 pin					
3 (current)	4	Signal:	0 V	+V	+I	SET 1 [1]	SET 2 [1]
		Pin:	3	2	1	5	4

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
4, 5 (current)	2, B	Signal:	0 V	+V	+U	SET 1 [1]	SET 2 [1]
		Cable color:	WH	BN	GN	GY	PK

Interface	Type of connection	M12 connector, 5 pin					
4, 5 (current)	4	Signal:	0 V	+V	+U	SET 1 [1]	SET 2 [1]
		Pin:	3	2	1	5	4

+V : encoder power supply +V DC
0 V : encoder power supply ground GND (0 V)
+U : voltage
+I : current
SET 1 : set input for teachpoint 1
SET 2 : set input for teachpoint 2

Top view of mating side, male contact base



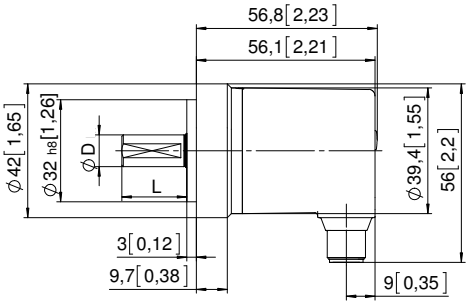
M12 connector, 5-pin

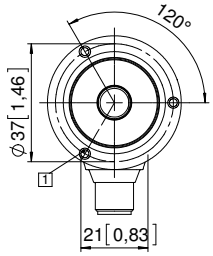
Dimensions

Dimensions in mm [inch]

Aluminum
clamping flange, ø 42 [1.65]
version 1

[1] 3 x M3, 6 [0.24] deep

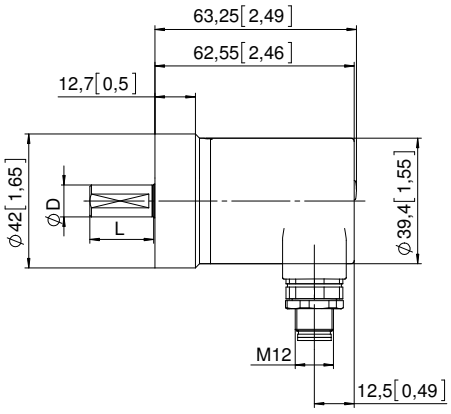


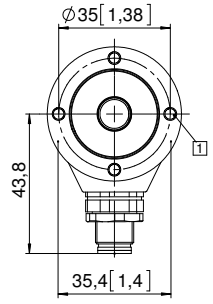


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

Stainless steel V4A
clamping flange, ø 42 [1.65]
version 7

[1] 4 x M4, 8 [0.31] deep





D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

1) For scalable version.

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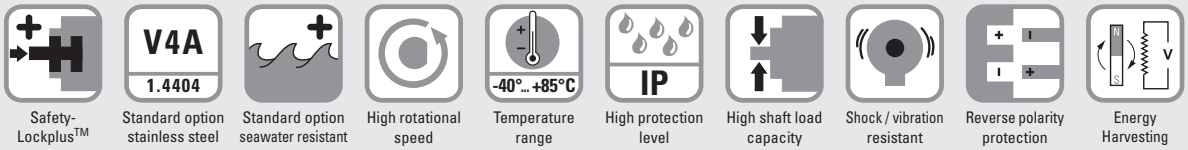
Compact, robust electronic multiturn, magnetic | **Sendix M3663R (shaft)** | **SSI**

The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.

e1 pending · cULus · Ex 2/22 pending · RoHS · SSI



Safety-Lockplus™ · Standard option stainless steel · Standard option seawater resistant · High rotational speed · Temperature range · High protection level · High shaft load capacity · Shock / vibration resistant · Reverse polarity protection · Energy Harvesting

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Absolute accuracy ±1°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

Order code Shaft version

8.M3663R.**X**(a)**X**(b)**2**(c)**X**(d).**X**(e)**X**(f)**X**(g)**2**
Type

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Version*
1 = standard [1]
clamping flange ø 42 mm [1.65"]
7 = stainless steel V4A [2]
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

c *Interface / power supply*
2 = SSI / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 8-pin
*) Available special lengths (connection type B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3663R.132B.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
G = SSI, gray

f *Resolution (singleturn)*
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST

g *Resolution (multiturn)*
2 = 12 bit MT
6 = 16 bit MT
A = 20 bit MT
4 = 24 bit MT

Optional on request
- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4" .

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Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3663R (shaft)	SSI

Mounting accessory for shaft encoders

		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808** [1]

Connection technology

		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PUR cable	**05.00.6051.8211.002M** [1]
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0** [1]

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)	
Starting torque at 20°C [68°F]		< 0.01 Nm	
Shaft load capacity	radial	80 N	
	axial	40 N	
Weight		approx. 0.2 kg [7.06 oz]	
Protection acc. to EN 60529/DIN 40050-9		IP66, IP67, IP69k	
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]	
Materials		**version "1"** (standard)	**version "7"** (stainless steel)
	shaft	V2A	V4A
	flange	aluminum	V4A
	housing	zinc die-cast	V4A
	cable	PUR	–
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms	
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz	

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes [2]
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	File 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW with I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit
Absolute accuracy [3]		±1°
Repeat accuracy		±0.2°
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate		2 ms
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = power supply)	HIGH	min. 60 % of +V, max: +V
	LOW	max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

1) Not for version "7" (V4A stainless steel)
2) Short circuit proof to 0 V or to output when power supply correctly applied.
3) Over the whole temperature range.

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Compact, robust electronic multiturn, magnetic | Sendix M3663R (shaft) | SSI

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input) 1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)									
2	2, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Interface	Type of connection	Features	M12 connector, 8-pin								
2	4	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

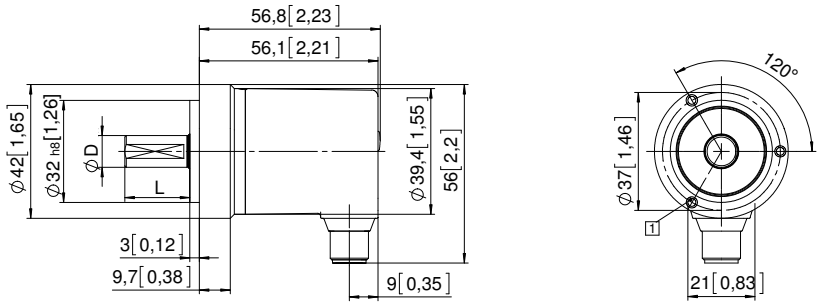
Dimensions

Dimensions in mm [inch]

Aluminum, clamping flange, ø 42 [1.65] version 1

1 3 x M3, 6 [0.24] deep

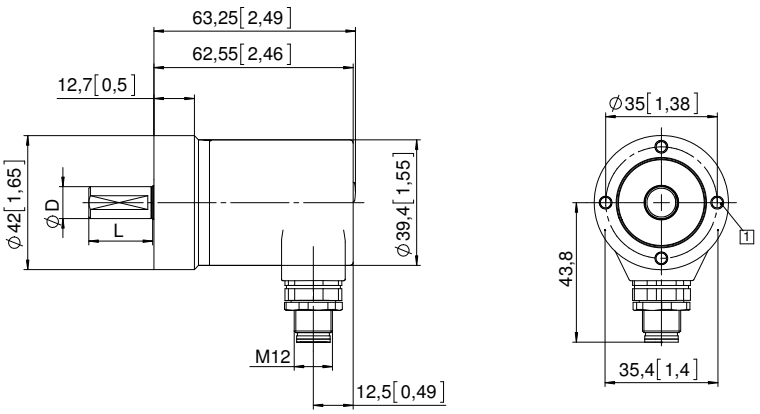
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]



Stainless steel V4A clamping flange, ø 42 [1.65] version 7

1 4 x M4, 8 [0.31] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]



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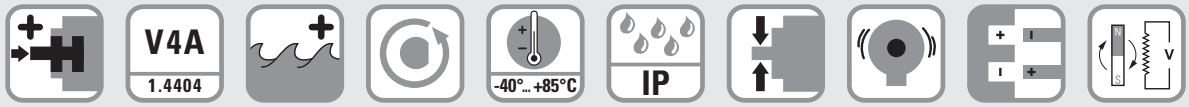
Compact, robust electronic multiturn, magnetic | **Sendix M3668R (shaft)** | **CANopen**

The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. It is characterized by robustness, reliability and cost-efficiency.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.

e1 pending · cULus · Ex 2/22 pending · RoHS · CANopen



Safety-Lockplus™ · Standard option stainless steel · Standard option seawater resistant · High rotational speed · Temperature range · High protection level · High shaft load capacity · Shock / vibration resistant · Reverse polarity protection · Energy Harvesting

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

Order code Shaft version

8.M3668R.	X	X	2	X	.	21	2	2
Type	a	b	c	d		e		

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Version*
1 = standard [1]
clamping flange ø 42 mm [1.65"]
7 = stainless steel V4A [2]
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

c *Interface / power supply*
2 = CANopen DS301 V4.2 / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 5-pin
*) Available special lengths (connection type B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3668.132B.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4" .

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Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3668R (shaft)	CANopen

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808** [1]

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [19.69'] PVC cable	**05.00.6091.A211.005M** [1]
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000** [1]

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)	
Starting torque at 20°C [68°F]		< 0.01 Nm	
Shaft load capacity	radial	80 N	
	axial	40 N	
Weight		approx. 0.2 kg [7.06 oz]	
Protection acc. to EN 60529/DIN 40050-9		IP66, IP67, IP69k	
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]	
Materials		**version "1"** (standard)	**version "7"** (stainless steel)
	shaft	V2A	V4A
	flange	aluminum	V4A
	housing	zinc die-cast	V4A
	cable	PVC	–
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms	
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz	

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes [2]
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	File 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen

Resolution singleturn	1 ... 16384 (14 bit), scalable default: 8192 (13 bit)
Absolute accuracy [3]	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 16.777.216 (24 bit) scalable only via the total resolution
Total resolution	1 ... 274.877.906.944 (38 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader
Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	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
Bootloader	configuration management CIA DS 302-3

1) Not for version "7" (V4A stainless steel)
2) Short circuit proof to 0 V or to output when power supply correctly applied.
3) Over the whole temperature range.

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Compact, robust electronic multiturn, magnetic | **Sendix M3668R (shaft)** | **CANopen**

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) 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.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed, acceleration** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

CANopen communication profile DS301 V4.2

Among others, 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 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

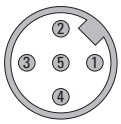
- Program download.
- Program start.
- Program erase.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
2	2, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
2	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

1) Over the whole temperature range.

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Compact, robust electronic multiturn, magnetic | Sendix M3668R (shaft) | CANopen

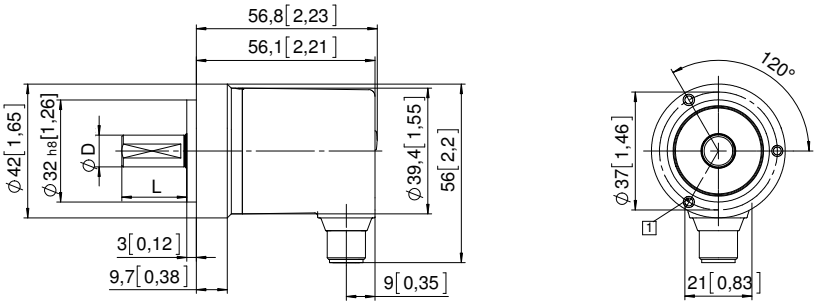
Dimensions

Dimensions in mm [inch]

Aluminum, clamping flange, ø 42 [1.65] version 1

1 3 x M3, 6 [0.24] deep

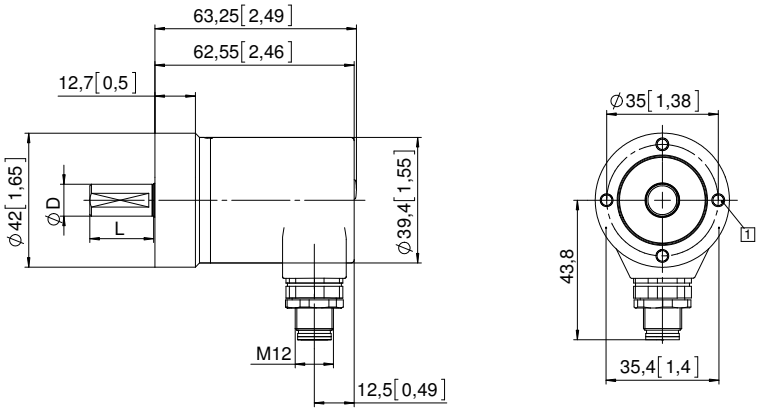
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]



Stainless steel V4A clamping flange, ø 42 [1.65] version 7

1 4 x M4, 8 [0.31] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4“	h7	12.5 [0.49]



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Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm.

Safety-Lock™ | High rotational speed | Temperature range -40°... +90°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +90°C.
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoASIC) - offering highest reliability, a high resolution up to 41 bits and 100% magnetic field insensitiveness.

Optimized performance

- High precision with data refresh rate of the position value ≤ 1µs.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Shaft version

8.F3663	.	X	X	X	X	.	X	X	X	2
Type		a	b	c	d		e	f	g	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
4 = ø 3/8" x 5/8"

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
U = tangential cable, 10 m [32.81'] PUR
5 = tangential cable, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin [1)]

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution (singleturn)*
B = 9 bit ST
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g *Resolution (multiturn)*
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

Optional on request
- surface protection salt spray tested
- other singleturn resolutions

1) Only with interface 1 and 2.

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Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Order code Hollow shaft

8.F3683 . X X X X . X X X 2
Type
a b c d e f g

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, short, IP65
3 = with spring element, long, IP65
2 = with stator coupling, IP65, ø 46 mm [1.81"]

b *Through hollow shaft*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
2 = ø 1/4"
Blind hollow shaft (insertion depth max. 14.5 mm [0.57"])
4 = ø 10 mm [0.39"]

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
U = tangential cable, 10 m [32.81'] PUR
5 = tangential cable, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin [1)]

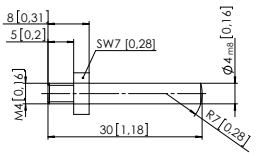
e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution (singleturn)*
B = 9 bit ST
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g *Resolution (multiturn)*
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

Optional on request
- surface protection salt spray tested
- other singleturn resolutions

Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 3)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PUR cable	**05.00.6051.8211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
shaft version without shaft seal (IP65)		12000 min^{-1}
or blind hollow shaft version		10000 min^{-1} (continuous)
shaft version with shaft seal (IP67)		10000 min^{-1}
or hollow shaft version		8000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		
without shaft seal		< 0.007 Nm
with shaft seal (IP67)		< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]

Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65 (solid shaft version opt. IP67)
Working temperature range		-40°C ... +90°C [-40°F ... +194°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

1) Only with output circuits 1 and 2.

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Absolute encoders – multiturn

Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 60 mA
	10 ... 30 V DC	max. 30 mA
Reverse polarity protection of the power supply		yes (only with 10 ... 30 V DC)
Short-circuit proof outputs		yes [1]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW with I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 17 bit
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate		
	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

BiSS interface

Resolution singleturn	10 ... 17 bit
Number of revolutions (multiturn)	max. 24 bit
Code	binary
BiSS Clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Incremental outputs (A/B), 2048 ppr

	SinCos	**RS422 TTL-compatible**
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (± 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes [1]	yes [1]

Status output

Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active		LOW

The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).

An active status output (LOW) displays:
LED fault (failure or ageing) – over-temperature – undervoltage
In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = power supply)	HIGH	min. 60 % of +V, max: +V
	LOW	max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

1) Short circuit proof to 0 V or to output when power supply correctly applied.

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Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS**

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, 3, U	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	shield

Interface	Type of connection	Features	M12 connector, 8-pin									
1, 2	5	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚	
			Pin:	1	2	3	4	5	6	7	8	PH	

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)												
3, 4	1, 3, U	SET, DIR, 2048 SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)										
5	1, 3, U	SET, DIR, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 V_{sens}	+V_{sens}	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6	1, 3, U	2048 SinCos, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	0 V_{sens}	+V_{sens}	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)												
7, 8	1, 3, U	2048 incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

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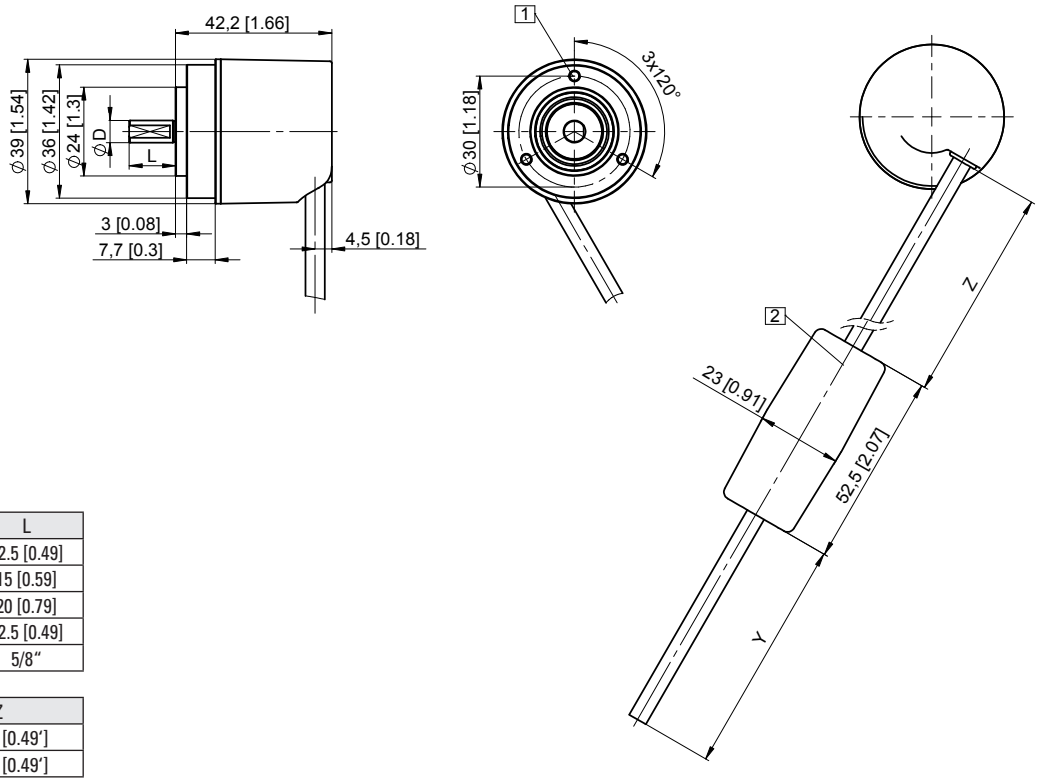
Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep
2 Battery (in the cable)

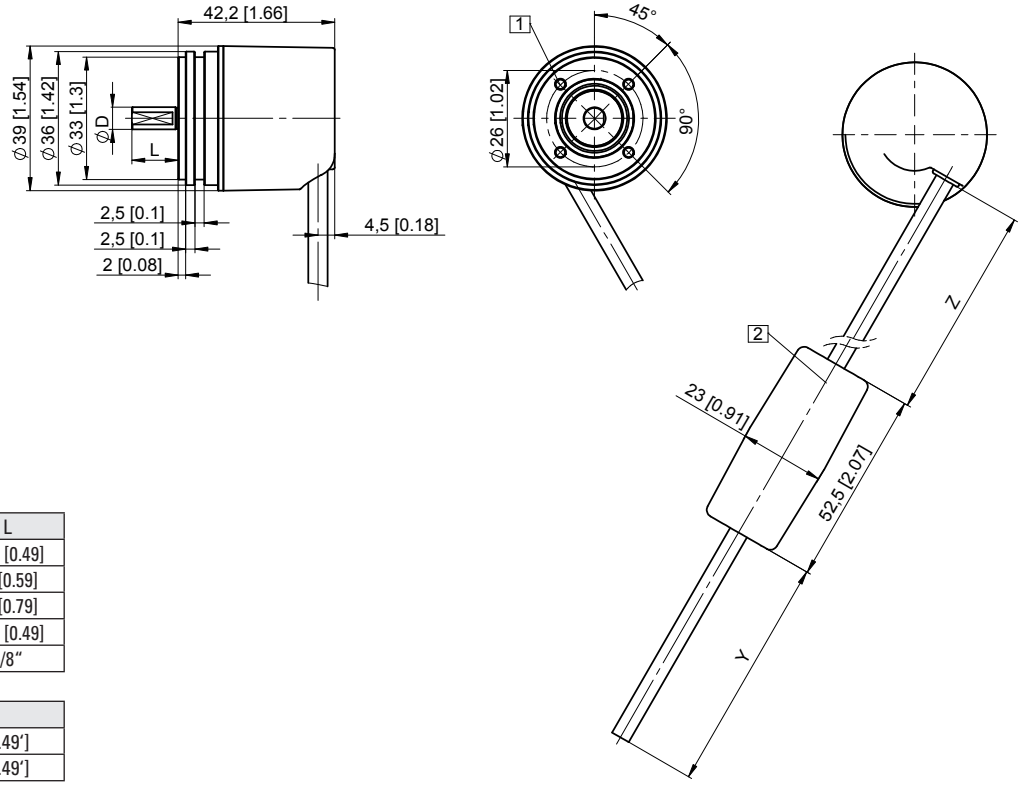


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Synchro flange, ø 36 [1.42]
Flange type 2 and 4
(drawing with cable)

1 4 x M3, 6 [0.24] deep
2 Battery (in the cable)



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

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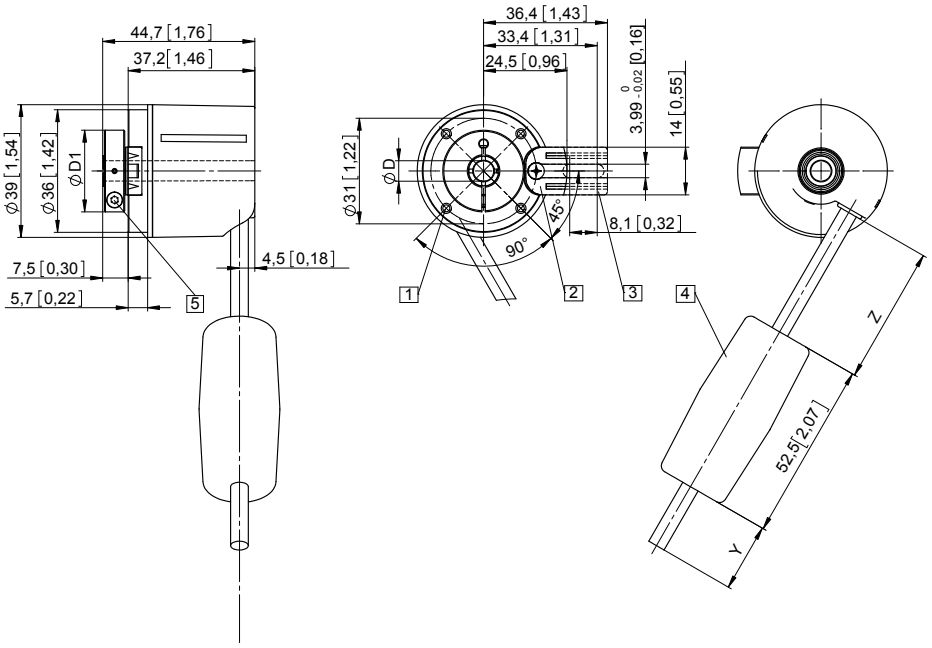
Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element
Flange type 1 and 3
(drawing with spring element short, spring element long is shown dashed)



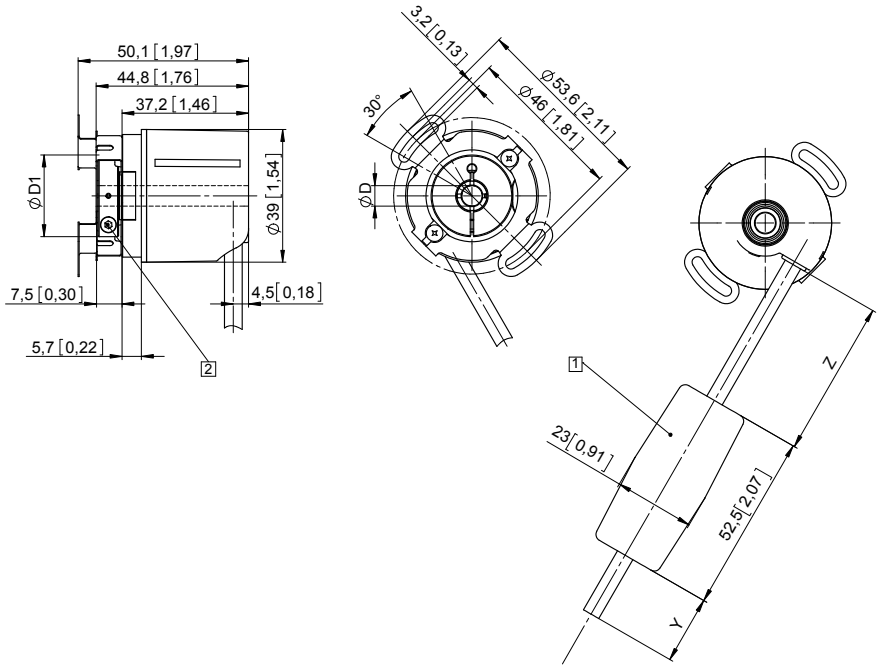
1 4 x M2.5, 5 [0.20] deep
2 Spring element, short recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Spring element, long recommendation: cylindrical pin DIN 7, ø 4 [0.16]
4 Battery (in the cable)
5 Recommended torque for the clamping ring 0.6 Nm

D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Flange with stator coupling, ø 46 [1.81]
Flange type 2



1 Battery (in the cable)
2 Recommended torque for the clamping ring 0.6 Nm

D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

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Compact electronic multiturn, optical | **Sendix F3668 / F3688 (shaft / hollow shaft)** | **CANopen**

The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.

With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm.

Safety-Lock™ | High rotational speed | Temperature range -40°... +85°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C [-40°F ... +185°F].
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoAsic) - offering highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitiveness.

Up-to-the-minute fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.

Order code Shaft version

8.F3668	.	X	X	2	X	.	21	2	2
Type		a	b	c	d		e		

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.49"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
4 = ø 3/8" x 5/8"

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
U = tangential cable, 10 m [32.81'] PUR

e *Fieldbus profile*
21 = CANopen

Optional on request
- surface protection salt spray tested

Order code Hollow shaft

8.F3688	.	X	X	2	X	.	21	2	2
Type		a	b	c	d		e		

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = with spring element, short, IP65
3 = with spring element, long, IP65
2 = with stator coupling, IP65, ø 46 mm [1.81"]

b *Blind hollow shaft (insertion depth max. 14.5 mm [0.57"])*
5 = ø 6 mm [0.24"]
7 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"]
6 = ø 1/4"

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
U = tangential cable, 10 m [32.81'] PUR

e *Fieldbus profile*
21 = CANopen

Optional on request
- surface protection salt spray tested

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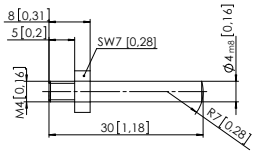
Compact electronic multiturn, optical | **Sendix F3668 / F3688 (shaft / hollow shaft)** | **CANopen**

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 8 mm [0.32“]	**8.0000.1102.0808**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 3)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut , 5-pin	**8.0000.5111.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		
shaft version without shaft seal (IP65)		12000 min^{-1}
or blind hollow shaft version		10000 min^{-1} (continuous)
shaft version with shaft seal (IP67)		10000 min^{-1} 8000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		
without shaft seal		< 0.007 Nm
with shaft seal (IP67)		< 0.01 Nm
Shaft load capacity	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection	housing side	IP67
acc. to EN 60529	shaft side	IP65 (solid shaft version opt. IP67)
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 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	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

Diagnostic LED (two-color, red/green)

LED ON or blinking	red	error display
	green	status display

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Compact electronic multiturn, optical | **Sendix F3668 / F3688 (shaft / hollow shaft)** | **CANopen**

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device-specific profiles like the encoder profile DS406 V3.2 and DS305 (LSS) 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.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length Lu.

Lu < 5 m [16.40'] cable length for 125 Kbit
Lu < 2 m [6.56'] cable length for 250 Kbit
Lu < 1 m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

For a network with 3 encoders and 250 Kbit the maximum length of the drop line/ encoder must not exceed 70 cm.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

LSS layer setting services DS305 V2.0

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

CANopen communication profile DS301 V4.02

Among others, 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 V3.2

The following parameters can be programmed:

- Event mode.
- 1 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.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific memory - 16 Bytes.
- Customer-specific protocol.
- "Watchdog controlled" device.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
2	1, 3, U	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

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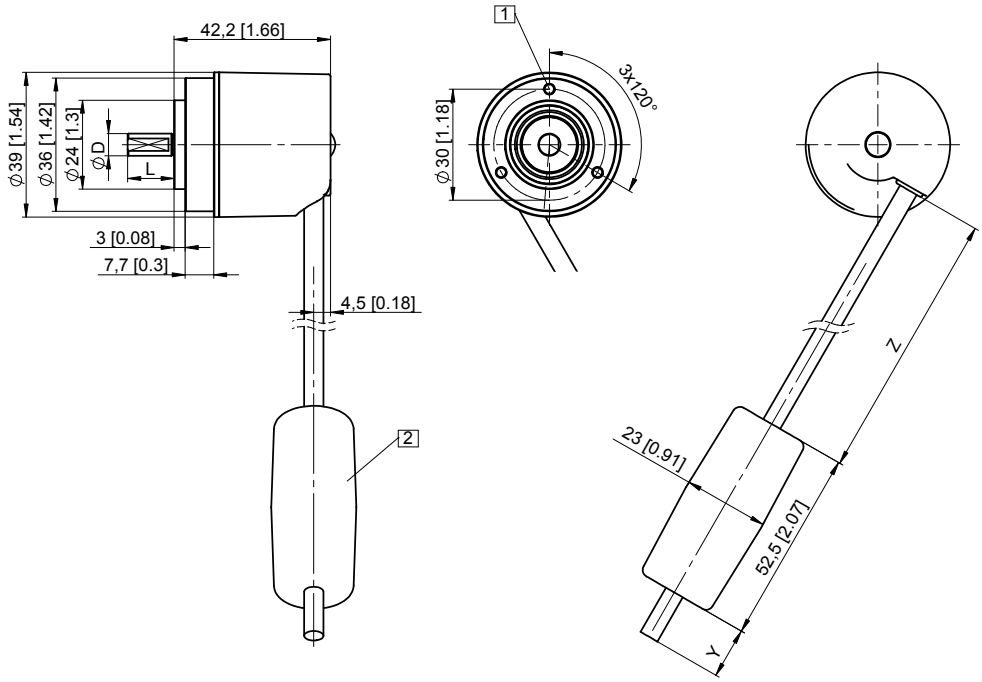
Compact electronic multiturn, optical | **Sendix F3668 / F3688 (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep
2 Battery (in the cable)

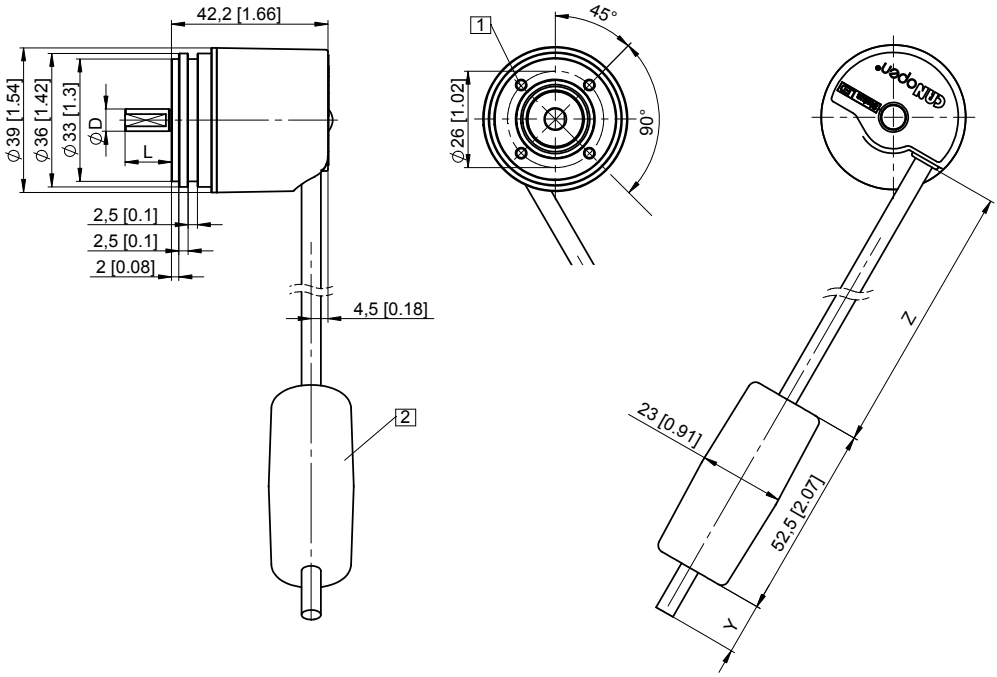


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Synchro flange, ø 36 [1.42]
Flange type 2 and 4
(drawing with cable)

1 4 x M3, 6 [0.24] deep
2 Battery (in the cable)



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

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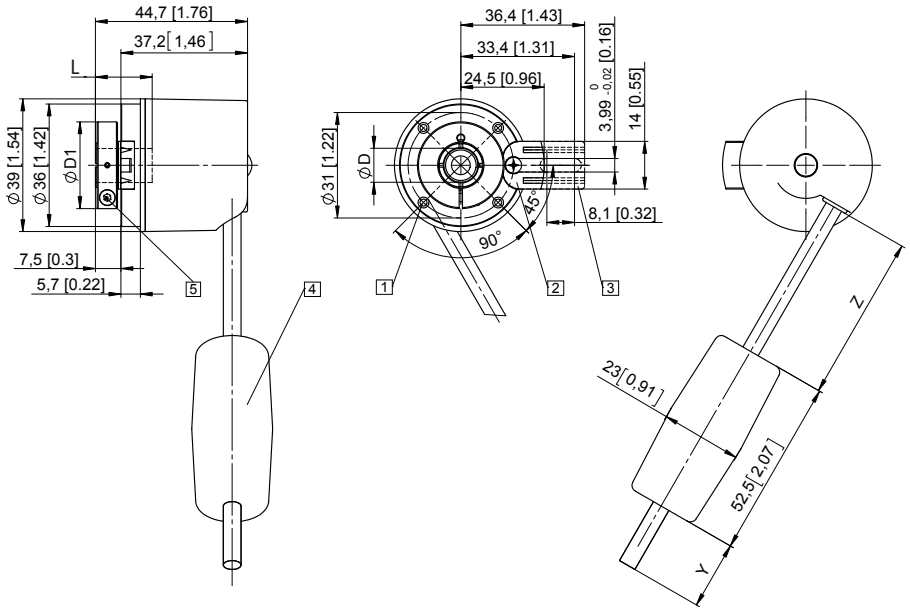
Compact electronic multiturn, optical | **Sendix F3668 / F3688 (shaft / hollow shaft)** | **CANopen**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element
Flange type 1 and 3
(drawing with spring element short, spring element long is shown dashed)

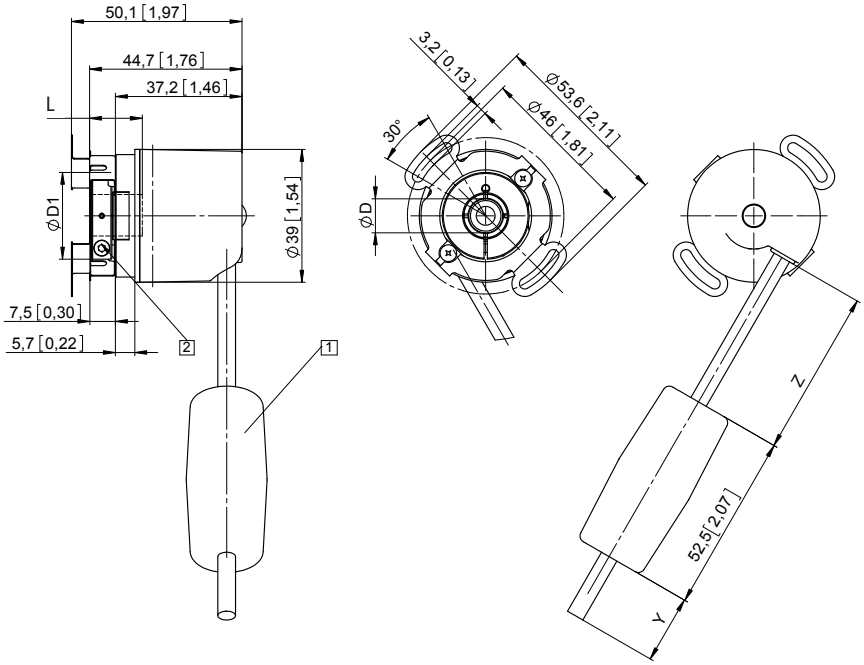


1 4 x M2.5, 5 [0.20] deep
2 Spring element, short recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Spring element, long recommendation: cylindrical pin DIN 7, ø 4 [0.16]
4 Battery (in the cable)
5 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Flange with stator coupling, ø 46 [1.81"]
Flange type 2



1 Battery (in the cable)
2 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]
L = insertion depth max. blind hollow shaft			

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

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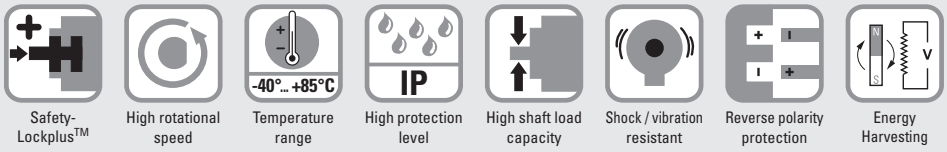
Standard
electronic multiturn, magnetic | **Sendix M5861 (shaft)** | **Analog**

The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



Safety-Lockplus™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Energy Harvesting

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

Order code Shaft version

8.M5861	.	X	X	X	X	.	X	X	1	2
Type		a	b	c	d		e	f		

a *Version*
3 = clamping flange, IP65, ø 58 mm [2.28"]
4 = synchro flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
5 = ø 10 x 20 mm [0.39 x 0.79"]

c *Output circuit* [1)]
3 = current output
4 = voltage output

d Type of connection
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 5-pin

*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M5861.3132.3112.0030 (for cable length 3 m)

e Interface / resolution / power supply
3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f *Measuring range*
1 = 16 revolutions / cw
2 = 16 revolutions / ccw
3 = scalable up to 65,536 revolutions, with limit switch function / cw
4 = scalable up to 65,536 revolutions, without limit switch function / cw
5 = scalable up to 65,536 revolutions, with limit switch function / ccw
6 = scalable up to 65,536 revolutions, without limit switch function / ccw

Optional on request
- Ex 2/22 (only for connection type 4)

Connection technology		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Output circuit "3" only in conjunction with interface "3",
output circuit "4" only in conjunction with interface "4" or "5".

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Absolute encoders – multiturn

Standard
electronic multiturn, magnetic | **Sendix M5861 (shaft)** | **Analog**

Technical data

Electrical characteristics current interface 4 ... 20 mA

Power supply		10 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes [1]
Measuring range	factory setting optionally scalable	2^4 revolutions up to 2^{16} revolutions
DA converter resolution		12 bit
Singleturn accuracy, at 25°C [77°F]		±1°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Output load	at 10 V DC at 24 V DC at 30 V DC	max. 200 Ohm max. 900 Ohm max. 1200 Ohm
Setting time		< 1 ms, R_{Burden} = 900 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - current loop interruption – input load too high - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options		- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms
UL approval		File 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V

Power supply	output 0 ... 5 V output 0 ... 10 V	10 ... 30 V DC 15 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes [1]
Measuring range	factory setting optionally scalable	2^4 revolutions up to 2^{16} revolutions
DA converter resolution	0 ... 10 V 0 ... 5 V	12 bit 11 bit
Singleturn accuracy, at 25°C [77°F]		±1°
Temperature coefficient		< 100 ppm/K
Repeat accuracy, at 25°C [77°F]		±0.2°
Current output		max. 10 mA
Setting time		< 1 ms, R_{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)		- system status - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options		- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs		level = +V for 1 s minimum
PowerON Time		< 1 s
Update rate		1 ms
UL approval		File 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial axial	80 N 40 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP65
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft flange housing cable	V2A aluminum zinc die-cast PVC
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

1) When the power supply is correctly applied.
But not output to +V. Power supply and sensor output signal are not galvanically isolated.

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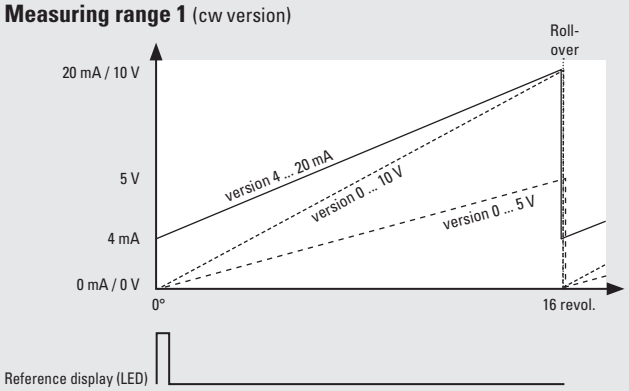
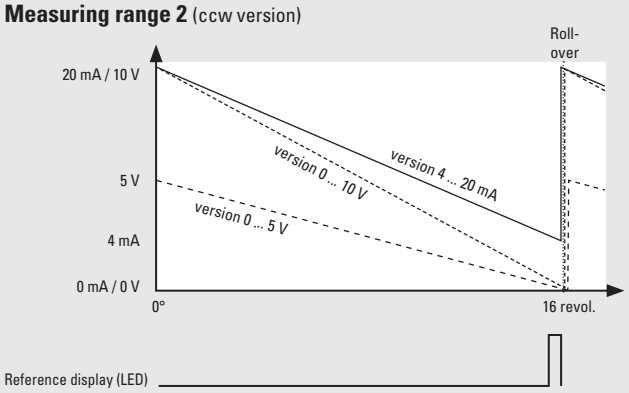
Standard
electronic multiturn, magnetic | **Sendix M5861 (shaft)** | **Analog**

Example (output signal evolution) – factory setting

Measuring range 1 (cw version)

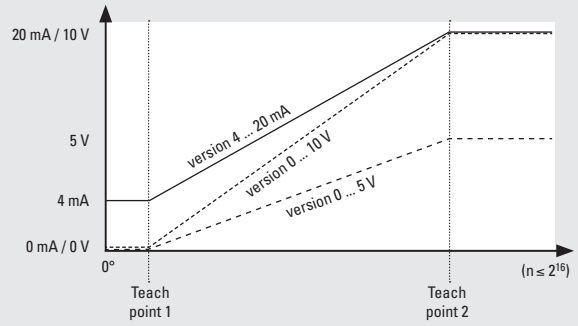


Measuring range 2 (ccw version)



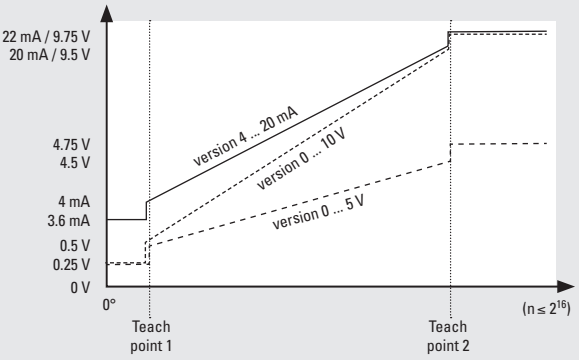
Example (output signal evolution) – option: scalable

Measuring range 4, 6 (scalable version without limit switch function)



no reference point display!

Measuring range 3, 5 (scalable version with limit switch function)



no reference point display!

Factory-set measuring range 2^4 revolutions with roll-over

Limit switch function	version	**0 ... 10 V**	**0 ... 5 V**	**4 ... 20 mA**
	limit switch low	0.25 V	0.25 V	3.6 mA
	limit switch high	9.75 V	4.75 V	22.0 mA

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
3 (current)	2, B	Signal:	0 V	+V	+I	SET 1 [1]	SET 2 [1]
		Cable color:	WH	BN	GN	GY	PK

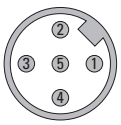
Interface	Type of connection	M12 connector, 5 pin					
3 (current)	4	Signal:	0 V	+V	+I	SET 1 [1]	SET 2 [1]
		Pin:	3	2	1	5	4

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
4, 5 (current)	2, B	Signal:	0 V	+V	+U	SET 1 [1]	SET 2 [1]
		Cable color:	WH	BN	GN	GY	PK

Interface	Type of connection	M12 connector, 5 pin					
4, 5 (current)	4	Signal:	0 V	+V	+U	SET 1 [1]	SET 2 [1]
		Pin:	3	2	1	5	4

+V : encoder power supply +V DC
0 V : encoder power supply ground GND (0 V)
+U : voltage
+I : current
SET 1 : set input for teachpoint 1
SET 2 : set input for teachpoint 2

Top view of mating side, male contact base



M12 connector, 5-pin

1) For scalable version.

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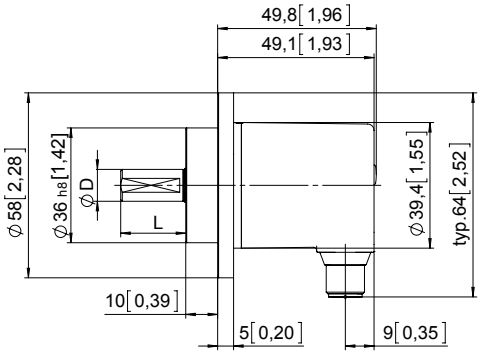
Standard
electronic multiturn, magnetic | **Sendix M5861 (shaft)** | **Analog**

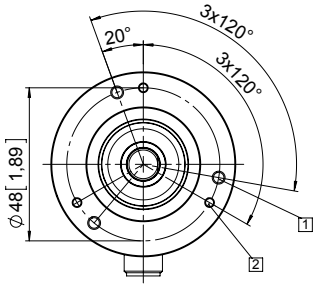
Dimensions

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 3

1 3 x M4, 10 [0.39] deep
2 3 x M3, 6 [0.24] deep

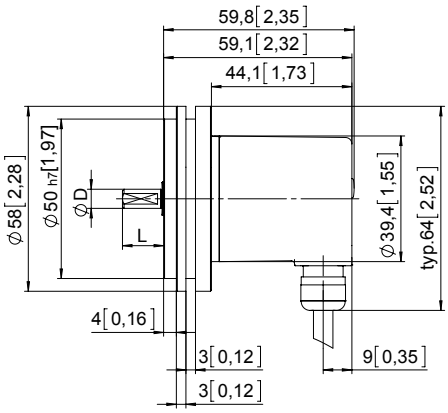


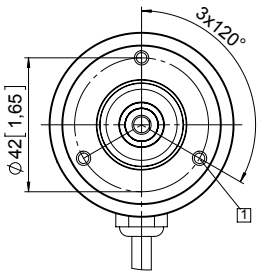


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]

Synchro flange, ø 58 [2.28]
Flange type 4

1 3 x M4, 10 [0.39] deep





D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]

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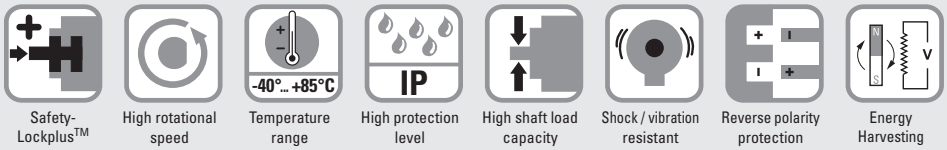
Standard
electronic multiturn, magnetic | **Sendix M5863 (shaft)** | **SSI**

The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



Safety-Lockplus™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Energy Harvesting

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Absolute accuracy ±1°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

Order code Shaft version

8.M5863 . X X 2 X . X X X 2
Type — a b c d — e f g

a *Version*
3 = clamping flange, IP65, ø 58 mm [2.28"]
4 = synchro flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
5 = ø 10 x 20 mm [0.39 x 0.79"]

c *Interface / power supply*
2 = SSI / 10 ... 30 V DC

d Type of connection
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 8-pin

*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M5863.3524.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
G = SSI, gray

f *Resolution (singleturn)*
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST

g *Resolution (multiturn)*
2 = 12 bit MT
6 = 16 bit MT
A = 20 bit MT
4 = 24 bit MT

Optional on request
- Ex 2/22 (only for connection type 4)

Connection technology		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin, 2 m [6.56'] PUR cable	**05.00.6051.8211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Absolute encoders – multiturn

Standard
electronic multiturn, magnetic | **Sendix M5863 (shaft)** | **SSI**

Technical data

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial axial	80 N 40 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP65
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft flange housing cable	V2A aluminum zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes [1]
UL approval	File 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH LOW with I_{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution singleturn		10 ... 14 bit
Absolute accuracy [2]		±1°
Repeat accuracy		±0.2°
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate		2 ms
Monoflop time		≤ 15 µs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = power supply)	HIGH LOW	min. 60 % of +V, max: +V max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

The number of preset value writing cycles is limited to 10,000.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

1) Short circuit proof to 0 V or to output when power supply correctly applied.
2) Over the whole temperature range.

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Standard electronic multiturn, magnetic | Sendix M5863 (shaft) | SSI

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)									
2	2, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Interface	Type of connection	Features	M12 connector, 8-pin									
2	4	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

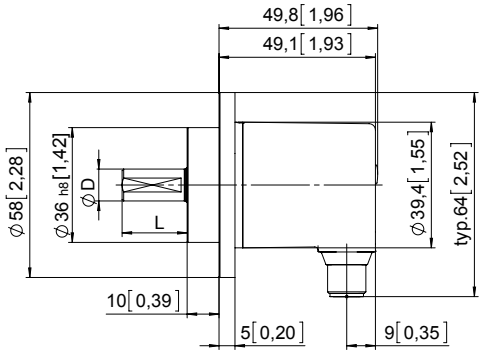
M12 connector, 8-pin

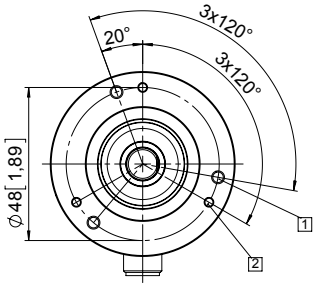
Dimensions

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 3

1 3 x M4, 10 [0.39] deep
2 3 x M3, 6 [0.24] deep

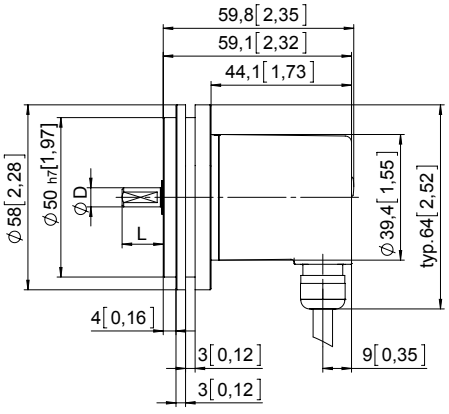


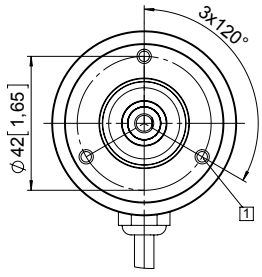


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]

Synchro flange, ø 58 [2.28]
Flange type 4

1 3 x M4, 10 [0.39] deep





D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]

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Standard
electronic multiturn, magnetic | **Sendix M5868 (shaft)** | **CANopen**

The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.

Safety-Lockplus™ | High rotational speed | Temperature range -40° ... +85°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Reverse polarity protection | Energy Harvesting

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

Order code Shaft version

8.M5868	.	X	X	2	X	.	21	2	2
Type		a	b	c	d		e		

a *Version*
3 = clamping flange, IP65, ø 58 mm [2.28"]
4 = synchro flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
5 = ø 10 x 20 mm [0.39 x 0.79"]

c *Interface / power supply*
2 = CANopen DS301 V4.2 / 10 ... 30 V DC

d Type of connection
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
4 = radial M12 connector, 5-pin

*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M5868.312B.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

Optional on request
- Ex 2/22 (only for connection type 4)

Connection technology		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Absolute encoders – multiturn

Standard
electronic multiturn, magnetic | **Sendix M5868 (shaft)** | **CANopen**

Technical data

Mechanical characteristics

Maximum speed		4000 min^{-1} 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial axial	80 N 40 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP65
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft flange housing cable	V2A aluminum zinc die-cast PVC
Shock resistance acc. to EN 60068-2-27		5000 m/s^2, 4 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes [1]
UL approval	File 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen

Resolution singleturn	1 ... 16384 (14 bit), scalable default: 8192 (13 bit)
Absolute accuracy [2]	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 16.777.216 (24 bit) scalable only via the total resolution
Total resolution	1 ... 274.877.906.944 (38 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader
Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	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
Bootloader	configuration management CIA DS 302-3

1) Short circuit proof to 0 V or to output when power supply correctly applied.
2) Over the whole temperature range.

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Standard
electronic multiturn, magnetic | **Sendix M5868 (shaft)** | **CANopen**

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) 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.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed, acceleration** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

CANopen communication profile DS301 V4.2

Among others, 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 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

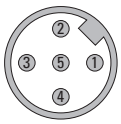
- Program download.
- Program start.
- Program erase.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
2	2, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
2	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

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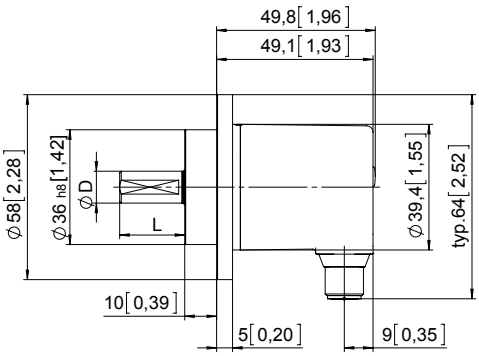
Standard electronic multiturn, magnetic | Sendix M5868 (shaft) | CANopen

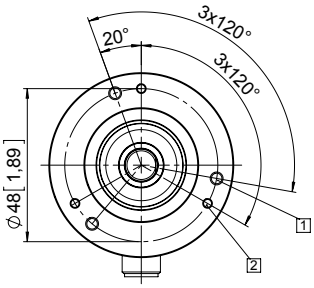
Dimensions

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 3

1 3 x M4, 10 [0.39] deep
2 3 x M3, 6 [0.24] deep

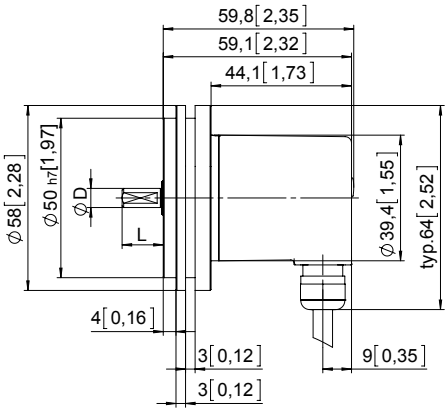


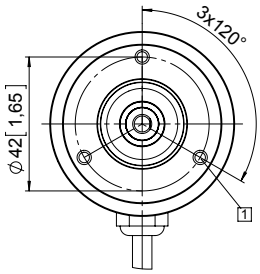


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]

Synchro flange, ø 58 [2.28]
Flange type 4

1 3 x M4, 10 [0.39] deep





D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]

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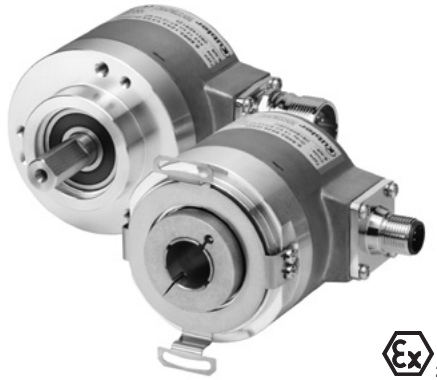
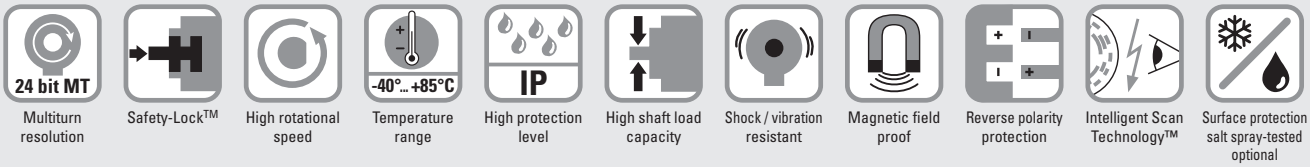
Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

41 bits total resolution, through hollow shaft up to 15 mm and versions with additional SinCos or RS422 incremental track.



Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

Versatile

- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- The right fixing solution or type of connection available for every application.
- SET button and LED for simple start-up.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Shaft version

8.F5863	.	X	X	X	X	.	X	X	X	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28"]
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39"] 1)
2 = 10 x 20 mm [0.39 x 0.79"] 2)
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
5 = axial M12 connector, 8-pin 3)
6 = radial M12 connector, 8-pin 3)

*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F5863.122A.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution (singleturn)* 4)
B = 9 bit ST
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g *Resolution (multiturn)* 4)
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 5)
- surface protection salt spray tested
- other singleturn resolutions

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.
3) Can be combined only with interface 1 and 2.
4) Resolution, preset value and counting direction factory-programmable.
5) For the cable connection type, cable material PUR.

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Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Order code Hollow shaft

8.F5883 . X X X X . X X X X
Type — a b c d — e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65, ø 65 mm [2.56"]
4 = with stator coupling, IP67, ø 65 mm [2.56"]
5 = with stator coupling, IP65, ø 63 mm [2.48"]
6 = with stator coupling, IP67, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin
6 = radial M12 connector, 8-pin [2)]

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F5883.542B.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

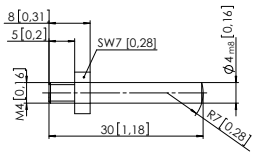
f *Resolution (singleturn) [1)]*
B = 9 bit ST
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g *Resolution (multiturn) [1)]*
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 (not for type of connection E, F) [3)]
- surface protection salt spray tested
- other singleturn resolutions

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Resolution, preset value and counting direction factory-programmable.
2) Can be combined only with Interface 1 and 2.
3) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Technical data

Mechanical characteristics

Maximum speed shaft version		
	IP65 up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	IP65 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	11000 min^{-1}, 9000 min^{-1} (continuous)
	IP67 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	IP65 up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to T_{max}	4000 min^{-1}, 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F] 1)
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply		5 V DC (+5%) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 60 mA
	10 ... 30 V DC	max. 30 mA
Reverse polarity protection of the power supply		yes (at 10 ... 30 V DC)
Short circuit proof outputs		yes 2)
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 17 bit
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Resolution singleturn	10 ... 17 bit
Number of revolutions (multiturn)	max. 24 bit
Code	binary
BiSS clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Status output and LED

Output driver	open collector, internal pull up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH: +V / LOW: < 1 V
Active	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 22 kOhm).

An active status output (LOW) displays:
- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or ageing)
- over- or under-temperature

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

Option incremental outputs (A/B), 2048 ppr

	SinCos	**RS422 TTL-compatible**
Max. frequency -3dB	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)

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = power supply)	HIGH	min. 60 % of +V, max: +V
	LOW	max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 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 button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

1) Cable version: -30°C ... + 75°C [-22°F ... +167°F].
2) Short circuit to 0 V or to output; if power supply correctly applied.

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Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

DIR input

Direction 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 status output will switch to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input) 1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
1, 2	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
5	1, 2, A, B, E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
		sensor output	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
5	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
3, 4, 7, 8	1, 2, A, B, E, F	SET, DIR, SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		or incr. RS422	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
3, 4, 7, 8	3, 4	SET, DIR, SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		or incr. RS422	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6	1, 2, A, B, E, F	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
		sensor output	Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

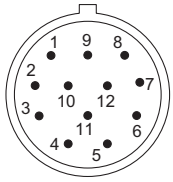
Interface	Type of connection	Features	M23 connector, 12-pin													
6	3, 4	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	M12 connector, 8-pin										
1, 2	5, 6	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚	
			Pin:	1	2	3	4	5	6	7	8	PH	

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

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Absolute encoders – multiturn

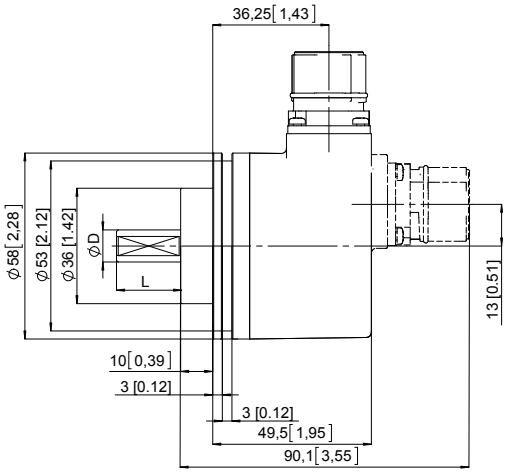
Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

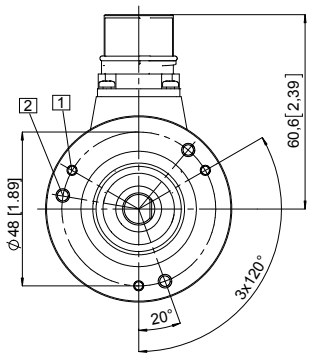
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

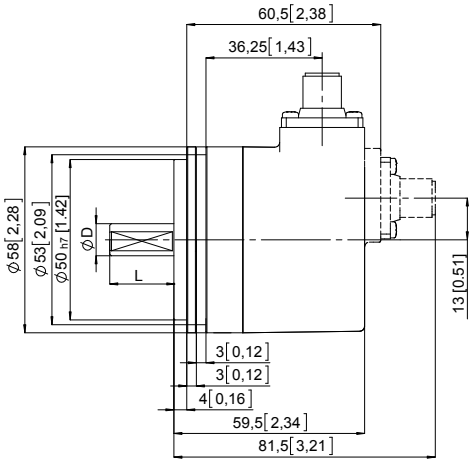


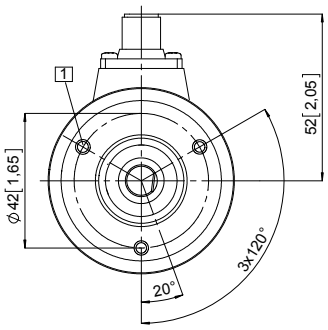


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

1 3 x M4, 6 [0.24] deep





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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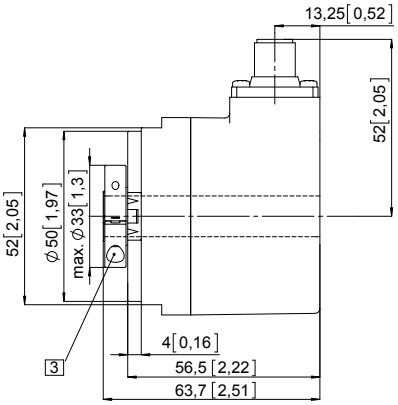
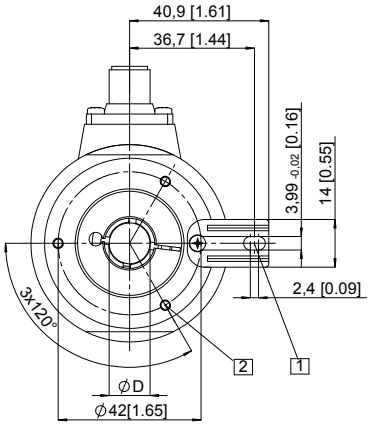
Standard electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with M12 connector)

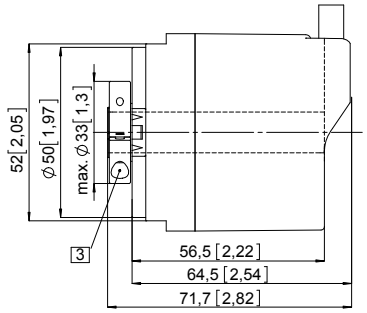


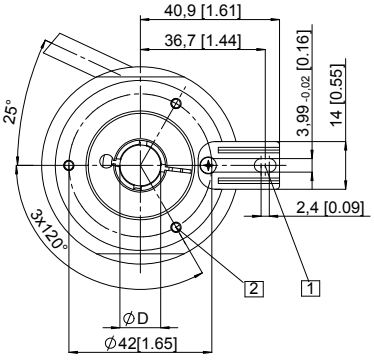


1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7

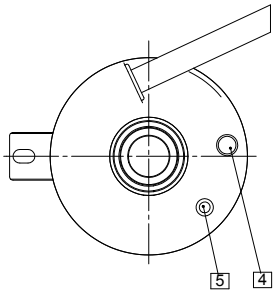
(drawing with tangential cable)





1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8“	H7
1/2“	H7



4 Status-LED
5 SET button

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Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

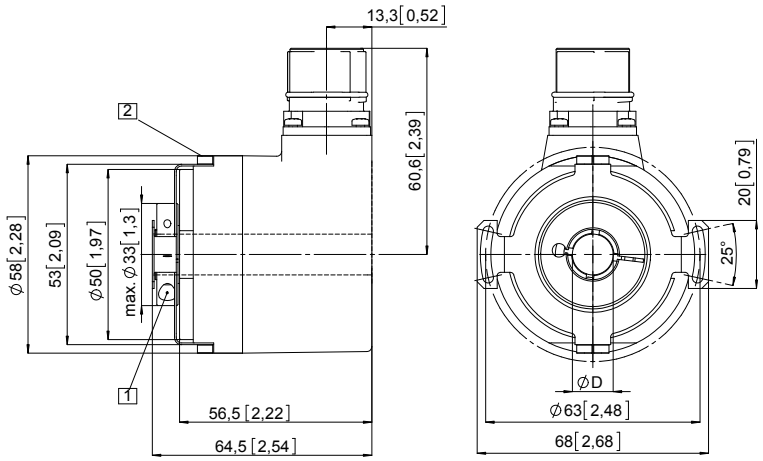
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws
63 mm [2.48]
(drawing with M23 connector)

1 Recommended torque for the clamping ring 0.6 Nm

2 Fixing screws (4x) DIN 912 M3 x 8 (washer included in delivery)



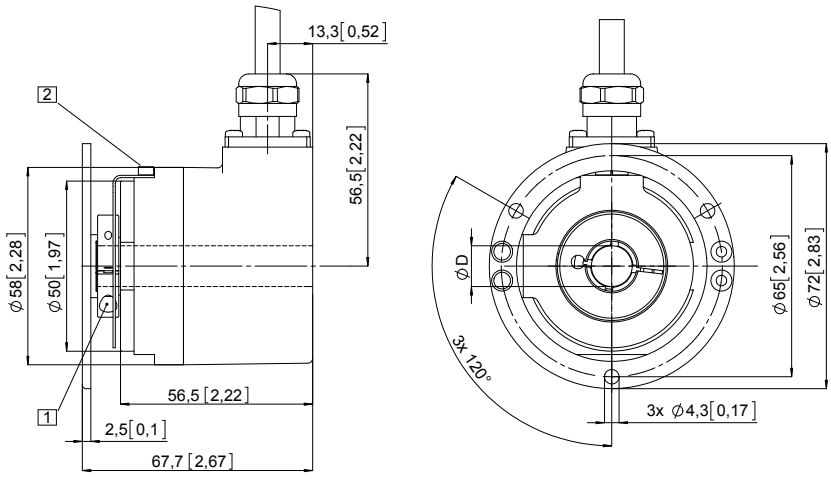
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

Pitch circle diameter for fixing screws
65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm

2 Fixing screws (2x) DIN 912 M3 x 8 (washer included in delivery)



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7

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Standard
Motor-Line, electronic multiturn, optical | **Sendix F5883M (hollow shaft)** | **SSI / BiSS + incremental**

The optical Sendix F5883 multiturn encoder in the Motor-Line version stands out particularly because of its reduced overall depth of only 43 mm with a through hollow shaft up to 15 mm.

This opens up new possibilities when dimensioning the motors and for installation in tight mounting spaces. Its technical features make the F5883 Motor-Line the ideal device for use in geared motors.

c UL us pending | RoHS | SSI | BiSS INTERFACE

Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Compact and robust

- Suitable for restricted mounting spaces thanks to its small construction depth of 43 mm and its tangential cable outlet.
- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

Versatile

- Through hollow shaft up to max. 15 mm and clamping both on the flange and on the cover side – suitable for usual drive shafts for geared motors, flexible installation.
- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- SET button and LED for simple start-up.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Hollow shaft

8.F5883M . X X X X . X X X X
Type — a b c d — e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = with spring element, long, IP65
5 = with stator coupling, IP65, ø 63 mm [2.48"]
9 = with torque stop, flexible, IP65

b *Through hollow shaft*
Clamping on the flange side
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
9 = ø 1/2"
Clamping on the cover side
A = ø 12 mm [0.39"]
B = ø 14 mm [0.55"]
C = ø 15 mm [0.59"]

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC
A = SSI, BiSS + 1024 ppr. RS422 (TTL-comp.) / 5 V DC
B = SSI, BiSS + 1024 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC

d *Type of connection*
E = tangential cable, 1 m PVC
F = tangential cable, special length PVC *)
*) Available special lengths (connection type F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F5883M.542F.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution (singleturn)* [1]
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g *Resolution (multiturn)* [1]
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- surface protection salt spray tested
- other singleturn resolutions

1) Resolution, preset value and counting direction factory-programmable.

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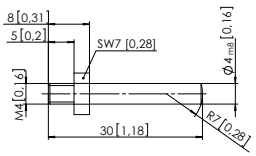
Absolute encoders – multiturn

Standard
Motor-Line, electronic multiturn, optical | **Sendix F5883M (hollow shaft)** | **SSI / BiSS + incremental**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1)	with fixing thread 	**8.0010.4700.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Suitable connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		9000 min^{-1}, 6000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Mass moment of inertia		6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection		IP65
Working temperature range		-40°C ... +85°C [-40°F ... +185°F] 1)
Material	hollow shaft flange housing cable	stainless steel aluminum zinc die-cast PVC
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply		5 V DC (+5%) or 10 ... 30 V DC
Current consumption (no load)	5 V DC 10 ... 30 V DC	max. 60 mA max. 30 mA
Reverse polarity protection of the power supply		yes (at 10 ... 30 V DC)
Short circuit proof outputs		yes 2)
UL approval		file 224618 (pending)
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH LOW at I_{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution singleturn		10 ... 17 bit
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ST resolution ≥ 15 bit	≤ 1 µs 4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Resolution singleturn	10 ... 17 bit
Number of revolutions (multiturn)	max. 24 bit
Code	binary
BiSS clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Status output and LED

Output driver	open collector, internal pull up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH: +V / LOW: < 1 V
Active	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 22 kOhm).

An active status output (LOW) displays:
- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or ageing)
- over- or under-temperature

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

Option incremental outputs (A/B), 1024 / 2048 ppr

	SinCos	RS422 TTL-compatible
Max. frequency -3dB	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)

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).
2) Short circuit to 0 V or to output; if power supply correctly applied.

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Standard
Motor-Line, electronic multiturn, optical | **Sendix F5883M (hollow shaft)** | **SSI / BiSS + incremental**

SET input

Input		active HIGH
Input type		comparator
Signal level (+V = power supply)	HIGH LOW	min. 60 % of +V, max: +V max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input Delay		1 ms
New position data readable after		1 ms
Internal processing time		200 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 button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.
The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction 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 status output will switch to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
5	E, F	SET, DIR, Status sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
3, 4, 7, 8, A, B	E F	SET, DIR, SinCos or incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6	E, F	SinCos or incr. RS422 sensor output	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: Set input
DIR: Direction input
Stat: Status output
PH ⏚: Plug connector housing (shield)

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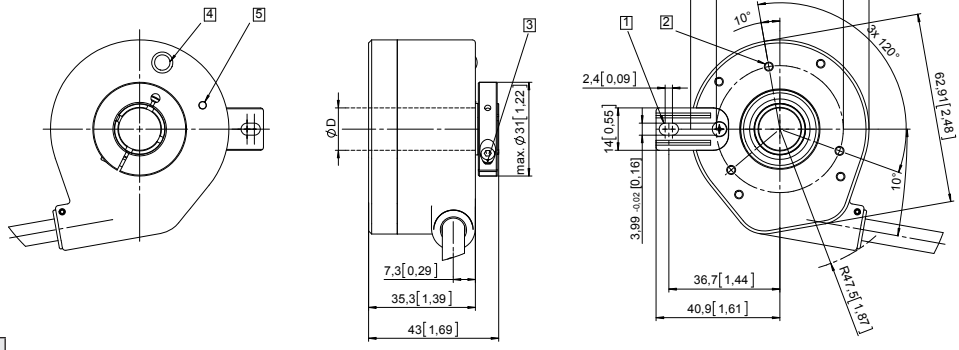
Standard
Motor-Line, electronic multiturn, optical | **Sendix F5883M (hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1

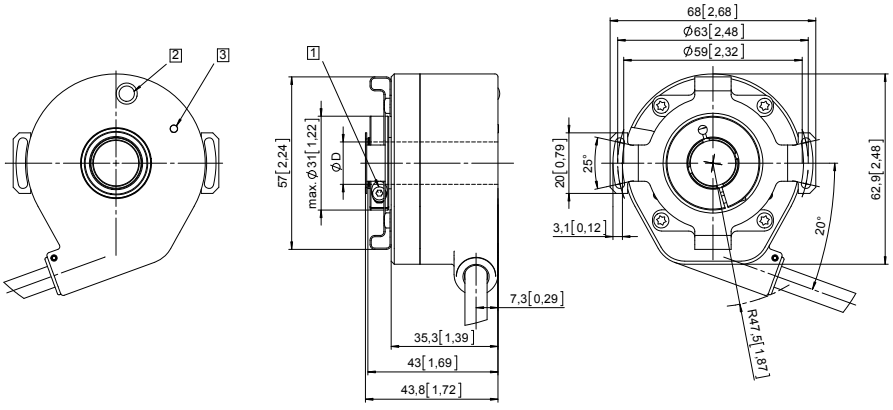


1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 6 [0.24] deep
3 Recommended torque for the clamping ring 0.6 Nm
4 Status-LED
5 SET button

D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

Flange with stator coupling, ø 63 [2.48]
Flange type 5

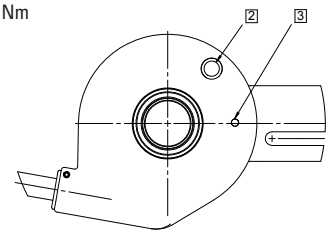
Pitch circle diameter for fixing screws 63 mm [2.48]



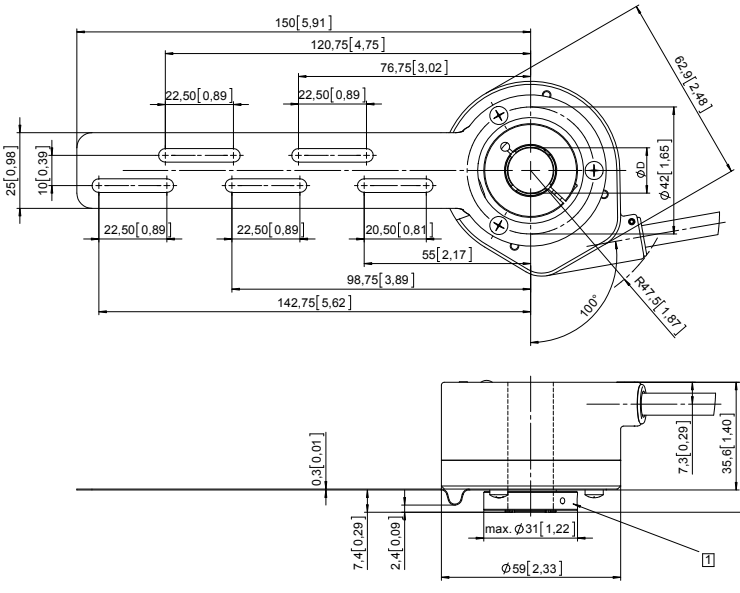
1 Recommended torque for the clamping ring 0.6 Nm
2 Status-LED
3 SET button

D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

Flange with torque stop, flexible
Flange type 9



1 Recommended torque for the clamping ring 0.6 Nm
2 Status-LED
3 SET button



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

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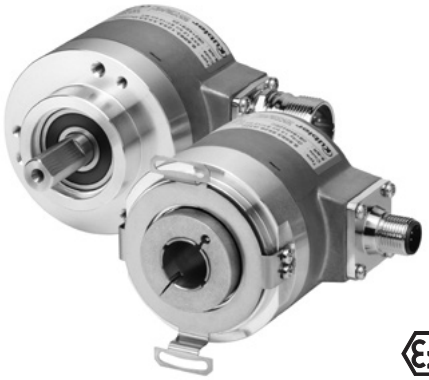
Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**



The Sendix 5863 and 5883 multiturn encoders with SSI or BiSS interface and optical sensor technology can achieve a resolution of max. 29 bits.

A through hollow shaft up to 14 mm and a blind hollow shaft up to 15 mm are available, as well as versions with additional SinCos or RS422 incremental track.

Ex 2/22 | cULus | RoHS | SSI | BiSS INTERFACE

Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range -40°...+90°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos

Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation.
- Absolutely reliable operation in areas with strong magnetic fields, thanks to mechanical gear with optical sensor technology.
- Rugged die-cast housing, remains sealed even in harsh everyday use.
- -40°C ... +90°C: use in wide temperature range and protection IP67.

Versatile

- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- The right fixing solution or type of connection available for every application.
- SET button and LED for simple start-up.

Order code Shaft version

8.5863	.	X	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*

1 = clamping flange, IP65 ø 58 mm [2.28"]
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]
5 = square flange, IP65 □63.5 mm [2.5"]
7 = square flange, IP67 □63.5 mm [2.5"]
6 = servo flange, IP65 ø 63.5 mm [2.5"] 1)
8 = servo flange, IP67 ø 63.5 mm [2.5"] 1)

b *Shaft (ø x L), with flat*

1 = 6 x 10 mm [0.24 x 0.39"] 2)
2 = 10 x 20 mm [0.39 x 0.79"] 3)
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / power supply*

1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC
9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output

d *Type of connection*

1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
5 = axial M12 connector, 8-pin 4)
6 = radial M12 connector, 8-pin 4)

*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5863.112A.G323.0030 (for cable length 3 m)

e *Code*

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

f *Resolution* 5)

A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs* 5)

2 = SET, DIR input additional status output

h *Options (service)*

1 = no option
2 = status LED
3 = SET button and status LED

Optional on request

- Ex 2/22 6)
- other singleturn resolutions
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested: 8.5863.32X6.XX22-C

V4A 1.4404 stainless steel V4A: 8.5863.32X6.XX22-V4A

1) US version.
2) Preferred type only in conjunction with flange type 2.
3) Preferred type only in conjunction with flange type 1.
4) Only in conjunction with interface type 1 and 2.
5) Resolution, preset value and counting direction factory-programmable.
6) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Order code Hollow shaft

8.5883 . X X X X . X X 2 X
Type
a b c d e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
8 = ø 3/8"
9 = ø 1/2"
Blind hollow shaft
(insertion depth max. 30 mm [1.18"])
6 = ø 15 mm [0.59"]

c *Interface / power supply*
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC
9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12-pin
6 = radial M12 connector, 8-pin [2]

*) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5883.542B.G323.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs* [1]
2 = SET, DIR input
additional
status output

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

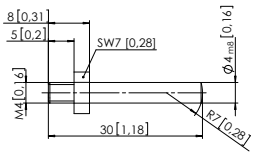
Optional on request
- Ex 2/22 (not for type of connection E, F) [3]
- other singleturn resolutions
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested:
8.5883.24X6.XX22-C
8.5883.25X6.XX22-C

V4A 1.4404 stainless steel V4A:
8.5883.24X6.XX22-V4A

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Resolution, preset value and counting direction factory-programmable.
2) Only in conjunction with interface type 1 and 2.
3) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard
mechanical multiturn, optical

Sendix 5863 / 5883 (shaft / hollow shaft)

SSI / BiSS + incremental

Technical data

Mechanical characteristics

Maximum speed shaft version		
	IP65 up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	IP65 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	11000 min^{-1}, 9000 min^{-1} (continuous)
	IP67 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	IP65 up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to T_{max}	4000 min^{-1}, 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] 1)
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply		5 V DC (+5%) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 80 mA
	10 ... 30 V DC	max. 50 mA
Reverse polarity protection of the power supply		yes (at 10 ... 30 V DC)
Short circuit proof outputs		yes 2)
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary
Clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Status output and LED

Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active		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 22 kOhm).

An active status output (LOW) displays:
- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or ageing)
- over- or under-temperature

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

Option incremental outputs (A/B), 2048 ppr

	SinCos	RS422 TTL compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (± 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes	yes

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].
2) Short circuit to 0V or to output, one channel at a time, power supply correctly applied.

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Absolute encoders – multiturn

Standard
mechanical multiturn, optical

Sendix 5863 / 5883 (shaft / hollow shaft)

SSI / BiSS + incremental

SET input or SET button

Input		active HIGH
Input type		comparator
Signal level	HIGH	min: 60 % of +V (power supply) max: +V
	LOW	max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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 button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

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Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
1, 2	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
5	1, 2, A, B, E, F	SET, DIR, Status sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
5	3, 4	SET, DIR, Status sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0 Vsens	+Vsens	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
3, 4, 7, 8	1, 2, A, B, E, F	SET, DIR, SinCos or incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector, 12-pin													
3, 4, 7, 8	3, 4	SET, DIR, SinCos or incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)														
6, 9	1, 2, A, B, E, F	SinCos o. incr. RS422 sensor output	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

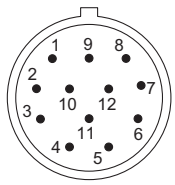
Interface	Type of connection	Features	M23 connector, 12-pin														
6, 9	3, 4	SinCos o. incr. RS422 sensor output	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	M12 connector, 8-pin									
1, 2	5, 6	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⏚
			Pin:	1	2	3	4	5	6	7	8	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Incremental output channel A (cosine)
B, $\overline{B}$: Incremental output channel B (sine)
SET: SET input
DIR: Direction input
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

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Absolute encoders – multiturn

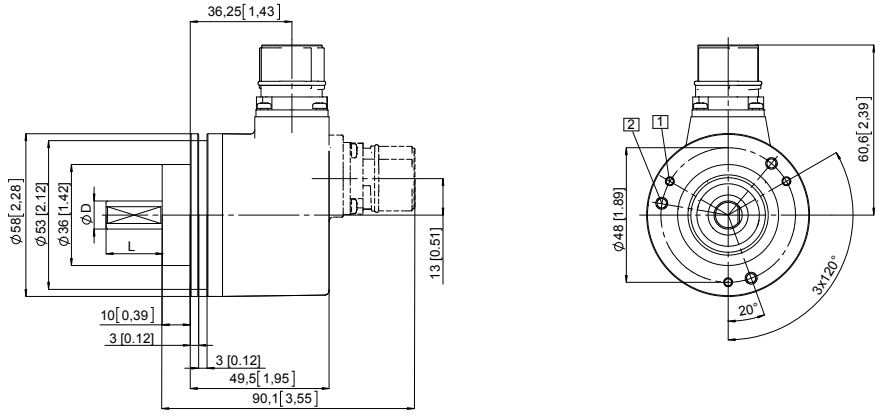
Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with M23 connector)

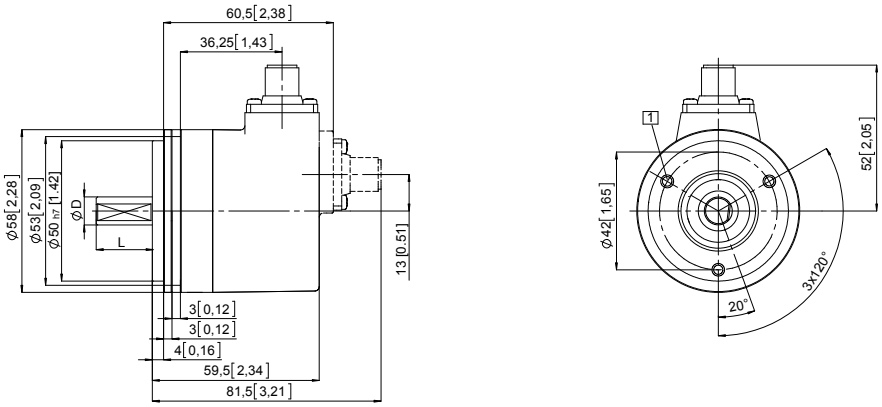
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

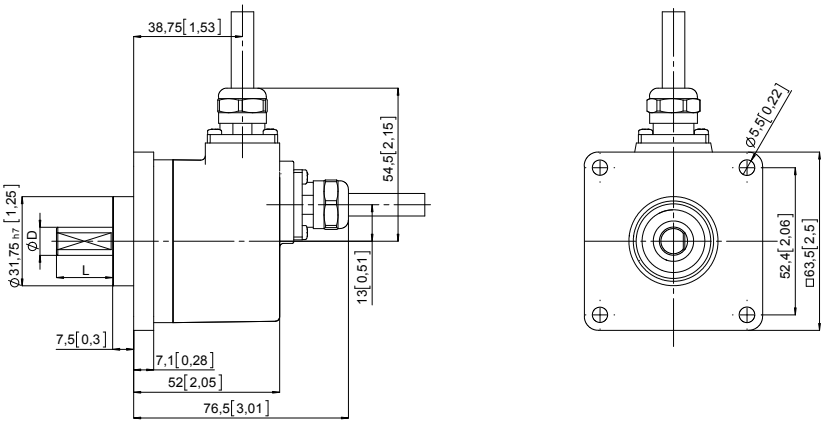
Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

1 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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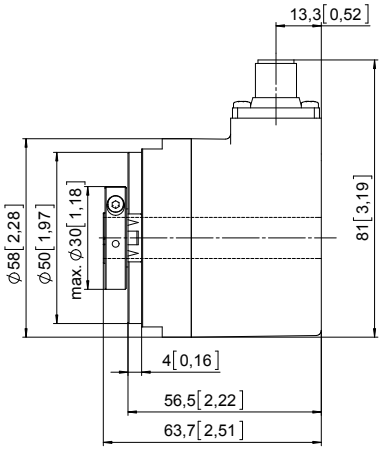
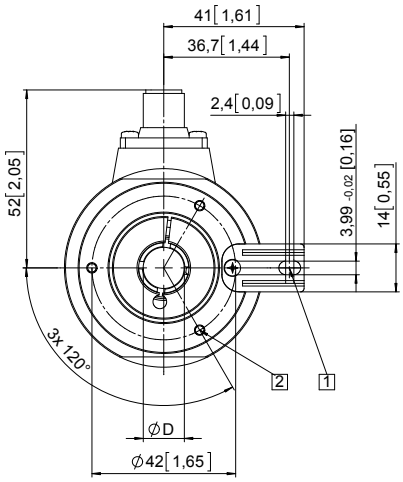
Standard
mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with M12 connector)

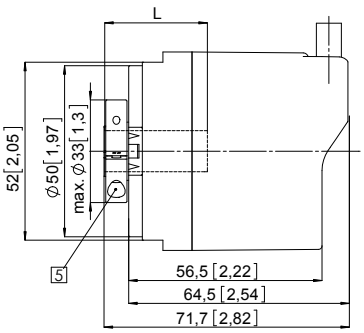


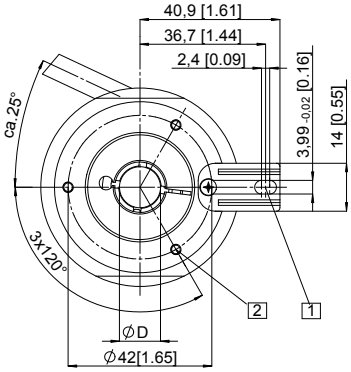


D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59] *)	H7
3/8“	H7
1/2“	H7

*) Blind hollow shaft,
insertion depth max. = 30 mm [1.18“]

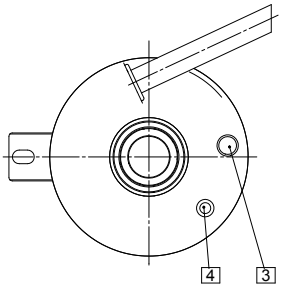
(drawing with tangential cable)





D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59] *)	H7
3/8“	H7
1/2“	H7

*) Blind hollow shaft,
insertion depth max. = 30 mm [1.18“]



- 1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Status-LED
- 4 SET button
- 5 Recommended torque for the clamping ring 0.6 Nm

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Absolute encoders – multiturn

Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS + incremental**

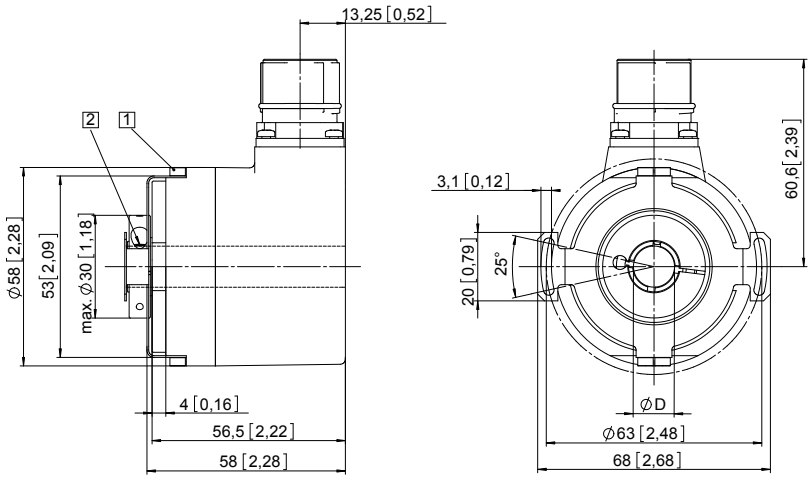
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with M23 connector)

1 Fixing screws DIN 912 M2,5 x 6 (washer included in delivery)

2 Recommended torque for the clamping ring 0.6 Nm

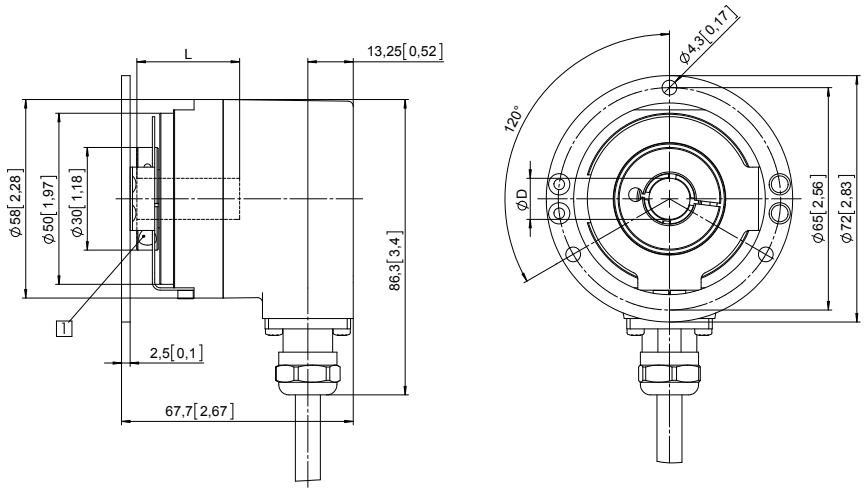


D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59] *)	H7
3/8"	H7
1/2"	H7

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59] *)	H7
3/8"	H7
1/2"	H7

*) Blind hollow shaft, insertion depth (L) max. = 30 mm [1.18"]

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Standard
SIL2/PLd, mech. multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)

SSI / BiSS + SinCos

The absolute multiturn encoders 5863FS2 and 5883FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

The extra strong Safety-Lock™ design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.

Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Order code Shaft version

8.5863FS2	.	1	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5863FS2.124A.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Input / output* [1]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 [2]
- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Order code Hollow shaft

8.5883FS2	.	X	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
9 = with torque stop, flexible, IP65
A = with torque stop set, rigid, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
Tapered shaft
K = ø 10 mm [0.39"]

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12 pin

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5883FS2.B44B.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1)]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Input / output* [1)]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 (not for type of connection E, F) [2)]
- other singleturn resolutions

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable [3)]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable [3)]	**8.0000.6905.0002.0032**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

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Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Technical data

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value [1]	2.16 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 80 mA
	10 ... 30 V DC	max. 50 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes [2]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics

Maximum speed shaft version		
	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]		
	shaft version	< 0.01 Nm
	hollow shaft version	< 0.03 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.0 x 10^{-6} kgm^2
Insertion depth for shaft		
	hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] [3]
Material	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

EMC

Relevant standards	EN 55011 class B :2009 / A1:2010 EN 61000-6-3:2007 / A1:2011 EN 61000-6-2:2005

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [2]
Pulse rate	2048 ppr

LED

The optional LED (red) serves to display various alarm or error messages.
In normal operation the LED is OFF.

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

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

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

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Absolute encoders – multiturn

Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

SET input or SET button

Input		HIGH active
Input type		comparator
Signal level	HIGH LOW	min: 60 % of +V, max: +V max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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 button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed.
The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Reaction time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

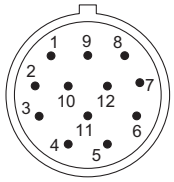
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)												
3, 4	1, 2, A, B, E, F	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	M23 connector, 12-pin												
3, 4	3, 4	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

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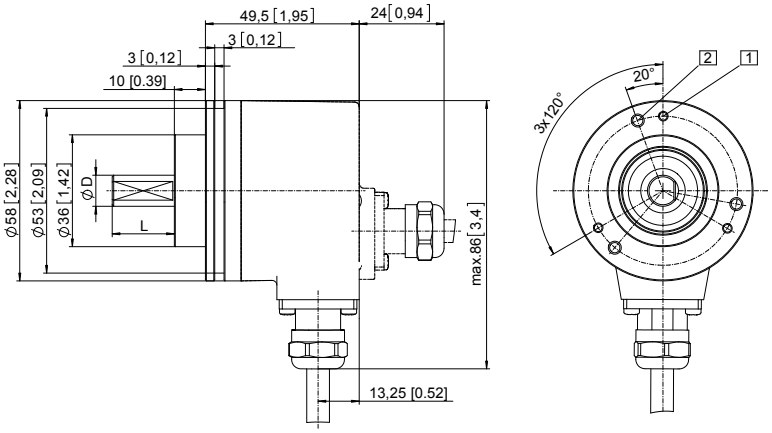
Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

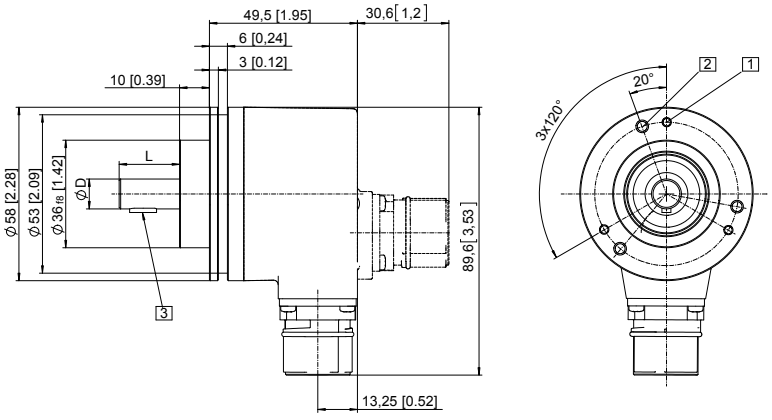
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6



D	Fit	L
10 [0.39]	f7	20 [0.79]

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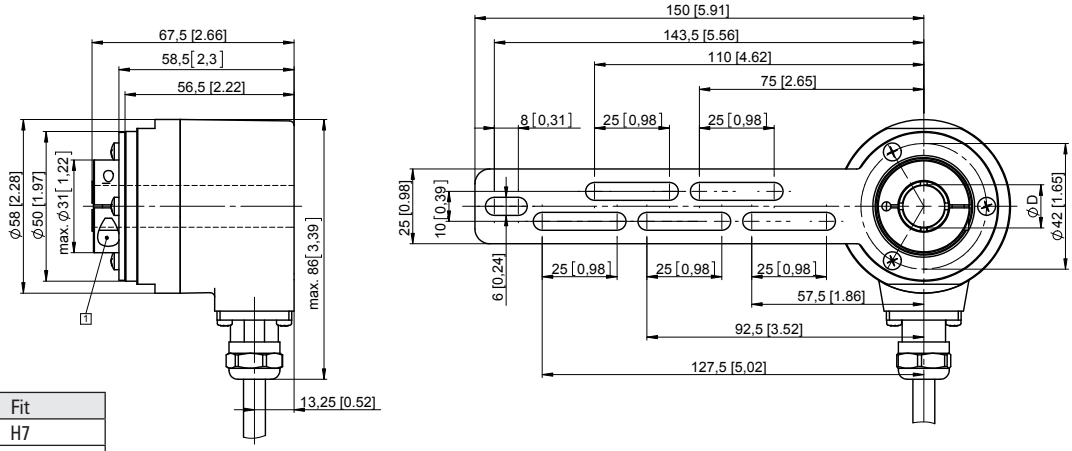
Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

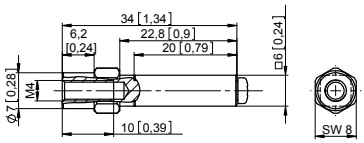
Flange with torque stop set, rigid
Flange type A
Through hollow shaft
(drawing with cable)

1 SW 3, recommended torque for the clamping ring 2.5 Nm



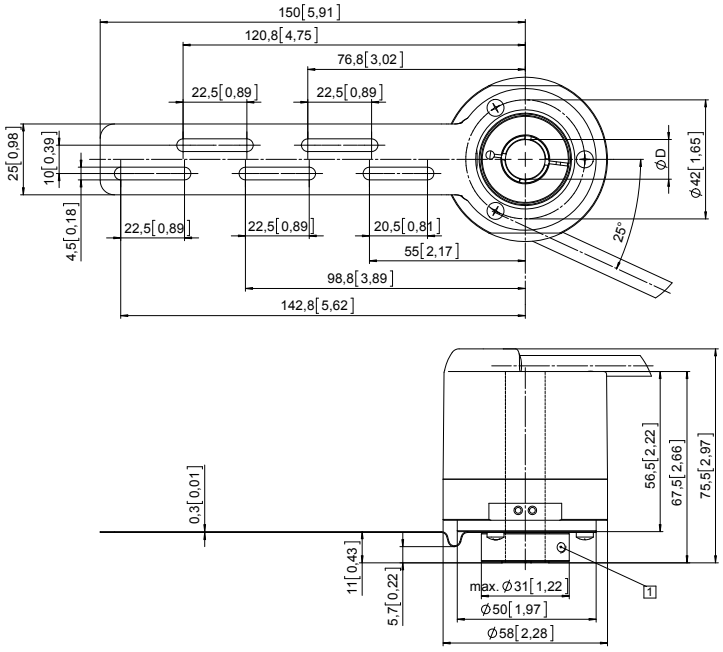
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Torque pin with rectangular sleeve with M4 thread



Flange with torque stop, flexible
Flange type 9
Through hollow shaft
(drawing with M23 connector)

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

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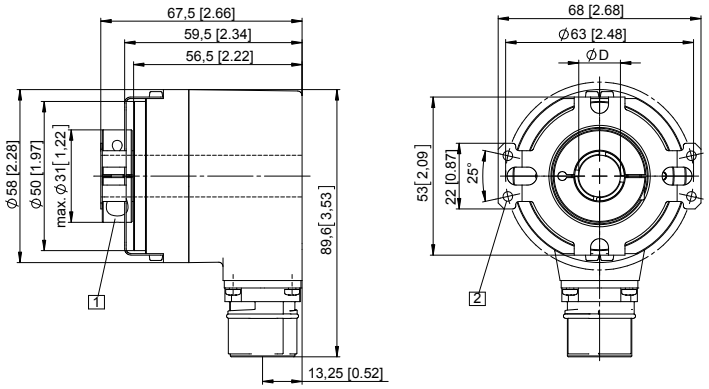
Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type B
Through hollow shaft
(drawing with M23 connector)

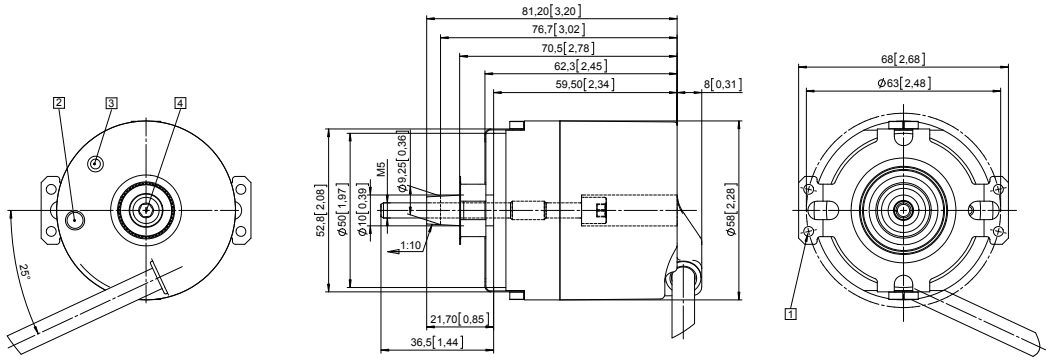
1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Tapered shaft
(drawing with tangential cable outlet)

1 For (4x) M3 screw
2 Status LED
3 SET button
4 SW 4



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Standard
SIL3/PLe, mech. multiturn, optical

Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

The absolute multiturn encoders 5863FS3 and 5883FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

The extra strong Safety-Lock™ design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.

Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Flexible

- Shaft and hollow shaft versions.
- Cable and connector variants.
- Various mounting options available.

Order code Shaft version

8.5863FS3	.	1	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65, ø 58 mm [2.28"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5863FS3.124A.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Input / output* [1]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 [2]
- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard
SIL3/PLe, mech. multiturn, optical

Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

Order code Hollow shaft

8.5883FS3	.	X	X	X	X	.	X	X	2	X
Type		a	b	c	d		e	f	g	h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
9 = with torque stop, flexible, IP65
A = with torque stop set, rigid, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
Tapered shaft
K = ø 10 mm [0.39"]

c *Interface / power supply*
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
4 = radial M23 connector, 12 pin

*) Available special lengths (connection types B, F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5883FS3.B44B.G322.0030 (for cable length 3 m)

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [1]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Input / output* [1]
2 = SET, DIR input

h *Options (service)*
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 (not for type of connection E, F) [2]
- other singleturn resolutions

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable [3]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable [3]	**8.0000.6905.0002.0032**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

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Absolute encoders – multiturn

Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Technical data

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value [1]	1.09 x 10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Electrical characteristics

Power supply		5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 80 mA
	10 ... 30 V DC	max. 50 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes [2]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics

Maximum speed shaft version		
	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
	up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]		
	shaft version	< 0.01 Nm
	hollow shaft version	< 0.03 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.0 x 10^{-6} kgm^2
Insertion depth for shaft		
	hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] [3]
Material	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

EMC

Relevant standards	EN 55011 class B :2009 / A1:2010 EN 61000-6-3:2007 / A1:2011 EN 61000-6-2:2005

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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

BiSS interface

Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [2]
Pulse rate	2048 ppr

LED

The optional LED (red) serves to display various alarm or error messages.
In normal operation the LED is OFF.

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

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

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.

2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

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Absolute encoders – multiturn

Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

SET input or SET button

Input		HIGH active
Input type		comparator
Signal level	HIGH LOW	min: 60 % of +V, max: +V max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		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 button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed.
The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Reaction time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

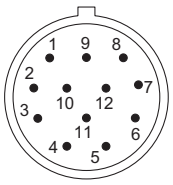
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
3, 4	1, 2, A, B, E, F	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	M23 connector, 12-pin													
3, 4	3, 4	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

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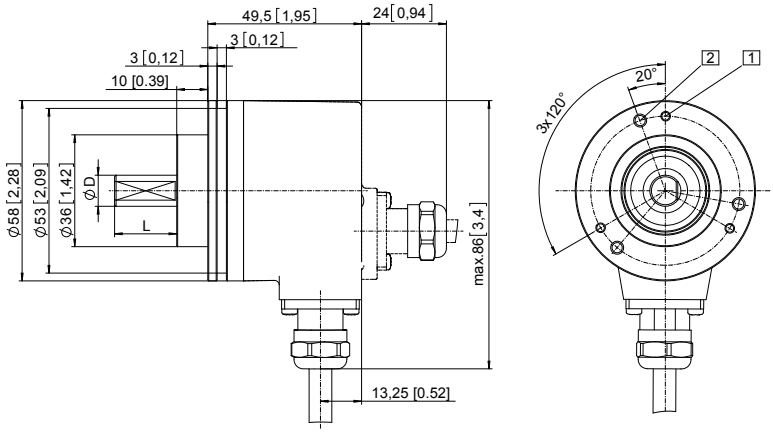
Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

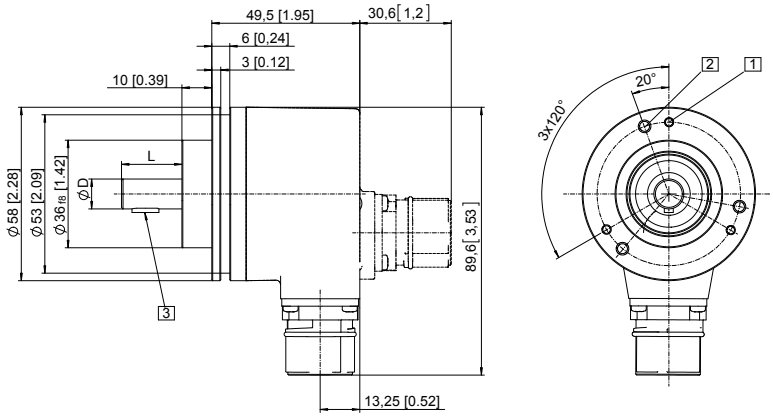
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6



D	Fit	L
10 [0.39]	f7	20 [0.79]

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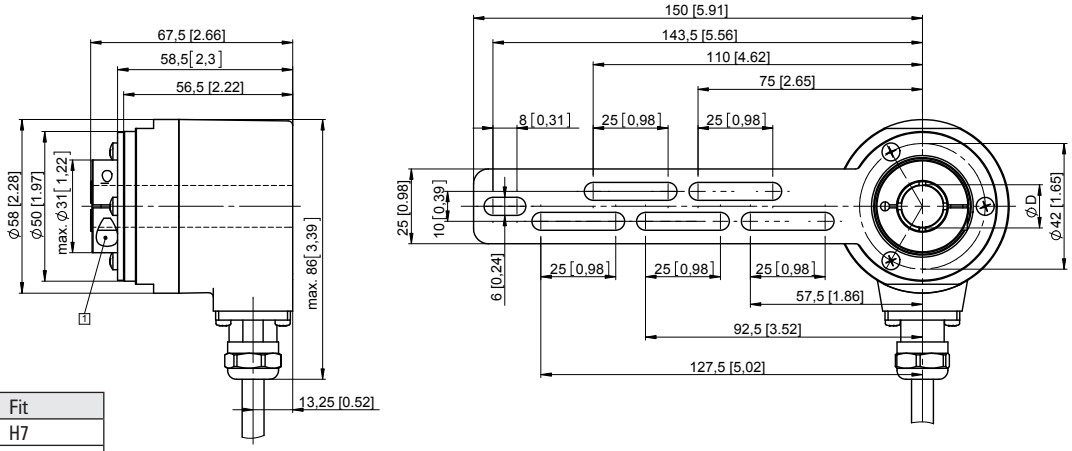
Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

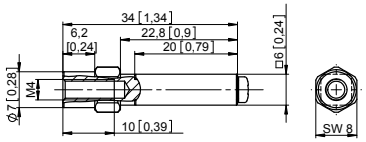
Flange with torque stop set, rigid
Flange type A
Through hollow shaft
(drawing with cable)

1 SW 3, recommended torque for the clamping ring 2.5 Nm



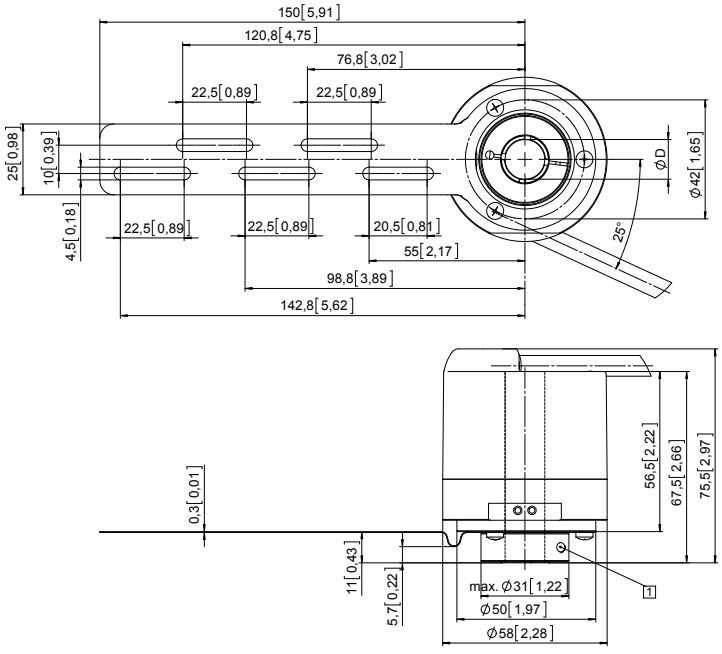
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Torque pin with rectangular sleeve with M4 thread



Flange with torque stop, flexible
Flange type 9
Through hollow shaft
(drawing with M23 connector)

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

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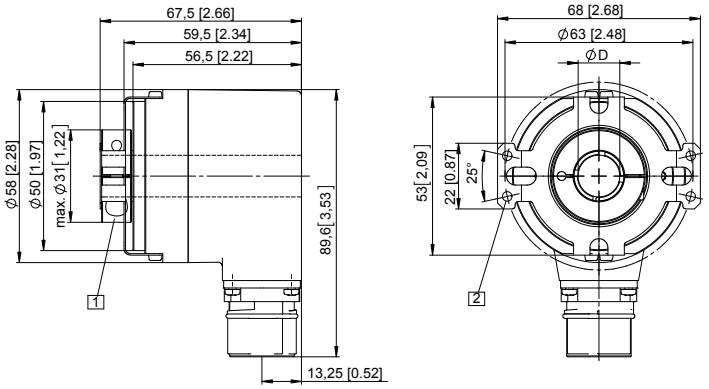
Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type B
Through hollow shaft
(drawing with M23 connector)

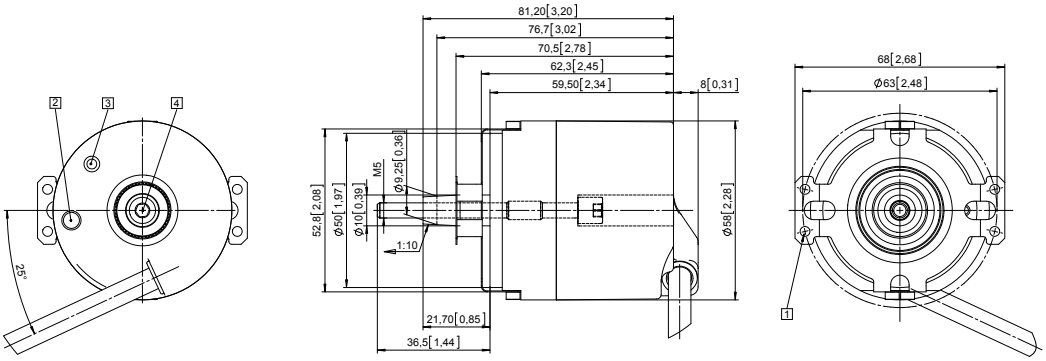
1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type B
Tapered shaft
(drawing with tangential cable outlet)

1 For (4x) M3 screw
2 Status LED
3 SET button
4 SW 4



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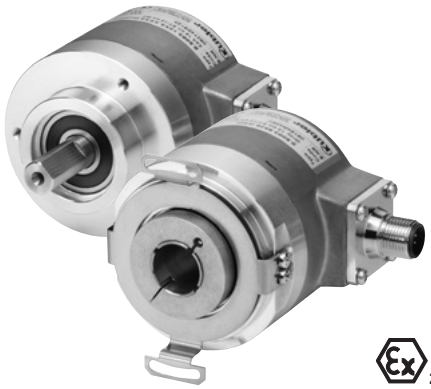
Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, through hollow shaft up to 15 mm and CANopen functionalities according to up-to-date encoder profile.

Ex 2/22 | cULus | RoHS | CANopen

Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.

Up-to-the-minute Fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).

Order code Shaft version

8.F5868	.	X	X	2	X	.	21	2	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28"]
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39"] 1)
2 = 10 x 20 mm [0.39 x 0.79"] 2)
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
A = radial cable, 2 m [6.56'] PVC
B = radial cable, special length PVC *)
E = 1 x radial M12 connector, 5-pin
F = 2 x radial M12 connector, 5-pin

*) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.F5868.122B.2123.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

f *Options (service)*
2 = no option
3 = SET button

Optional on request
- Ex 2/22 3)
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.
3) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**

Order code Hollow shaft

8.F5888	.	X	X	2	X	.	21	2	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Through hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
Blind hollow shaft
(insertion depth max. 30 mm [1.18"])
B = ø 12 mm [1)]

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
L = tangential cable, 2 m [6.56'] PVC
M = tangential cable, special length PVC *)
E = 1 x radial M12 connector, 5-pin
F = 2 x radial M12 connector, 5-pin [2)]

*) Available special lengths (connection type M):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F5888.542M.2123.0030 (for cable length 3 m)

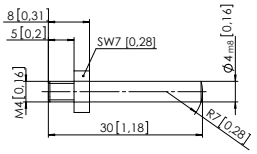
e *Fieldbus profile*
21 = CANopen

f *Options (service)*
2 = no option
3 = SET button

Optional on request
- Ex 2/22 [3)] (not for type of connection L, M)
- surface protection salt spray tested

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread	**8.0010.4700.0000**



Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in, 5-pin 2 m [6.56'] PVC cable	**05.00.6091.A211.002M**
	M12 male connector with external thread for bus out, 5-pin 2 m [6.56'] PVC cable	**05.00.6091.A411.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in, 5-pin	**8.0000.5116.0000**
	M12 male connector with external thread for bus out, 5-pin	**8.0000.5111.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Can be combined only with type of connection F.
2) Can be combined only with blind hollow shaft ø12 mm [0.47"].
3) For the cable connection type, cable material PUR.

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Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**

Technical data

Mechanical characteristics

Maximum speed shaft version		
	IP65 up to 70°C	12000 min^{-1}, 10000 min^{-1} (continuous)
	IP65 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
	IP67 up to 70°C	11000 min^{-1}, 9000 min^{-1} (continuous)
	IP67 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	IP65 up to 70°C	9000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
	IP67 up to 70°C	8000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to T_{max}	4000 min^{-1}, 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Mass moment of inertia	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F] 1)
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Diagnostic LED (two-color, red/green)

LED ON or blinking	red	error display
	green	status display
	combination red / green	error code

Interface characteristics CANopen

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit) default: 25 bit
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 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

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

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Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.2. In addition, device specific profiles such as encoder profile DS406 V3.2 and DS305 (LSS) 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 can be programmed via the CAN bus.
When switching the device on, all parameters, which have been saved on an EEPROM to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed**, **temperature** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

CANopen Communication Profile DS301 V4.2

Among others, the following functionality is integrated. Class C2 functionality:

- NMT slave.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 4 sending PDO's.
- Node address, baud rate and CANbus / programmable termination.
- Producer / consumer heartbeat.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

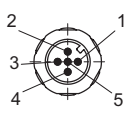
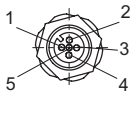
- Event mode.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error message, raw data.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- Customer-specific memory 16 Byte.
- Customer-specific protocol.
- Universal Scaling Function (USF).
- "Watchdog controlled" device.
- Extended diagnostic modes.

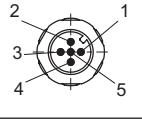
LSS layer setting services DS305 V2.0

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

Terminal assignment

Interface	Type of connection	Function	Cable (Bus terminal cover with terminal box)						
2	A, B, L, M	Bus IN	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
			Kabelfarbe:	WH	BN	YE	GN	GY	

Interface	Type of connection	Function	Steckeranschluss 2 x M12 connector, 5-pin						
2	F	Bus IN	Signal:	0 V Versorgung	+V Versorgung	CAN_L	CAN_H	CAN_GND	
			Pin:	3	2	5	4	1	
		Bus OUT	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
			Pin:	3	2	5	4	1	

Interface	Type of connection	Function	Steckeranschluss 1 x M12 connector, 5-pin						
2	E	Bus IN	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
			Pin:	3	2	5	4	1	

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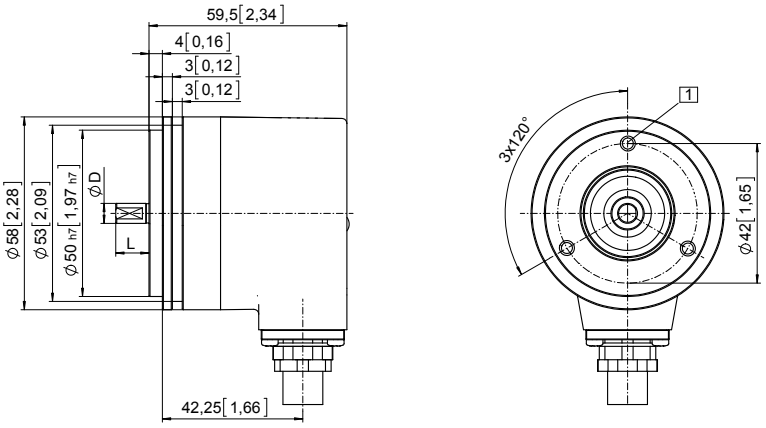
Standard electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

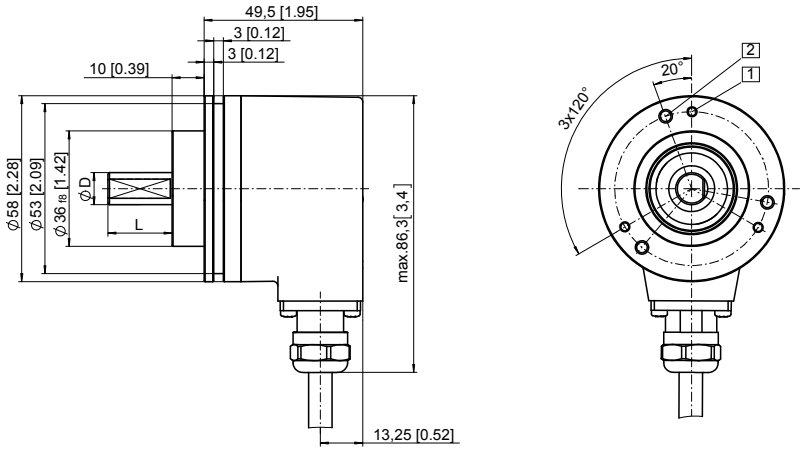
1 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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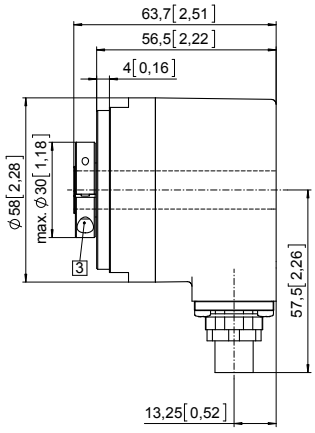
Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**

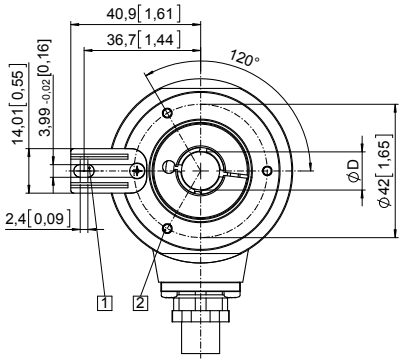
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with cable)

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 6 [0.24] deep
3 Recommended torque for the clamping ring 0.6 Nm



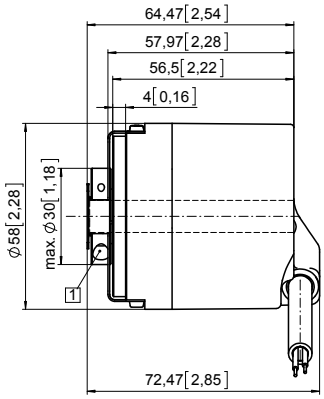


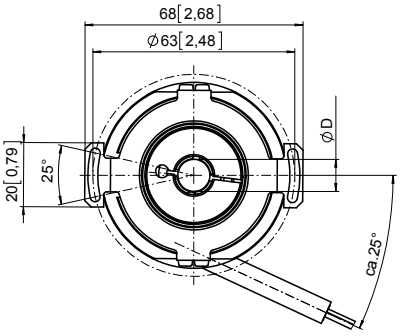
D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with tangential cable)

1 Recommended torque for the clamping ring 0.6 Nm



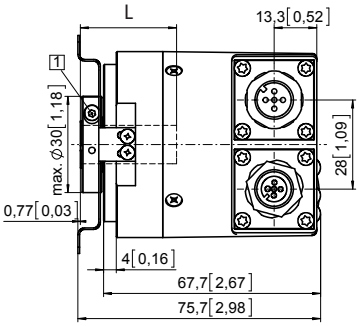


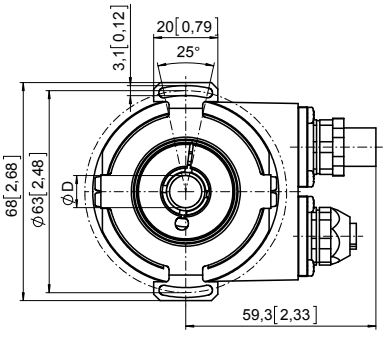
D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with 2 x M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

*) Blind hollow shaft, insertion depth (L) max. = 30 mm [1.18"]

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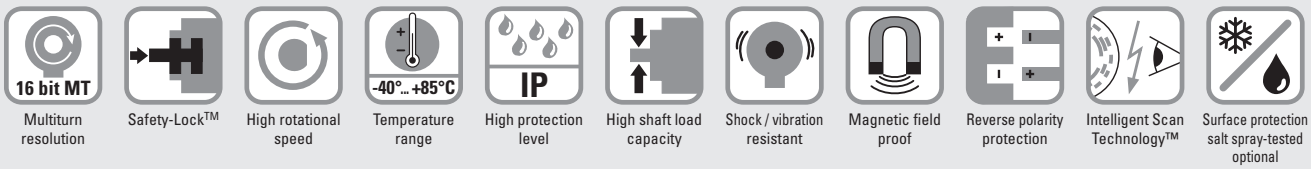
Standard
Motor-Line, electronic multiturn, optical | **Sendix F5888M (hollow shaft)** | **CANopen**

The optical Sendix F5888 multiturn encoder in the Motor-Line version stands out particularly because of its reduced overall depth of only 43 mm with a through hollow shaft up to 15 mm.

This opens up new possibilities when dimensioning the motors and for installation in tight mounting spaces. Its technical features make the F5888 Motor-Line the ideal device for use in geared motors.



Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray-tested optional

Compact and robust

- Suitable for restricted mounting spaces thanks to its small construction depth of 43 mm and its tangential cable outlet.
- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

Up-to-the-minute Fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).

Order code Hollow shaft

8.F5888M	.	X	X	X	X	.	21	2	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
5 = with stator coupling, IP65, ø 63 mm [2.48"]
9 = with torque stop, flexible, IP65

b *Through hollow shaft*
Clamping on the flange side
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
9 = ø 1/2"

Clamping on the cover side
A = ø 12 mm [0.39"]
B = ø 14 mm [0.55"]
C = ø 15 mm [0.59"]

c *Interface / power supply*
2 = CANopen DS301 V4.2 / 10 ... 30 V DC
5 = CANopen DS301 V4.2, 10 ... 30 V DC with 2048 ppr incremental track (TTL compatible)

d *Type of connection*
L = tangential cable, 1 m [3.28'] PVC
M = tangential cable, special length PVC *)

*) Available special lengths (connection type M): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.F5888M.542M.2123.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen

f *Options (service)*
2 = no option
3 = SET button

Optional on request
- surface protection salt spray tested

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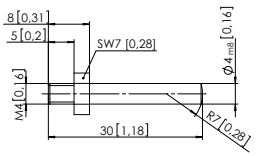
Absolute encoders – multiturn

Standard
Motor-Line, electronic multiturn, optical | **Sendix F5888M (hollow shaft)** | **CANopen**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1)	with fixing thread 	**8.0010.4700.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Suitable connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		9000 min^{-1}, 6000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Mass moment of inertia		6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection		IP65
Working temperature range		-40°C ... +85°C [-40°F ... +185°F] [1]
Material	hollow shaft flange housing cable	stainless steel aluminum zinc die-cast PVC
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Diagnostic LED (two-color, red/green)

LED ON or blinking	red	error display
	green	status display
	combination red / green	error code

Interface characteristics CANopen

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit) default: 25 bit
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 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

Incremental track characteristics

Output driver		RS422 (TTL-compatible)
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH LOW	typ. 3.8 V typ. 1.3 V
Short circuit proof outputs		yes [2]
Resolution		2048 ppr

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).
2) Short circuit to 0 V or to output, only one channel at a time, power supply correctly applied.

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Standard
Motor-Line, electronic multiturn, optical | **Sendix F5888M (hollow shaft)** | **CANopen**

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.2. In addition, device specific profiles such as encoder profile DS406 V3.2 and DS305 (LSS) 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 can be programmed via the CAN bus.
When switching the device on, all parameters, which have been saved on an EEPROM to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position**, **speed**, **temperature** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

CANopen Communication Profile DS301 V4.2

Among others, the following functionality is integrated. Class C2 functionality:

- NMT slave.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 4 sending PDO's.
- Node address, baud rate and CANbus / programmable termination.
- Producer / consumer heartbeat.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error message, raw data.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- Customer-specific memory 16 Byte.
- Customer-specific protocol.
- Universal Scaling Function (USF).
- "Watchdog controlled" device.
- Extended diagnostic modes.

LSS layer setting services DS305 V2.0

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)					
2	L, M	Bus IN	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
			Cable color:	WH	BN	YE	GN	GY

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)								
5	L, M	Bus IN	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	A	$\overline{A}$	B	$\overline{B}$
			Cable color:	WH	BN	YE	GN	GY	BK	VT	GY-PK	RD-BU

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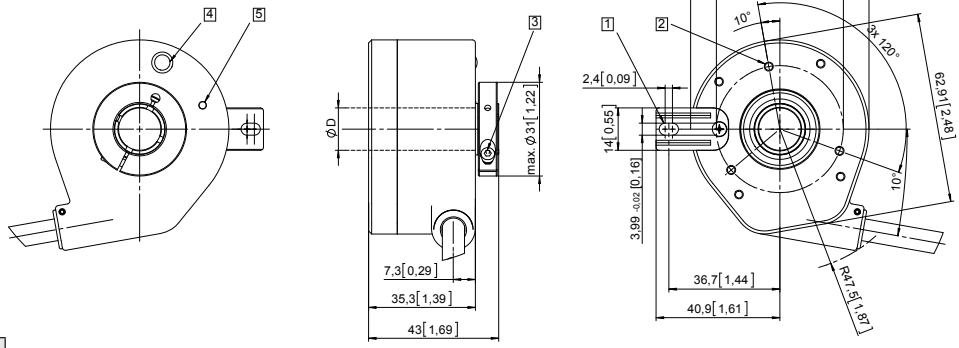
Standard
Motor-Line, electronic multiturn, optical | **Sendix F5888M (hollow shaft)** | **CANopen**

Dimensions

Dimensions in mm [inch]

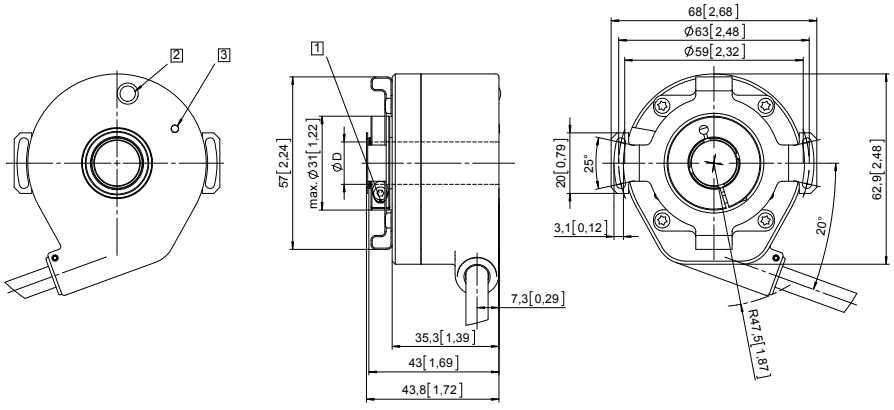
Flange with spring element, long
Flange type 1



1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 6 [0.24] deep
3 Recommended torque for the clamping ring 0.6 Nm
4 Status-LED
5 SET button

D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

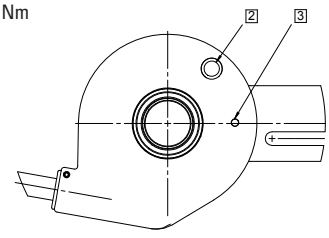
Flange with stator coupling, ø 63 [2.48]
Flange type 5
Pitch circle diameter for fixing screws 63 mm [2.48]



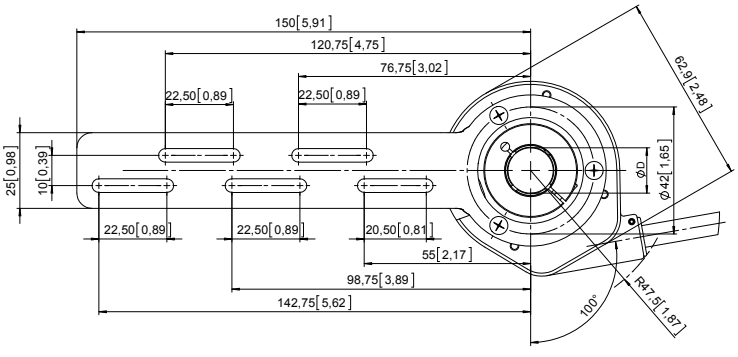
1 Recommended torque for the clamping ring 0.6 Nm
2 Status-LED
3 SET button

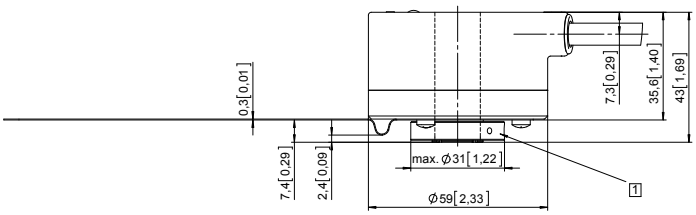
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

Flange with torque stop, flexible
Flange type 9



1 Recommended torque for the clamping ring 0.6 Nm
2 Status-LED
3 SET button





D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

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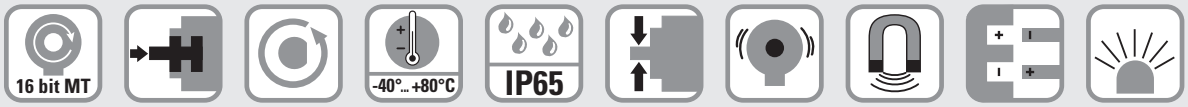
Standard electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **EtherNet/IP**

The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, shaft up to 10 mm, blind hollow shaft up to 15 mm and certified EtherNet/IP functionality.

Ex 2/22 pending | cULus | RoHS | EtherNet/IP™



Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor

Up-to-the-minute EtherNet/IP functionality

- Fast, easy commissioning and configuration possible thanks to cyclic services.
- Low RPI time, of 1 ms minimum – makes the encoder suitable for time-critical applications up to an update frequency of 1000 Hz.
- Faster encoder start after applying the power – increases plant performance.

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.
- Thanks to the implementation of DLR (Device Level Ring) a single cable break does not lead to plant stoppage.

Order code Shaft version

8.F5868	.	X	X	A	N	.	A2	2	2
Type		a	b	c	d		e		

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
5 = square flange, IP65 □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39"]
2 = 10 x 20 mm [0.39 x 0.79"]
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / Power supply*
A = EtherNet IP / 10 ... 30 V DC

d *Type of connection*
N = 3 x axial M12 connector, 4-pin

e *Fieldbus profile*
A2 = EtherNet/IP

Optional on request
- Ex 2/22

Order code Hollow shaft

8.F5888	.	X	X	A	N	.	A2	2	2
Type		a	b	c	d		e		

a *Flange*
1 = with spring element long, IP65
3 = with stator coupling, IP65 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18"])*
A = ø 10 mm [0.39"]
B = ø 12 mm [0.47"]
C = ø 14 mm [0.55"]
D = ø 15 mm [0.59"]
E = ø 3/8"
F = ø 1/2"

c *Interface / Power supply*
A = EtherNet IP / 10 ... 30 V DC

d *Type of connection*
N = 3 x axial M12 connector, 4-pin

e *Fieldbus profile*
A2 = EtherNet/IP

Optional on request
- Ex 2/22

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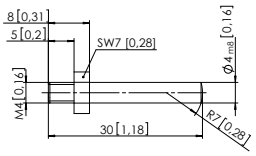
Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	EtherNet/IP

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56’] PUR cable	**05.00.6031.4411.002M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56’] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin	**05.WASCSY4S**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Max. speed shaft version		
	IP65 up to 70°C	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 4000 min^{-1} (continuous)
Max. speed hollow shaft version		
	IP65 up to 70°C	6000 min^{-1}, 4000 min^{-1} (continuous)
	IP65 up to T_{max}	4000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	aluminum
Shock resistance acc. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 250 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics EtherNet/IP

Singleturn resolution	1 ... 65.536 (16 bit), scalable default: 65.536 (16 bit)
Multiturn resolution	max. 65.536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit), scalable
Code	binary
Protocol	EtherNet/IP

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Standard electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **EtherNet/IP**

General information about EtherNet/IP

EtherNet/IP conformance tested acc. to	version CT-12 of 11. Dez. 2014
EtherNet/IP specification	Vol 2, Ed 1.17
CIP specification	Vol 1, Ed 3.16

The following functionalities are integrated

Adjustable parameters

- Preset
- Count direction
- Resolution
- Unity of speed
- IP address
- Number of revolutions
- Position
- Diagnosis
- Position limit
- Warning messages

Objects (CIP Objects)

- Identity Object
- Message Router
- Assembly Object
- Connection Manager
- Parameter Object
- Position Sensor Object
- Qos Object
- Port Object
- TCP / IP Interface Object
- EtherNet Link Object

EtherNet/IP features

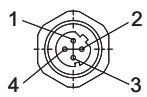
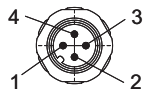
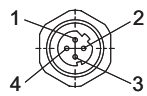
- DLR (Device Level Ring) possible
- Qos (Quality of Service) possible
- ACD (Address Conflict Detection)
- Multicast and unicast capability

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

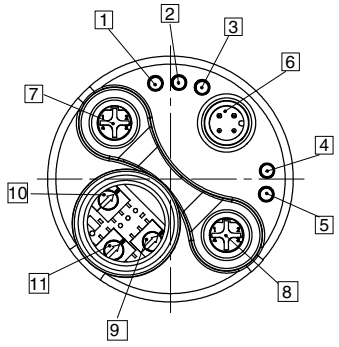
The universal scaling function remedies this problem.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					
A	N (3 x M12 connector)	Bus Port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus Port 2	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	

Rear side connections and display elements

1 LED: Link 1
2 LED: Mod.
3 LED: Net.
4 LED: Encoder
5 LED: Link 2
6 Power
7 Port 1
8 Port 2
9 Switch: x1
10 Switch: x100
11 Switch: x10



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Absolute encoders – multiturn

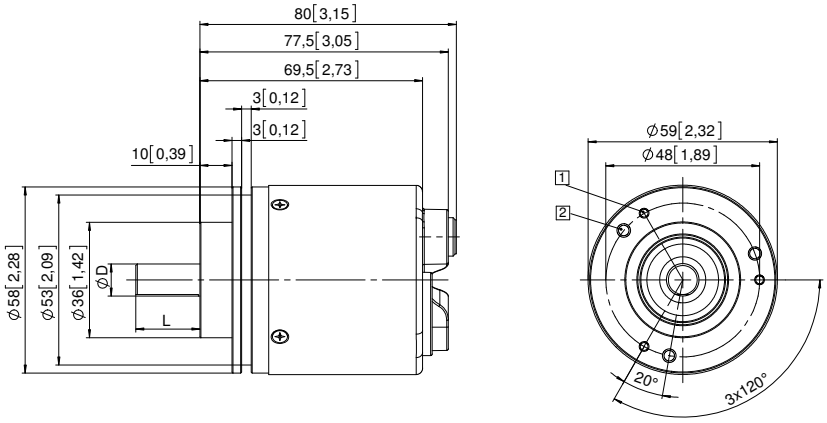
Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **EtherNet/IP**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

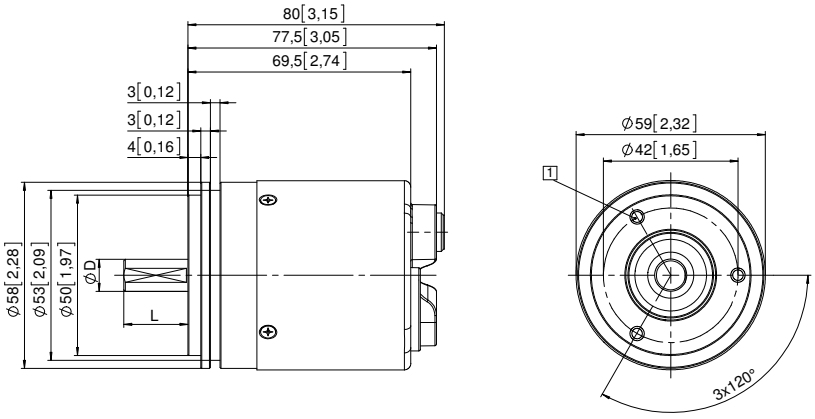
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.31] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

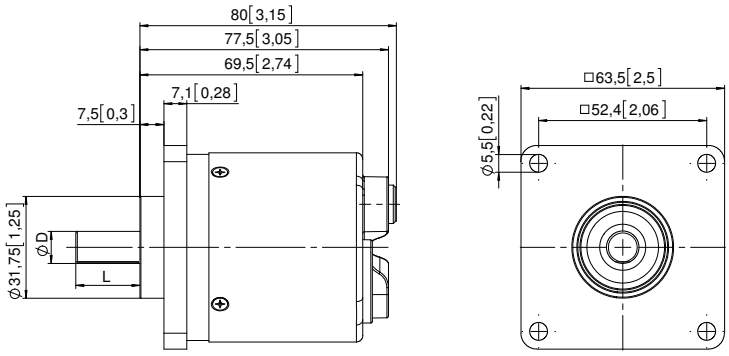
Synchro flange, ø 58 [2.28]
Flange type 2

1 3 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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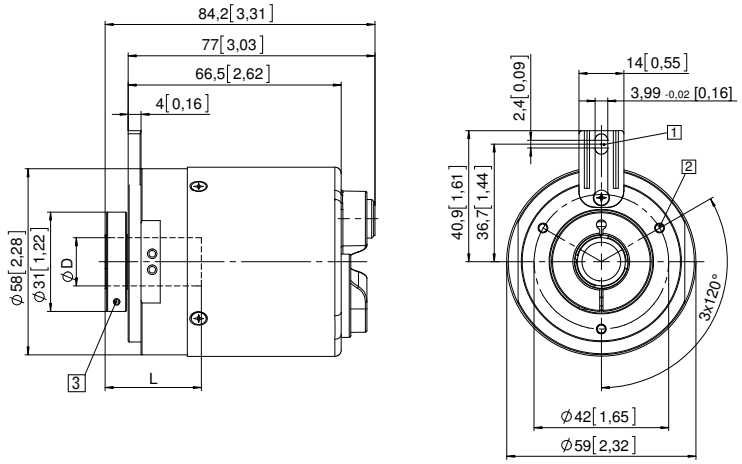
Standard electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **EtherNet/IP**

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1

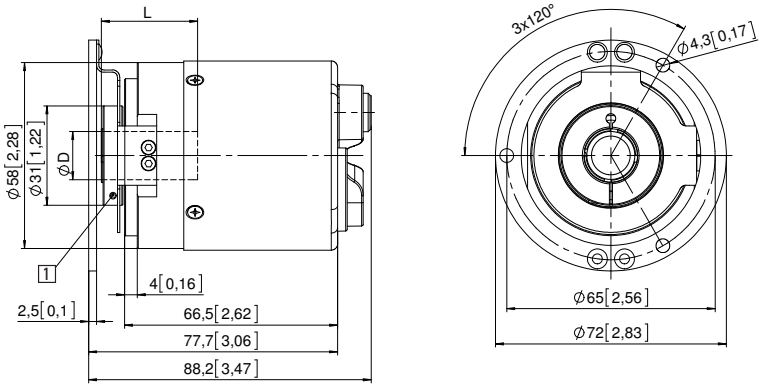
1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3

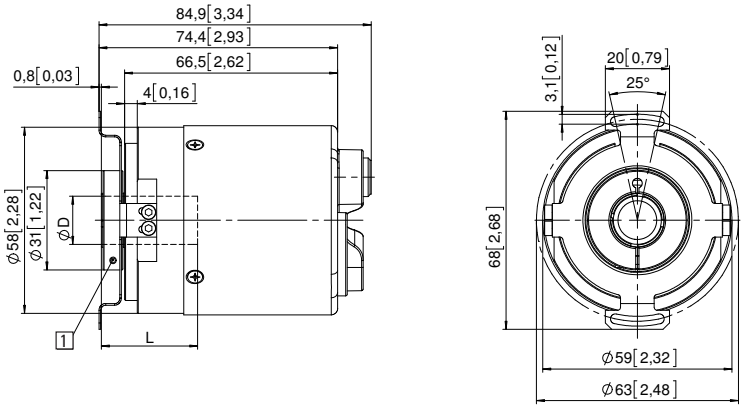
1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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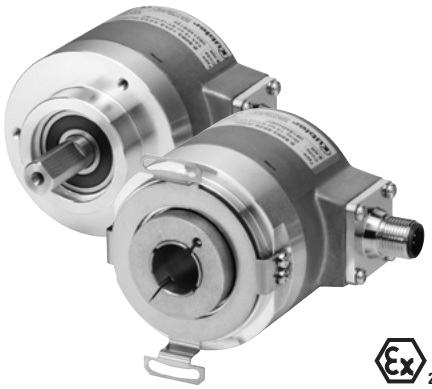
Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **Modbus**



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, through hollow shaft up to 15 mm and Modbus RTU interface.

Ex 2/22 | cULus | RoHS | Modbus

Multiturn resolution | Safety-Lock™ | High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Intelligent Scan Technology™ | Surface protection salt spray tested optional

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100 % magnetic field insensitivity.

Current Modbus performance

- Modbus register for configuration of the node address and baud rate.
- Scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).
- Preset function.
- Diagnostic functions.
- Limit switch function.

Order code Shaft version

8.F5868 . X X 6 E . 61 1 2
Type — a b c d — e

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28“]
3 = clamping flange, IP67 ø 58 mm [2.28“]
2 = synchro flange, IP65 ø 58 mm [2.28“]
4 = synchro flange, IP67 ø 58 mm [2.28“]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39“]
2 = 10 x 20 mm [0.39 x 0.79“]
3 = 1/4“ x 7/8“
4 = 3/8“ x 7/8“

c *Interface / power supply*
6 = Modbus RTU, 10 ... 30 V DC

d *Type of connection*
E = 1 x radial M12 connector, 5-pin

e *Fieldbus profile*
61 = Modbus RTU Application Protocol V1.1b3

Optional on request
- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.F5888 . X X 6 E . 61 1 2
Type — a b c d — e

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56“]
4 = with stator coupling, IP67 ø 65 mm [2.56“]
5 = with stator coupling, IP65 ø 63 mm [2.48“]
6 = with stator coupling, IP67 ø 63 mm [2.48“]

b *Through hollow shaft*
3 = ø 10 mm [0.39“]
4 = ø 12 mm [0.47“]
5 = ø 14 mm [0.55“]
6 = ø 15 mm [0.59“]

c *Interface / power supply*
6 = Modbus RTU, 10 ... 30 V DC

d *Type of connection*
E = 1 x radial M12 connector, 5-pin

e *Fieldbus profile*
61 = Modbus RTU Application Protocol V1.1b3

Optional on request
- Ex 2/22
- surface protection salt spray tested

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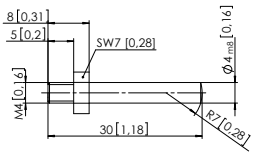
Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in, 5-pin 2 m [6.56‘] PVC cable	**05.00.6091.A211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed shaft version		
	IP65 up to 70°C	12000 min^{-1}, 10000 min^{-1} (continuous)
	IP65 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
	IP67 up to 70°C	11000 min^{-1}, 9000 min^{-1} (continuous)
	IP67 up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed hollow shaft version		
	IP65 up to 70°C	9000 min^{-1}, 6000 min^{-1} (continuous)
	IP65 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
	IP67 up to 70°C	8000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to T_{max}	4000 min^{-1}, 2000 min^{-1} (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	6.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Diagnostic LED (two-color, red/green)

LED ON or blinking	red	error display
	green	status display
	combination red / green	error code

Interface characteristics Modbus

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 65536 (16 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit), scalable
Code	binary
Interface	Modbus V1.02
Protocol	Modbus RTU V1.1b3
Baud rate	9600 ... 115200 kbit/s software configurable
Node address	1 ... 63 software configurable
Termination	software configurable

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Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **Modbus**

Read holding register

Register	Data name
40257	Baud rate Number Data Parity Stopbits
40261	Comm Update
40262	Node Address
40263	Node Update
40264	Presetvalue
40266	Preset Update
40267	Count Direct
40268	Count Update
40269	Termination
40270	Term Update

Write holding register

Register	Data name
40275	Lower Limit
40276	Upper Limit
40277	Compare Activ
40278	MUR (MSB)
40279	MUR (LSB)
40280	TMR (MSB)
40281	TMR (LSB)
40282	Scaling Function
40283	Delay Prescaler

Modbus Communication Profile V 1.02

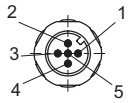
- Node address, baud rate and bus termination programmable.

Modbus Application Protocol V1.1b3

The following parameters can be programmed:

- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- "Watchdog controlled" device.
- Extended diagnostic modes.

Terminal assignment

Interface	Type of connection	1 x M12 connector, 5-pin						
6	E Bus in	Signal:	0 V power supply	+V power supply	D0	D1	TG	
		Pin:	3	2	5	4	1	

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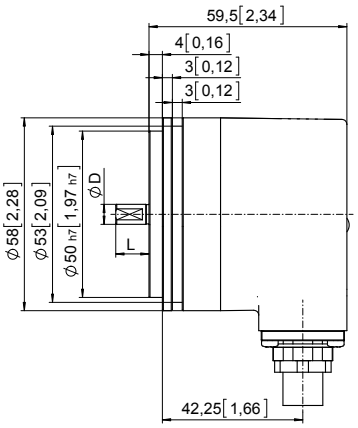
Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **Modbus**

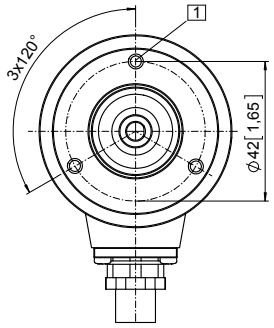
Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

1 3 x M4, 6 [0.24] deep

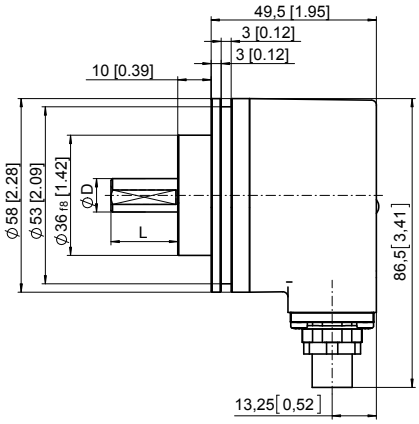


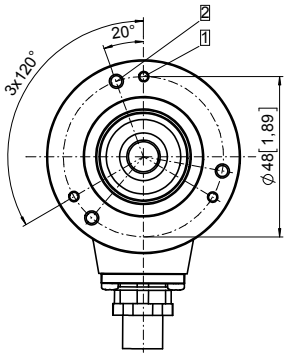


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Clamping flange, ø 58 [2.28]
Flange type 1 and 3

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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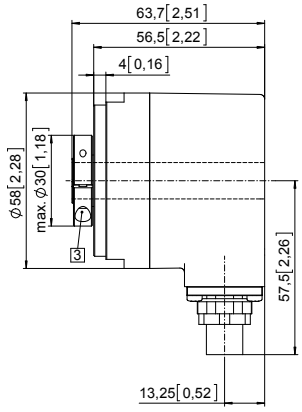
Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **Modbus**

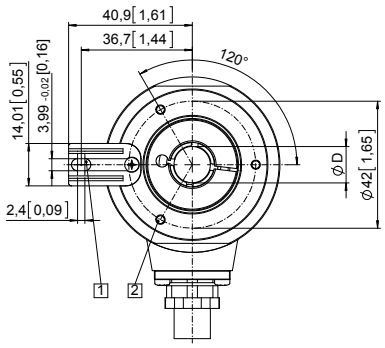
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

1 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 6 [0.24] deep
3 Recommended torque for the clamping ring 0.6 Nm

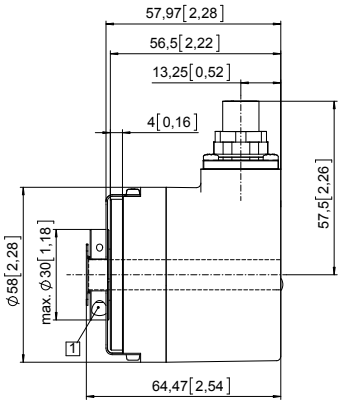


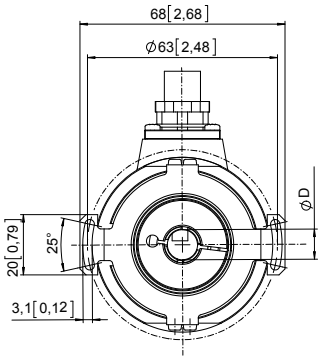


D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7

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Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFIBUS DP**

The multiturn encoders Sendix 5868 and 5888 with Profibus interface and optical sensor technology are the ideal solution for all Profibus applications.

With a maximum resolution of 28 bits these encoders are available with blind hollow shaft up to 15 mm.

Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range -40°...+80°C | High protection level IP | High shaft load capacity | Magnetic field proof | Shock / vibration resistant | Reverse polarity protection | SinCos

Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation.
- Absolutely reliable operation in areas with strong magnetic fields, thanks to mechanical gear with optical sensor technology.

Flexible

- Fast, simple, error-free connection using versions with M12 connector.
- Wide-ranging programming options thanks to latest encoder profile.

Order code Shaft version

8.5868	.	X	X	3	X	.	31	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
- **1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- **2 = synchro flange, IP65 ø 58 mm [2.28"]**
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □63.5 mm [2.5"]
- 7 = square flange, IP67 □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
- **1 = 6 x 10 mm [0.24 x 0.39"]** 1)
- **2 = 10 x 20 mm[0.39 x 0.79"]** 2)
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c *Interface / power supply*
- **3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC**

d *Type of connection, removable bus terminal cover*
- 1 = with radial cable gland fitting
- **2 = with 3 x radial M12 connectors**

e *Fieldbus profile*
- **31 = PROFIBUS DP V0 encoder profile class 2**

f *Options (service)*
- 2 = no option
- **3 = SET button**

Optional on request
- Ex 2/22
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested: 8.5868.3232.3112-C

V4A 1.4404 stainless steel V4A: 8.5868.3232.3112-V4A

1) Preferred type only in conjunction with flange type 2.

2) Preferred type only in conjunction with flange type 1.

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Absolute encoders – multiturn

Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFIBUS DP**

Order code Hollow shaft

8.5888	.	X	X	3	X	.	31	1	X
Type		a	b	c	d		e		f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18"])*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"

c *Interface / power supply*
3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC

d *Type of connection, removable bus terminal cover*
1 = with radial cable gland fitting
2 = with 3 x radial M12 connectors

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Options (service)*
2 = no option
3 = SET button

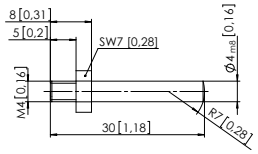
Optional on request
- Ex 2/22
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested:
8.5888.2432.3112-C
8.5888.2532.3112-C

V4A 1.4404 stainless steel V4A:
8.5888.2432.3112-V4A

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in , 5-pin 5 m [16.40'] PUR cable	**05.00.6011.3211.005M**
	M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PUR cable	**05.00.6011.3411.005M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in , 5-pin	**05.BMWS 8151-8.5**
	M12 male connector with external thread for bus out, 5-pin	**05.BMSWS 8151-8.5**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFIBUS DP**

Technical data

Mechanical characteristics

Maximum speed	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	7.5 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	with bus terminal cover	approx. 0.57 kg [10.11 oz]
	with fixed connection	approx. 0.52 kg [18.34 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 120 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SET button (zero or defined value, option)

Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)

LED is ON with following errors	Sensor error (Profibus error)

Interface characteristics PROFIBUS DP

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scalable
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	Interface specification acc. to PROFIBUS-DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated
Protocol	Profibus encoder profile V1.1 class1 and class 2 with manufacturer-specific add-ons
Baud rate	max. 12 Mbit/s
Device address	1 ... 127 set by rotary switches
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 field bus 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 can be used now with the guarantee that they are ready for the future too.

The following parameters can be programmed

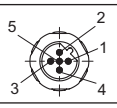
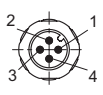
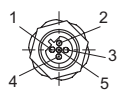
- Direction of rotation.
- Scaling (number of steps per revolution).
- Preset value.
- Diagnostics mode.

The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Address programmable via DIP switches.
- Diagnostics LED.
- Full class 1 and class 2 functionality.

Terminal assignment terminal box

Interface	Type of connection		BUS IN				BUS OUT				
3	1 (terminal box)	Signal:	B	A	0 V	+V	0 V	+V	B	A	The shield of the connection cable must be connected over a large area via the cable gland.
		Terminal:	1	2	3	4	5	6	7	8	

Interface	Type of connection	Function	3 x M12 connector						
3	2 (3 x M12 connector)	Bus in	Signal:	–	PB_A	–	PB_B	Shield	
			Pin:	1	2	3	4	5	
		Power supply	Signal:	+V	–	0 V	–		
			Pin:	1	2	3	4		
		Bus out	Signal:	BUS_VDC [1]	PB_A	BUS_GND [1]	PB_B	Shield	
			Pin:	1	2	3	4	5	

1) For supplying an external Profibus DP termination resistor.

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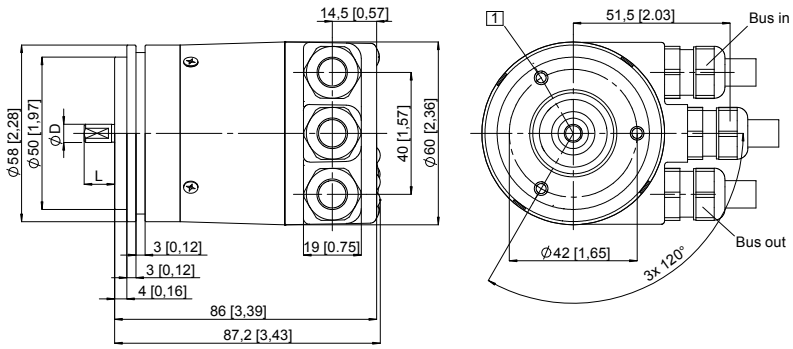
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFIBUS DP**

Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with cable)

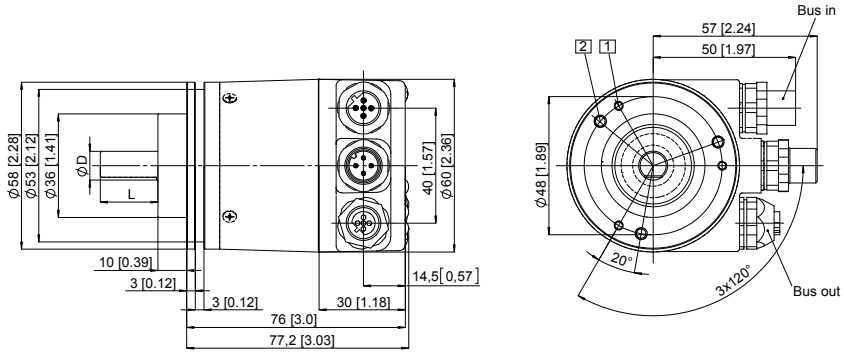
1 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

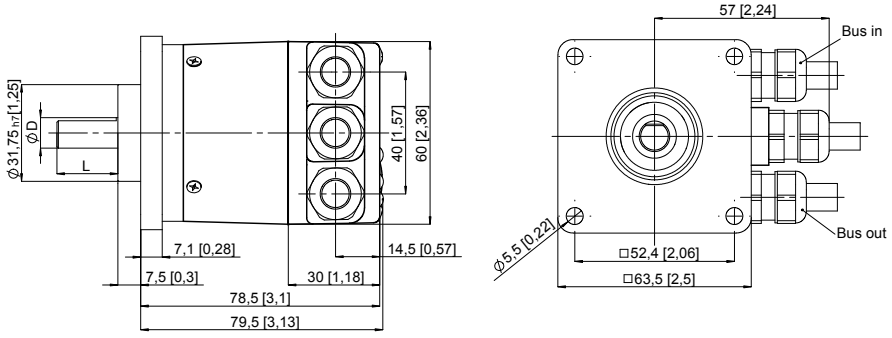
Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with 3 x M12 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFIBUS DP**

Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

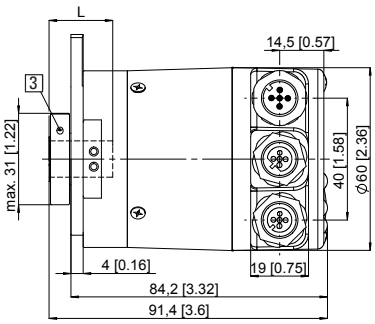
Dimensions in mm [inch]

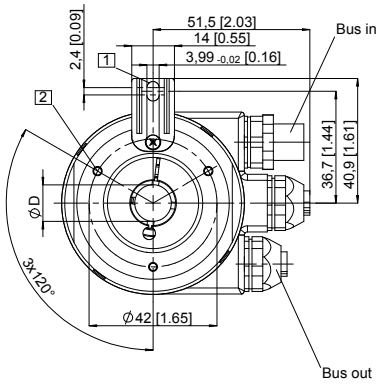
Flange with spring element, long
Flange type 1 and 2
(drawing with 3 x M12 connector)

1 Slot spring element
recommendation:
cylindrical pin DIN 7, ø 4 [0.16]

2 3 x M3, 5.5 [0.22] deep

3 Recommended torque for the
clamping ring 0.6 Nm

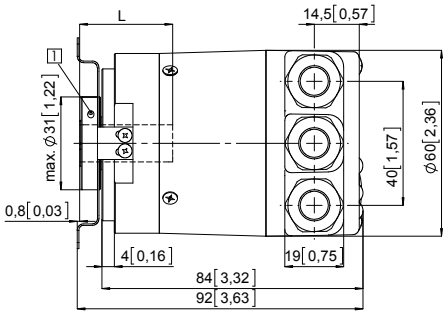


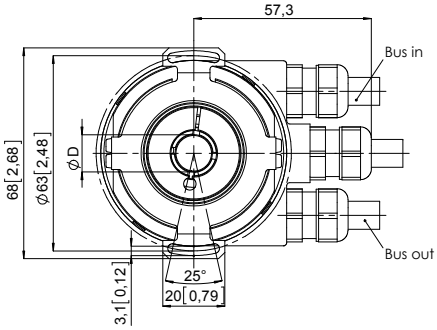


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws
63 [2.48]
(drawing with cable)

1 Recommended torque for the
clamping ring 0.6 Nm

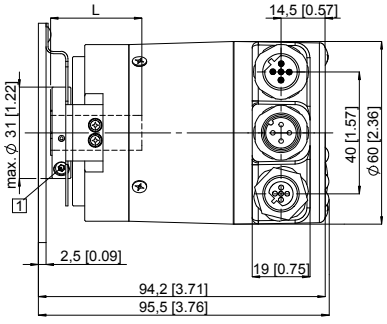


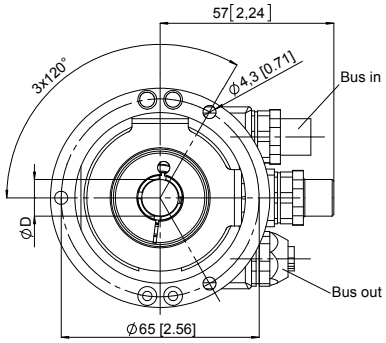


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws
65 [2.56]
(drawing with 3 x M12 connector)

1 Recommended torque for the
clamping ring 0.6 Nm





D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

The Sendix multiturn encoders 5868 and 5888 with CANopen or CANopenLift interface and optical sensor technology are the right encoders for all CANopen or CANopenLift applications.

With a maximum resolution of 28 bits these encoders offer an optional additional RS422 incremental track with 2048 pulses.

Ex 2/22 | cULus | RoHS | CANopen | CANopen LIFT

Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range -40°...+80°C | High protection level IP | High shaft load capacity | Magnetic field proof | Shock / vibration resistant | Reverse polarity protection | SinCos

Reliable

- Tried-and-tested in applications with the highest demands, such as in mobile automation or medical technology.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.

Flexible

- Node address can be set via rotary switches or software.
- Baud rate and termination can be set via DIP switches or software.
- With bus terminal cover or fixed connection, as well as M12 connectors or cable connection.
- Universal scaling function.

Order code Shaft version

8.5868	.	X	X	X	X	.	XXX	X
Type		a	b	c	d		e	f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
1 = clamping flange, IP65 ø 58 mm [2.28"]
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]
5 = square flange, IP65 □ 63.5 mm [2.5"]
7 = square flange, IP67 □ 63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
1 = 6 x 10 mm [0.24 x 0.39"] 1)
2 = 10 x 20 mm [0.39 x 0.79"] 2)
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c *Interface / power supply*
2 = CANopen DS301 V4.02, 10 ... 30 V DC
5 = CANopen DS301 V4.02, 10 ... 30 V DC with 2048 ppr incremental track (TTL-compatible) 3)

d *Type of connection*
removable bus terminal cover
1 = radial cable gland
2 = 2 x or 3 x M12 connector, 5-pin
Fixed connection without bus terminal cover
A = radial cable, 2 m [6.56'] PVC
B = radial cable, special length PVC *)
E = 1 x radial M12 connector, 5-pin
F = 2 x radial M12 connector, 5-pin
I = 1 x radial M23 connector, 12-pin
J = 2 x radial M23 connector, 12-pin
K = 1 x Sub-D connector, 9-pin

*) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5868.112B.2123.0030 (for cable length 3 m)

Optional on request
- Ex 2/22 4)
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

e *Fieldbus profile*
212 = CANopen
221 = CANlift DS417 V1.01

f *Options (service)*
2 = no options
3 = SET button

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested: 8.5868.3222.2122-C

V4A 1.4404 stainless steel V4A: 8.5868.3222.2122-V4A

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.
3) Only in conjunction with connection type 2.
4) For the cable connection type, cable material PUR.

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Standard mechanical multiturn, optical | Sendix 5868 / 5888 (shaft / hollow shaft) | CANopen/CANopenLift

Order code Hollow shaft

8.5888 . X X X X . X X X X
Type — a b c d — e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

10 by 10

a *Flange*
1 = with spring element, long, IP65
2 = with spring element, long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18"])*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]
8 = ø 3/8"
9 = ø 1/2"

c *Interface / power supply*
2 = CANopen DS301 V4.02, 10 ... 30 V DC
5 = CANopen DS301 V4.02, 10 ... 30 V DC with 2048 ppr incremental track (TTL-compatible) [1]

d *Type of connection*
removable bus terminal cover
1 = radial cable gland
2 = 2 x or 3 x M12 connector, 5-pin
Fixed connection without bus terminal cover
A = radial cable, 2 m [6.56'] PVC
B = radial cable, special length PVC *)
E = 1 x radial M12 connector, 5-pin
F = 2 x radial M12 connector, 5-pin
I = 1 x radial M23 connector, 12-pin
J = 2 x radial M23 connector, 12-pin
K = 1 x Sub-D connector, 9-pin

*) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5888.542B.2123.0030 (for cable length 3 m)

Optional on request
- Ex 2/22 [2]
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

e *Fieldbus profile*
212 = CANopen
221 = CANlift DS417 V1.01

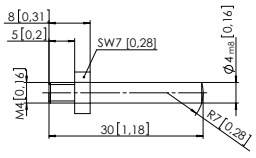
f *Options (service)*
2 = no options
3 = SET button

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested:
8.5888.2422.2122-C
8.5888.2522.2122-C

V4A 1.4404
stainless steel V4A:
8.5888.2422.2122-V4A

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
	M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A411.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in, 5-pin	**8.0000.5116.0000**
	M12 male connector with external thread for bus out, 5-pin	**8.0000.5111.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Only in conjunction with connection type 2.
2) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard
mechanical multiturn, optical

Sendix 5868 / 5888 (shaft / hollow shaft)

CANopen/CANopenLift

Technical data

Mechanical characteristics

Maximum speed		
	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	4.0 x 10^{-6} kgm^2
	hollow shaft version	7.5 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	with bus terminal cover	approx. 0.57 kg [20.11 oz]
	with fixed connection	approx. 0.52 kg [18.34 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F] 1)
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 100 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen/CANopenLift

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons or CANlift profile DS417 V1.1
Baud rate	10 ... 1000 kbit/s can be set via DIP switches, software configurable
Node address	1 ... 127 can be set via rotary switches, software configurable
Termination switchable	can be set via DIP switches, software configurable

Incremental track characteristics

Output driver		RS422 (TTL-compatible)
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW	typ. 1.3 V
Short circuit proof outputs		yes 2)
Resolution		2048 ppr

SET button (zero or defined value, option)

Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)

LED is ON with the following fault conditions

Sensor error (internal code or LED error) too low voltage, over-temperature

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].
2) Short circuit to 0 V or to output, only one channel at a time, power supply correctly applied.

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Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

General information about CANopen / CANopenLift

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 . In addition, device specific profiles such as encoder profile DS406 V3.2 and DS417 V1.1 (for lift applications) 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 CAN bus.
When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined in a freely variable way as PDO (PDO mapping): position, speed, acceleration as well as the status of the working area.

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

Universal Scaling Function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The Universal Scaling Function remedies this problem.

CANopen communication profile DS301 V4.02

Among others, 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).
- 3 Sending PDO's.
- Node address, baud rate and CANbus.
- Programmable termination.

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min^{-1}).
- Factor for speed calculation (e.g. circumference of measuring wheel).
- Integration time for the speed value from 1 ... 32.
- 2 working areas with 2 upper and lower limits 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 - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

CANopen Lift Profile DS417 V1.1

Among others, the following functionality is integrated:

- Car position unit.
- 2 virtual devices.
- 1 virtual device delivers the position in absolute measuring steps (steps).
- 1 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...32.
- 2 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 LED's.
- "Watchdog controlled" device.

All profiles stated here: Key-features
The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

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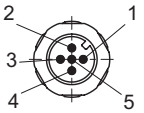
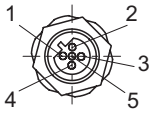
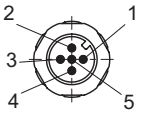
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

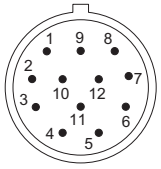
Terminal assignment

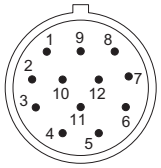
Interface	Type of connection	Cable gland (bus terminal cover with terminal box)									
			Bus OUT					Bus IN			
2, 5	1	Signal:	CAN_GND	CAN_L	CAN_H	0 V power supply	+V power supply	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Abbreviation:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG

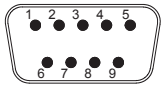
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
			Bus IN				
2, 5	A, B	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Cable color:	WH	BN	YE	GN	GY

Interface	Type of connection	2 x M12 connector, 5-pin (3 x M12 connector with interface 5)						
			Bus OUT					
2, 5	2, F	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H)	CAN_GND	
		Pin:	3	2	5	4	1	
			Bus IN					
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	3	2	5	4	1	
			Incremental track					
5	2	Signal:	A	$\overline{A}$	B	$\overline{B}$	0 V	
		Pin:	1	2	3	4	5	

Interface	Type of connection	1 x M12 connector, 5-pin					
			Bus IN				
2, 5	E	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	3	2	5	4	1	

Interface	Type of connection	2 x M23 connector, 12-pin						
			Bus OUT					
2, 5	J	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	2 x 
		Pin:	10	12	2	7	3	
			Bus IN					
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	10	12	2	7	3	

Interface	Type of connection	1 x M23 connector, 12-pin					
			Bus IN				
2, 5	I	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	10	12	2	7	3	

Interface	Type of connection	Sub-D connector, 9-pin						
			Bus IN					
2, 5	K	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	6	9	2	7	3	

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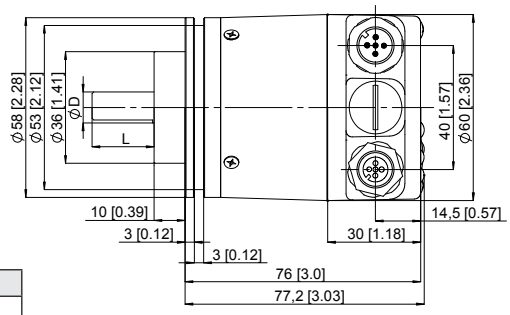
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

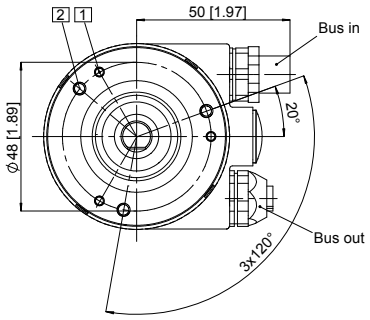
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with 2 x M12 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

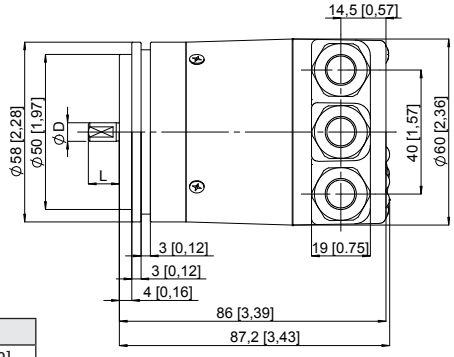


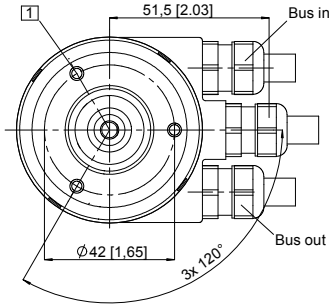


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with cable)

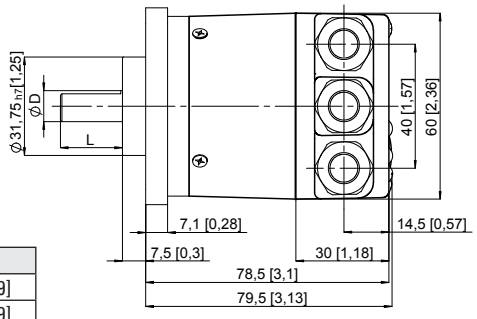
1 3 x M4, 6 [0.24] deep

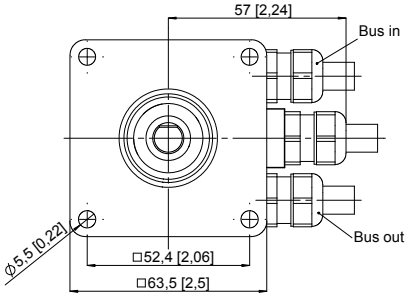




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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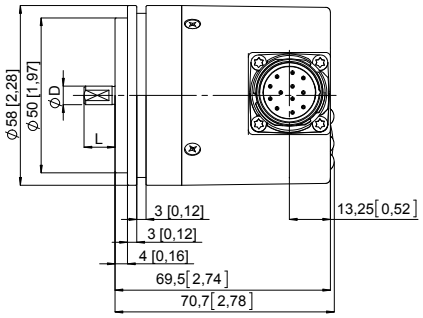
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

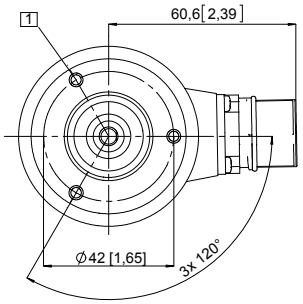
Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M23 connector)

1 3 x M4, 6 [0.24] deep

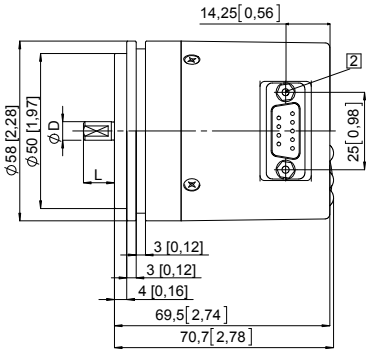


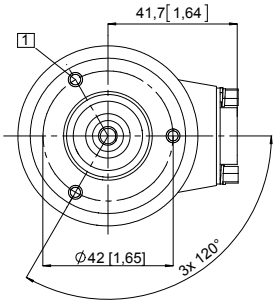


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with Sub-D connector)

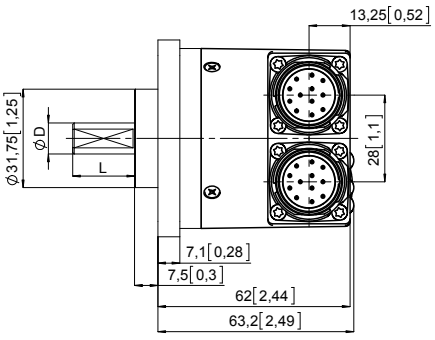
1 3 x M4, 6 [0.24] deep
2 2 x 4/40 UNC; 3.0 [0.12] deep

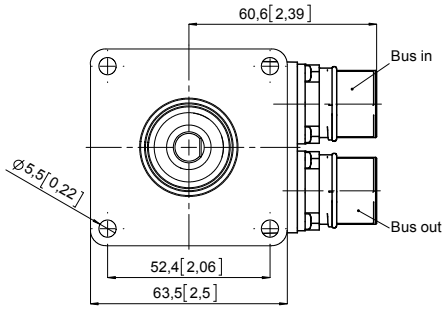




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with 2 x M23 connector)





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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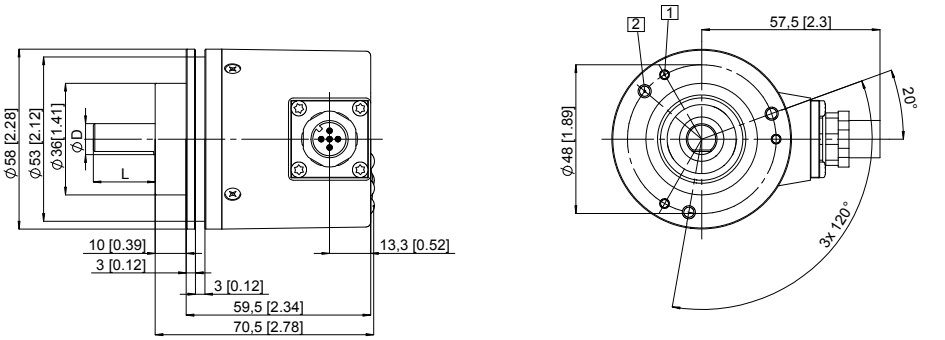
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with 1 x M12 connector)

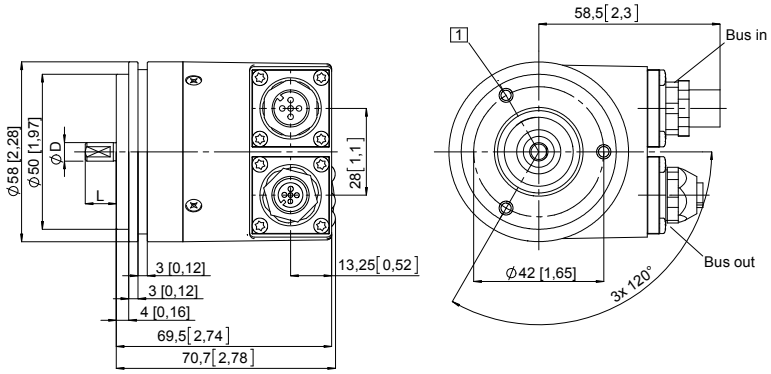
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with 2 x M12 connector)

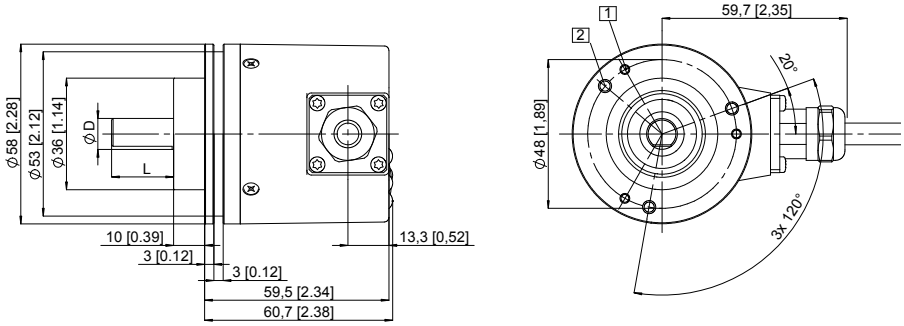
1 3 x M4, 8 [0.32] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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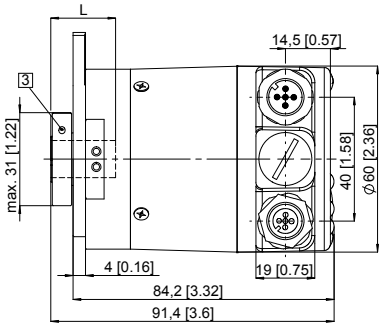
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

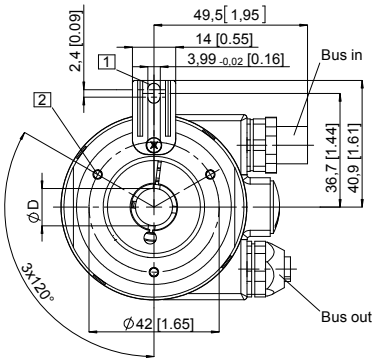
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

1 Slot spring element recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm

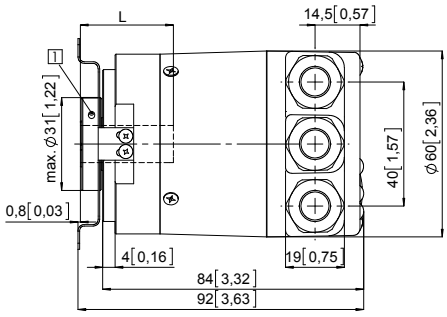


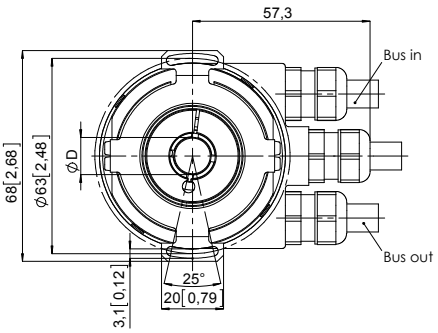


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm

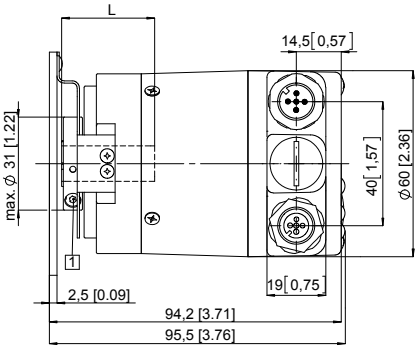


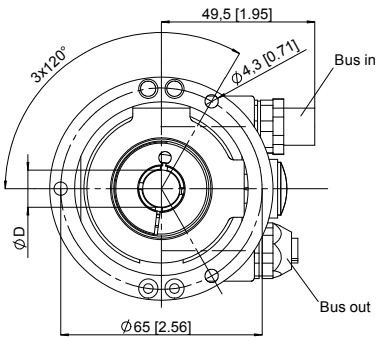


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with 2x M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm





D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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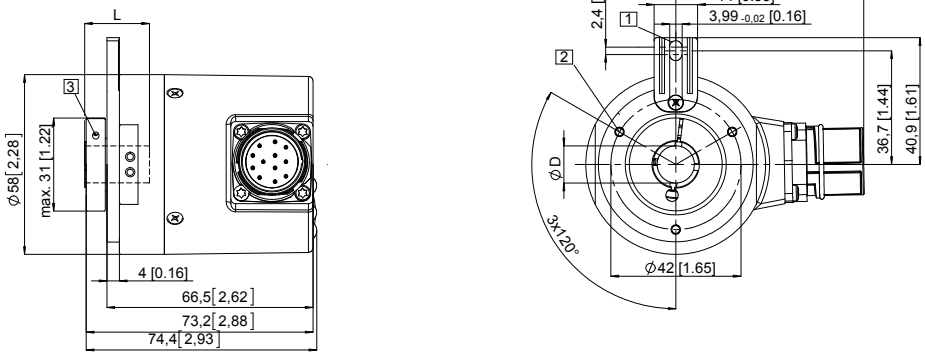
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with M23 connector)

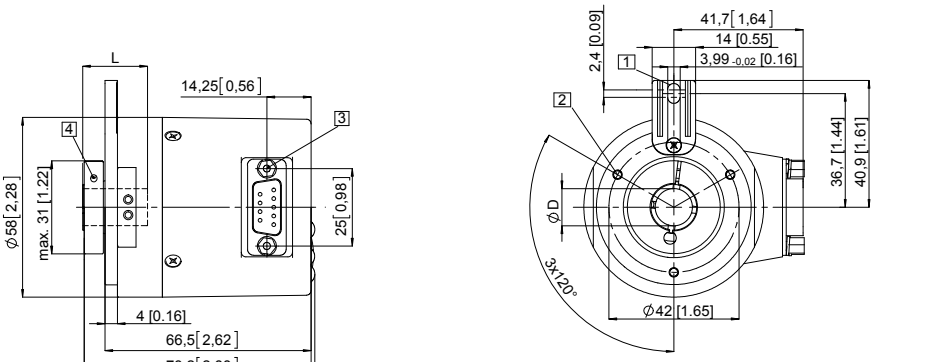
1 Slot spring element recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with spring element, long
Flange type 1 and 2
(drawing with Sub-D connector)

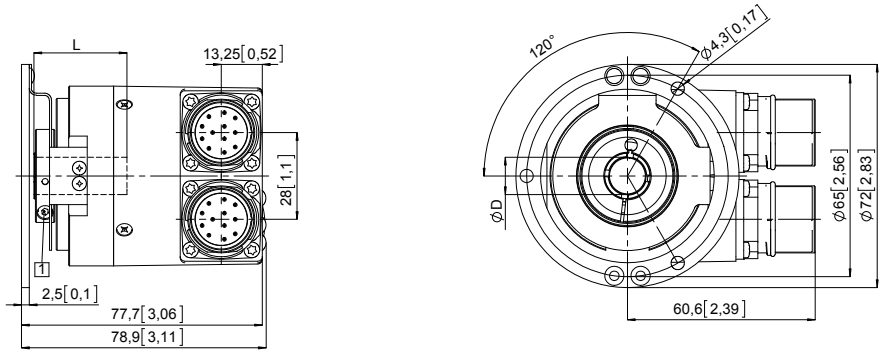
1 Slot spring element recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 2 x 4/40 UNC; 3.0 [0.12] deep
4 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with 2 x M23 connector)

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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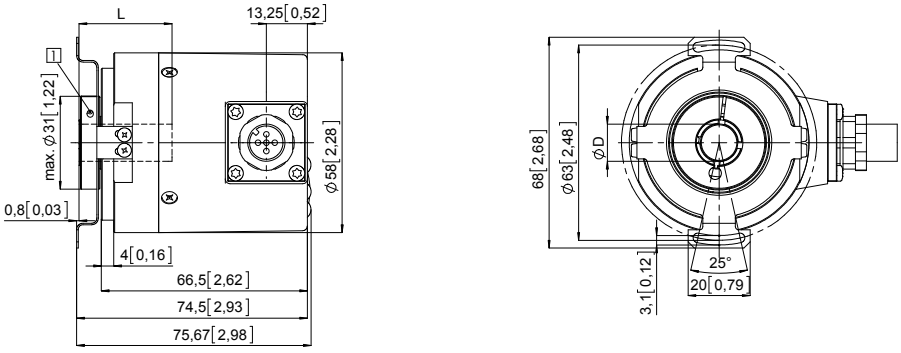
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with M12 connector)

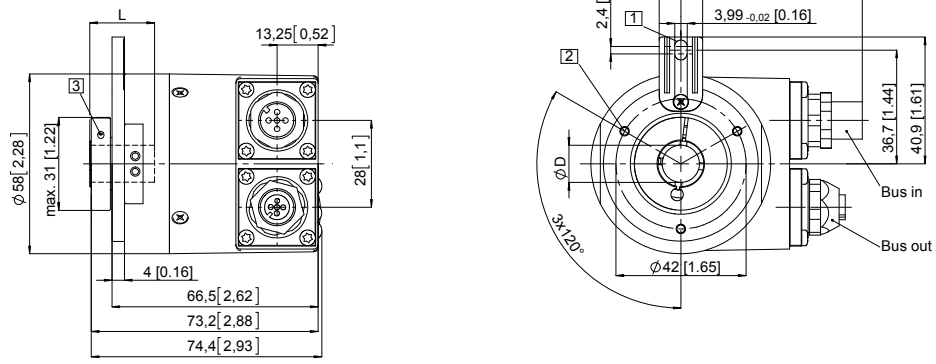
1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

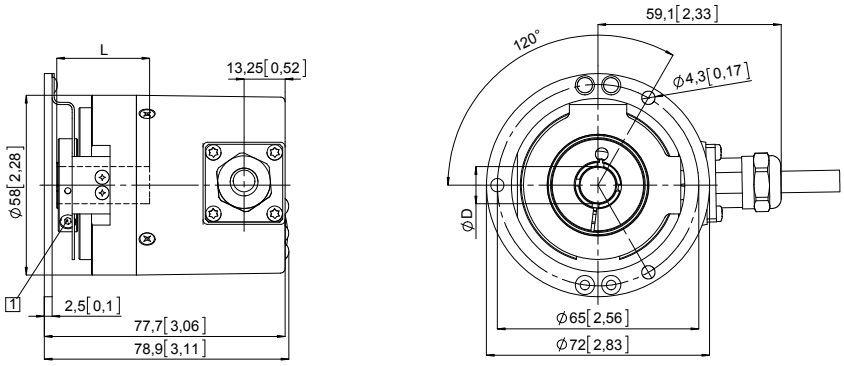
1 Slot spring element recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **EtherCAT**

The multiturn encoders Sendix 5868 and 5888 with second-generation EtherCAT interface and optical sensor technology are ideal for use in all applications with an EtherCAT interface.

The data communication is based on CAN over EtherNet and ideally suited for use in real time applications.

These encoders are available with a solid shaft up to a maximum of 10 mm or a blind hollow shaft up to 15 mm.

Ex 2/22 | cULus | RoHS | EtherCAT Conformance tested

Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range -40°...+80°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional

Reliable

- EtherCAT conformance tested.
- Integration of the latest slave – EtherCAT stack from Beckhoff, Version 5.01.
- Ideally suited for use in harsh outdoor environments, thanks to IP67 protection and rugged housing construction.

Flexible

- Use of CoE (CAN over EtherNet).
- Genuine new position information as a result of minimal cycle time of 62.5 µs in the DC mode.
- Faster, easier error-free connection thanks to M12 connectors.
- Supports Hot Connect.

Order code Shaft version

8.5868	.	X	X	B	2	.	B2	12
Type		a	b	c	d		e	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
- **1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- **2 = synchro flange, IP65 ø 58 mm [2.28"]**
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □63.5 mm [2.5"]
- 7 = square flange, IP67 □63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
- **1 = 6 x 10 mm [0.24 x 0.39"]** 1)
- **2 = 10 x 20 mm [0.39 x 0.79"]** 2)
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c *Interface / power supply*
- **B = EtherCAT / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Fieldbus profile*
- **B2= EtherCAT with CoE (CAN over EtherNet)**

Optional on request
- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.5888	.	X	X	B	2	.	B2	12
Type		a	b	c	d		e	

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- **5 = with stator coupling, IP65 ø 63 mm [2.48"]**
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18"])*
- 3 = ø 10 mm [0.39"]
- **4 = ø 12 mm [0.47"]**
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

c *Interface / power supply*
- **B = EtherCAT / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Fieldbus profile*
- **B2= EtherCAT with CoE (CAN over EtherNet)**

Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

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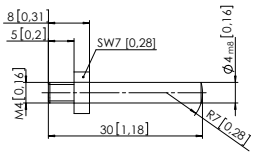
Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port IN and port OUT, 4-pin 2 m [6.56’] PUR cable	**05.00.6031.4411.002M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56’] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 male connector with external thread for port IN and port OUT, 4-pin	**05.WASCSY4S**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	7.5 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.54 kg [19.05 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 120 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics EtherCAT

Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	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:
Preop-, Safeop and Op-State (EtherCAT status machine)

2 x Link LEDs (yellow)

LED is ON with the following conditions (port IN and port OUT):
Link detected

Modes

Freerun, distributed clock

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Absolute encoders – multiturn

Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **EtherCAT**

General information about CoE (CAN over EtherNet)

The EtherCAT encoders support the CANopen communication profile according to DS301. In addition device-specific profiles like the encoder profile DS406 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 are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

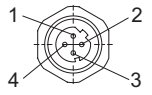
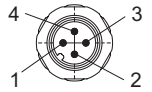
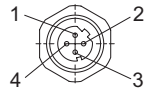
The following output values may be combined as PDO (PDO mapping): **position, speed, temperature values** and **working area state** as well as other process values.

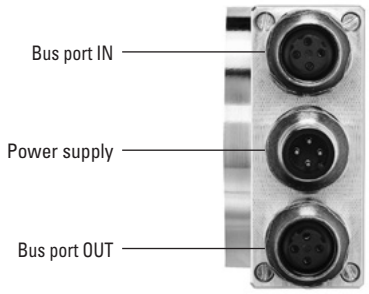
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

The following parameters are programmable:

- Position update time of 62.5 µs.
- EtherCAT certificate of conformity.
- Speed with sign.
- Four units for speed calculation: steps/sec, steps/100 ms, steps/10 ms, min^{-1}.
- Time stamp as system time at the point in time when the position is read out.
- Two working area state registers.
- Along with the scaled position, the raw data – position as process value – is also mappable.
- Dynamic mapping.
- Gating time: setting of the time interval, via which the speed value can be interpolated.
- Sensor temperature in degrees Celsius.
- Comprehensive plausibility test when downloading parameters to the encoder.
- Alarm and warning messages.
- User interface with visual display of bus and fault status – 4 LEDs.
- Extended error management for position sensing with integrated temperature control.
- Implementation of the latest CANopen profile 3.2.10 from the 18th February 2011.
- Hot-Connect – Support for rapid change of Bus-topology.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					
B	2 (3 x M12 connector)	Bus Port IN	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus Port OUT	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



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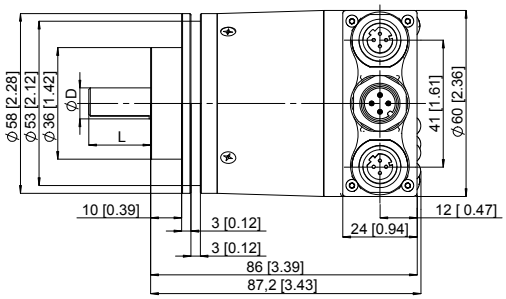
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **EtherCAT**

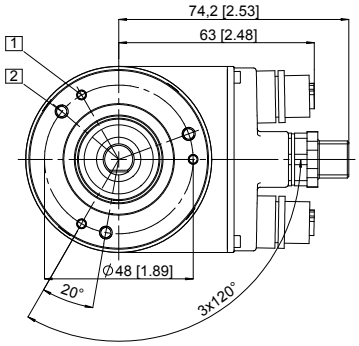
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3

1 3 x M3, 6.0 [0.24] deep
2 3 x M4, 8.0 [0.31] deep

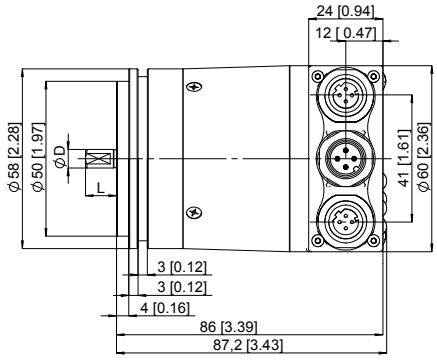


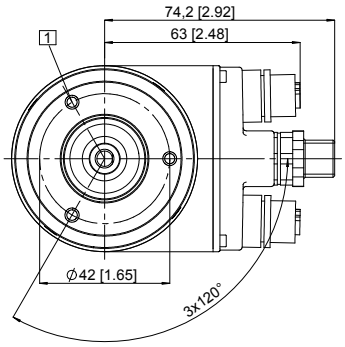


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

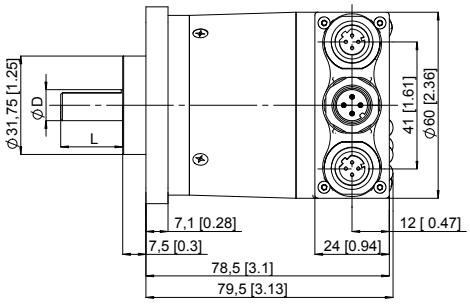
1 3 x M4, 6.0 [0.24] deep

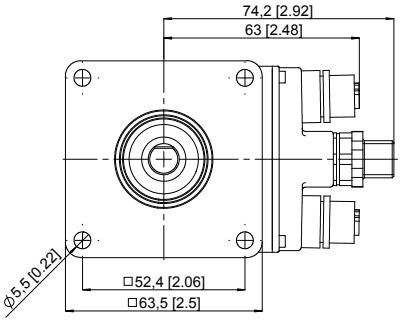




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, □ 63.5 [2.5]
Flange type 5 and 7





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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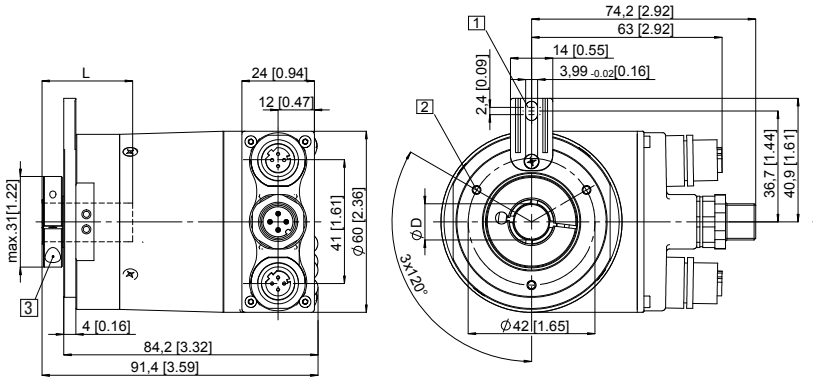
Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **EtherCAT**

Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

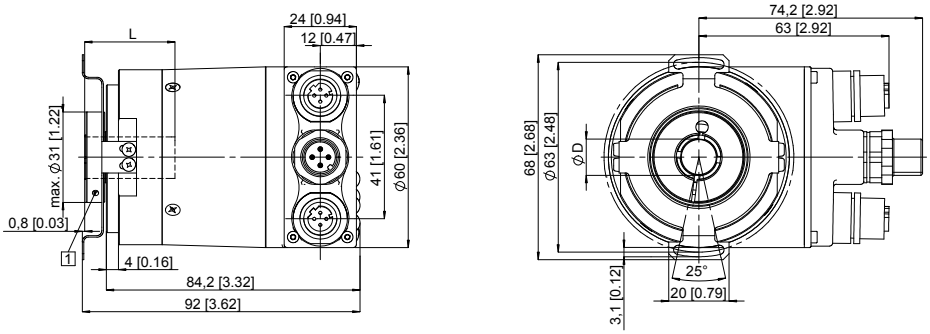
1 Slot spring element recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

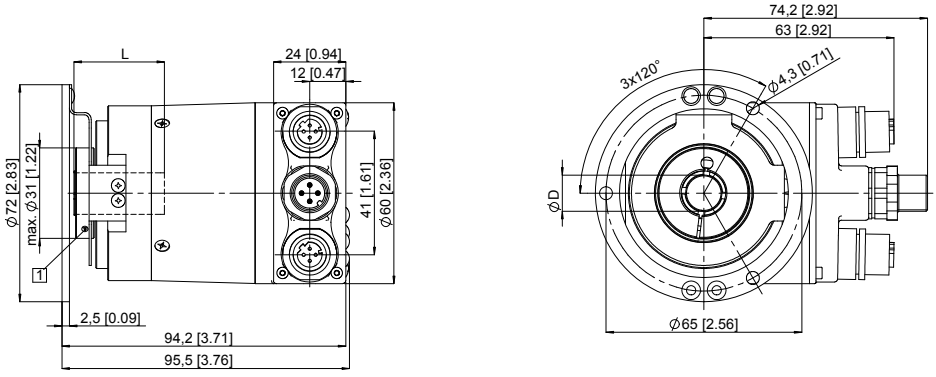
1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFINET IO**

The multiturn encoders Sendix 5868 and 5888 with PROFINET interface and optical sensor technology are ideal for use in all applications with PROFINET technology.

The encoder supports the isochronous (IRT) mode and is therefore ideal for real-time applications.

Ex 2/22 | cULus | RoHS | PROFINET

Mechanical drive | Safety-Lock™ | High rotational speed | Temperature range -40°...+85°C | High protection level IP | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor | Surface protection salt spray-tested optional

Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1.
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction.

Flexible

- Easy setting of a preset value using a control bit (telegram 860).
- IRT-Mode.
- Cycle time ≤ 1 ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.

Order code Shaft version

8.5868 . X X C 2 . C2 12
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
- **1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- **2 = synchro flange, IP65 ø 58 mm [2.28"]**
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]
- 7 = square flange, IP67 □ 63.5 mm [2.5"]

b *Shaft (ø x L), with flat*
- **1 = 6 x 10 mm [0.24 x 0.39"]** 1)
- **2 = 10 x 20 mm [0.39 x 0.79"]** 2)
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c *Interface / power supply*
- **C = PROFINET IO / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Fieldbus profile*
- **C2= PROFINET IO**

Optional on request
- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.5888 . X X C 2 . C2 12
Type — a b c d — e

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days. 10 by 10

a *Flange*
- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- **5 = with stator coupling, IP65 ø 63 mm [2.48"]**
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b *Blind hollow shaft (insertion depth max. 30 mm [1.18"])*
- 3 = ø 10 mm [0.39"]
- **4 = ø 12 mm [0.47"]**
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

c *Interface / power supply*
- **C = PROFINET IO / 10 ... 30 V DC**

d *Type of connection removable bus terminal cover*
- **2 = 3 x M12 connector, 4-pin**

e *Fieldbus profile*
- **C2= PROFINET IO**

Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

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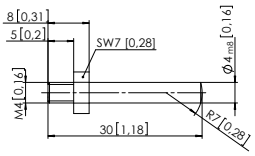
Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFINET IO

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75“] for shaft 6 mm [0.24“]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75“] for shaft 10 mm [0.39“]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	**8.0010.4700.0000**

Connection technology		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56‘] PUR cable	**05.00.6031.4411.002M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56‘] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin	**05.WASCSY4S**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	IP65 up to 70°C [158°F]	9000 min^{-1}, 7000 min^{-1} (continuous)
	IP65 up to T_{max}	7000 min^{-1}, 4000 min^{-1} (continuous)
	IP67 up to 70°C [158°F]	8000 min^{-1}, 6000 min^{-1} (continuous)
	IP67 up to T_{max}	6000 min^{-1}, 3000 min^{-1} (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10^{-6} kgm^2
	hollow shaft version	7.5 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.54 kg [19.05 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 200 mA
Reverse polarity protection of the power supply	yes
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics PRROFINET IO

Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Protocol	PROFINET IO

Link 1 and 2, LED (green / yellow)

two colored	green	active link
	yellow	data transfer

Error LED (red) / PWR LED (green)

Functionality see manual

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Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFINET IO**

General information about PROFINET IO

The PROFINET encoder implements the Encoder Profile 4.1. (according to the specification Encoder Version 4.1 Dec 2008")

It permits scaling and preset values, as well as many other additional parameters to be programmed via the PROFINET-Bus.

When switching on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure, or taken over by the controller in the start-up phase.

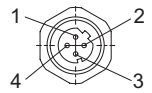
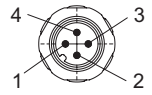
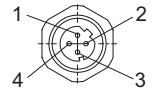
Position, speed and many other states of the encoder can be transmitted.

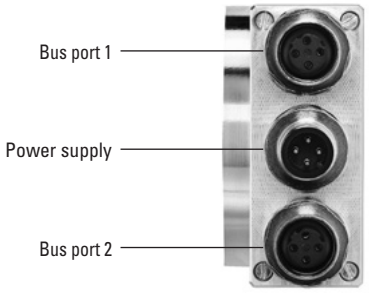
PROFINET IO

The complete encoder profile according to profile encoder version 4.1 as well as the identification & maintenance functionality version 1.16 has been implemented. IM blocks 0, 1, 2, 3 and 4 are supported.

The **M**edia **R**edundancy **P**rotocol is implemented here.
Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

Terminal assignment

Interface	Type of connection	Function	M12 connector, 4-pin					
C	2 (3 x M12 connector)	Bus port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus port 2	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	 D coded
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



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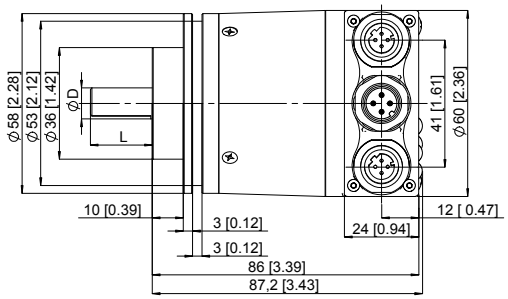
Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFINET IO**

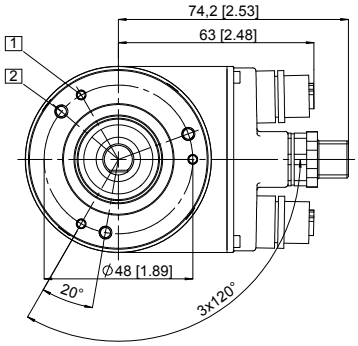
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3

1 3 x M3, 6.0 [0.24] deep
2 3 x M4, 8.0 [0.31] deep

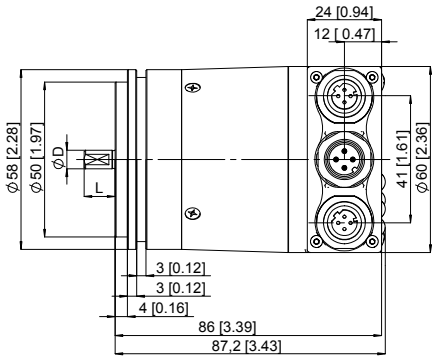


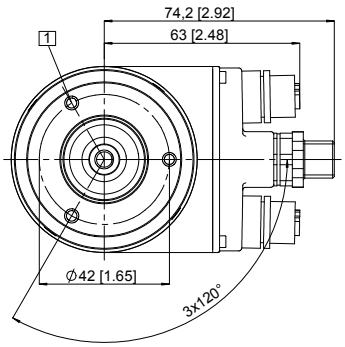


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

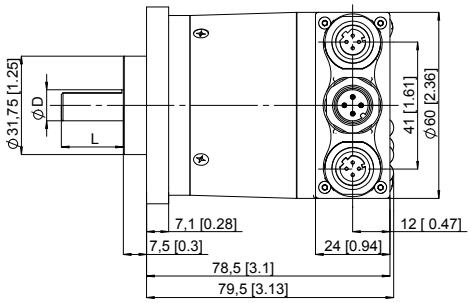
1 3 x M4, 6.0 [0.24] deep

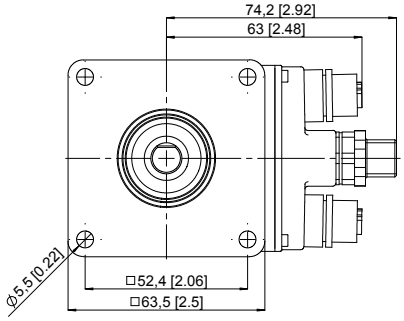




D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, □63.5 [2.5]
Flange type 5 and 7





D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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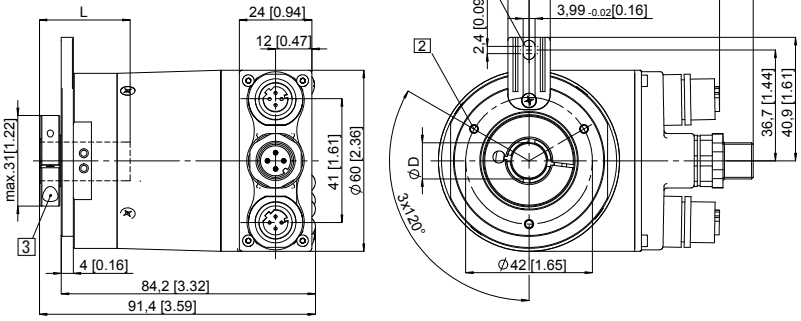
Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFINET IO**

Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

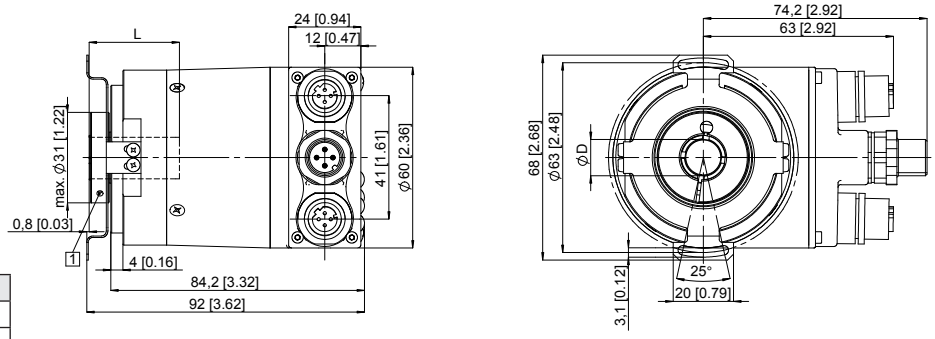
1 Slot spring element recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

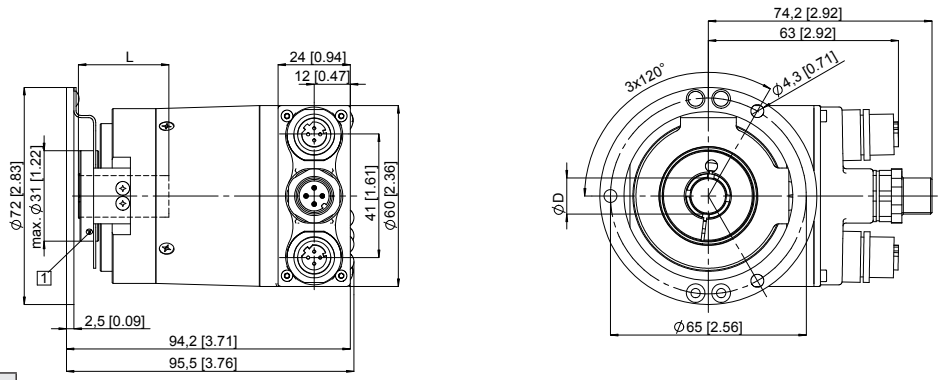
1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]
L = insertion depth max. blind hollow shaft		

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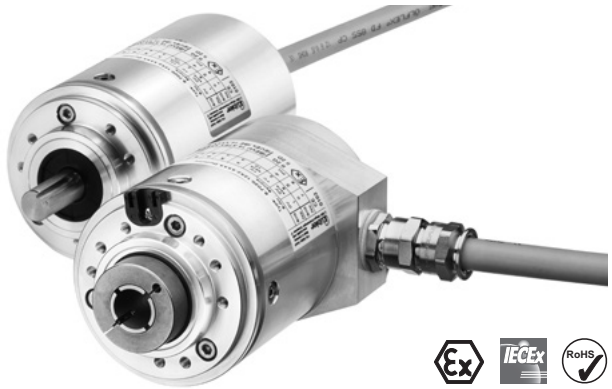
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7063 / 7083 (shaft / hollow shaft) | SSI/BiSS



The Sendix 7063 / 7083 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with an SSI or BiSS interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 29 bits; they are also available with axial and radial cable outlets.

Ex approval | Mechanical drive | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Magnetic field proof | Magnetic field proof | Reverse polarity protection | Optical sensor | Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7063	.	1	X	2	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i [1]

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [2]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs* [2]
2 = SET, DIR input additional status output

h *Options*
1 = no option

i *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other singleturn resolutions
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7063.1221.XX21.V4A
8.7063.122A.XX21.XXXX-V4A

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Absolute encoders – multiturn

Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | **Sendix 7063 / 7083 (shaft / hollow shaft)** | **SSI/BiSS**

Order code Hollow shaft

8.7083	.	X	X	2	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i [1]

a *Flange*
1 = with spring element, short
5 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* [2]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs* [2]
2 = SET, DIR input
additional status output

h *Options*
1 = no option

i *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other singleturn resolutions
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7083.1221.XX21-V4A
8.7083.122A.XX21.XXXX-V4A

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7063

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7083

ATEX

EC type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0020 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes [3]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7063 / 7083 (shaft / hollow shaft) | SSI/BiSS

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
– CRC data verification

Status output

Output driver		open collector, internal pull-up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active at		LOW

The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation.

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = Power supply)	HIGH	min. 60 % of +V
		max. +V
	LOW	max. 25 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction 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 reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
2	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚	⏚
			Cable marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
Stat: Status output
⏚: Protective earth

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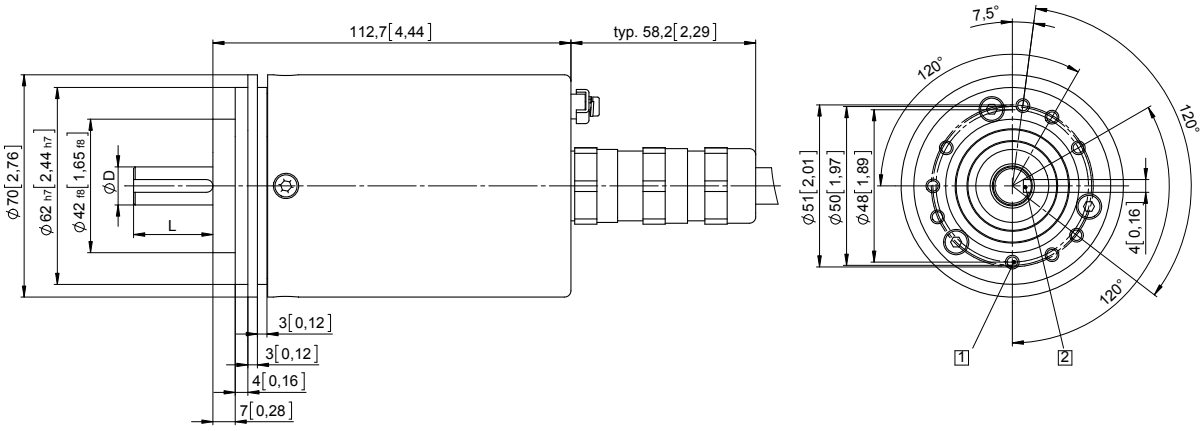
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7063 / 7083 (shaft / hollow shaft) | SSI/BiSS

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

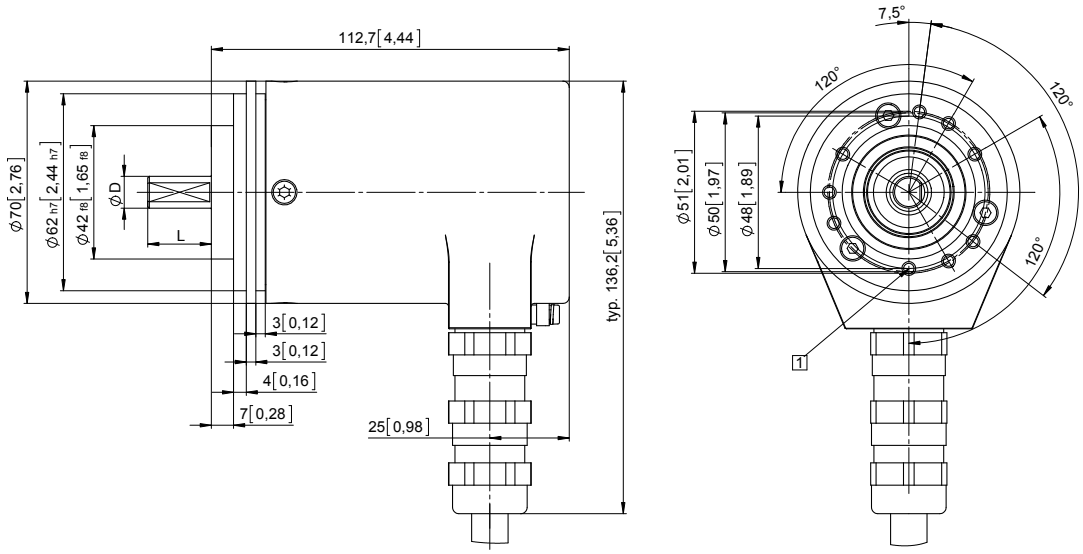
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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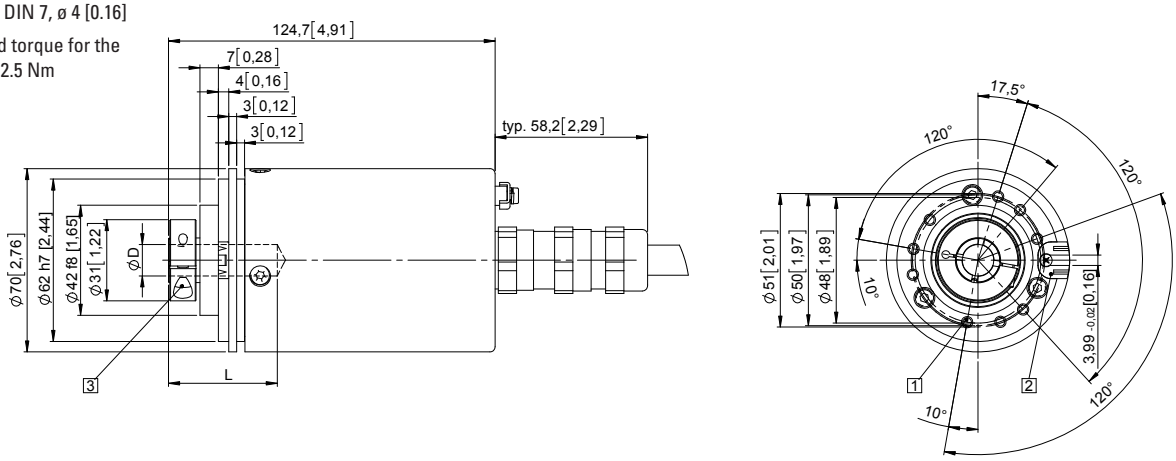
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7063 / 7083 (shaft / hollow shaft) | SSI/BiSS

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

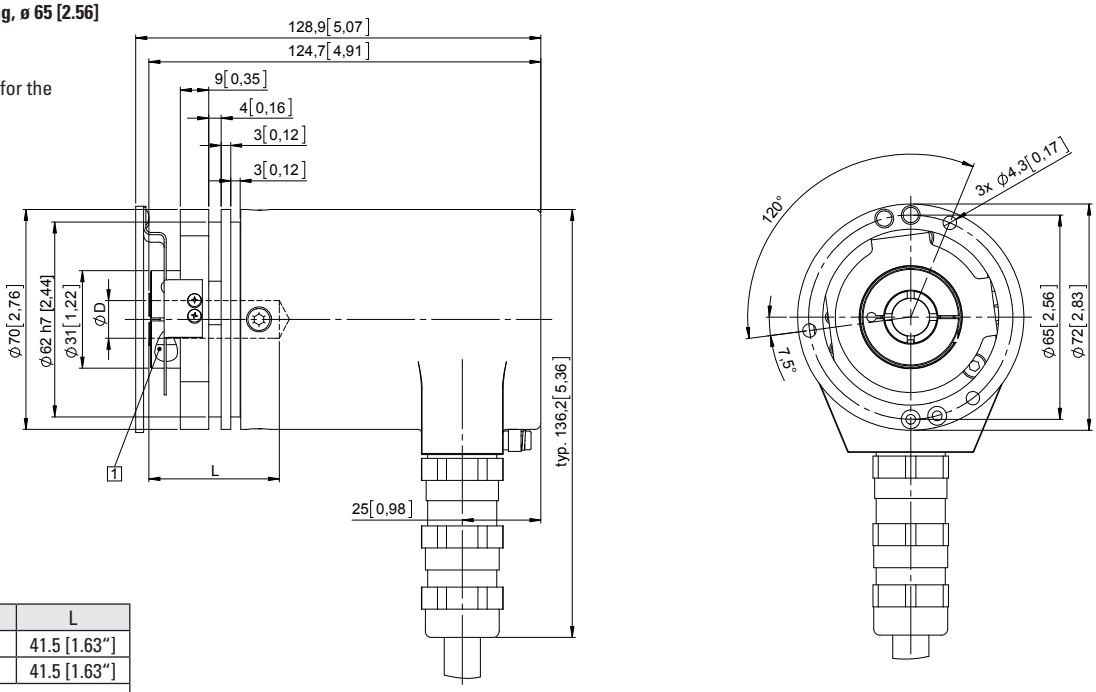
1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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Standard, ATEX / IECEx – zone 1 / 21
SIL2/PLd, mechanical multiturn, optical

Sendix SIL 7063FS2 (shaft)

SSI / BiSS + SinCos

Ex protection and Functional Safety in one device.

The absolute multiturn encoders 7063FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7063FS2	.	1	X	4	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see **i**, e. g.: 0100 = 10 m [32.81']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* 2)
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs* 2)
2 = SET input

h *Options*
1 = no option

i *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other singleturn resolutions
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7063FS2.1241.XX21.V4A
8.7063FS2.124A.XX21.XXXX-V4A

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Standard, ATEX/IECEx – zone 1/21
SIL2/PLd, mechanical multiturn, optical | **Sendix SIL 7063FS2 (shaft)** | **SSI/BiSS + SinCos**

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.
Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value [1]	2.16×10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 50 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes [2]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0×10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEx – zone 1/21
SIL2/PLd, mechanical multiturn, optical | **Sendix SIL 7063FS2 (shaft)** | **SSI/BiSS + SinCos**

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
– CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [1]
Pulse rate	2048 ppr

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = Power supply)	HIGH	min. 60 % of +V max. +V
	LOW	max. 25 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
4	1, 2, A, B	SET	Signal:	0 V	+V	C+	C-	D+	D-	SET	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable marking:	6	1	2	3	4	5	11	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: SET input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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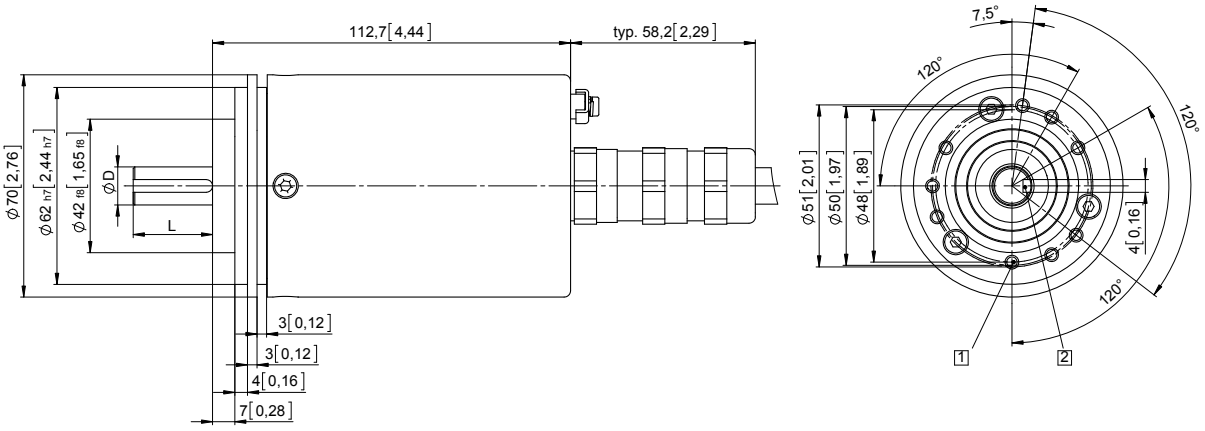
Standard, ATEX/IECEx – zone 1/21
SIL2/PLd, mechanical multiturn, optical | Sendix SIL7063FS2 (shaft) | SSI/BiSS + SinCos

Dimensions shaft version
Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

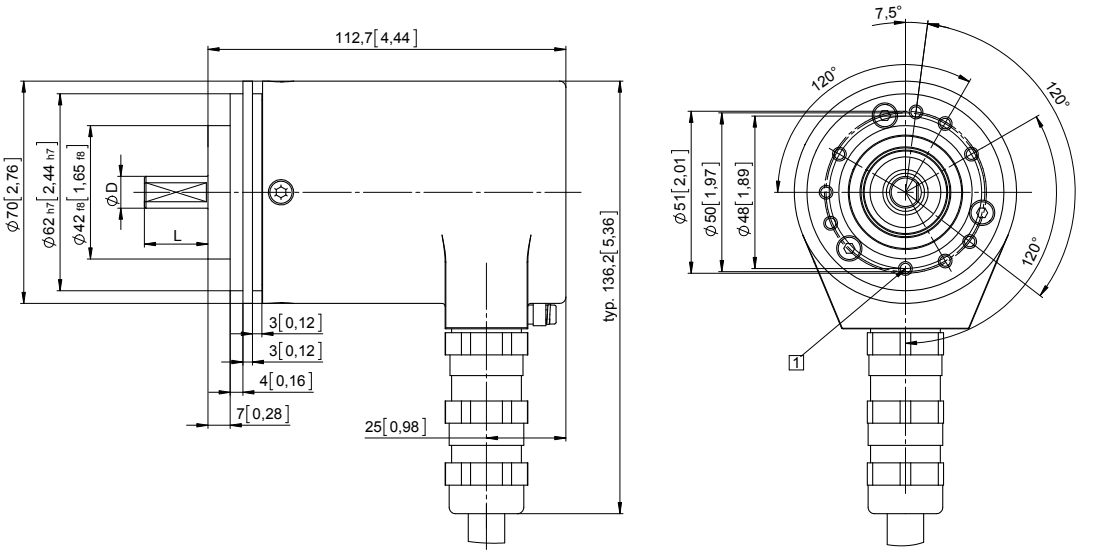
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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Standard, ATEX / IECEx – zone 1 / 21
SIL2/SIL3/PLe, mechanical multiturn, optical | **Sendix SIL 7063FS3 (shaft)** | **SSI / BiSS + SinCos**

Ex protection and Functional Safety in one device.

The absolute multiturn encoders 7063FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.

Ex approval | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Short-circuit proof | Reverse polarity protection | Optical sensor | Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7063FS3	.	1	X	4	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see **i**, e. g.: 0100 = 10 m [32.81']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* 2)
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs* 2)
2 = SET input

h *Options*
1 = no option

i *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other singleturn resolutions
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7063FS3.1241.XX21.V4A
8.7063FS3.124A.XX21.XXXX-V4A

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Standard, ATEX / IECEx – zone 1 / 21
SIL2/SIL3/PLe, mechanical multiturn, optical | **Sendix SIL 7063FS3 (shaft)** | **SSI / BiSS + SinCos**

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	**8.0000.4G06.0000**
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display.	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.

Safety characteristics

Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value [1]	1.09×10^{-8} h^{-1}
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 50 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes [2]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0×10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		500 m/s^2, 11 ms
Vibration resistance acc. to EN 60068-2-6		200 m/s^2, 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEx – zone 1/21
SIL2/SIL3/PLe, mechanical multiturn, optical | **Sendix SIL 7063FS3 (shaft)** | **SSI/BiSS + SinCos**

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
– CRC data verification

SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [1]
Pulse rate	2048 ppr

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = Power supply)	HIGH	min. 60 % of +V max. +V
	LOW	max. 25 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
4	1, 2, A, B	SET	Signal:	0 V	+V	C+	C-	D+	D-	SET	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable marking:	6	1	2	3	4	5	11	7	8	9	10	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: SET input
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

1) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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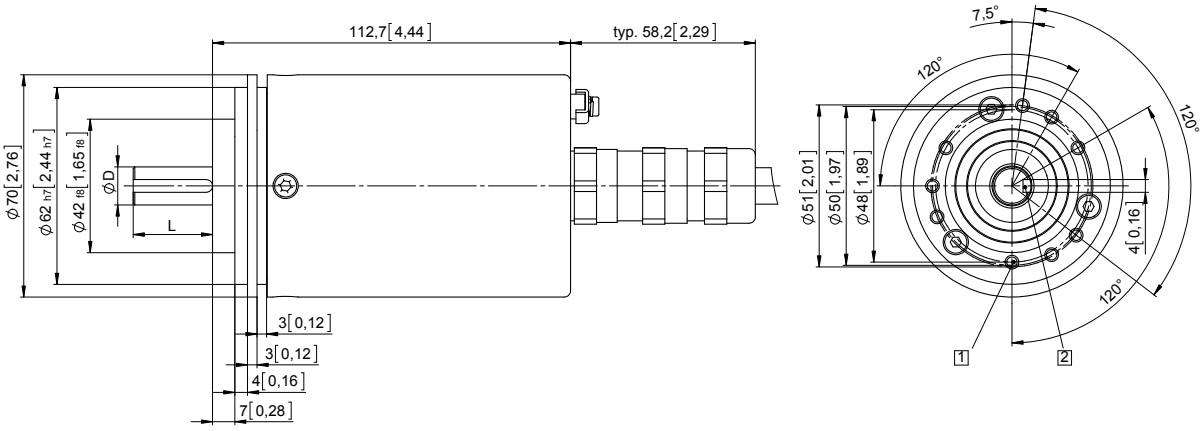
Standard, ATEX/IECEx – zone 1/21
SIL2/SIL3/PLe, mechanical multiturn, optical | **Sendix SIL7063FS3 (shaft)** | **SSI/BiSS + SinCos**

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

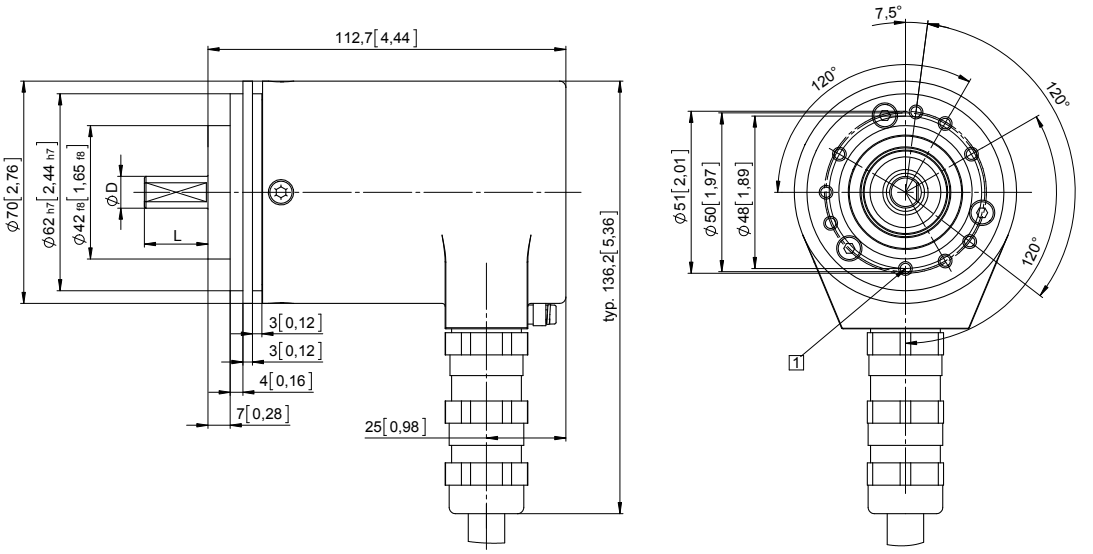
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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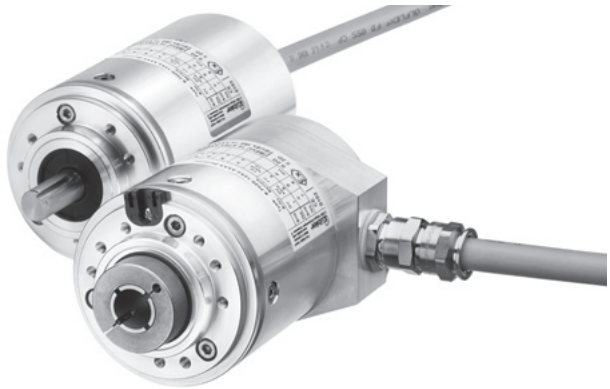
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | PROFIBUS DP



The Sendix 7068 / 7088 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a Profibus interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.

PROFIBUS

Ex approval | Mechanical drive | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor | Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7068	.	1	X	3	X	.	31	11	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7068.1231.3111.V4A
8.7068.123A.3111.XXXX-V4A

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | PROFIBUS DP

Order code Hollow shaft

8.7088	.	X	X	3	X	.	31	11	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
1 = with spring element, short
5 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / Power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7088.1231.3111.V4A
8.7088.123A.3111.XXXX-V4A

Mounting accessory for shaft encoders

		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7068

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7088

ATEX

EC type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0020 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 120 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | PROFIBUS DP

Interface characteristics PROFIBUS DP	
Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scalable
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
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 add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a CLASS 2-master, default address: 125
Termination	active termination can only be switched on externally

Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. 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 use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of 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 acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

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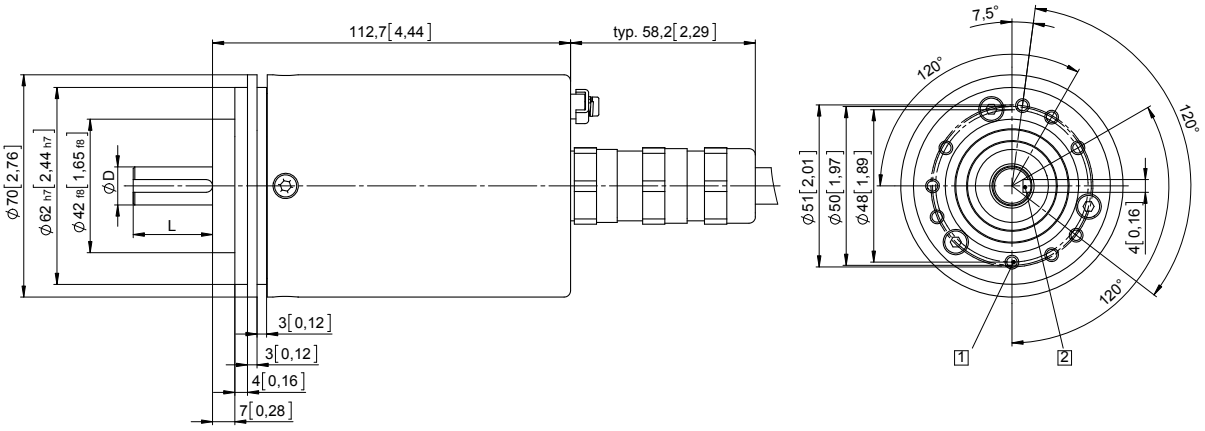
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | PROFIBUS DP

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

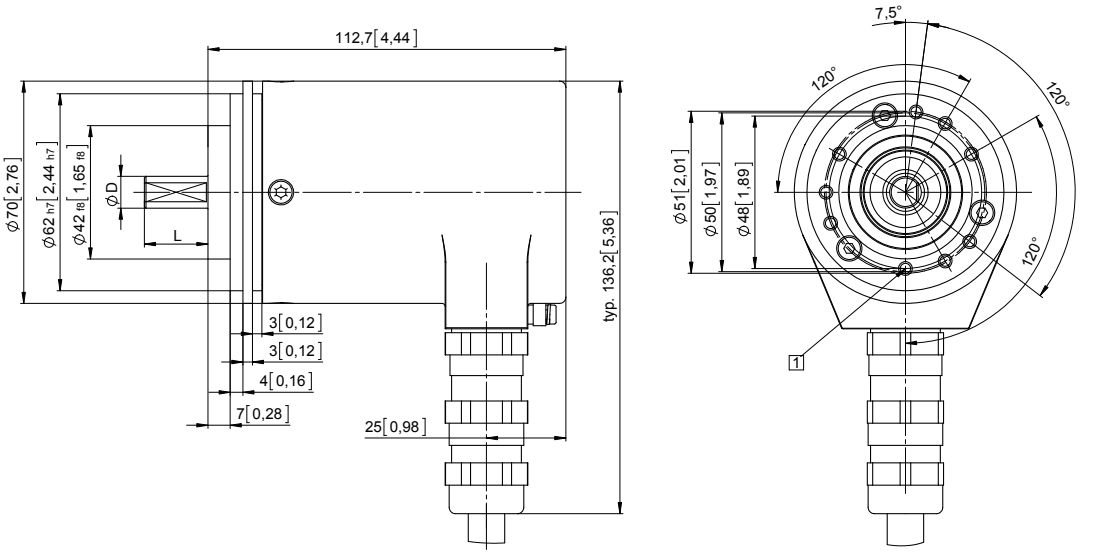
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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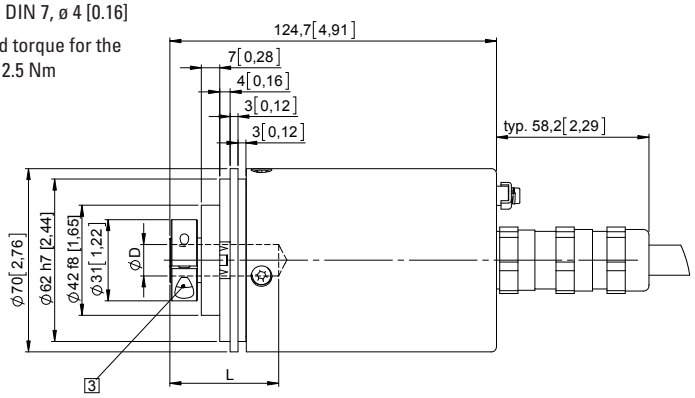
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | **Sendix 7068 / 7088 (shaft / hollow shaft)** | **PROFIBUS DP**

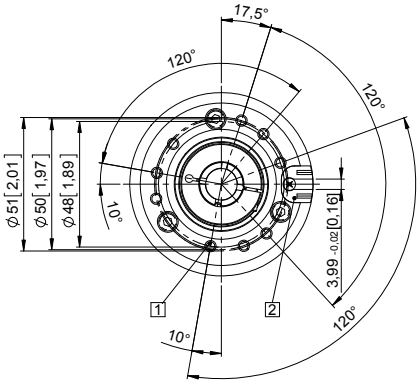
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

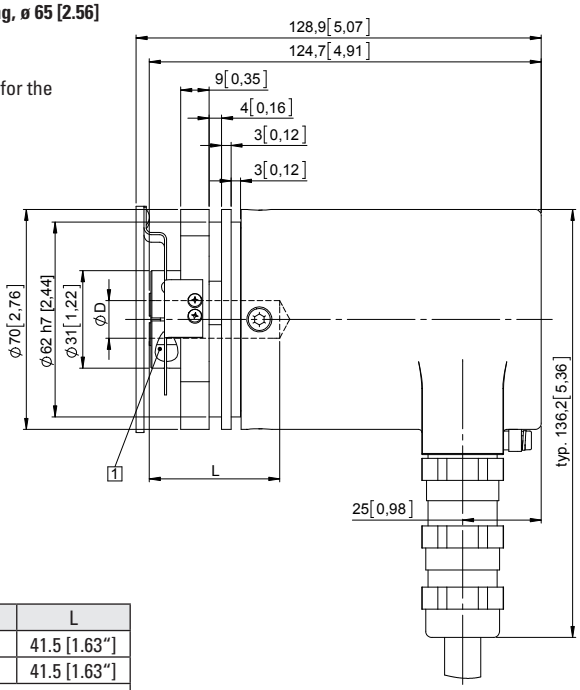


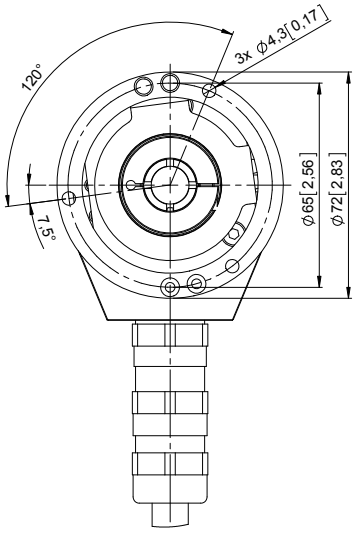


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | CANopen

The Sendix 7068 / 7088 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a CANopen interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.

Ex approval | Mechanical drive | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor | Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7068	.	1	X	2	X	.	21	21	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* [1)]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7068.1221.2121.V4A
8.7068.122A.2121.XXXX-V4A

1) Not applicable with connection types 1 and 2.

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Absolute encoders – multiturn

Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | **Sendix 7068 / 7088 (shaft / hollow shaft)** | **CANopen**

Order code Hollow shaft

8.7088	.	X	X	2	X	.	21	21	.	XXXX
Type		a	b	c	d		e			f [1]

a *Flange*
1 = with spring element, short
5 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
V4A 1.4404
8.7088.1221.2121.V4A
8.7088.122A.2121.XXXX-V4A

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7068

ATEX

EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009

IECEx

Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7088

ATEX

EC type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0020 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 100 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | CANopen

Interface characteristics CANopen	
Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2 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 can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position**, **speed**, **acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, 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), 3 Sending PDO's.
- Node address, baud rate and CANbus programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min^{-1}).
- Factor for speed calculation (e.g. measuring wheel circumference) Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working 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 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

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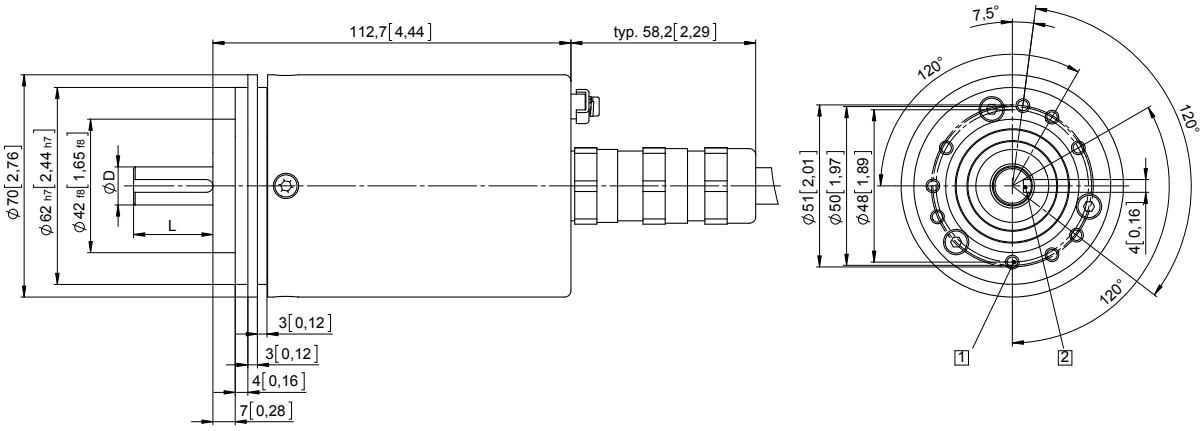
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | CANopen

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

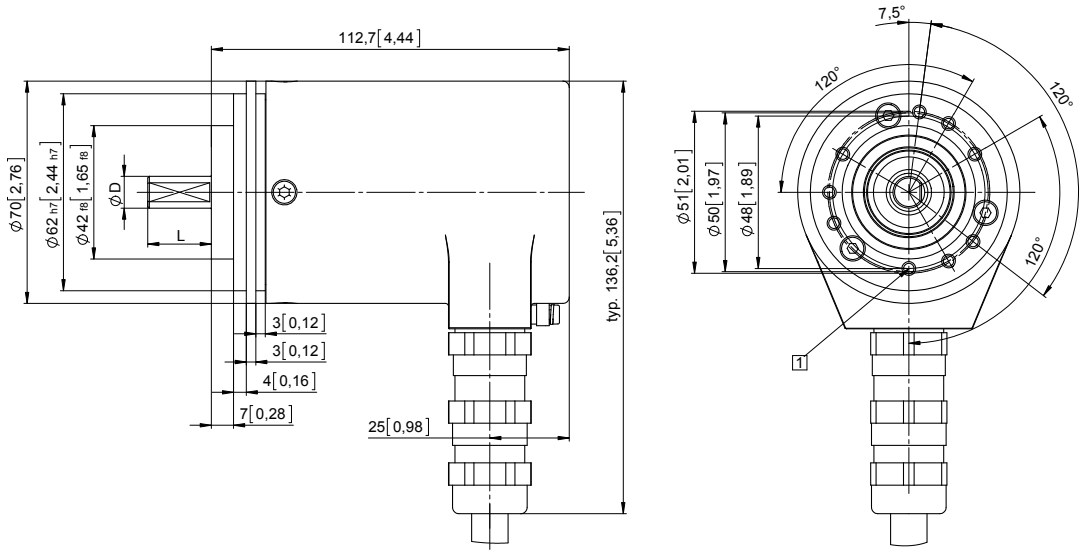
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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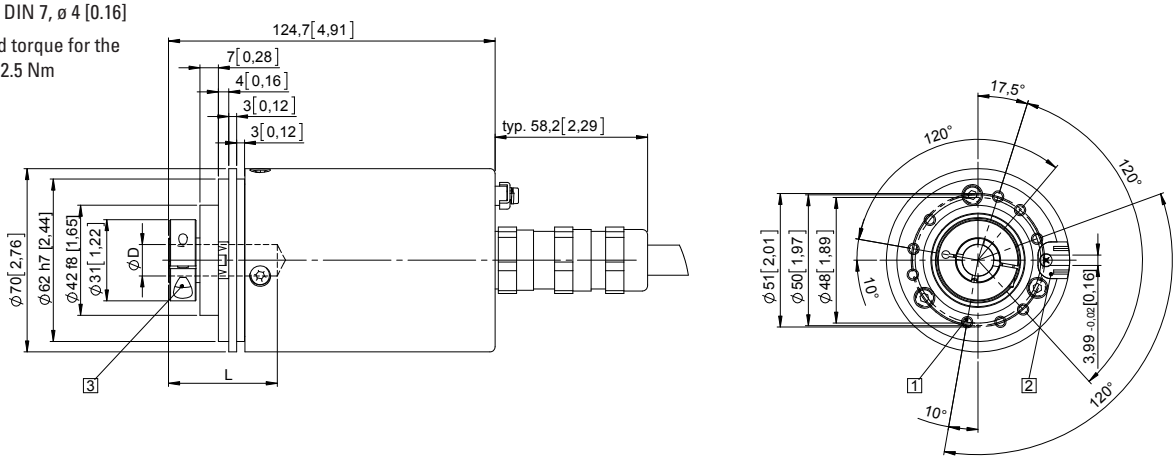
Standard, ATEX/IECEx – zone 1/21 mechanical multiturn, optical | Sendix 7068 / 7088 (shaft / hollow shaft) | CANopen

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 1

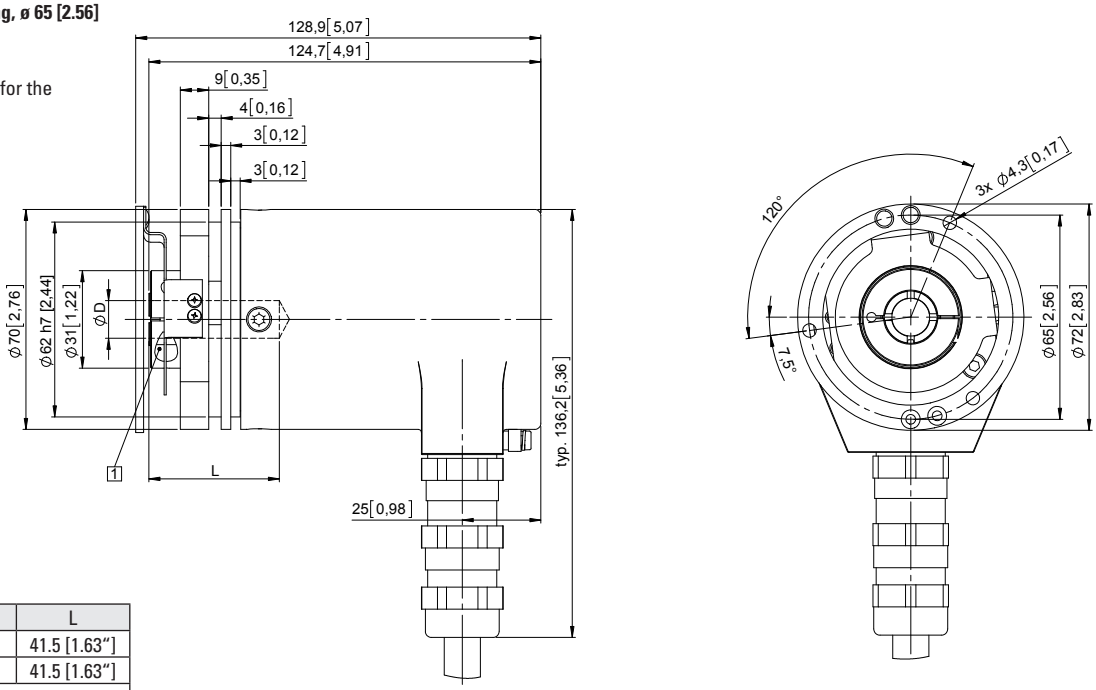
1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 5

1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]
L = insertion depth max. blind hollow shaft		

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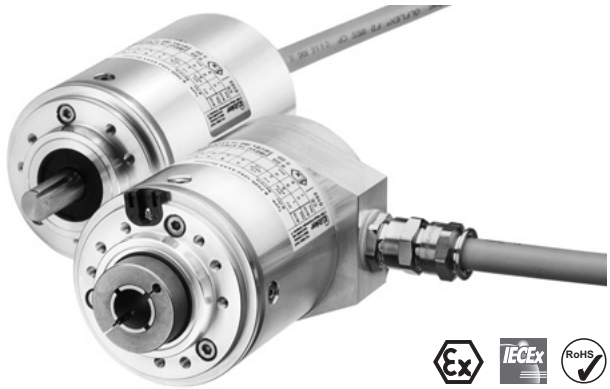
Absolute encoders – multiturn

Standard, ATEX/IECEx – mining mechanical multiturn, optical | **Sendix 7163 / 7183 (shaft / hollow shaft)** | **SSI/BiSS**



The Sendix 7163 / 7183 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a an SSI or BiSS interface and optical sensor technology have an ATEX/IECEx mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 29 bits; they are also available with axial and radial cable outlets.

Ex approval | Mechanical drive | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7163	.	2	X	2	X	.	X	X	2	1	.	XXXX
Type		a	b	c	d		e	f	g	h		i 1)

a *Flange*
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution* 2)
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs* 2)
2 = SET, DIR input additional status output

h *Options*
1 = no option

i *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other singleturn resolutions

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

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Standard, ATEX / IECEx – mining mechanical multiturn, optical | Sendix 7163 / 7183 (shaft / hollow shaft) | SSI / BiSS

Order code Hollow shaft

8.7183 . X X 2 X . X X 2 1 . XXXX
Type
a b c d e f g h i [1]

a *Flange*
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = SSI, BiSS / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution [2]*
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g *Inputs / outputs [2]*
2 = SET, DIR input additional status output

h *Options*
1 = no option

i *Cable length in dm [1]*
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other singleturn resolutions

Technical data

Explosion protection 7163

ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007
IECEx	
Certificate of Conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7183

ATEX	
EC type-examination certificate	IBExU 15 ATEX 1057 X
Category	Ex I M2 Ex d I/IIC T4 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2014
IECEx	
Certificate of Conformity (CoC)	IECEx IBE 15.0019 X
Category	Ex d I/IIC T4 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance acc. to EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes [3]
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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Standard, ATEX / IECEx – mining mechanical multiturn, optical | Sendix 7163 / 7183 (shaft / hollow shaft) | SSI / BiSS

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ 3.8 V
	LOW at I_{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Monoflop time		≤ 15 µs

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. The update rate depends on clock speed, data length and monoflop time.

BiSS interface

Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs

Note:
– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
– CRC data verification

Status output

Output driver		open collector, internal pull-up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active at		LOW

The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation.

SET input

Input		HIGH active
Input type		comparator
Signal level (+V = Power supply)	HIGH	min. 60 % of +V
		max. +V
	LOW	max. 25 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction 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 reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms

Power-ON

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

Hot plugging of the encoder should be avoided.

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)										
2	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚	⏚
			Cable marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input
DIR: Direction input
Stat: Status output
⏚: Protective earth

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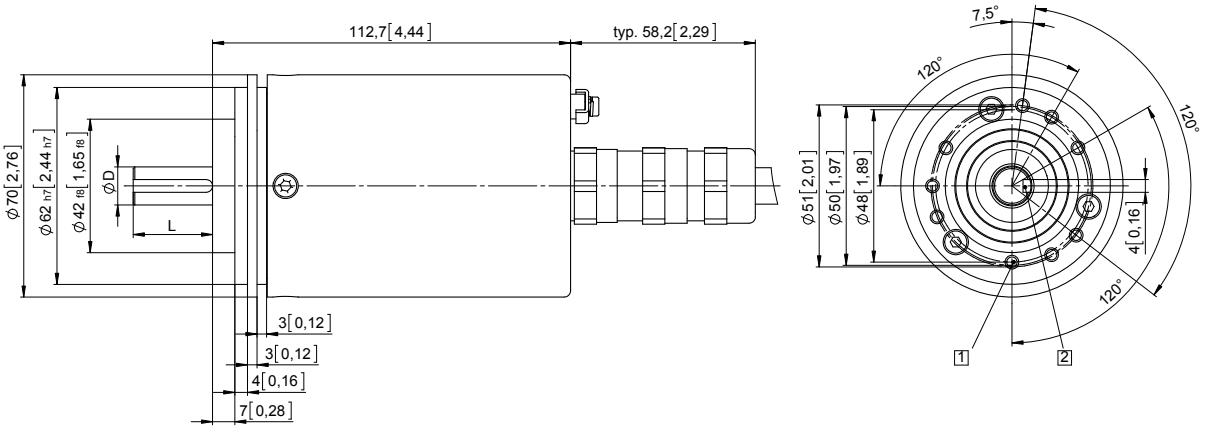
Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7163 / 7183 (shaft / hollow shaft) | SSI/BiSS

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

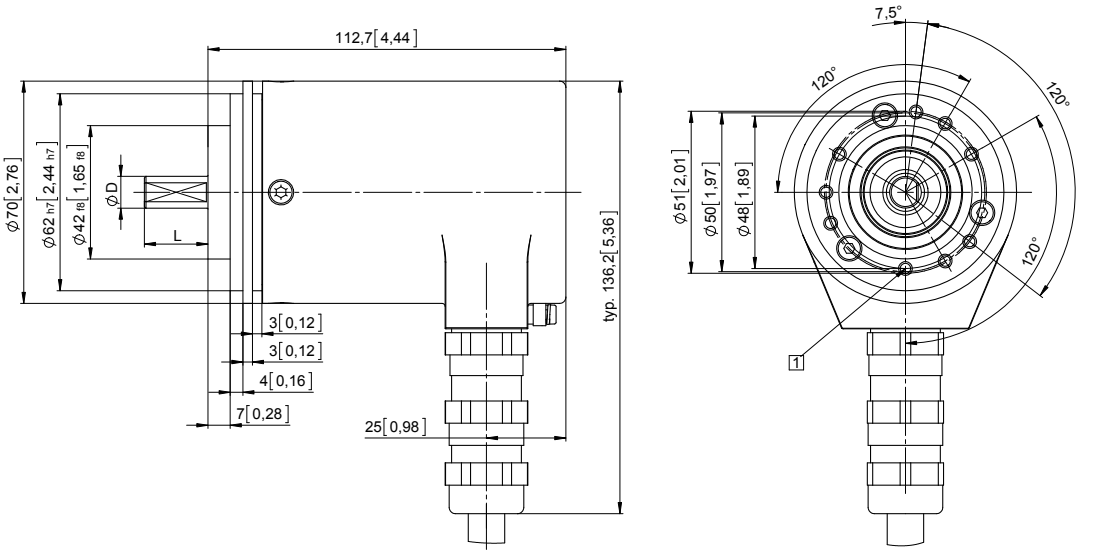
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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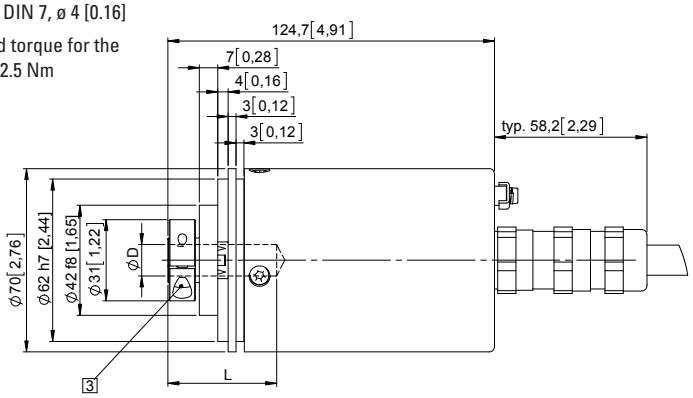
Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7163 / 7183 (shaft / hollow shaft) | SSI/BiSS

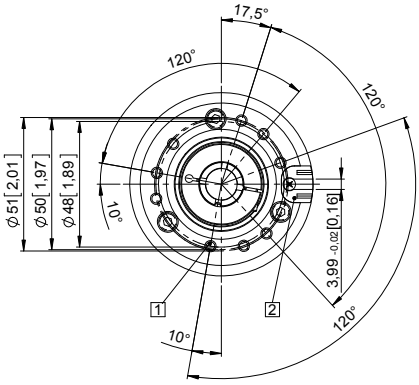
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 2

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

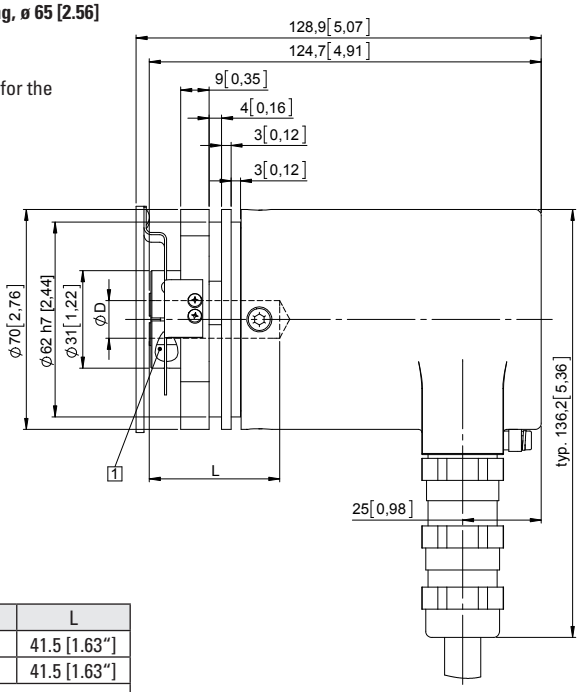


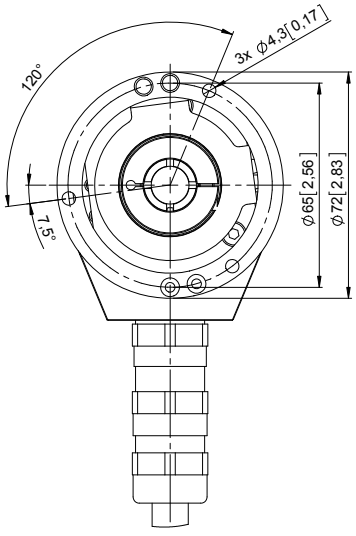


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 6

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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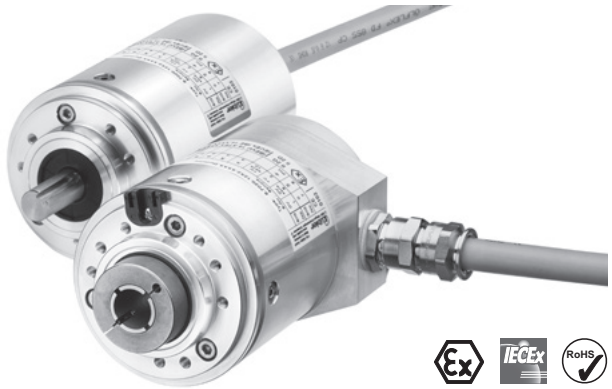
Standard, ATEX/IECEx – mining mechanical multiturn, optical

Sendix 7168 / 7188 (shaft / hollow shaft) | **PROFIBUS DP**



The Sendix 7168 / 7188 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a PROFIBUS interface and optical sensor technology have an ATEX/IECEx mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.

Ex approval | Mechanical drive | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7168 . 2 X 3 X . 31 11 . XXXX

Type | a | b | c | d | e | f 1)

a *Flange*
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

Order code Hollow shaft

8.7188 . X X 3 X . 31 11 . XXXX

Type | a | b | c | d | e | f 1)

a *Flange*
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])*
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
3 = PROFIBUS DP V0 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Cable length in dm* 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

1) Not applicable with connection types 1 and 2.

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Standard, ATEX / IECEx – mining mechanical multiturn, optical | **Sendix 7168 / 7188 (shaft / hollow shaft)** | **PROFIBUS DP**

Technical data

Explosion protection 7168

ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007

IECEx

Certificate of Conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7188

ATEX

EC type-examination certificate	IBExU 15 ATEX 1057 X
Category	Ex I M2 Ex d I/IIC T4 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0019 X
Category	Ex d I/IIC T4 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 120 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | PROFIBUS DP

Interface characteristics PROFIBUS DP	
Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scalable
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
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 add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a CLASS 2-master, default address: 125
Termination	active termination can only be switched on externally

PROFIBUS encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. 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 use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of 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 acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

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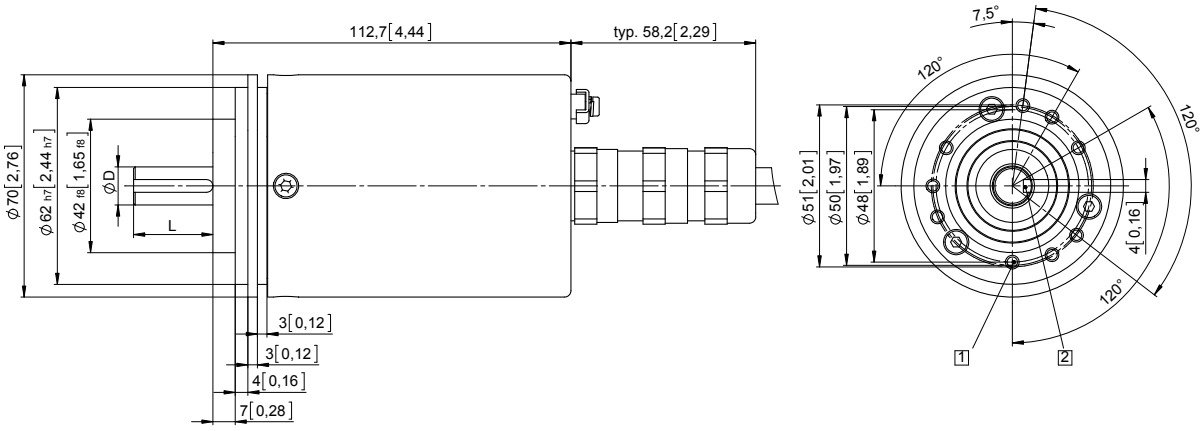
Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | PROFIBUS DP

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

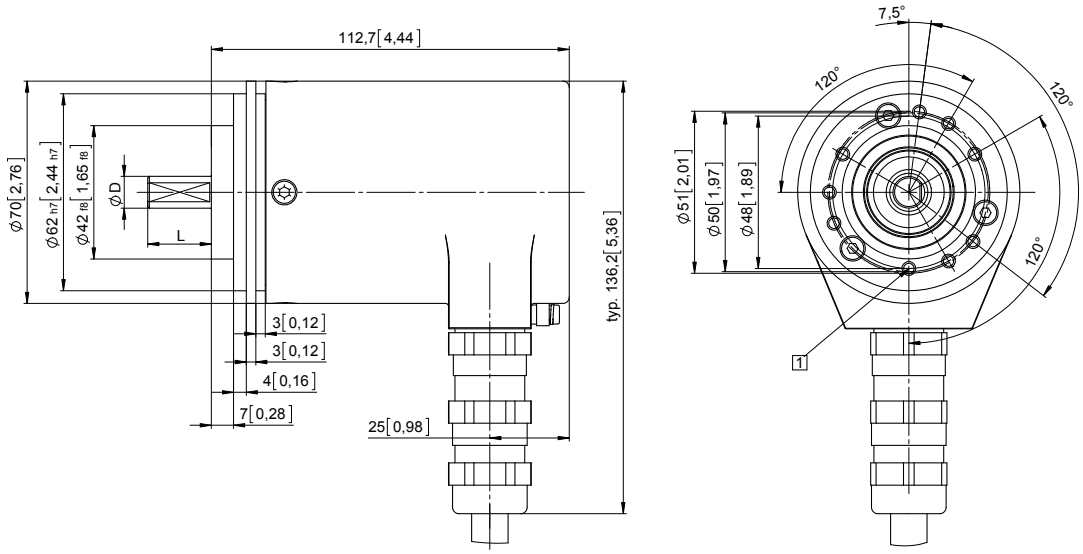
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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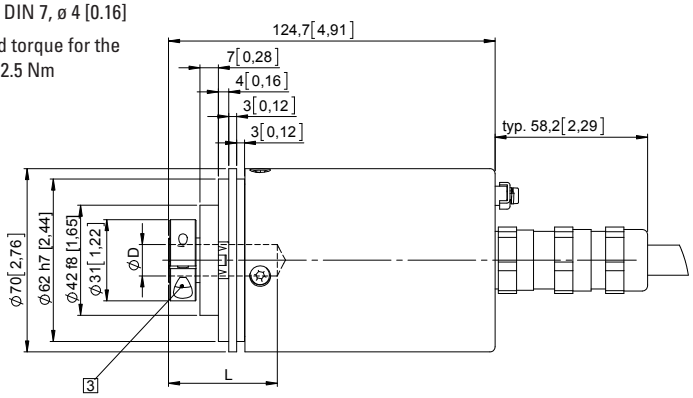
Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | PROFIBUS DP

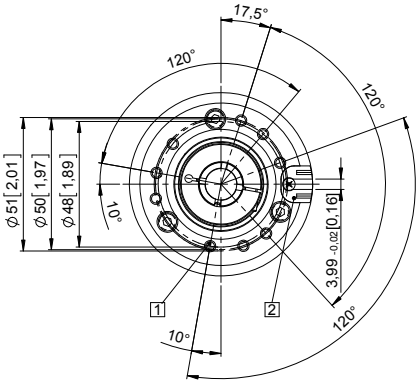
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 2

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

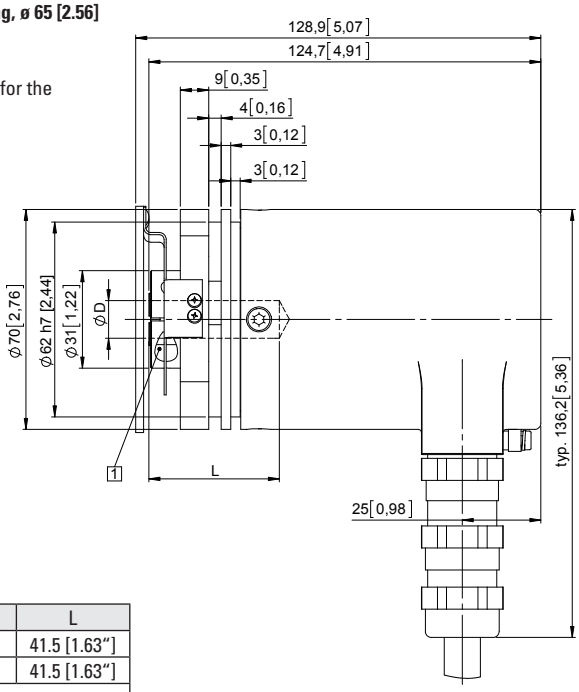


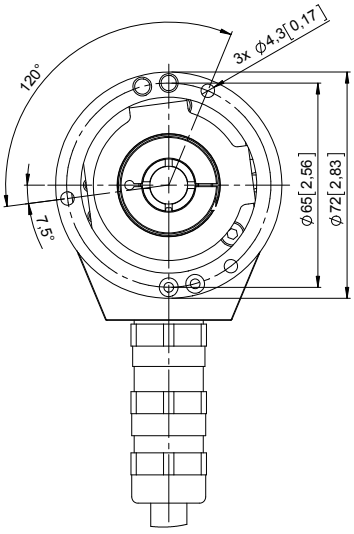


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 6

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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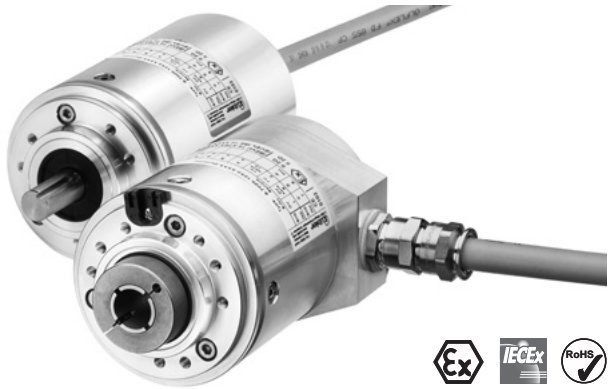
Absolute encoders – multiturn

Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | CANopen



The Sendix 7168 / 7188 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a CANopen interface and optical sensor technology have an ATEX/IECEx mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.

Ex approval | Mechanical drive | Safety-Lock™ | High rotational speed | High protection level | High shaft load capacity | Shock / vibration resistant | Magnetic field proof | Reverse polarity protection | Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7168	.	2	X	2	X	.	21	21	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b *Shaft (ø x L)*
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

Order code Hollow shaft

8.7188	.	X	X	2	X	.	21	21	.	XXXX
Type		a	b	c	d		e			f 1)

a *Flange*
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]

b *Blind hollow shaft*
(insertion depth max. 41.5 mm [1.63"])
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]

c *Interface / power supply*
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d *Type of connection*
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e *Fieldbus profile*
21 = CANopen

f *Cable length in dm* [1]
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | CANopen

Technical data

Explosion protection 7168

ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007

IECEx

Certificate of Conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7188

ATEX

EC type-examination certificate	IBExU 15 ATEX 1057 X
Category	Ex I M2 Ex d I/IIC T4 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2014

IECEx

Certificate of Conformity (CoC)	IECEx IBE 15.0019 X
Category	Ex d I/IIC T4 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics

Maximum speed		6000 min^{-1} (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10^{-6} kgm^2
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance acc. to. EN 60068-2-27		1000 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 100 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Absolute encoders – multiturn

Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | CANopen

Interface characteristics CANopen	
Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02.

In addition, device-specific profiles like the encoder profile DS406 V3.2 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 can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position**, **speed**, **acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, 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), 3 Sending PDO's.
- Node address, baud rate and CANbus programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:
- Event mode.
- Units for speed selectable (steps/sec or min^{-1}).
- Factor for speed calculation (e.g. measuring wheel circumference) Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working 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 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

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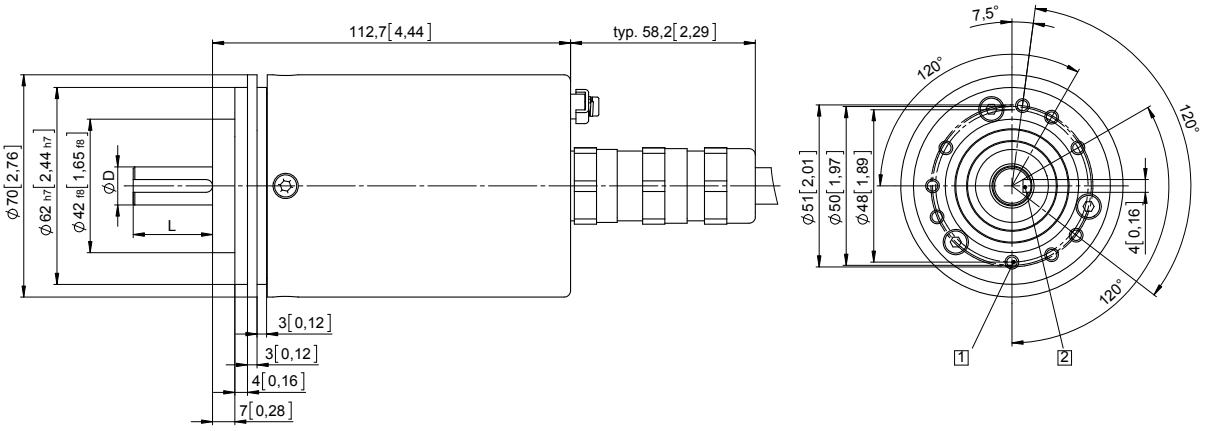
Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | CANopen

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

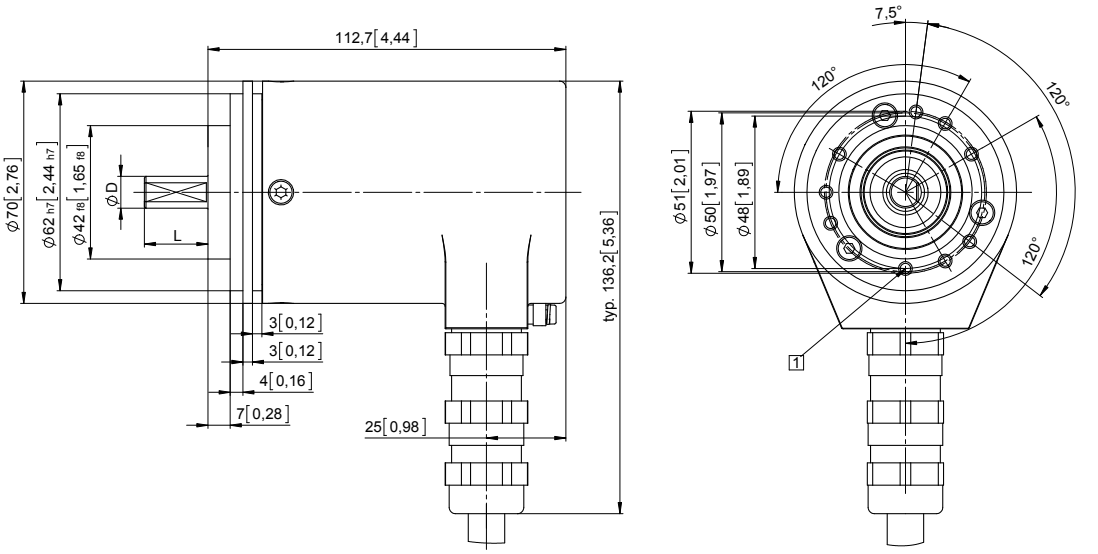
1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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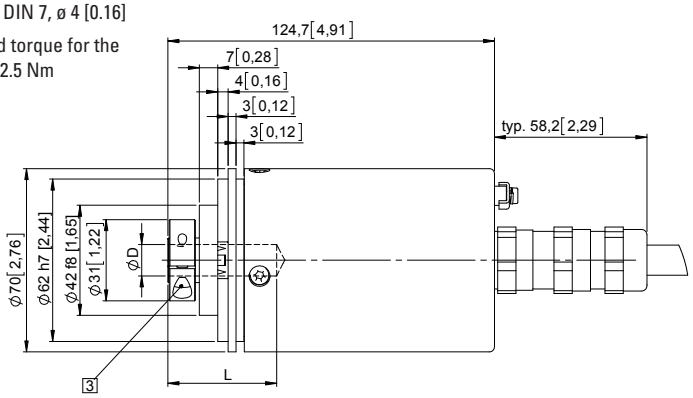
Standard, ATEX/IECEx – mining mechanical multiturn, optical | Sendix 7168 / 7188 (shaft / hollow shaft) | CANopen

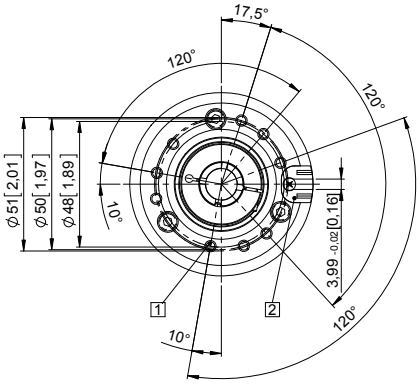
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short
Flange type 2

1 9 x M4, 10 [0.39] deep
2 Slot spring element, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 2.5 Nm

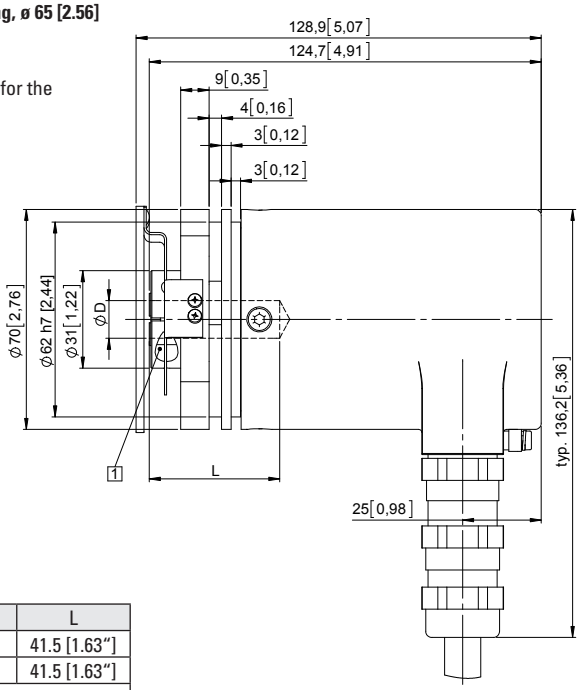


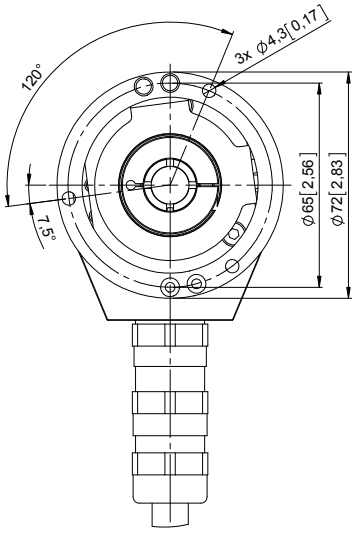


D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

Flange with stator coupling, ø 65 [2.56]
Flange type 6

1 Recommended torque for the clamping ring 2.5 Nm





D	Fit	L
12 [0.47]	H7	41.5 [1.63“]
14 [0.55]	H7	41.5 [1.63“]
L = insertion depth max. blind hollow shaft		

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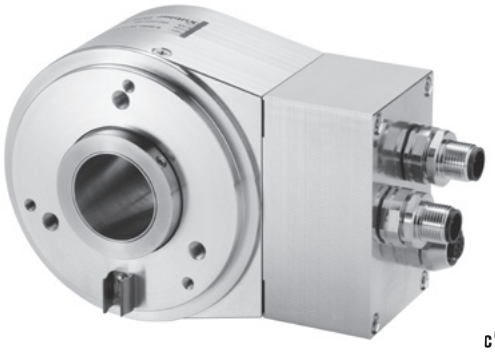
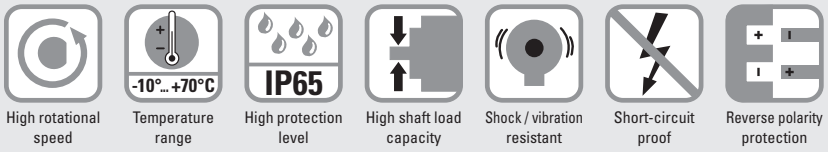
Large hollow shaft optical / magnetic | 9080 (hollow shaft) | PROFIBUS DP



The multiturn encoder 9080 with Profibus interface and combined optical / mechanical sensor technology is perfect for Profibus applications, where a large hollow shaft is required.

This through hollow shaft is available with a diameter up to 28 mm. The maximum resolution of the 9080 is 25 bits.



High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection

Adaptable

- With cable gland or M12 connector.
- Hollow shaft of 12 up to 28 mm.
- Programmable over the bus.

User-friendly

- All relevant parameters programmable.
- Wide selection of shafts and fixing options.

Order code Hollow shaft

8.9080	.	X	X	3	X	.	3001
Type		a	b	c	d		e

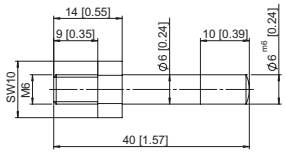
a *Flange*
1 = without mounting aid
2 = with spring element, short
3 = with spring element, long
4 = with mounting flange
5 = with tether arm, long

b *Through hollow shaft*
1 = ø 12 mm [0.47"]
2 = ø 15 mm [0.59"]
9 = ø 16 mm [0.63"]
3 = ø 20 mm [0.79"]
4 = ø 24 mm [0.94"]
C = ø 25 mm [0.98"]
5 = ø 28 mm [1.10"]
6 = ø 5/8"
7 = ø 1"

c *Interface / power supply*
3 = PROFIBUS DP / 10 ... 30 V DC

d *Type of connection, removable bus terminal cover*
1 = with cable gland M16
2 = with 3 x M12 connector

e *Fieldbus profile*
3001 = Profibus class 2

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2 + 3)	with fixing thread 	**8.0010.4700.0003**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in, 5-pin 5 m [16.40'] PUR cable	**05.00.6011.3211.005M**
	M12 male connector with external thread for bus out , 5-pin 5 m [16.40'] PUR cable	**05.00.6011.3411.005M**
	M12 female connector with coupling nut for power supply, 4-pin 2 m [5.56'] PUR cable	**05.00.6061.6211.002M**
Connector, self-assembly (straight))	M12 female connector with coupling nut for bus in, 5-pin	**05.BMWS 8151-8.5**
	M12 male connector with external thread for bus out , 5-pin	**05.BMSWS 8151-8.5**
	M12 female connector with coupling nut for power supply, 4-pin	**05.B8141-0**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Absolute encoders – multiturn

Large hollow shaft optical / magnetic | **9080 (hollow shaft)** | **PROFIBUS DP**

Technical data

Mechanical characteristics

Maximum speed	6000 min^{-1}, 3000 min^{-1} (continuous)
Mass moment of inertia	approx. 72 x 10^{-6} kgm^2
Starting torque	< 0.2 Nm
Weight	approx. 0.9 kg [31.74 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-10°C ... +70°C [+14°F ... +158°F]
Material hollow shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27	2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption	290 mA
Recommended fuse	T 0.315 A
Performance against magnetic influence acc. to	EN 61000-4-8, Severity level 5
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics PROFIBUS DP

Resolution singleturn	1 ... 8192 (13 bit) scalable
Number of revolutions (multiturn)	1 ... 4096 (12 bit) scalable
Code	binary
Interface	RS485
Protocol	PROFIBUS DP, encoder profile class 2
Baud rate	max. 12 Mbit/s
Device address	adjustable with 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 field bus 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 can be used now with the guarantee that they are ready for the future too.

The following parameters can be programmed:

- Direction of rotation.
- Scaling factor
  – number of pulse/rotation.
  – total resolution.
- Preset value.
- Diagnostics mode.

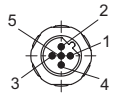
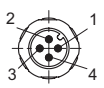
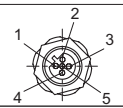
The following functionality is integrated:

- 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 1 and class 2 functionality.

Terminal assignment terminal box

Interface	Type of connection		Terminal box												
3	1		Signal:	ENC.		BUS IN			BUS OUT			ENC.		Shield	
				+V DC	0 V	0 V	B	A	A	B	0 V	0 V	+V DC	⏚	
			Terminal:	1	2	3	4	5	6	7	8	9	10	11	12

Terminal assignment M12 connector

Interface	Type of connection	Function	M12 connector						
3	2	Bus in	Signal:	–	PB_A	–	PB_B	–	
			Pin:	1	2	3	4	5	
		Power supply	Signal:	+V	–	0 V	–		
			Pin:	1	2	3	4		
		Bus out	Signal:	BUS_VDC	PB_A	PB_GND	PB_B	⏚	
			Pin:	1	2	3	4	5	

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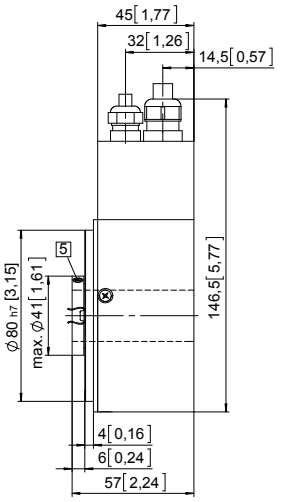
Large hollow shaft optical / magnetic | 9080 (hollow shaft) | PROFIBUS DP

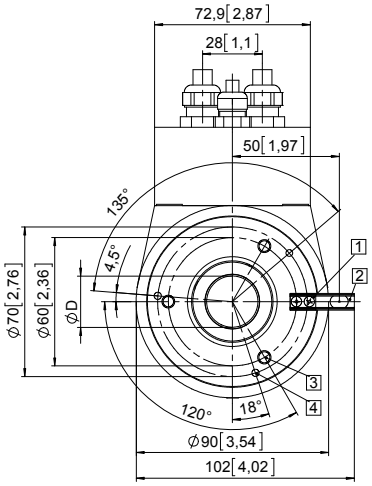
Dimensions

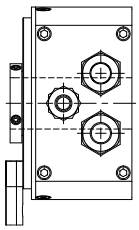
Dimensions in mm [inch]

Flange with spring element

1 Spring element, short (flange no. 2) cylindrical pin DIN 6325, ø 6 [0.24]
2 Spring element, long (flange no. 3) cylindrical pin DIN 6325, ø 6 [0.24]
3 3 x M6, 10 [0.39] deep
4 3 x M4, 7 [0.28] deep
5 Recommended torque for the clamping ring 1.0 Nm



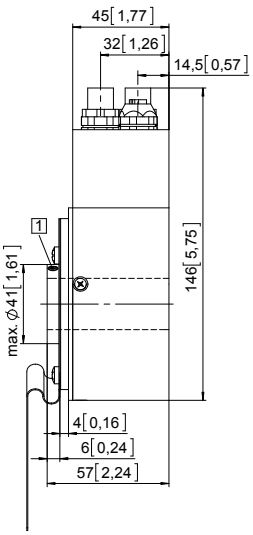


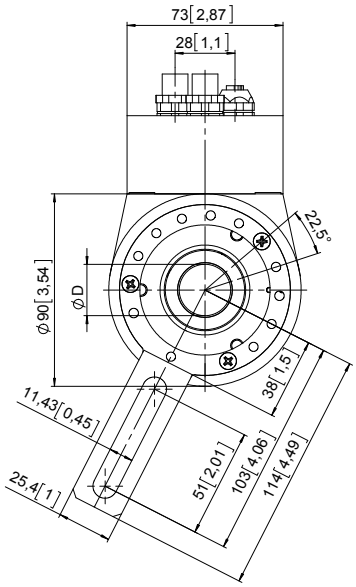


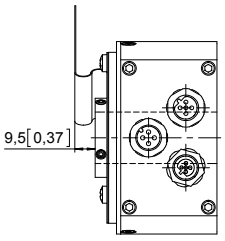
D	Fit
12 [0.47]	H7
15 [0.59]	H7
16 [0.63]	H7
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7

Flange with tether arm, long

1 Recommended torque for the clamping ring 1.0 Nm







D	Fit
12 [0.47]	H7
15 [0.59]	H7
16 [0.63]	H7
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7

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Large hollow shaft
optical / magnetic

9080 (hollow shaft)

CANopen / DeviceNet

The multiturn encoder 9080 with CANopen interface and combined optical / mechanical sensor technology is perfect for CANopen applications, where a large hollow shaft is required.

This through hollow shaft is available with a diameter up to 28 mm. The maximum resolution of the 9080 is 25 bits.

High rotational speed | Temperature range | High protection level | High shaft load capacity | Shock / vibration resistant | Short circuit proof | Reverse polarity protection

Adaptable

- With cable gland or M12 connector.
- Hollow shaft of 12 up to 28 mm.
- Programmable over the bus.

User-friendly

- All relevant parameters programmable.
- Wide selection of shafts and fixing options.

Order code Hollow shaft

8.9080	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

a *Flange*
1 = without mounting aid
2 = with spring element, short
3 = with spring element, long
4 = with mounting flange
5 = with tether arm, long

b *Through hollow shaft*
1 = ø 12 mm [0.47“]
2 = ø 15 mm [0.59“]
9 = ø 16 mm [0.63“]
3 = ø 20 mm [0.79“]
4 = ø 24 mm [0.94“]
C = ø 25 mm [0.98“]
5 = ø 28 mm [1.10“]
6 = ø 5/8“
7 = ø 1“

c *Interface / power supply*
1 = DeviceNet / 10 ... 30 V DC
2 = CANopen / 10 ... 30 V DC

d *Type of connection, removable bus terminal cover*
1 = with cable gland M16 [1)]
2 = with 3 x M12 connector, 5-pin

e *Fieldbus profile*
1001 = DeviceNet
2001 = CANopen

Includes EDS-file and documentation on CD
Use **couplings** for the **BUS-IN** connection and **connectors** for the **BUS-OUT** connection.

1) Only in conjunction with CANopen.

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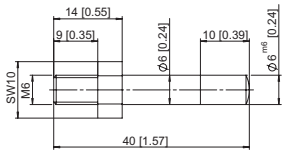
Large hollow shaft optical / magnetic | 9080 (hollow shaft) | CANopen / DeviceNet

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 2 + 3)	with fixing thread 	**8.0010.4700.0003**

Connection technology		Order no.
Cordset, pre-assembled	DeviceNet, M12 female connector with coupling nut for bus in, 5-pin 5 m [16.40'] PUR cable	**05.00.6021.2211.005M**
	DeviceNet, M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PUR cable	**05.00.6021.2411.005M**
	CANopen, M12 female connector with coupling nut for bus in, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
	CANopen, M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A411.005M**
Connector, self-assembly (straight))	M12 female connector with coupling nut for bus in, 5-pin	**8.0000.5116.0000**
	M12 male connector with external thread for bus out, 5-pin	**8.0000.5111.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed	6000 min^{-1}, 3000 min^{-1} (continuous)
Mass moment of inertia	approx. 72 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]	< 0.2 Nm
Weight	approx. 0.9 kg [31.74 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-10°C ... +70°C [+14°F ... + 158°F]
Material hollow shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27	2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s^2, 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption	290 mA
Recommended fuse	T 0.315 A
Performance against magnetic influence acc. to	EN 61000-4-8, severity level 5
UL approval	file 224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen / DeviceNET

Resolution singleturn	1 ... 8192 (13 bit) scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 33.554.432 (25 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN hIGH-speed acc. to ISO/DIS 11898, Basic and Full-CAN; CAN specification 2.0 B (11 and 29 bit Identifier)
Protocol	CANopen according to profile DSP 406 with additional functions. DeviceNet profile for Encoder Release V 2.0
Baud rate	10 ... 1000 kbit/s programmable via DIP switches
Basic identifier/node	programmable via DIP switches

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Absolute encoders – multiturn

Large hollow shaft optical / magnetic | **9080 (hollow shaft)** | **CANopen / DeviceNet**

CANopen - Device profile

General description

The CANopen Device profiles describe 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 can be programmed::

- Polling mode or auto mode with adjustable time.
- Code sequence (direction).
- Number of pulses/rotation 1 ... 8192.
- Number of revolutions 1 ... 4096.
- Total resolution.
- Preset.
- Offset.
- Number of revolutions.

DeviceNet Encoder profile

General description

The DeviceNet Device 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 can be programmed:

- Direction of rotation.
- Scaling factor
  - Number of pulses/rotation 1 ... 8192.
  - Total resolution.
- Number of revolutions 1 ... 4096.
- 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 ... 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.
- 2 I/O Assembly: position value / position value and status.

Fieldbus encoders can be used in following applications:

CANopen

- Elevators.
- Construction plant.
- Cranes.
- Agricultural vehicles.
- Mobile plant.
- Special purposes vehicles.

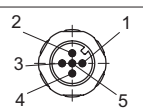
DeviceNet

Especially suitable for applications in the USA.

Terminal assignment terminal box

Interface	Type of connection		Terminal box												
1, 2	1		Signal:	ENC.		BUS IN			BUS OUT			ENC.		shield	
				+V DC	0 V	0 V	B	A	A	B	0 V	0 V	+V DC	⏚	
			Terminal:	1	2	3	4	5	6	7	8	9	10	11	12

Terminal assignment M12 connector version

Interface	Type of connection	Function	M12 connector, 5-pin						
1, 2	2	Bus in	Signal:	DRAIN	+ V DC	– V DC	CAN_H	CAN_L	
			Pin:	1	2	3	4	5	
			Color:	GY	RD	BK	WH	BU	
		Bus out	Signal:	DRAIN	+ V DC	– V DC	CAN_H	CAN_L	
			Pin:	1	2	3	4	5	
			Color:	GY	RD	BK	WH	BU	

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Large hollow shaft optical / magnetic | 9080 (hollow shaft) | CANopen / DeviceNet

Dimensions

Dimensions in mm [inch]

Flange with spring element

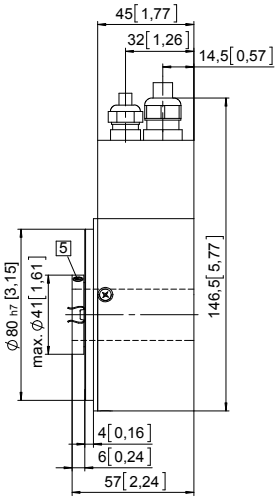
1 Spring element, short (flange no. 2) cylindrical pin DIN 6325, ø 6 [0.24]

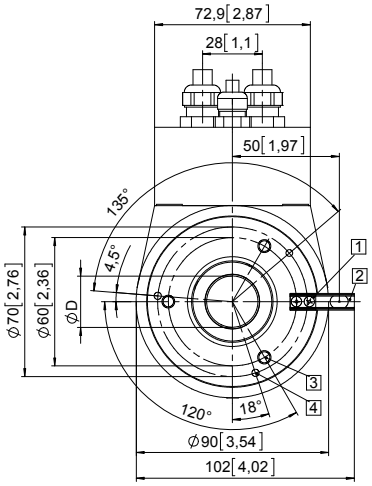
2 Spring element, long (flange no. 3) cylindrical pin DIN 6325, ø 6 [0.24]

3 3 x M6, 10 [0.39] deep

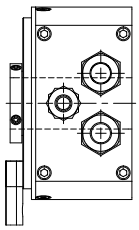
4 3 x M4, 7 [0.28] deep

5 Recommended torque for the clamping ring 1.0 Nm



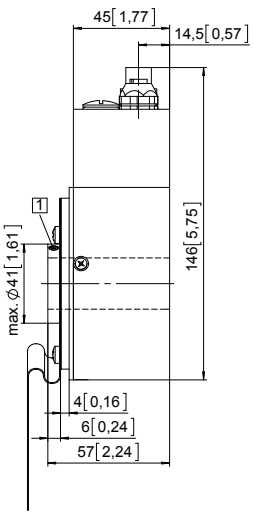


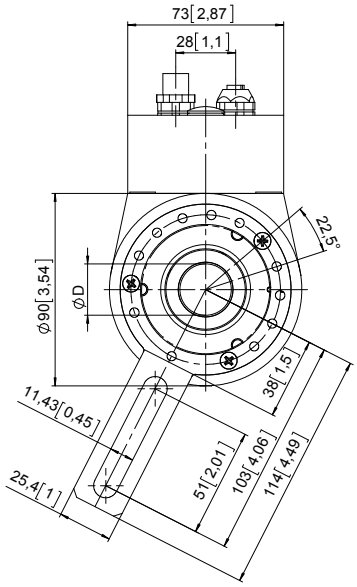
D	Fit
12 [0.47]	H7
15 [0.59]	H7
16 [0.63]	H7
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
5/8"	H7
1"	H7



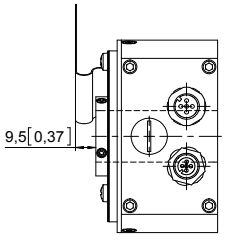
Flange with tether arm, long

1 Recommended torque for the clamping ring 1.0 Nm





D	Fit
12 [0.47]	H7
15 [0.59]	H7
16 [0.63]	H7
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
5/8"	H7
1"	H7



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Large hollow shaft optical / magnetic | **9081 (hollow shaft)** | **SSI**

The multiturn encoder 9081, with SSI interface and combined optical / mechanical sensor technology, has a through hollow shaft with a diameter up to 28 mm and offers resolutions up to 25 bits.

High rotational speed | Temperature range (-20°...+70°C) | High protection level (IP65) | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection

Optimized dimensions

- Hollow shaft up to max. 28 mm with an installation depth of just 47 mm.
- Outer diameter 90 mm.

Order code Hollow shaft

8.9081	.	3	X	2	2	.	2004
Type		a	b	c	d		e

a *Flange*
3 = with spring element, long

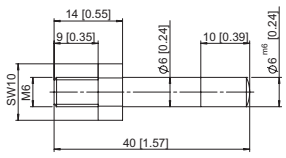
b *Through hollow shaft*
3 = ø 20 mm [0.79"]
4 = ø 24 mm [0.94"]
5 = ø 28 mm [1.10"]
6 = ø 5/8"

c *Interface / power supply*
2 = SSI with 4 status outputs / 5 ... 30 V DC

d *Type of connection*
2 = radial M23 connector, 12-pin without mating connector

e *SSI interface*
2004 = 8192 x 4096 (25 bit), gray

Optional on request
- other hollow shaft diameters

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 3)	with fixing thread 	**8.0010.4700.0003**

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Absolute encoders – multiturn

Large hollow shaft optical / magnetic | **9081 (hollow shaft)** | **SSI**

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1}, 3000 min^{-1} (continuous)
Mass moment of inertia		approx. 65 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]		< 0.2 Nm
Weight		approx. 0.7 kg
Protection acc. to EN 60529		IP65
Working temperature range		-20°C ... +70°C [-4°F ... +158°F]
Materials	hollow shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Power supply		5.0 ... 30 V DC [1]
Power consumption (no load)	typ.	89 mA
	max.	138 mA
Short circuit proof outputs [2]		yes [3]
Reverse polarity protection of the power supply		yes
Performance against magnetic influence acc. to		EN 61000-4-8, severity level 5
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Control inputs (V/R, SET)

Voltage		5 ... 30 V DC = +V
Response time		10 ms
Switching level	LOW	max. 25% +V
	HIGH	min. 60% +V, max. +V
Max. current load		0.5 mA

SSI interface

Output driver		RS485
Permissible load / channel		max. +/- 20 mA
Update rate for position data		approx. 1600/s
SSI clock rate	min. / max.	100 kHz / 500 kHz
Signal level	HIGH	typ. 3.8 V
	LOW (I_{Load} = 20 mA)	typ. 1.3 V
Resolution singleturn		1 ... 8192 (13 bit), scalable
Number of revolutions (multiturn)		1 ... 4096 (12 bit), scalable
Falling edge time t_f (without cable)		max. 100 ns
Rising edge time t_r (without cable)		max. 100 ns

Control outputs

Output driver		Push-Pull
Max. current output		± 10.0 mA
Signal level	HIGH	min. +V - 2.8 V
	LOW	max. 1.8 V
Falling edge time t_f (without cable)		max. 1 µs
Rising edge time t_r (without cable)		max. 1 µs

Control inputs

V/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).

The appropriate option can be selected via a hardware configuration of the V/R input BEFORE powering up the encoder.

The following table shows the function selection dependent on hardware and software settings:

Hardware configuration of the V/R input:	Function: increasing code value when the shaft is in the following direction
„LOW“ (0V) on the V/R input (=cw)	cw
„HIGH“ (+V) on the V/R input (= ccw)	ccw
„LOW“ (0V) on the V/R input (=cw)	ccw
„HIGH“ (+V) on the V/R input (= ccw)	ccw

Note:

- Any hardware configuration of the V/R input must take place BEFORE powering up the encoder!
- If the V/R input is not configured, then a 0 V configuration will apply (default condition)!
- If the direction of rotation is changed due to the V/R configuration, without activating the SET function again, and if the encoder is also then 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 therefore follow this sequence:
  1. Determine the count direction of the encoder either via the V/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 V/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 V/R input with +V = 5 ... 30 V DC power supply is 10 ms.

1) The power supply at the encoder input must not be less than 4.75 V (5 V - 5%).
2) If power supply +V correctly applied.
3) Only one channel allowed to be shorted-out:
at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.
at +V ≥ 5 ... 30 V DC short circuit to channel or 0 V is permitted.

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Large hollow shaft optical / magnetic | **9081 (hollow shaft)** | **SSI**

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. The default value is zero.

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 V DC power supply is 10 ms.

Output

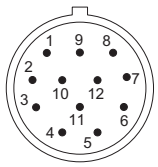
Output	Default-function
A1	battery control

Terminal assignment (SSI Synchronous Serial Interface with 12-pin connector)

Interface	Type of connection	Features	M23 connector, 12-pin										
2	2	SET Up/down input	Signal:	0 V	+V	C+	C-	D+	D-	ST	VR	A1	⏚
			Pin:	1	2	3	4	5	6	7	8	9	PH
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
ST: Set input. The current position becomes defined as position zero.
VR: Up/down input. As long as this input (High-Level = +V)is active, decreasing code values are transmitted when shaft turning clockwise.
A1: Output battery monitoring
⏚PH: Plug connector housing (Shield)

Top view of mating side, male contact base

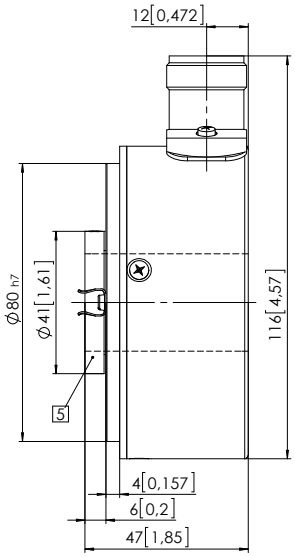


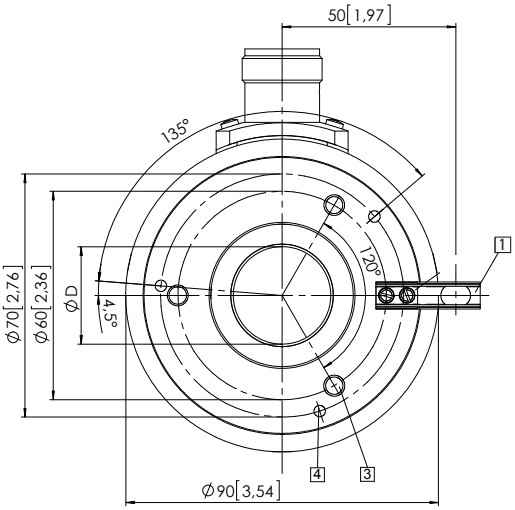
M23 connector, 12-pin

Dimensions

Dimensions in mm [inch]

1 Spring element, long (flange no. 3) cylindrical pin DIN 6325, ø 6 [0.24]
3 3 x M6, 10 [0.4] deep
4 3 x M4, 7 [0.28] deep
5 Recommended torque for the clamping ring 1.0 Nm





D	Fit
20 [0.79]	H7
24 [0.94]	H7
28 [1.10]	H7
5/8"	H7

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Kübler
Fritz Kübler GmbH
www.kuebler.com
Made in Germany
Type: B.LI50.1111.2000
S-Nr.: 16047110/67
4.8-26 VDC
60 mA
Shield
0V
+V
A
A\
WH
BN
GN
YE
B
B\
0
0\
GY
PK
BU
RD

Bearingless encoders

Series			Type	Interface	Page
Incremental, standard	Magnetic	new	RLI20 (hollow shaft)	Push-pull / RS422	**476**
	Zero pulse, magnetic	new	RLI50 (hollow shaft)	Push-pull / RS422	**479**
Incremental, standard	Magnetic		RI20 / Limes LI20 (hollow shaft)	Push-pull / RS422	**482**
	Zero pulse, magnetic		RI50 / Limes LI50 (hollow shaft)	Push-pull / RS422	**485**
Incremental, large hollow shaft	Magnetic	new	RLI200 (hollow shaft)	Push-pull / RS422	**488**
	Zero pulse, magnetic	new	RLI500 (hollow shaft)	Push-pull / RS422	**491**
Absolute, standard singleturn	Magnetic	new	RLA50 (hollow shaft)	SSI / CANopen	**494**

Incremental, standard magnetic | **RLI20 (hollow shaft)** | **Push-pull / RS422**

Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RLI20, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.
This bearingless encoder can be mounted on shafts with a diameter up to max. 30 mm.

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

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

Order code RLI20

8.RLI20	.	X	1	X	X	.	XXXX	.	XXXX
Type		a		b	c		d		e

a *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b *Output circuit / Power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

c *Type of connection*
1 = radial cable, 2 m [6.56'] PUR
A = radial cable, special length PUR *)
*) Available special lengths (connection type A):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI20.111A.0250.0080.0030 (for cable length 3 m)

d *Pulses per revolution* 1)
0250, 0360, 1000, 1024, 2500, 3600

e *Bore diameter*
0080 = 8 mm [0.32"]
0095 = 3/8"
0100 = 10 mm [0.39"]
0158 = 5/8"
0120 = 12 mm [0.47"]
0254 = 1" 2)
0150 = 15 mm [0.59"]
0180 = 18 mm [0.71"]
0200 = 20 mm [0.79"]
0250 = 25 mm [0.98"] 2)
0300 = 30 mm [1.18"] 2)

1) Other pulse rates on request.
2) Only possible for pulse rates 0360 and 3600.

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Incremental, standard magnetic	RLI20 (hollow shaft)	Push-pull / RS422

Accessories / Display type 572

		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Protection	Model 1 Model 2	IP67 acc. to EN 60529 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s^2, 1 ms
Vibration resistance		300 m/s^2, 10 ... 2000 Hz
Pole gap		2 mm from pole to pole
Housing (sensor head)		aluminum
Cable		2 m [6.56'] long, PUR 8 x 0.14 mm^2 [AWG 26], shielded, may be used in trailing cable installations
Status LED	green red	pulse-index error; speed too high or magnetic fields too weak
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics

Output circuit		**RS422**		**Push-pull**		
Power supply		4.8 ... 26 VDC		4.8 ... 30 VDC		
Power consumption (no load)		typ. 25 mA max. 60 mA		typ. 25 mA max. 60 mA		
Permissible load / channel		120 Ohm		+/- 20 mA		
Min. pulse edge interval		1 µs				
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V		min. +V - 2.0 V max. 0.5 V		
Reference signal		index periodical				
System accuracy		typ. 0.3° with shaft tolerance g6				
Pulse rate [ppr] 1)		**250, 360**	**1000**	**1024**	**2500**	**3600**
	max. speed min^{-1}	12000	2400	7000	3900	2700

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield 2)

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A / cosine signal
B, $\overline{B}$: Incremental output channel B / sine signal
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.
2) Shield is attached to connector housing.

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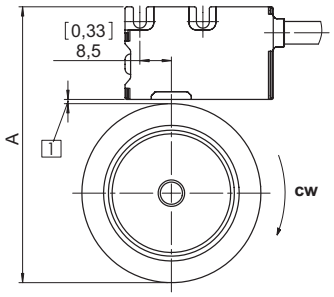
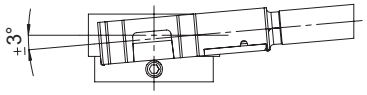
Incremental, standard magnetic | **RLI20 (hollow shaft)** | **Push-pull / RS422**

Mounting orientation and permissible mounting tolerances

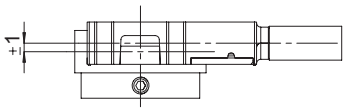
Distances



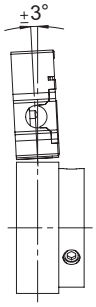
Torsion



Offset



Tilting



1 Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

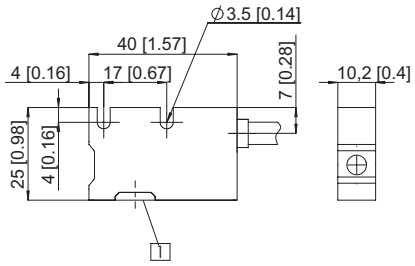
Pulse rate	A for distance sensor head / magnetic ring: = 0.4 [0.02]
250, 1000, 2500	56.4 [2.22]
1024	66.6 [2.62]
360, 3600	70.4 [2.77]

Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

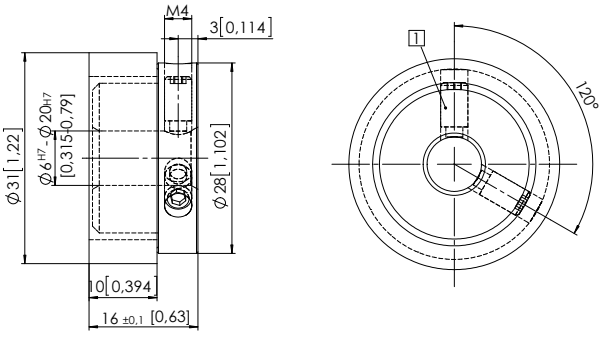
Dimensions

Dimensions in mm [inch]

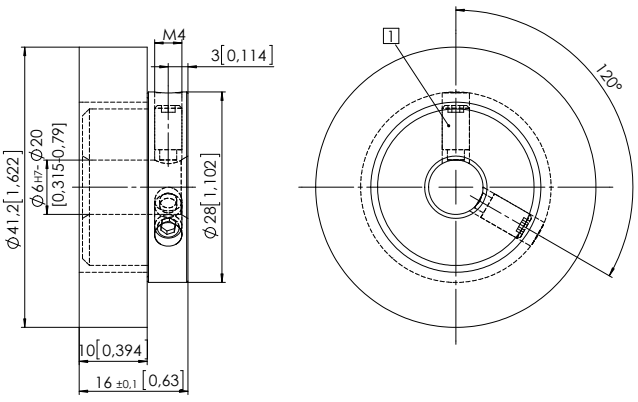
Sensor head



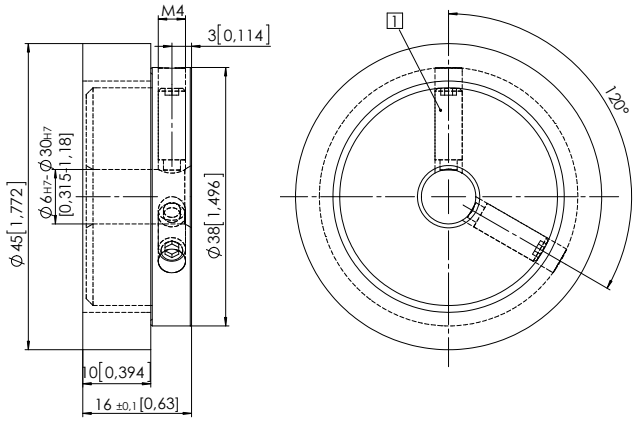
Magnetic ring for pulse rate 250, 1000 or 2500



Magnetic ring for pulse rate 1024



Magnetic ring for pulse rate 360 or 3600



1 Set screw M4 Recommended tolerance of the drive shaft diameter: g6

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Incremental, standard zero pulse, magnetic | **RLI50 (hollow shaft)** | **Push-pull / RS422**

Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RLI50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RLI20, a single zero pulse is also implemented here.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 35 mm.

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

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Order code RLI50

8.RLI50	.	X	1	X	X	.	XXXX	.	XXXX
Type		a		b	c		d		e

a *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b *Output circuit / Power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

c *Type of connection*
1 = radial cable, 2 m [6.56'] PUR
A = radial cable, special length PUR *)
*) Available special lengths (connection type A):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI50.111A.2000.0080.0030 (for cable length 3 m)

d *Pulses per revolution* 1)
1000, 1024, 2000, 2048, 3600

e *Bore diameter*
0060 = 6 mm [0.24"]
0080 = 8 mm [0.32"]
0100 = 10 mm [0.39"]
0120 = 12 mm [0.47"]
0150 = 15 mm [0.59"]
0158 = 5/8"
0200 = 20 mm [0.79"]
0250 = 25 mm [0.98"] 2)
0254 = 1" 2)
0300 = 30 mm [1.18"] 2)
0350 = 35 mm [1.34"] 3)

1) Other pulse rates on request.
2) Only possible for pulse rates 1024, 2048 and 3600.
3) Only possible for pulse rate 3600.

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Incremental, standard zero pulse, magnetic | **RLI50 (hollow shaft)** | **Push-pull / RS422**

Accessories / Display type 572

		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Protection	model 1	IP67 acc. to EN 60529
	model 2	IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s^2, 1 ms
Vibration resistance		300 m/s^2, 10 ... 2000 Hz
Pole gap		5 mm from pole to pole
Housing (sensor head)		aluminum
Cable		2 m [6.56'] long, PUR 8 x 0.14 mm^2 [AWG 26], shielded, may be used in trailing cable installations
Status LED	green	pulse index
	red	error; speed too high or magnetic fields too weak
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics

Output circuit		**RS422**	**Push-pull**
Power supply		4.8 ... 26 V DC	4.8 ... 30 V DC
Power consumption (no load)		typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA
Permissible load/channel		120 ohm	+/- 20 mA
Min. pulse edge interval		1 µs	1 µs
Signal level	HIGH	min. 2.5 V	min. +V - 2.0 V
	LOW	max. 0.5 V	max. 0.5 V
Reference signal		fixed	
System accuracy		typ. 0.3° with shaft tolerance g6	

Pulse rate [ppr] [1]	**1000**	**1024**	**2000**	**2048**	**3600**
max. speed min^{-1} without using zero pulse	9000	9000	4000	4000	2500
max. speed min^{-1} using zero pulse	3000	2000	3000	2000	1700

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield [2]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A / sine signal
B, $\overline{B}$: Incremental output channel B / cosine signal
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.
2) Shield is attached to connector housing.

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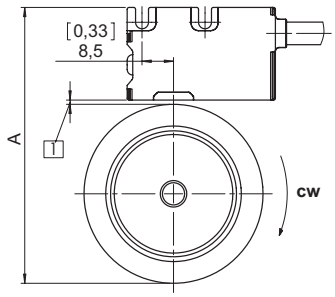
Incremental, standard zero pulse, magnetic | **RLI50 (hollow shaft)** | **Push-pull / RS422**

Mounting orientation and permissible mounting tolerances

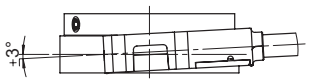
Distances



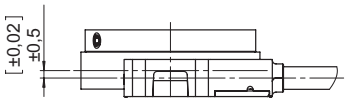
1 Distance sensor head / magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

Pulse rate	A for distance sensor head / magnetic ring = 1 [0.04]
1000, 2000	57.0 [2.24]
1024, 2048	74.3 [2.93]
3600	80.7 [3.18]

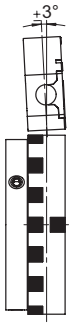
Torsion



Offset



Tilting

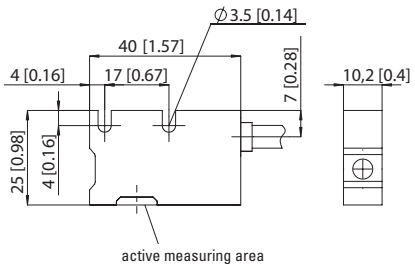


Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

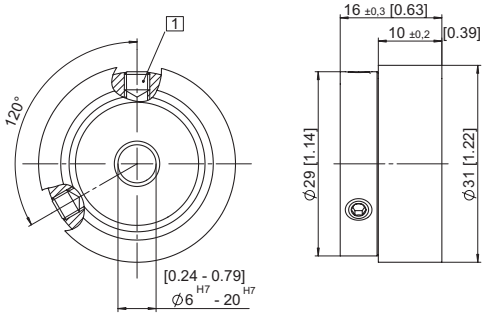
Dimensions

Dimensions in mm [inch]

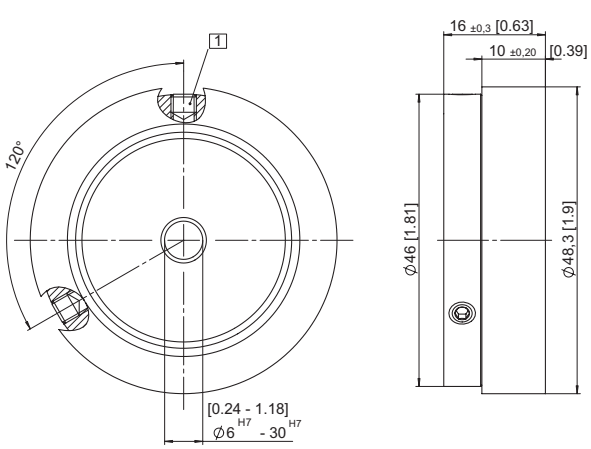
Sensor head



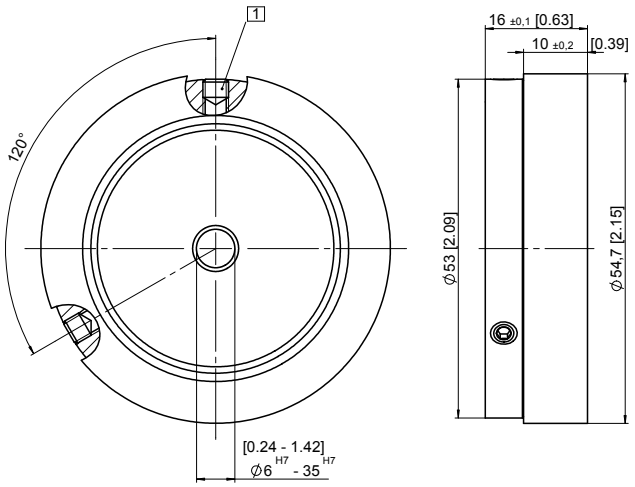
Magnetic ring for pulse rate 1000 or 2000



Magnetic ring for pulse rate 1024 or 2048



Magnetic ring for pulse rate 3600



1 M4 set screw

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Incremental, standard magnetic | **RI20 / Limes LI20 (hollow shaft)** | **Push-pull / RS422**

Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI20 / Limes LI20, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

For outdoor use with extremely sturdy aluminum housing and stainless steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

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

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

Selection guide magnetic ring RI20 / Limes LI20

Pulses per revolution [1] (further ppr on request)	Order code magnetic ring RI20	Order code sensor head Limes LI20	Max. rotational speed min^{-1} [2]
250	8.RI20.031.XXXX.111	8.LI20.11X1.2005	12 000
1 000	8.RI20.031.XXXX.111	8.LI20.11X1.2020	2 400
2 500	8.RI20.031.XXXX.111	8.LI20.11X1.2050	3 900
1 024	8.RI20.041.XXXX.111	8.LI20.11X1.2016	7 000
360	8.RI20.045.XXXX.111	8.LI20.11X1.2005	12 000
3 600	8.RI20.045.XXXX.111	8.LI20.11X1.2050	2 700

Order code Magnetic ring RI20

8.RI20	.	XXX	.	XXXX	.	111
Type		ⓐ		ⓑ		

Min. order quantity for non-stock types: 10 pieces

ⓐ *Outer diameter*
031 = 31 mm [1.22“]
041 = 41.2 mm [1.62“]
045 = 45 mm [1.77“]

ⓑ *Bore diameter*
0800 = 8 mm [0.32“]
1000 = 10 mm [0.39“]
1200 = 12 mm [0.47“]
1500 = 15 mm [0.59“]
1800 = 18 mm [0.71“]
2000 = 20 mm [0.79“]
2500 = 25 mm [0.98“] [3]
3000 = 30 mm [1.18“] [3]
0952 = 3/8“
1587 = 5/8“
2540 = 1“ [3]

Stock types
8.RI20.031.0800.111
8.RI20.031.1000.111
8.RI20.031.1200.111
8.RI20.031.1500.111
8.RI20.041.0800.111
8.RI20.045.1200.111
8.RI20.045.1500.111
8.RI20.045.2500.111
8.RI20.045.2540.111
8.RI20.045.3000.111

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters.
2) With an input frequency of the evaluation unit of 250 kHz.
3) Only possible for outer diameter 045.

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Bearingless encoders

Incremental, standard magnetic | **RI20 / Limes LI20 (hollow shaft)** | **Push-pull / RS422**

Order code Sensor head Limes LI20

8.LI20	.	X	1	X	X	.	2	XXX
Type		a		b	c		d	e

a *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b *Output circuit / power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

c *Type of connection*
1 = cable, 2 m [6.56'] PUR
A = radial cable, special length PUR *)
*) Available special lengths (connection type A): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.LI20.111A.2005.0030 (for cable length 3 m)

d *Reference signal*
2 = Index periodical

e *Interpolation factor*
005, 016, 020, 050

Stock types
8.LI20.1111.2005
8.LI20.1111.2020
8.LI20.1111.2050
8.LI20.1121.2005
8.LI20.1121.2020
8.LI20.1121.2050

Accessories / Display type 572

		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Protection	Model 1	IP67 acc. to EN 60529
	Model 2	IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s^2, 1 ms
Vibration resistance		300 m/s^2, 10 ... 2000 Hz
Pole gap		2 mm from pole to pole
Housing (sensor head)		aluminum
Cable		2 m [6.56'] long, PUR 8 x 0.14 mm^2 [AWG 26], shielded, may be used in trailing cable installations
Status LED	green	pulse-index
	red	error; speed too high or magnetic fields too weak (8.LI20.XXXX.X050 and 8.LI20.XXXX.X250)
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics

		RS422	Push-pull
Output circuit			
Power supply		4.8 ... 26 VDC	4.8 ... 30 VDC
Power consumption (no load)		typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA
Permissible load / channel		120 Ohm	+/- 20 mA
Min. pulse edge interval		1 µs	
Signal level	HIGH	min. 2.5 V	min. +V - 2.0 V
	LOW	max. 0.5 V	max. 0.5 V
Reference signal		index periodical	
System accuracy		typ. 0.3° with shaft tolerance g6	

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield [1]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A / cosine signal
B, $\overline{B}$: Incremental output channel B / sine signal
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) Shield is attached to connector housing.

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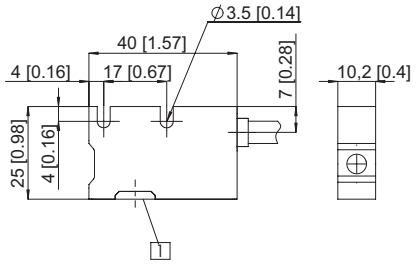
Incremental, standard magnetic | **RI20 / Limes LI20 (hollow shaft)** | **Push-pull / RS422**

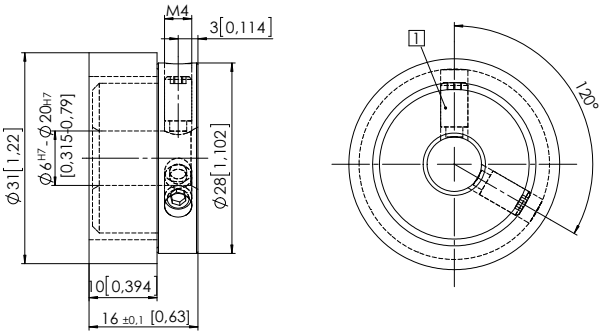
Dimensions

Dimensions in mm [inch]

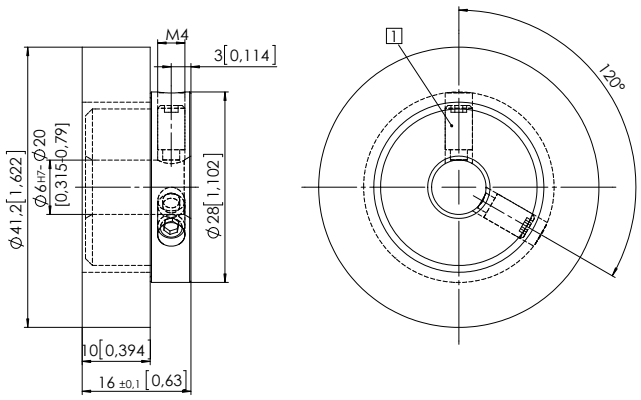
Sensor head Limes LI20



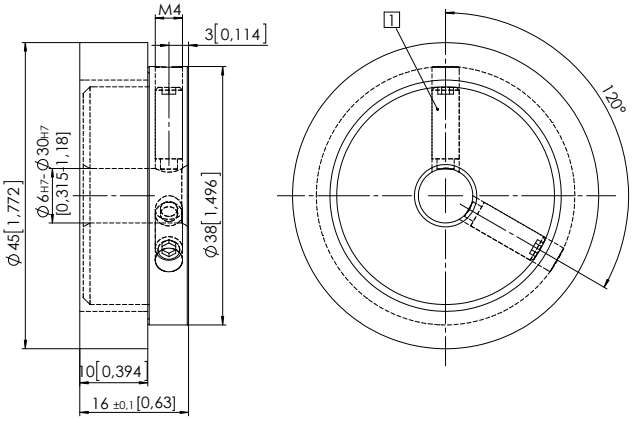
Magnetic ring, ø 31 [1.22], 8.RI20.031.XXXX.111



Magnetic ring, ø 41.2 [1.62], 8.RI20.041.XXXX.111



Magnetic ring, ø 45 [1.77], 8.RI20.045.XXXX.111

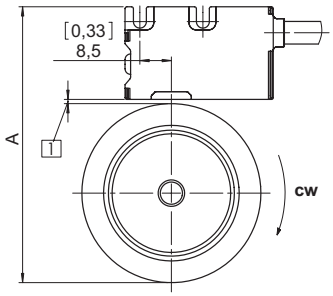


1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

Mounting orientation and permissible mounting tolerances

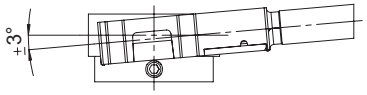
Distances



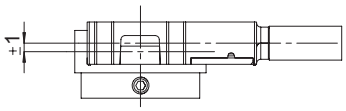
1 Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

Magnetic ring	A for distance sensor head / magnetic ring: = 0.4 [0.02]
8.RI20.031.XXXX.111	56.4 [2.22]
8.RI20.041.XXXX.111	66.6 [2.62]
8.RI20.045.XXXX.111	70.4 [2.77]

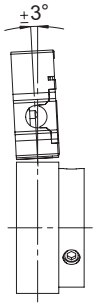
Torsion



Offset



Tilting



Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

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Incremental, standard zero pulse, magnetic | **RI50 / Limes LI50 (hollow shaft)** | **Push-pull / RS422**

Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI50 / Limes LI50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RI20 / Limes LI20, a single zero pulse is also implemented here.

For outdoor use with extremely sturdy aluminum housing and stainless steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

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

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Selection guide magnetic ring RI50 / Limes LI50

Pulse per revolution [1]	Order code magnetic ring RI50	Order code sensor head Limes LI50	Max. rotational speed min^{-1} (electronic) [2]	
			without using index signal	using index signal
1000	8.RI50.031.XXXX.112	8.LI50.11X1.1050	9000	3000
2000	8.RI50.031.XXXX.112	8.LI50.11X1.1100	4000	3000
1024	8.RI50.048.XXXX.112	8.LI50.11X1.1032	9000	2000
2048	8.RI50.048.XXXX.112	8.LI50.11X1.1064	4000	2000
3600	8.RI50.055.XXXX.112	8.LI50.11X1.1100	2500	1700

Order code Magnetic ring RI50

8.RI50	.	XXX	.	XXXX	.	112
Type		ⓐ		ⓑ		

Min. order quantity for non-stock types: 10 pieces

ⓐ *Outer diameter*
031 = 31 mm [1.22“]
048 = 48.3 mm [1.90“]
055 = 54.7 mm [2.15“]

ⓑ *Bore diameter*
0600 = 6 mm [0.24“]
0800 = 8 mm [0.32“]
1000 = 10 mm [0.39“]
1200 = 12 mm [0.47“]
1500 = 15 mm [0.59“]
2000 = 20 mm [0.79“]
2500 = 25 mm [0.98“] [3]
3000 = 30 mm [1.18“] [3]
3500 = 35 mm [1.34“] [4]
1587 = 5/8“
2540 = 1“ [3]

Stock types
8.RI50.048.2000.112

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters.
2) With an input frequency of the evaluation unit of 250 kHz.
3) Only possible for outer diameters 048 and 055.
4) Only possible for outer diameter 055.

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Incremental, standard zero pulse, magnetic | **RI50 / Limes LI50 (hollow shaft)** | **Push-pull / RS422**

Order code Sensor head Limes LI50

8.LI50 . X 1 X X . 1 XXX
Type
a b c d e

a *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b *Output circuit / Power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

c *Type of connection*
1 = radial cable, 2 m [6.56'] PUR
A = radial cable, special length PUR *)
*) Available special lengths (connection type A): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.LI50.111A.1032.0030 (for cable length 3 m)

d *Reference signal*
1 = separate index signal (linked with A and B)

e *Interpolation factor*
032, 050, 064, 100

Stock types
8.LI50.1121.1032

Accessories / Display type 572		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Protection	model 1 model 2	IP67 acc. to EN 60529 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s^2, 1 ms
Vibration resistance		300 m/s^2, 10 ... 2000 Hz
Pole gap		5 mm from pole to pole
Housing (sensor head)		aluminum
Cable		2 m [6.56'] long, PUR 8 x 0.14 mm^2 [AWG 26], shielded, may be used in trailing cable installations
Status LED	green red	pulse index error; speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics

		RS422	Push-Pull
Output circuit		**RS422**	**Push-Pull**
Power supply		4.8 ... 26 V DC	4.8 ... 30 V DC
Power consumption (no load)		typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA
Permissible load/channel		120 ohm	+/- 20 mA
Min. pulse edge interval		1 µs	1 µs
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Reference signal		fixed	
System accuracy		typ. 0.3° with shaft tolerance g6	

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield [1]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A / sine signal
B, $\overline{B}$: Incremental output channel B / cosine signal
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) Shield is attached to connector housing.

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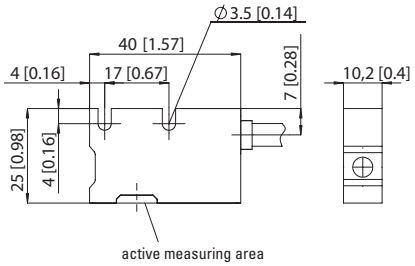
Incremental, standard zero pulse, magnetic | **RI50 / Limes LI50 (hollow shaft)** | **Push-pull / RS422**

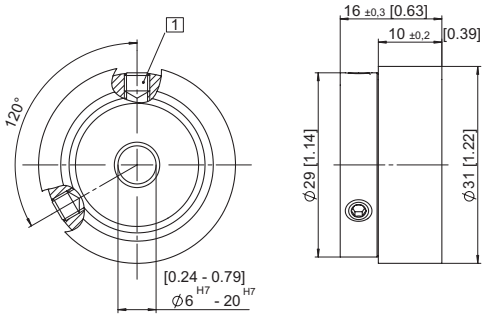
Dimensions

Dimensions in mm [inch]

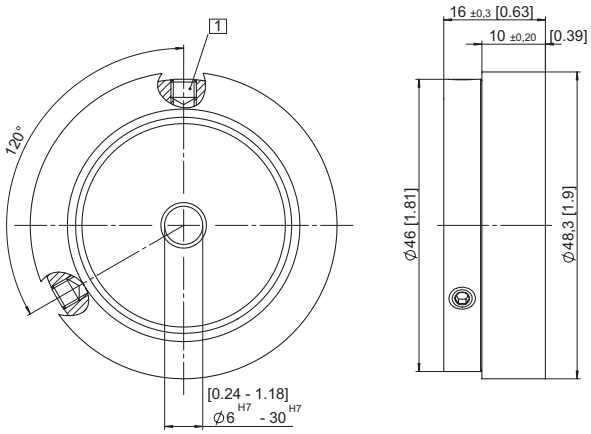
Sensor head Limes LI50



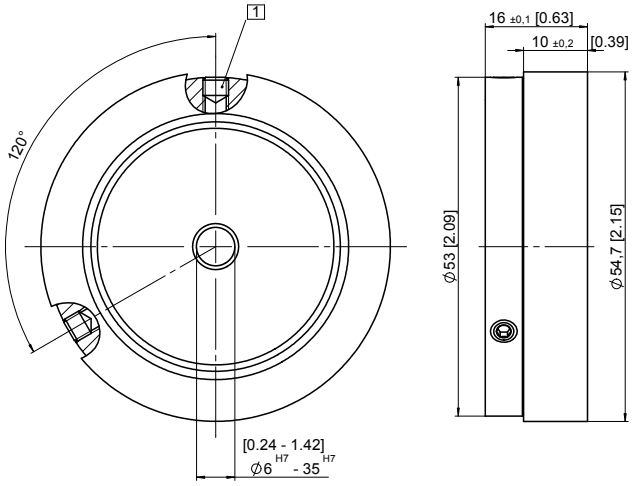
Magnetic ring, ø 31 [1.22], 8.RI50.031.XXXX.112



Magnetic ring, ø 48.3 [1.90], 8.RI50.048.XXXX.112



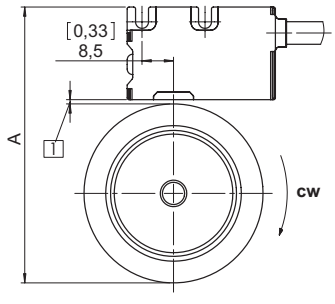
Magnetic ring, ø 54.7 [2.15], 8.RI50.055.XXXX.112



1 M4 Set screw

Mounting orientation and permissible mounting tolerances

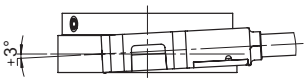
Distances



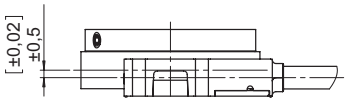
1 Distance sensor head / magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

Magnetic ring	A for distance sensor head / magnetic ring = 1 [0.04]
8.RI50.031.XXXX.112	57.0 [2.24]
8.RI50.048.XXXX.112	74.3 [2.93]
8.RI50.055.XXXX.112	80.7 [3.18]

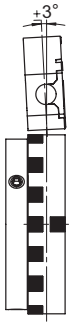
Torsion



Offset



Tilting



Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

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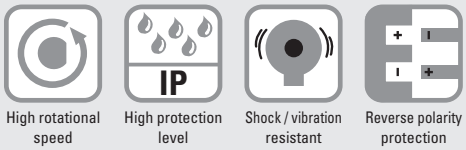
Incremental, large hollow shaft magnetic | **RLI200 (hollow shaft)** | **Push-pull / RS422**

Thanks to its installation depth of min. 10 mm, the bearingless magnetic rotary encoder RLI200, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.
This bearingless encoder can be mounted on shafts with a diameter up to max. 390 mm.



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

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

Order code RLI200

8.RLI200	.	X	X	1	X	X	.	XXXXX	.	XXXX
Type		a	b		c	d		e		f

a *Magnetic ring mounting method*
1 = Press fit
2 = Hub screw [1)]
3 = Screwed flange [1)]

b *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

c *Output circuit / Power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

d *Type of connection*
1 = radial cable, 2 m [6.56'] PUR
A = radial cable, special length PUR *)

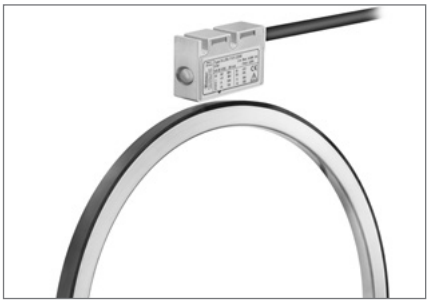
*) Available special lengths (connection type A):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI200.1111A.07000.0760.0030 (for cable length 3 m)

e *Pulses per revolution*
700, 2240, 2800, 7000 (for hollow shaft ø 76 mm)
1600, 5120, 6400, 16000 (for hollow shaft ø 180 mm)
(e.g.: 1600 pulses => 01600)

f *Hollow shaft diameter*
0760 = 76 mm [2.99"] [2)]
1800 = 180 mm [7.09"] [2)]

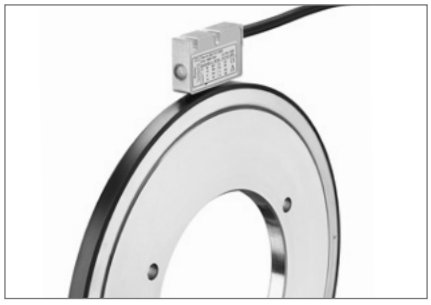
Optional on request
- other pulse rates
- other hollow shaft diameter (up to max. 390 mm)

Press fit



Hub screw

Screwed flange



1) On request.
2) With magnetic ring mounting method 2 or 3 on request.

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Incremental, large hollow shaft magnetic | RLI200 (hollow shaft) | Push-pull / RS422

Accessories / Display type 572		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Protection	Model 1 Model 2	IP67 acc. to EN 60529 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s^2, 1 ms
Vibration resistance		300 m/s^2, 10 ... 2000 Hz
Pole gap		2 mm from pole to pole
Housing (sensor head)		aluminum
Cable		2 m [6.56'] long, PUR 8 x 0.14 mm^2 [AWG 26], shielded, may be used in trailing cable installations
Status LED	green red	pulse-index error; speed too high or magnetic fields too weak
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics

Output circuit	**RS422**	**Push-pull**	
Power supply	4.8 ... 26 VDC	4.8 ... 30 VDC	
Power consumption (no load)	typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA	
Permissible load / channel	120 Ohm	+/- 20 mA	
Min. pulse edge interval	1 µs		
Signal level HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V	
Reference signal	index periodical		
System accuracy	typ. 0.3° with shaft tolerance g6		

Pulse rate [ppr] 1)	**700**	**2240**	**2800**	**7000**
max. speed min^{-1}	12000	6600	5300	2100
	1600	**5120**	**6400**	**16000**
max. speed min^{-1}	9300	2900	2300	900

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield 2)

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A / cosine signal
B, $\overline{B}$: Incremental output channel B / sine signal
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.
2) Shield is attached to connector housing.

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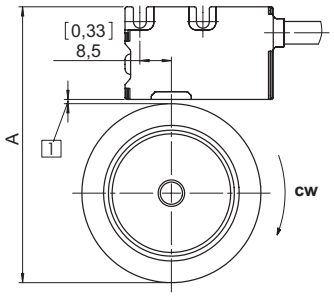
Incremental, large hollow shaft magnetic | RLI200 (hollow shaft) | Push-pull / RS422

Mounting orientation and permissible mounting tolerances

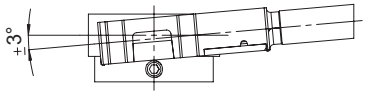
Distances



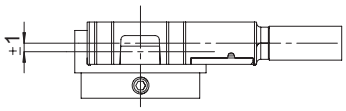
1 Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

Pulse rate	A for distance sensor head / magnetic ring = 0.4 mm [0.02]
700, 2240, 2800, 7000	112.5 [4.43]
1600, 5120, 6400, 16000	227.7 [8.96]

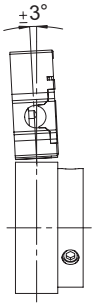
Torsion



Offset



Tilting

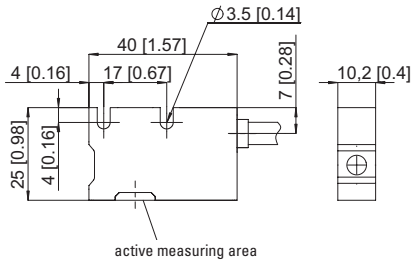


Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

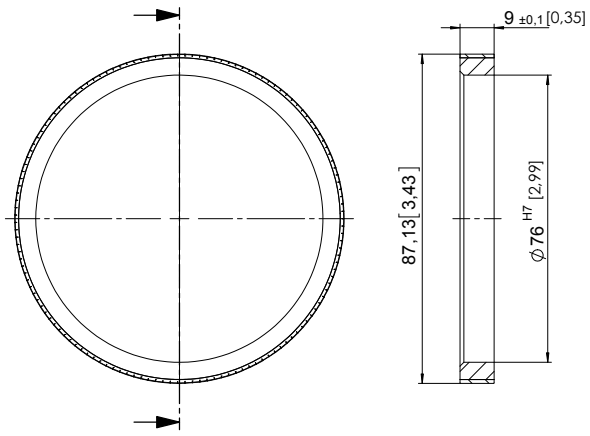
Dimensions

Dimensions in mm [inch]

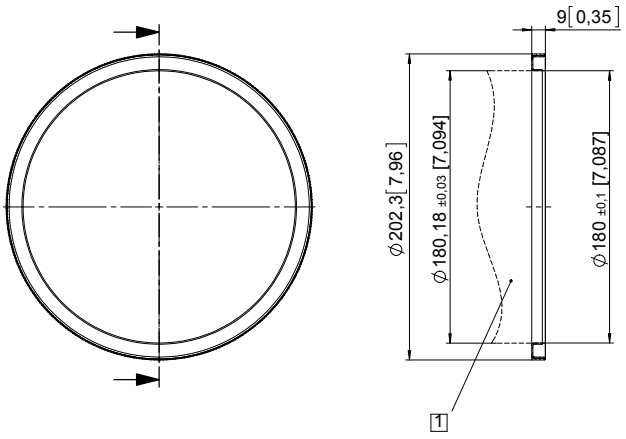
Sensor head



Magnetic ring (press fit) for pulse rate 700, 2240, 2800, 7000



Magnetic ring (press fit) for pulse rate 1600, 5120, 6400, 16000



1 Customer shaft

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Incremental, large hollow shaft zero pulse, magnetic | **RLI500 (hollow shaft)** | **Push-pull / RS422**

Thanks to its installation depth of min. 10 mm, the bearingless magnetic rotary encoder RLI500, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RLI200, a single zero pulse is also implemented here.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 350 mm.

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

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Order code RLI500

8.RLI500	.	X	X	1	X	X	.	XXXXX	.	0700
Type		a	b		c	d		e		f

a *Magnetic ring mounting method*
1 = Press fit [1)]
2 = Hub screw
3 = Screwed flange [1)]

b *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

c *Output circuit / Power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

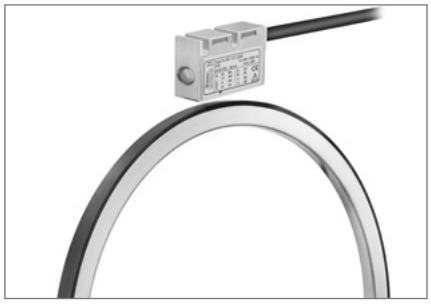
d *Type of connection*
1 = radial cable, 2 m [6.56'] PUR
A = radial cable, special length PUR *)
*) Available special lengths (connection type A):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI500.2112A.04096.0700.0030 (for cable length 3 m)

e *Pulses per revolution*
2048, 3200, 4096, 6400 (for hollow shaft ø 70 mm)
(e.g.: 2048 pulses => 02048)

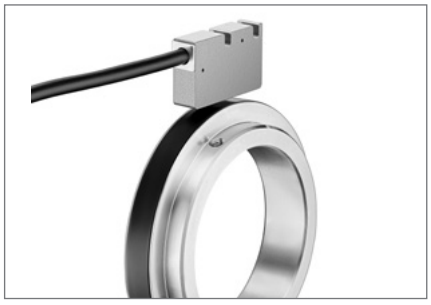
f *Hollow shaft diameter*
0700 = 70 mm [2.76"] [2)]

Optional on request
- other pulse rates
- other hollow shaft diameter (up to max. 350 mm)

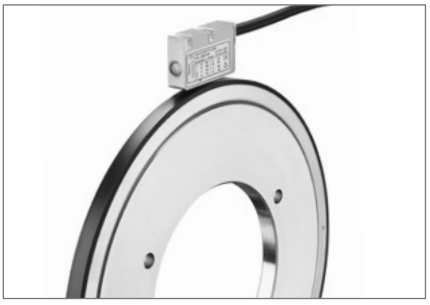
Press fit



Hub screw



Screwed flange



1) On request.
2) With magnetic ring mounting method 1 or 3 on request.

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Incremental, large hollow shaft zero pulse, magnetic | RLI500 (hollow shaft) | Push-pull / RS422

Accessories / Display type 572		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs and serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics

Maximum speed		12000 min^{-1}
Protection	model 1 model 2	IP67 acc. to EN 60529 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s^2, 1 ms
Vibration resistance		300 m/s^2, 10 ... 2000 Hz
Pole gap		5 mm from pole to pole
Housing (sensor head)		aluminum
Cable		2 m [6.56'] long, PUR 8 x 0.14 mm^2 [AWG 26], shielded, may be used in trailing cable installations
Status LED	green red	pulse index error; speed too high or magnetic fields too weak
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics

Output circuit		**RS422**	**Push-pull**
Power supply		4.8 ... 26 V DC	4.8 ... 30 V DC
Power consumption (no load)		typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA
Permissible load/channel		120 ohm	+/- 20 mA
Min. pulse edge interval		1 µs	1 µs
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Reference signal		fixed	
System accuracy		typ. 0.3° with shaft tolerance g6	

Pulse rate [ppr] 1)	**2048**	**3200**	**4096**	**6400**
max. speed min^{-1}	7300	4600	3600	2300

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield 2)

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A / sine signal
B, $\overline{B}$: Incremental output channel B / cosine signal
0, $\overline{0}$: Reference signal
⏚: Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.
2) Shield is attached to connector housing.

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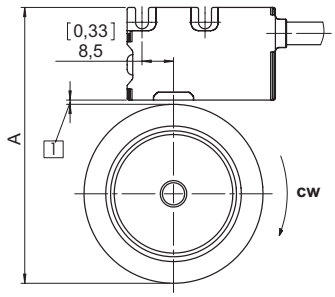
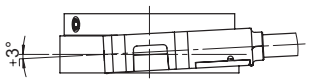
Incremental, large hollow shaft zero pulse, magnetic | RLI500 (hollow shaft) | Push-pull / RS422

Mounting orientation and permissible mounting tolerances

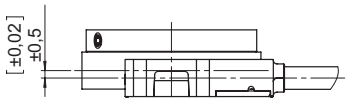
Distances



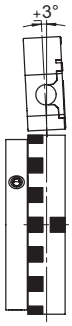
Torsion



Offset



Tilting



1 Distance sensor head / magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

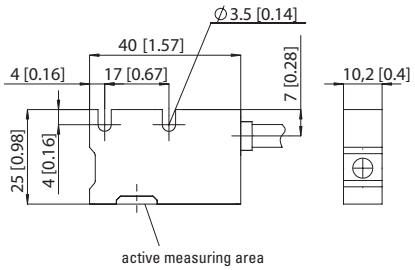
Impulsions par tour	A for distance sensor head / magnetic ring = 1 mm [0.04]
2048, 3200, 4096, 6400	128.0 [5.04]

Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

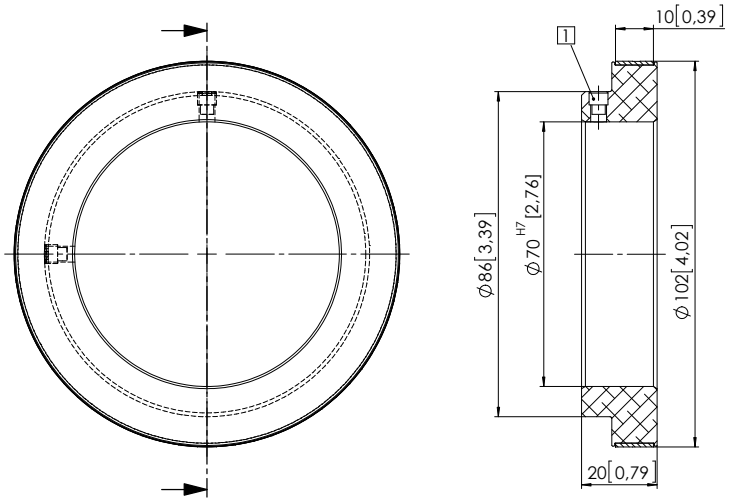
Dimensions

Dimensions in mm [inch]

Sensor head



Magnetic ring (hub screw) pulse rate 2048. 3200, 4096, 6400



1 M5 set screw M4

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Absolut, standard singleturn, magnetic | **RLA50 (hollow shaft)** | **SSI / CANopen**

Thanks to its installation depth of only 20 mm, the bearingless magnetic rotary encoder RLA50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

This bearingless encoder can be mounted on shafts with a diameter of 30 mm.

RoHS SSI CANopen

High rotational speed | Protection level | Shock / vibration resistant | Reverse polarity protection | Temperature range

Powerful

- High shock and vibration resistance.
- Non-contact measuring system, free from wear, ensures a long service life.
- High resolution, 16,000 measuring steps/revolution.
- Direct measurement on shaft or axis.

Fast start-up

- Distance monitoring by LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Connection by M12 connector.

Order code

8.RLA50	.	1	3	1	X	2	.	16000	.	0300
Type		a	b	c	d	e		f		g

a *Magnetic ring mounting method*
1 = Press fit

b *Model*
3 = IP50

c *Number of poles*
1 = 32 pols, pole length 5 mm [0.2"]

d *Interface*
1 = SSI
3 = CANopen

e *Type of connection*
2 = M12 connector, 12-pin

f *Measuring steps per revolution*
16000

g *Bore diameter*
0300 = 30 mm

Optional on request
- other bore diameters
- other number of measuring steps
- additional incremental signals (HTL, TTL or SinCos)

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut, 12 pin, A coded	**8.0000.5162.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 12 pin, 5 m [16.4'] PUR cable 6 x 2 x 0.14 mm² [AWG 26]	**05.00.60B1.B211.005M**

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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Absolut, standard singleturn, magnetic | **RLA50 (hollow shaft)** | **SSI / CANopen**

Technical data

Mechanical characteristics

Maximum speed	1000 min^{-1}
Working temperature	-10°C ... +70°C [+14°F ... +158°F] (non condensing)
Storage temperature	-25°C ... +85°C [-13°F ... +185°F]
Protection acc. to EN 60529	IP50
Housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27	5000 m/s², 1 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s², 10 ... 2000 Hz
Distance sensor head / magnetic band	0.5 ... 1.0 mm (recommended 0.8 mm)
Type of connection (standard)	M12 connector, 12-pin

Electrical characteristics

Power supply	10 ... 30 V DC ±10 %
Residual ripple	< 10 %
Current consumption	max. 150 mA
Reverse polarity protection	yes
Short circuit proof	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Accuracy

Measuring principle	absolute
System accuracy at 20°C [+68°F]	±0.35°
Repeat accuracy	±1 increment
Resolution	0.0225°
LED, red	lights up when distance too large

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. ±20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Clock rate		25 bit (24 + 1 failurebit for distance)
Code		binary / gray (default) switchable
SSI clock rate		80 kHz ... 0.4 MHz
Monoflop time		≤ 40 µs
Data refresh rate		≤ 250 µs

CANopen interface

Interface	CAN High-Speed acc. to ISO 11898, Basic and Full CAN, CAN specification 2.0 B
Protocol	CANopen
Baud rate	250 kbit/s; 125 ... 1000 kbit/s configurable
Termination	software configurable
Node address	1 ... 15 configurable (default 1)
LSS protocol	CIA LSS protocol DS305 global command support for node address and baud rate selective commands via attributes of the identity object

Terminal assignment sensor head

Interface	Type of connection	M12 connector, 12-pin											
1	2	Signal:	0 V	+V	C+	C-	D+	D-	–	–	–	–	–
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

Interface	Type of connection	M12 connector, 12-pin											
3	2	Signal:	0 V	+V	CAN_L	CAN_H	–	–	–	–	–	–	–	–
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal

Terminal assignment connection cable (accessory)

Connection cable color assignment with M12 female connector	Connection cable with M12 connector, 12 pin (accessory) – 05.00.60B1.B211.005M												
	Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU
	Pin:	1	2	3	4	5	6	7	8	9	10	11	12

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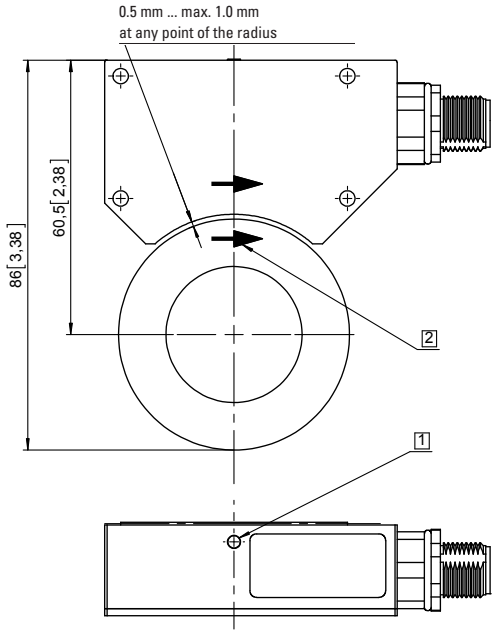
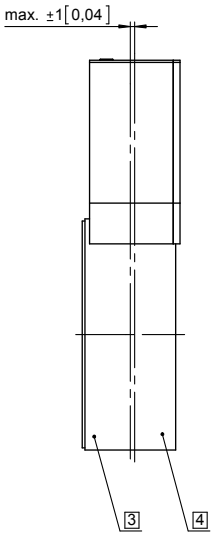
Absolut, standard singleturn, magnetic | **RLA50 (hollow shaft)** | **SSI / CANopen**

Mounting position and permissible mounting tolerances

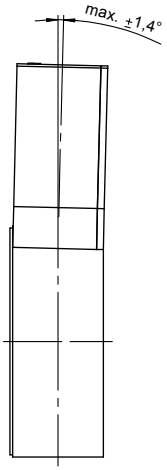
Sensor distance



Offset



Tilting

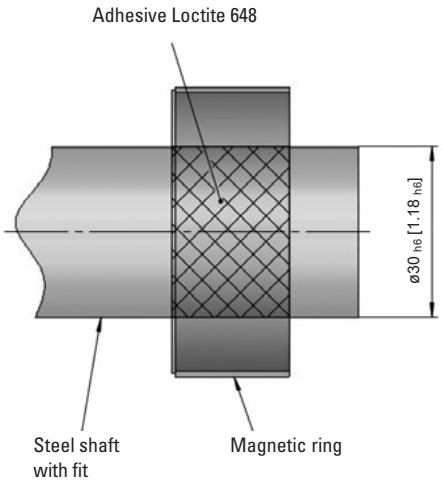


1 LED for distance monitoring
2 Direction arrows for the assembly
3 Fine interpolation track
4 Absolute track

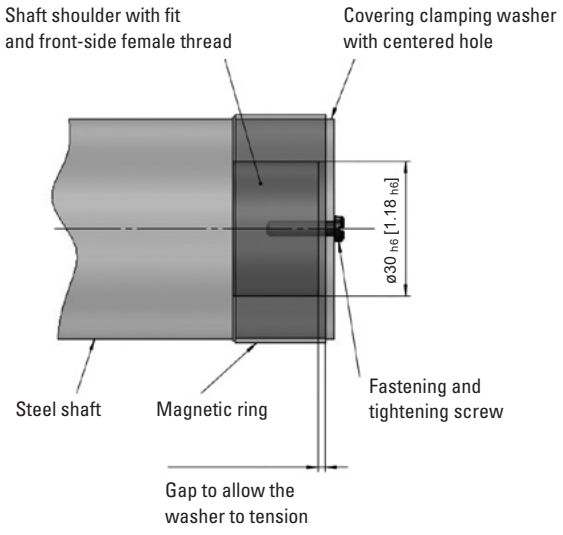
Caution: imperatively comply with the mounting position of the sensor head with respect to the magnetic ring!

Mounting recommendation

Glued assembly



Screwed assembly



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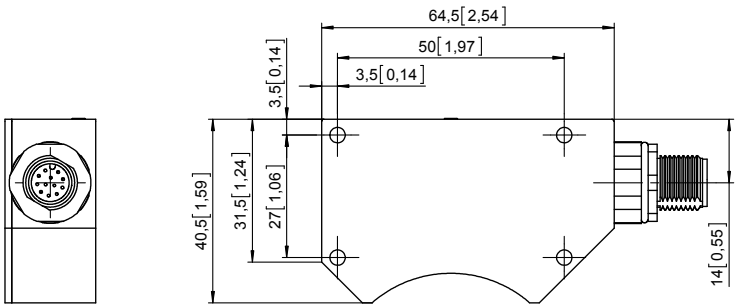
Absolut, standard singleturn, magnetic | **RLA50 (hollow shaft)** | **SSI / CANopen**

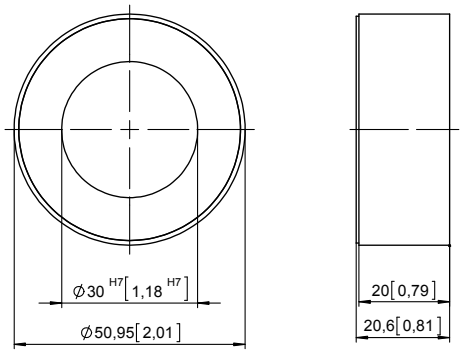
Dimensions

Dimensions in mm [inch]

Sensor head



Magnetic ring



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Linear measuring technology

		Type	Description	Page
Incremental magnetic measurement system	Sensor head, magnetic band	Limes LI20 / B1	Resolution min. 10 µm	**500**
	Sensor head, magnetic band	Limes LI50 / B2	Resolution min. 5 µm	**503**
Absolute magnetic measurement system	Sensor head, magnetic band	Limes LA10 / BA1	Resolution min. 1 µm	**506**
	Sensor head, magnetic band	Limes LA50 / BA5	Resolution min. 10 µm	**510**
Draw wire mechanics	With analog sensor	Draw wire encoder A30	Measuring length max. 0.6 m	**514**
	With analog sensor	Draw wire encoder A40	Measuring length max. 1 m	**516**
	With encoder or analog sensor	Draw wire encoder A50	Measuring length max. 1.25 m	**518**
	With incremental encoder	Draw wire encoder A40	Measuring length max. 2 m	**523**
	With analog sensor	Draw wire encoder A41	Measuring length max. 2 m	**516**
	With absolute encoder	Draw wire encoder A41	Measuring length max. 2 m	**525**
	With encoder or analog sensor	Draw wire encoder B75	Measuring length max. 3 m	**528**
	With encoder or analog sensor	Draw wire encoder B80	Measuring length max. 3 m	**532**
	With encoder	Draw wire encoder C105	Measuring length max. 6 m	**538**
	With encoder or analog sensor	Draw wire encoder C120	Measuring length max. 6 m	**541**
	For outdoor applications	new Draw wire encoder D120	Measuring length max. 10 m	**547**
	With encoder or analog sensor	Draw wire encoder D135	Measuring length max. 42.5 m	**554**
Lift measuring system	For shaft-copying	Encoder mounting fixture, guided-belt, LM3	Max. height 53 m	**561**
Length measuring kit	With spring encoder arm	new Limes Kit TB1	Measuring length max. 400 m	**563**
	With encoder / preset counter	With rack and pinion	Incremental / absolute	**567**
	With encoder / preset counter	Measuring wheelsystem	Incremental / absolute	**568**
	With encoder	Mini measurement system	Incremental	**569**
	Flexible fastening	Spring encoder arm		**570**
	Measuring wheels	Various wheel coatings		**571**

Incremental magnetic measurement system sensor head, magnetic band | Limes LI20 / B1 | Resolution min. 10 µm

The non-contact incremental magnetic linear measurement system Limes LI20 / B1 - made up of the sensor head LI20 and of the magnetic band B1 - reaches a resolution up to 10 µm with a maximum distance of 1 mm between the sensor and the band.

For outdoor use with extremely sturdy aluminum housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encap-sulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

Temperature range | High protection level | Shock / vibration resistant | Reverse polarity protection

Robust

- Sturdy housing with IP67 protection.
  Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system – free from wear.
- Masking tape protecting the magnetic band.

Easy installation

- Simple glued assembly of the magnetic band.
- Large mounting tolerances.
- Requires very little installation space.
- Warning signals via LED if the magnetic field is too weak.

Order code sensor head Limes LI20

8.LI20	.	X	1	X	1	.	2	XXX
Type		a	b	c	d		e	f

a *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b *Pulse edge interval*
1 = standard

c *Output circuit / power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

d *Type of connection*
1 = cable, 2 m [6.56'] PUR

e *Reference signal*
2 = index periodic

f *Code (resolution)* [1)]
005 = 100 µm
020 = 25 µm
050 = 10 µm

Stock types
8.LI20.1111.2005
8.LI20.1111.2020
8.LI20.1111.2050
8.LI20.1121.2005
8.LI20.1121.2020
8.LI20.1121.2050

Order code magnetic band Limes B1

8.B1	.	10	.	010	.	XXXX
Type		a				b

a *Width*
10 = 10 mm

b *Length*
0010 = 1 m
0020 = 2 m
0040 = 4 m
0050 = 5 m
0060 = 6 m
0100 = 10 m
0200 = 20 m

Optional on request
- other lengths up to 70 m

Stock types
8.B1.10.010.0010

1) With quadruple evaluation (only connected with magnetic band Limes B1)

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Incremental magnetic measurement system sensor head, magnetic band | Limes LI20 / B1 | Resolution min. 10 µm

Accessories / display type 572

		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs, serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs, serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Sensor head Limes LI20

Output circuit	Push-pull	RS422
Power supply	4.8 ... 30 V DC	4.8 ... 26 V DC
Permissible load / channel	±20 mA	120 Ω
Max. cable length	max. 30 m [98.43']	RS422 standard
Power consumption (no load)	typ. 25 mA, max. 60 mA	
Short circuit proof [1]	yes	yes [2]
Min. pulse edge interval	1 µs (corresponds to 4 µs/cycle see signal figures below)	
Output signal	A, $\overline{A}$, B, $\overline{B}$, 0, $\overline{0}$	
Reference signal	index periodical	

Accuracy

System accuracy:	typ. +200 µm, max. ± (0.04 + 0.02 x L) mm (L in [m], up to L = 70 m, at T = 20°C [+68°F] and gap sensor head/magnetic band = 0.4 mm)
Repeat accuracy	±1 increment
Resolution and speed [3]	100 µm (quadruple), max. 25 m/s 25 µm (quadruple), max. 4 m/s 10 µm (quadruple), max. 6.5 m/s

Permissible alignment tolerance (see draft „mounting tolerances")

Gap sensor head / magnetic band	0.1 ... 1.0 mm, recommended 0.4 mm
Offset	max. ±1 mm
Tilting	max. 3°
Torsion	max. 3°

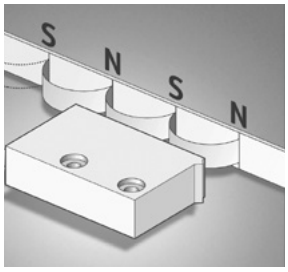
General data

Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s², 1 ms
Vibration resistance		300 m/s², 10 ... 2000 Hz
Protection	model 1 model 2	IP67 acc. to EN 60529 IP68 / IP69k acc. to EN 60529 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Housing		aluminum
Cable		2 m [6.56'] PUR 8 x 0.14 mm² [AWG25] shielded, may be used in trailing cable installations
Status LED	green red	pulse-index error; speed too high or magnetic fields too weak (8.LI20.XXXX.X020 and 8.LI20.XXXX.X050)
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Magnetic band Limes B1

Pole gap		2 mm from pole to pole
Dimensions	width thickness	10 mm 1.97 mm incl. masking tape
Temperature coefficient		16 x 10^{-6}/K
Working temperature		-20°C ... +80°C [-4°F ... +176°F] -20°C ... +65°C [-4°F ... +144°F] (when mounted solely with adhesive tape)
Storage temperature		-20°C ... +80°C [-4°F ... +176°F]
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		≥ 150 mm (when mounted solely with adhesive tape)
Material metal tape		precision steel strip 1.4404 acc. to EN 10088-3

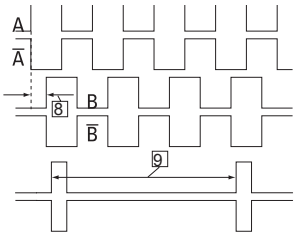
Function principle



Signal figures

[8] Pulse edge interval:
Pay attention to the instructions in the technical data

[9] Periodic index signal every 2 mm [0.08"] ;
the logical assignment A, B and 0-signal can change



1) If power supply 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) At the listed rotational speed the min. pulse edge interval is 1 µs, 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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Incremental magnetic measurement system sensor head, magnetic band | Limes LI20 / B1 | Resolution min. 10 µm

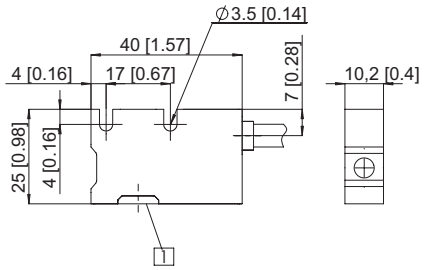
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield [1]

Dimensions

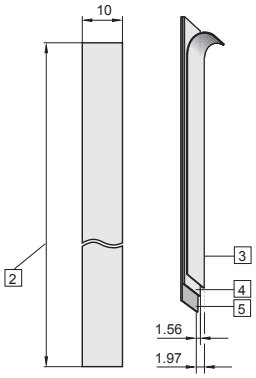
Dimensions in mm [inch]

Sensor head Limes LI20



1 Active measuring area

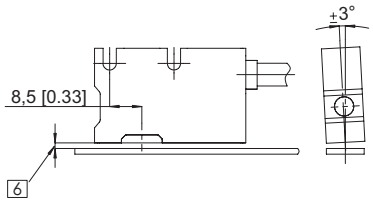
Magnetic band Limes B1



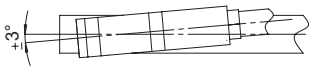
2 Length L, max. 70 m
3 Masking tape
4 Magnetic band
5 Carrier band

Permissible mounting tolerances

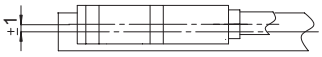
Tilting



Torsion



Offset



6 Distance sensor head / magnetic band:
0.1 ... 1.0 mm (recommended 0.4 mm)

1) Shield is attached to connector housing

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Incremental magnetic measurement system sensor head, magnetic band | Limes LI50 / B2 | Resolution min. 5 µm

The non-contact incremental magnetic linear measurement system Limes LI50 / B2 - made up of the sensor head LI50 and of the magnetic band B2 - reaches a resolution up to 5 µm with a maximum distance of 2 mm between the sensor and the band.

For outdoor use with extremely sturdy aluminum housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

Temperature range | High protection level | Shock / vibration resistant | Reverse polarity protection

Robust

- Sturdy housing with IP67 protection.
  Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system – free from wear.
- Masking tape protecting the magnetic band.

Easy installation

- Simple glued assembly of the magnetic tape.
- Large mounting tolerances.
- Requires very little installation space.
- Warning signals via status LED if the magnetic field is too weak.

Order code sensor head Limes LI50

8.LI50	.	X	1	X	1	.	2	XXX
Type		a	b	c	d		e	f

a *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b *Pulse edge interval*
1 = standard

c *Output circuit / power supply*
1 = RS422 / 4.8 ... 26 V DC
2 = Push-pull / 4.8 ... 30 V DC

d *Type of connection*
1 = cable, 2 m [6.56'] PUR

e *Reference signal*
2 = index periodic

f *Code (resolution)* [1)]
050 = 25 µm
250 = 5 µm

Stock types
8.LI50.1111.2050
8.LI50.1111.2250
8.LI50.1121.2050
8.LI50.1121.2250

Order code magnetic band Limes B2

8.B2	.	10	.	010	.	XXXX
Type		a				b

a *Width*
10 = 10 mm

b *Length*
0010 = 1 m
0020 = 2 m
0040 = 4 m
0050 = 5 m
0060 = 6 m
0100 = 10 m
0200 = 20 m

Optional on request
- other lengths up to 70 m

Stock types
8.B2.10.010.0020

1) With quadruple evaluation (only connected with magnetic band Limes B2)

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Incremental magnetic measurement system sensor head, magnetic band | Limes LI50 / B2 | Resolution min. 5 µm

Accessories / Display type 572		Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface	**6.572.0116.D05**
	with 4 fast switch outputs, serial interface and scalable analog output	**6.572.0116.D95**
Position display, 8-digit	with 4 fast switch outputs and serial interface	**6.572.0118.D05**
	with 4 fast switch outputs, serial interface and scalable analog output	**6.572.0118.D95**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Sensor head Limes LI50

Output circuit	Push-pull	RS422
Power supply	4.8 ... 30 V DC	4.8 ... 26 V DC
Permissible load / channel	±20 mA	120 Ω
Max. cable length	max. 30 m	RS422 standard
Power consumption (no load)	typ. 25 mA, max. 60 mA	
Short circuit proof [1]	yes	yes [2]
Min. pulse edge interval	1 µs (corresponds to 4 µs/cycle see signal figures below)	
Output signal	A, $\overline{A}$, B, $\overline{B}$, 0, $\overline{0}$	
Reference signal	index periodical	

Accuracy

System accuracy	typ. +200 µm, max. ± (0.06 + 0.02 x L) mm (L in [m], up to L = 70 m, at T = 20°C [+68°F] and gap sensor head/magnetic band = 1.0 mm)
Repeat accuracy	±1 increment
Resolution and speed [3]	25 µm (quadruple), max. 16.25 m/s 5 µm (quadruple), max. 3.25 m/s

Permissible alignment tolerance (see draft „mounting tolerances“)

Gap sensor head / magnetic band	0.1 ... 2.0 mm, 1.0 mm recommended
Offset	max. ±1 mm [0.4“]
Tilting	max. 3°
Torsion	max. 3°

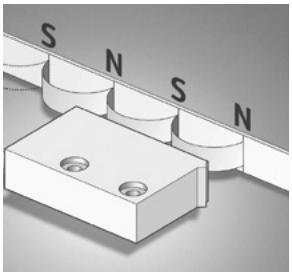
General data

Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Shock resistance		5000 m/s², 1 ms
Vibration resistance		300 m/s², 10 ... 2000 Hz
Protection	model 1 model 2	IP67 acc. to EN 60529 IP68 / IP69k acc. to EN 60529 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Housing		aluminum
Cable		2 m [6.56‘] PUR 8 x 0.14 mm² [AWG 25] shielded, may be used in trailing cable installations
Status LED	green red	pulse-index error; speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Magnetic band Limes B2

Pole gap		5 mm from pole to pole
Dimensions	width thickness	10 mm 1.97 mm incl. masking tape
Temperature coefficient		16 x 10^{-6}/K
Working temperature		-20°C ... +80°C [-4°F ... +176°F] -20°C ... +65°C [-4°F ... +144°F] (when mounted solely with adhesive tape)
Storage temperature		-20°C ... +80°C [-4°F ... +176°F]
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		≥ 150 mm (when mounted solely with adhesive tape)
Material metal tape		precision steel strip 1.4404 acc. to EN 10088-3

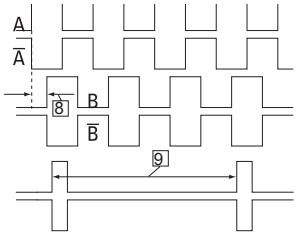
Function principle



Signal figures

[8] Pulse edge interval:
pay attention to the instructions in the technical data

[9] Periodic index signal
every 5 mm [0.20“];
the logical assignment A, B and 0-Signal can change



1) If power supply 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) At the listed rotational speed the min. pulse edge interval is 1 µs, 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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Incremental magnetic measurement system sensor head, magnetic band | Limes LI50 / B2 | Resolution min. 5 µm

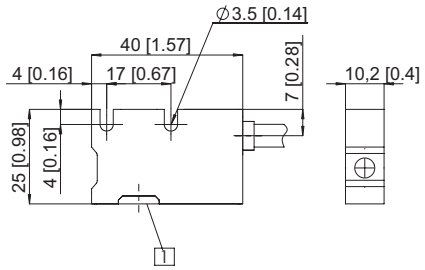
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	shield [1]

Dimensions

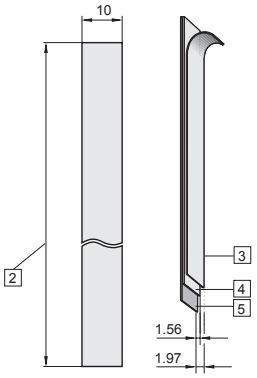
Dimensions in mm [inch]

Sensor head Limes LI50



1 Active measuring area

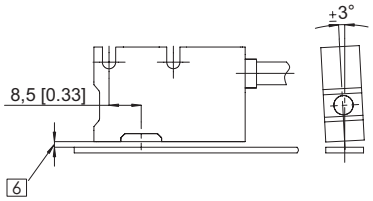
Magnetic band Limes B2



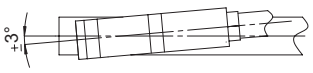
2 Length L, max. 70 m
3 Masking tape
4 Magnetic band
5 Carrier band

Permissible mounting tolerances

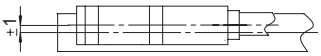
Tilting



Torsion



Offset



6 Distance sensor head / magnetic band:
0.1 ... 2.0 mm (recommended 1 mm)

1) PH = Shield is attached to connector housing.

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Absolute magnetic measurement system sensor head, magnetic

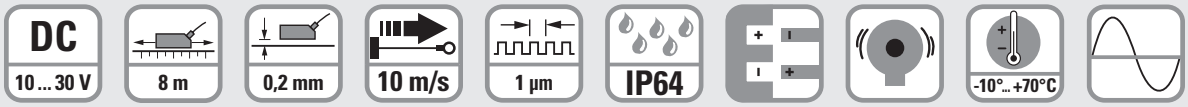
Limes LA10 / BA1

Measuring length max. 8 m
Resolution min. 1 µm

The non-contact absolute magnetic linear measurement system Limes LA10 / BA1 - made up of the sensor head LA10 and of the magnetic band BA1 - reaches a resolution up to 1 µm with a maximum distance of 0.2 mm between the sensor and the band (incl. masking tape).

The additional SinCos interface makes the measurement system LA10 / BA1 the optimal equipment for use in the linear drive technology.

RoHS SSI CANopen



Robust and versatile

- High resolution - 1µm / measuring length max. 8 m.
- Non-contact magnetic absolute measuring technology – therefore no wear – no referencing movement required.
- Sturdy housing with IP64 protection.
- For highly dynamic control.
- Optional SinCos signal (1 Vpp) for dynamic movement control with 1 mm pole pitch.
- Masking tape protecting the magnetic band.

Easy installation

- Simple glued assembly of the magnetic band.
- Requires very little installation space.
- Robust measuring principle – insensitive to dirt, smoke and humidity.

Order code sensor head Limes LA10

8.LA10 . 1 2 X 2
Type — a b c d

a *Model*
1 = IP64, standard

b *baud rate*
2 = standard (CANopen, 250 k)

c *Output circuit / Power supply*
1 = SSI, 25 bit Gray-Code / 10 ... 30 V DC
2 = SSI, 25 bit Gray-Code, SinCos 1 Vpp / 10 ... 30 V DC
3 = CANopen, without bus terminating resistor / 10 ... 30 V DC
4 = CANopen, with bus terminating resistor / 10 ... 30 V DC
5 = CANopen, SinCos 1 Vpp, without bus terminating resistor / 10 ... 30 V DC
6 = CANopen, SinCos 1 Vpp, with bus terminating resistor / 10 ... 30 V DC

d *Type of connection*
2 = standard, M12 connector, 12 pin

Stock types
8.LA10.1212 8.LA10.1232
8.LA10.1242

Scope of delivery
sensor head + spacing template

Order code magnetic band Limes BA1

8.BA1 . 10 . 010 . XXXX
Type — a — b

a *Width*
10 = 10 mm

b *Length (measuring range = length - 0.1 m)*
0005 = 0.5 m 0040 = 4 m
0010 = 1 m 0060 = 6 m
0020 = 2 m 0080 = 8 m
0030 = 3 m

Optional on request
- other lengths

Stock types
8.BA11.10.010.0080

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Absolute magnetic measurement system sensor head, magnetic band | Limes LA10 / BA1 | Measuring length max. 8 m Resolution min. 1 µm

Accessories		Order no.
SSI display type 570 Position display, 6-digit	with 2 relay outputs and serial interface DC power supply	**0.570.010.305**
	with 2 fast switch outputs AC/DC power supply	**0.570.011.E00**
	with scalable analog output AC/DC power supply	**0.570.012.E90**
	RS232 / RS485 interface AC/DC power supply	**0.570.012.E05**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut, 12 pin, A coded	**8.0000.5162.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 12 pin, 5 m [16.4'] PUR cable 6 x 2 x 0.14 mm² [AWG 26]	**05.00.60B1.B211.005M**
Unprepared cable, cut to length	6 x 2 x 0.14 mm² [AWG 26] PVC cable	**8.0000.6900.XXXX** 1)
	6 x 2 x 0.14 mm² [AWG 26] PUR cable	**8.0000.6Y00.XXXX** 1)
	5 x 2 x 0.14 mm² [AWG 26] PVC cable	**8.0000.6Z00.XXXX** 1)

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Weight	approx. 0.1 kg [3.53 oz]
Working temperature	-10°C ... +70°C [+14°F ... +158°F] (non condensing)
Storage temperature	-25°C ... +85°C [-13°F ... +185°F]
Protection acc. to EN 60529	IP64
Housing	aluminum
Max. traverse speed SinCos reading permanent absolute positions reading	 10 m/s 1 m/s
Shock resistance acc. to EN 60068-2-27	5000 m/s², 1 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s², 10 ... 2000 Hz
Distance sensor head / magnetic band	0.01 ... 0.2 mm incl. masking tape (recommended 0.2 mm)
Measuring length	max. 8 m
Type of connection (standard)	M12 connector, 12 pin

Electrical characteristics

Power supply	10 ... 30 V DC ±10%
Residual ripple	< 10 %
Current consumption	max. 150 mA
Reverse polarity protection	yes
Short circuit proof	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Accuracy

Measuring principle	absolute + incremental (option)
System accuracy at 20°C [+68°F]	max. ± (10 + 20 x L) µ m L = measuring length in meters
Repeat accuracy	±1 increment
Resolution	0.001 mm
LED, red	lights up when distance too large

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. ±20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Clock rate		25 bit (24 + 1 failurebit for distance)
Code		Gray
SSI clock rate		80 kHz ... 0.4 MHz
Monoflop time		≤ 40 µs
Data refresh rate		≤ 250 µs

CANopen interface

Interface	CAN High-Speed acc. to ISO 11898, Basic and Full CAN, CAN specification 2.0 B
Protocol	CANopen
Baud rate	250 kbit/s; 125 ... 1000 kbit/s configurable
Termination	software configurable
Node address	1 (optional on request)

Option SinCos interface

Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10%)
Short circuit proof	yes
Pulse rate	1 SinCos per 1 mm pole

1) XXXX = cable length in meters (e.g. 10 m = 0010).

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Absolute magnetic measurement system sensor head, magnetic band

Limes LA10 / BA1

Measuring length max. 8 m
Resolution min. 1 µm

Magnetic band Limes BA1		
Pole gap		basic pole pitch 1 mm
Dimensions	width	10 mm
	thickness	1.97 mm incl. masking tape
Relative linear expansion		$\Delta L = L \times \alpha \times \Delta\delta$ L = measuring length in meters α = 16×10^{-6} 1/K temperature coefficient $\Delta\delta$ = relative temperature change based on 20°C [+68°F] in °K

Working temperature	-20°C ... +70°C [-4°F ... +158°F] (in case of mounting with adhesive tape only)
Storage temperature	-20°C ... +80°C [-4°F ... +176°F]
Mounting	adhesive joint
Additional length	100 mm in order to obtain an optimal measuring result, the magnetic band should be about 0.1 m longer than the required measuring length
Min. bending radius for storage	≥ 150 mm
Material metal tape	precision steel strip 1.4404 acc. to EN 10088-3

Terminal assignment

Output circuit	Type of connection	M12 connector, 12 pin											
1	2	Signal:	0 V	+V	C+	C-	D+	D-	–	–	–	–	–
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

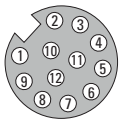
Output circuit	Type of connection	M12 connector, 12 pin											
2	2	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	–	–
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

Output circuit	Type of connection	M12 connector, 12 pin											
3, 4	2	Signal:	0 V	+V	CAN_L	CAN_H	–	–	–	–	–	–	–	–
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

Output circuit	Type of connection	M12 connector, 12 pin											
5, 6	2	Signal:	0 V	+V	CAN_L	CAN_H	–	–	A	$\overline{A}$	B	$\overline{B}$	–	–
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal

Connection cable color assignment with M12 female connector	Connection cable with M12 connector, 12 pin (accessory) – for example 05.00.60B1.B211.005M												
	Color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU
	Pin:	1	2	3	4	5	6	7	8	9	10	11	12



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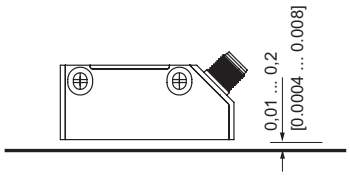
Absolute magnetic measurement system sensor head, magnetic band | **Limes LA10 / BA1** | **Measuring length max. 8 m Resolution min. 1 µm**

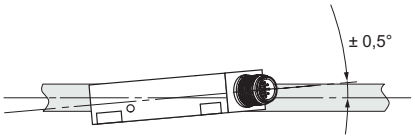
Permissible mounting tolerances

Dimensions in mm [inch]

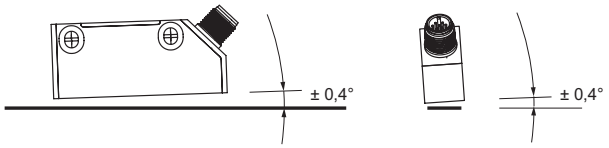
Distance sensor head / magnetic band (incl. masking tape)



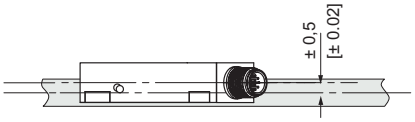
Torsion



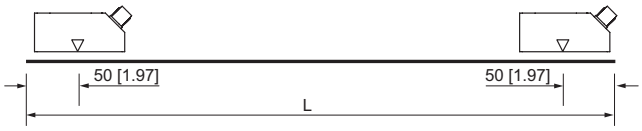
Tilting



Offset



Measuring range

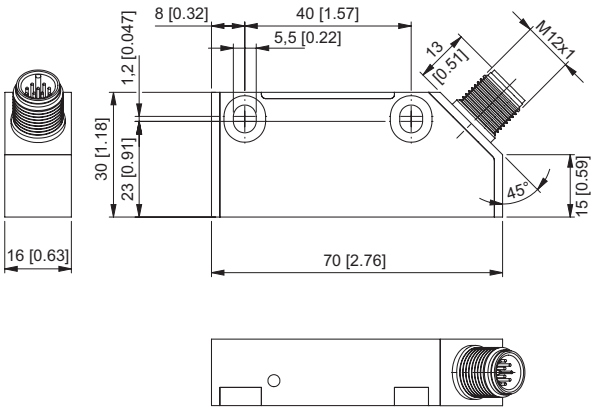


Observe mounting direction

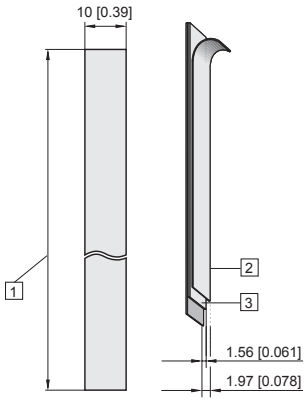
Dimensions

Dimensions in mm [inch]

Sensor head Limes LA10



Magnetic band Limes BA1



1 Length L, max. 8 m
2 Masking tape
3 Magnetic band

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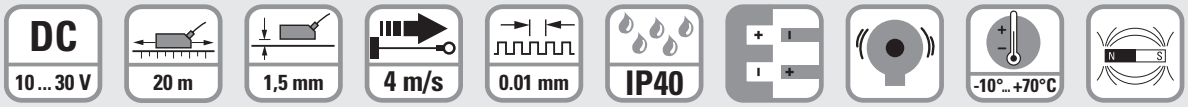
Absolute magnetic measurement system sensor head, magnetic band | **Limes LA50 / BA5** | **Measuring length max. 20 m Resolution min. 10 µm**

The non-contact absolute magnetic linear measurement system Limes LA50 / BA5 - made up of the sensor head LA50 and of the magnetic band BA5 - reaches a resolution up to 10 µm with a maximum distance of 1.5 mm between the sensor and the band.

RoHS SSI CANopen



Robust and versatile

- Resolution 0.01 mm / measuring lengths max. 20 m.
- Rugged die-cast zinc housing.
- Positions changes are also detected when de-energized no referencing movement required – no wear.
- Automatic distance detection in case of too high distance between the sensor and the magnetic band. ■
- Masking tape protecting the magnetic band.
- Address, baud rate, bus termination can be modified via microswitches.
- Interfaces: SSI, CANopen.

Easy installation

- Simple glued assembly of the magnetic band.
- Large mounting tolerances.
- Requires very little installation space.
- LED warning signals in case of too weak magnetic field.

■

Order code sensor head Limes LA50

8.LA50	.	1	2	X	1
Type		a	b	c	d

a *Model*
1 = IP40, standard

b *baud rate*
2 = standard (CANopen, 250 k)

c *Output circuit / power supply*
1 = SSI 25 bit / 10 ... 30 V DC
3 = CANopen / 10 ... 30 V DC

d *Type of connection*
1 = cable, 1.5 m PUR

Stock types
8.LA50.1211
8.LA50.1231

Order code magnetic band Limes BA5

8.BA5	.	20	.	010	.	XXXX
Type		a				b

a *Width*
20 = 20 mm

b *Length (measuring range = length - 0.1 m)*
0010 = 1 m
0020 = 2 m
0040 = 4 m
0050 = 5 m
0060 = 6 m
0100 = 10 m
0200 = 20 m

Stock types
8.BA5.20.010.0200

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Absolute magnetic measurement system sensor head, magnetic band	Limes LA50 / BA5	Measuring length max. 20 m Resolution min. 10 µm

Accessories

		Order no.
SSI display type 570 Position display, 6-digit	with 2 relay outputs and serial interface DC power supply	**0.570.010.305**
	with 2 fast switch outputs AC/DC power supply	**0.570.011.E00**
	with scalable analog output AC/DC power supply	**0.570.012.E90**
	RS232 / RS485 interface AC/DC power supply	**0.570.012.E05**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics

Weight	ca. 0.19 kg [6.70 oz]
Working temperature	-10°C ... +70°C [+14°F ... +158°F] (non condensing)
Storage temperature	-25°C ... +85°C [-13°F ... +185°F]
Protection acc. to EN 60529	IP40
Housing	zinc die-cast
Max. traverse speed permanent absolute positions reading	4 m/s
Shock resistance acc. to EN 60068-2-27	5000 m/s², 1 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s², 10 ... 2000 Hz
Distance sensor head / magnetic band	0.1 ... 1.5 mm incl. masking tape (recommended 0.5 mm)
Measuring length	max. 20 m
Type of connection (standard)	cable, 1.5 m PUR, open cable ends

Electrical characteristics

Power supply	10 ... 30 V DC ±10%
Residual ripple	< 10 %
Current consumption	max. 150 mA
Reverse polarity protection	yes
Short circuit proof	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Accuracy

Measuring principle	absolute
System accuracy at 20°C [+68°F]	max. ± (150 + 20 x L) µm L = measuring length in meters
Repeat accuracy	±1 increment
Resolution	0.01 mm
LED, red	lights up when distance too large

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. ±20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I_{Load} = 20 mA	typ. 1.3 V
Clock rate		25 bit (24 + 1 failurebit for distance)
Code		binary / gray (default) switchable
SSI clock rate		80 kHz ... 0.4 MHz
Monoflop time		≤ 40 µs
Data refresh rate		≤ 250 µs

CANopen interface

Interface	CAN High-Speed acc. to ISO 11898, Basic and Full CAN, CAN specification 2.0 B
Protocol	CANopen
Baud rate	250 kbit/s; 125 ... 1000 kbit/s configurable
Termination	software configurable
Node address	1 ... 15 configurable (default 1)
LSS protocol	CIA LSS protocol DS305 global command support for node address and baud rate selective commands via attributes of the identity object

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Absolute magnetic measurement system sensor head, magnetic band | Limes LA50 / BA5 | Measuring length max. 20 m Resolution min. 10 µm

Magnetic band Limes BA5		
Pole gap		basic pole pitch 5 mm
Dimensions	width	20 mm
	thickness	1.8 mm incl. masking tape
Relative linear expansion		$\Delta L = L \times \alpha \times \Delta\delta$ L = measuring length in meters α = 16×10^{-6} 1/K temperature coefficient $\Delta\delta$ = relative temperature change based on 20°C [+68°F] in °K

Working temperature	-20°C ... +70°C [-4°F ... +158°F]
Storage temperature	-20°C ... +80°C [-4°F ... +176°F]
Mounting	adhesive joint
Additional length	100 mm in order to obtain an optimal measuring result, the magnetic band should be about 0.1 m longer than the required measuring length
Min. bending radius for storage	≥ 150 mm
Material metal tape	precision steel strip 1.4404 acc. to EN 10088-3

Terminal assignment

Output circuit	Type of connection	Cable									
1 (SSI)	1	Signal:	0 V	+V	D+	D-	C+	C-	–	–	⏚
		Cable color:	WH	BN	YE	OR	GN	PK	GY	BK	shield [1]

Output circuit	Type of connection	Cable									
3 (CANopen)	1	Signal:	0 V	+V	CAN_H	CAN_L	–	–	–	–	⏚
		Cable color:	WH	BN	YE	OR	GN	PK	GY	BK	shield [1]

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0V)
C+, C-: Clock signal
D+, D-: Data signal

1) Connect shielding only machine side

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Absolute magnetic measurement system
Sensor head, magnetic band

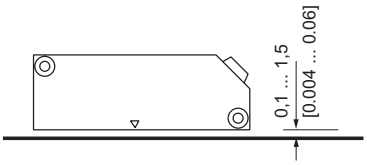
Limes LA50 / BA5

Measuring length max. 20 m
Resolution min. 10 µm

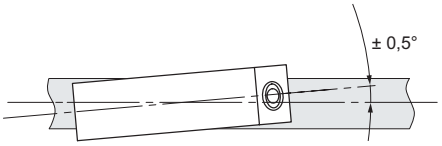
Permissible mounting tolerances

Dimensions in mm [inch]

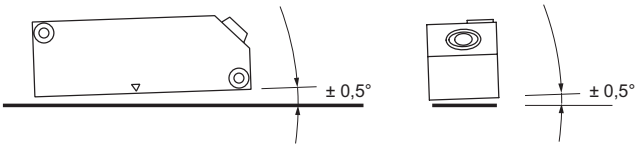
Distance sensor head / magnetic band (incl. masking tape)



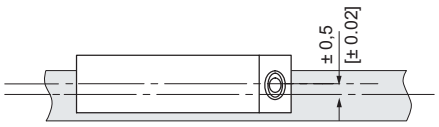
Torsion



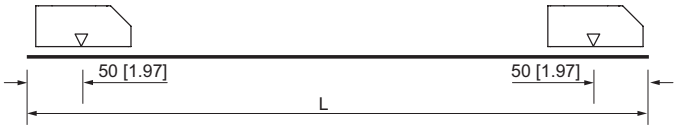
Tilting



Offset



Measuring range

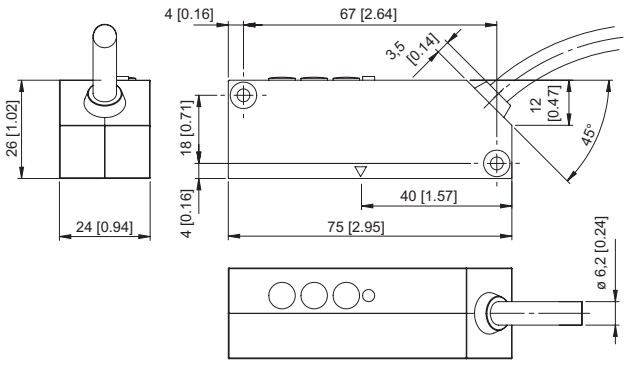


Observe mounting direction

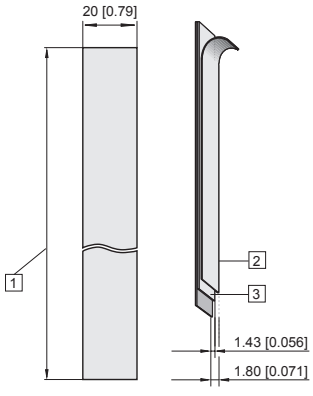
Dimensions

Dimensions in mm [inch]

Sensor head Limes LA50



Magnetic band Limes BA5



1 Length L, max. 20 m
2 Masking tape
3 Magnetic band

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Draw wire mechanics with analog sensor

Draw wire encoder A30

Measuring length max. 0.6 m
Traverse speed max. 0.8 m/s

The draw wire mechanics A30 with analog output stands out with its miniaturized design. It is available with potentiometer, voltage or current output.

RoHS

Analog output

Miniaturized and simple

- Measuring length up to 600 mm.
- For applications with a low traversing speed.
- Easy to install.

Order code draw wire encoder

D5.350	X	.	A	XX	X	.	0000
Type	a			b	c		

a *Measuring range*
A = 300 mm [1)]
B = 600 mm

b *Output circuit*
11 = analog output 4 ... 20 mA
22 = analog output 0 ... 10 V DC
power supply 15 ... 28 V DC
33 = potentiometer output 10 kΩ

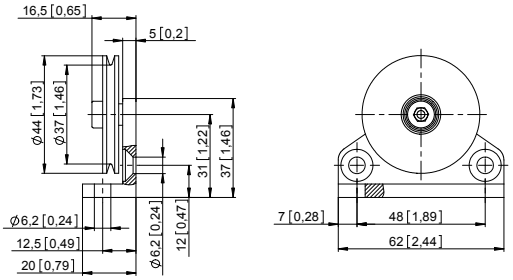
c *Type of connection*
4 = radial cable, 0.5 m [1.64']

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

1) Not suitable for potentiometer output.

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Draw wire mechanics with analog sensor | **Draw wire encoder A30** | **Measuring length max. 0.6 m**
Traverse speed max. 0.8 m/s

Technical data

Mechanical characteristics (draw wire mechanics)

Speed max.		0.8 m/s
Working temperature		-10°C ... +80°C [+14°F ... +176°F]
Protection acc. to EN 60529		IP50
Weight		approx. 60 g [2.12 oz]
Extension force F_{min}		3 N
Repeat accuracy		±0.15 mm
Linearity		±0.35 %
Material	housing	plastic
	wire	stainless-steel ø 0.4 mm plastic-coated

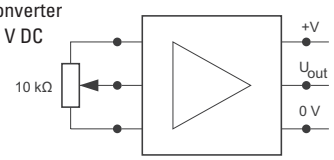
Electrical characteristics

Analog output	0 ... 10 V DC	4 ... 20 mA	potentiometer 10 kΩ
Power supply	15 ... 28 V DC	–	–
Operating range	–	15 ... 28 V DC	max. 48 V DC
Max. load current	15 mA	–	–
Load	–	max. 500 Ω	–
Temperature range	-10°C ... +80°C [+14°F ... +176°F]		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

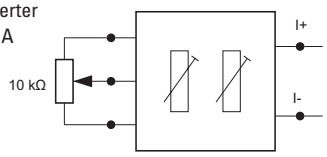
Terminal assignment

Color	BN	WH	GN
0 ... 10 V DC	+ 24 V DC	0 V	U_{out}
4 ... 20 mA	+I	-I	n.c.
Potentiometer	Po	Pe	S

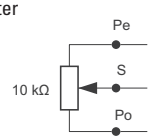
R/U converter
0 ... 10 V DC



R/I converter
4 ... 20 mA

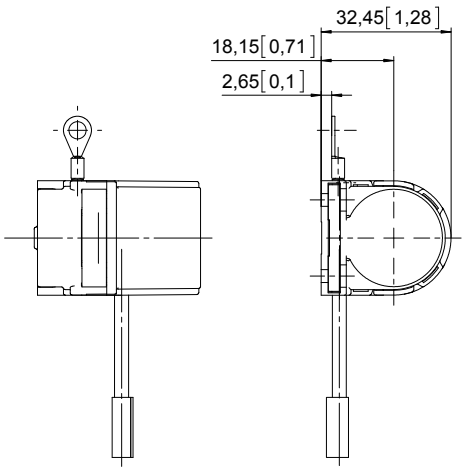


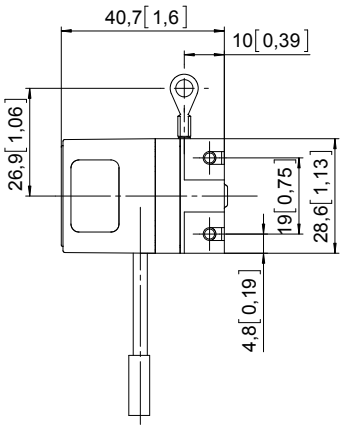
Potentiometer



Dimensions

Dimensions in mm [inch]





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Draw wire mechanics with analog sensor

Draw wire encoder A40, 1 m
Draw wire encoder A41, 2 m

Measuring length max. 2 m
Traverse speed max. 1 m/s

The draw wire encoders A40 and A41 with analog output is characterized by its compact design. They are available with a potentiometer, voltage or current output.

RoHS

Analog output

Compact and simple

- Measuring length up to 2000 mm.
- For applications with a low traversing speed.
- Easy to install.

Order code draw wire encoder

D5.350	X	.	A	XX	X	.	0000
Type	a			b	c		

a *Measuring range*
1 = 1000 mm
2 = 2000 mm

b *Output circuit*
11 = analog output 4 ... 20 mA
22 = analog output 0 ... 10 V DC
power supply 15 ... 28 V DC
33 = potentiometer output 10 kΩ

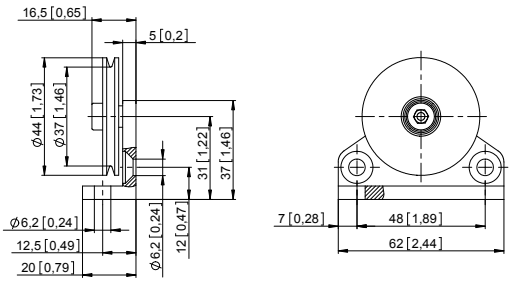
c *Type of connection*
1 = cable 2 m [6.56'] for measuring range 1000 mm: axial
for measuring range 2000 mm: radial
2 = radial M12 connector, 4-pin
(only available for measuring range 2000 mm)

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley

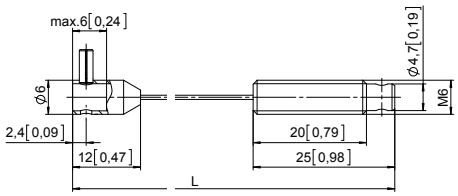


Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



Steel wire 2 m [6.56']	**8.0000.7000.0033**
Steel wire 5 m [16.40']	**8.0000.7000.0034**
Steel wire 10 m [32.81']	**8.0000.7000.0035**
Paraleine 2 m [6.56']	**8.0000.7000.0032**

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Draw wire mechanics with analog sensor

Draw wire encoder A40, 1 m
Draw wire encoder A41, 2 m

Measuring length max. 2 m
Traverse speed max. 1 m/s

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range	**1000 mm (A40)**	**2000 mm (A41)**
Speed max.	0.8 m/s	1 m/s
Working temperature	0°C ... 50°C [+32°F ... +122°F]	-10°C ... +80°C [+14°F ... +176°F]
Protection (sensor) acc. to EN 60529	IP50	IP65
Weight	approx. 200 g [7.06 oz]	approx. 320 g [11.29 oz]
Extension force F_{min}	2 N	
Repeat accuracy	±0.15 mm	
Linearity	±0.35 %	
Material housing	plastic / zinc die-cast	
wire	stainless-steel ø 0.45 mm plastic-coated	

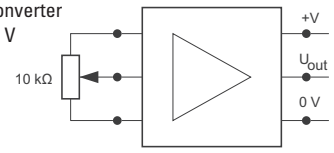
Electrical characteristics

Analog output	0 ... 10 V	4 ... 20 mA	potentiometer 10 kΩ
Power supply	15 ... 28 V DC	–	–
Operating range	–	15 ... 28 V DC	max. 48 V DC
Temperature range	0°C ... 50°C [+32°F ... +122°F]	0°C ... 50°C [+32°F ... +122°F]	0°C ... 50°C [+32°F ... +122°F]
Load	max. 500 Ω	max. 500 Ω	–
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

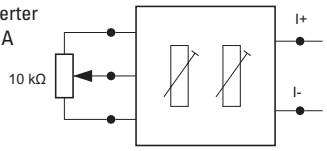
Terminal assignment

Color	BN	WH	GN	
Pin M12	1	2	3	4
0 ... 10 V	+ 24 V DC	0 V	U_{out}	n.c.
0 ... 20 mA	I+	I-	n.c.	n.c.
Potentiometer	Po	Pe	S	n.c.

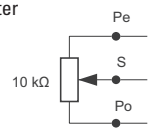
R/U converter
0 ... 10 V



R/I converter
4 ... 20 mA



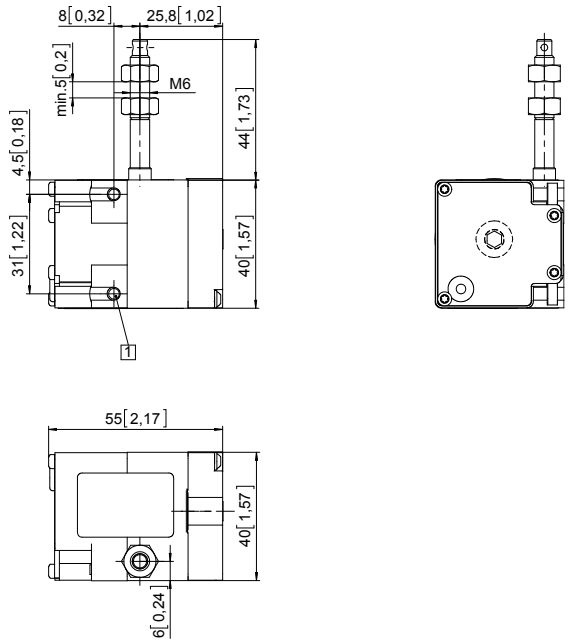
Potentiometer



Dimensions

Dimensions in mm [inch]

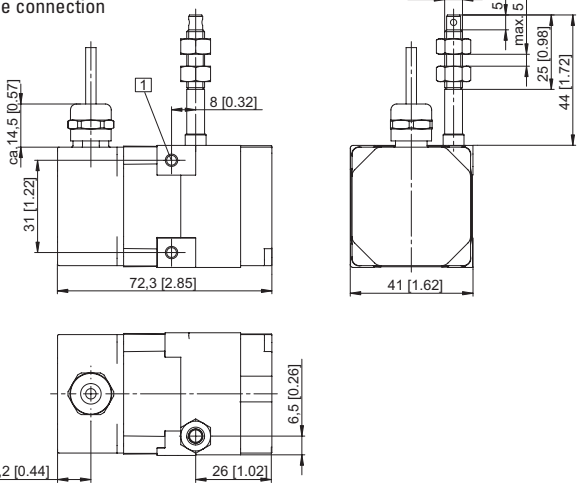
for measuring range 1000 mm



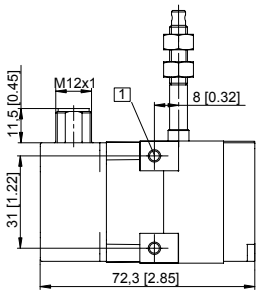
1 2 x M4, max. screw-in depth 8 mm [0.32"]

for measuring range 2000 mm

cable connection



M12 connector



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Draw wire mechanics with encoder or analog sensor

Draw wire encoder A50

Measuring length max. 1.25 m
Traverse speed max. 10 m/s

The draw wire mechanics A50 boast both a compact design and high dynamics.

The draw wire mechanics may be equipped with encoders with an analog, incremental or absolute output. The maximum measuring length is 1.25 m.

RoHS · Analog output · SSI · CANopen

Max. acceleration · Long service life · Wide temperature range · High protection level · Reverse polarity protection

Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 300 m/s².
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Scalable analog output with limit switch function.

Order code with encoder (incremental, absolute)

D8.6A1	.	XXXX	.	XX	X	X	.	XXXX
Type		ⓐ		ⓑ	ⓒ	ⓓ		ⓔ

Standard variants are represented **bold underlined**

ⓐ *Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm

ⓑ *Encoder used*
36 = Sendix 3610, incremental
M3 = Sendix M3663, absolute, SSI
F3 = Sendix F3663, absolute, SSI
M8 = Sendix M3668, absolute, CANopen
F8 = Sendix F3668, absolute, CANopen

ⓒ *Output circuit*
depends on the encoder used

ⓓ *Type of connection*
depends on the encoder used

ⓔ *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 3610			
Drum circumference [mm]	125	125	125
Pulses / revolution [ppr]	125	1250	2500
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix F3663/M3663 (12 bit ST) or F3668/M3668 (12 bit ST, programmable via bus)	
Drum circumference [mm]	125
Pulses / revolution [ppr]	4096
Pulses / mm	32.8
Resolution [mm]	0.03

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder A50

Measuring length max. 1.25 m
Traverse speed max. 10 m/s

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.6A1.xxxx.3642.1250	3610 (8.3610.2342.1250)	Push-pull with inverted signal	8 ... 30 V DC	radial cable, 2 m	1250 ppr	-
D8.6A1.xxxx.M324.G222	Sendix M3663 (8.M3663.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.6A1.xxxx.M824.2122	Sendix M3668 (8.M3668.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.6A1.xxxx.F321.G222	Sendix F3663 (8.F3663.4121.G222)	SSI	10 ... 30 V DC	tangential cable, 1 m	4096 ppr / SSI-Gray-Code	-
D8.6A1.xxxx.F821.2122	Sendix F3668 (8.F3668.4121.2122)	CANopen	10 ... 30 V DC	tangential cable, 1 m	CANopen encoder profile DS406 V3.2	-

Order code with encoder (analog, scalable with limit switch function)

D8.6A1	.	XXXX	.	M1	X	X	.	XXXX
Type		a		b	c	d		e

Standard variants are represented **bold underlined**

a *Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm

b *Encoder used*
M1 = Sendix M3661, absolute [1)]

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Recommended standard variants (with analog encoder, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.6A1.xxxx.M134.3512	Sendix M3661 (8.M3661.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	M12-Stecker radial	12 Bit / 4 ... 20 mA	scalable with limit switch function [2)]
D8.6A1.xxxx.M144.4512	Sendix M3661 (8.M3661.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	M12-Stecker radial	12 Bit / 0 ... 10 V	scalable with limit switch function [2)]
D8.6A1.xxxx.M134.3612	Sendix M3661 (8.M3661.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	M12-Stecker radial	12 Bit / 4 ... 20 mA	scalable without limit switch function [2)]
D8.6A1.xxxx.M144.4612	Sendix M3661 (8.M3661.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	M12-Stecker radial	12 Bit / 0 ... 10 V	scalable without limit switch function [2)]

Order code with analog sensor (scaled to measuring range)

D8.3A1	.	XXXX	.	XXX	X	.	0000
Type		a		b	c		

a *Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm

b *Analog sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

c *Type of connection*
1 = axial cable, 2 m PVC
3 = axial M12 connector, 4-pin

Optional on request
- Other measuring ranges
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)
- Increased temperature range -40°C ... +85°C and -20°C ... +120°C

1) With ccw option.
2) Delivery condition: scaled to measuring range.
Description for scaling and limit switch function see data sheet M3661.

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder A50

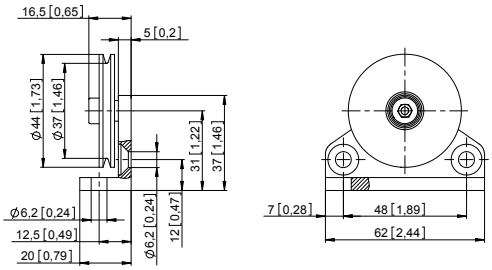
Measuring length max. 1.25 m
Traverse speed max. 10 m/s

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analog sensor

Order no.

Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range		250 mm	500 mm	1250 mm
Extension force	F_{min}	6.8 N	3.4 N	4.1 N
	F_{max}	7.9 N	4.0 N	5.4 N
Max. speed		8 m/s	8 m/s	10 m/s
Max. acceleration		200 m/s²	200 m/s²	300 m/s²
Linearity (of the measuring range)				
with analog sensor		±0.15 %	±0.1 %	±0.1 %
with encoder		±0.05 %	±0.05 %	±0.05 %
		±0.02 % [1]	±0.02 % [1]	±0.02 % [1]
Weight		approx. 330 g [11.64 oz] (depending on the sensor / encoder used)		
Material	housing	titanium-anodized aluminum		
	wire	stainless steel ø 0.5 mm (other wire types on request)		
Protection acc. to EN 60529		IP65 (sensor)		

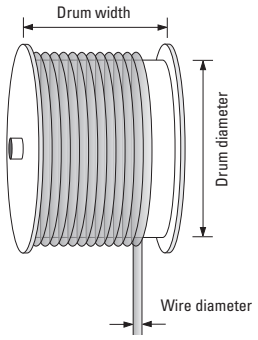
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

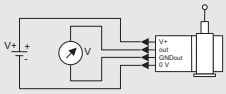
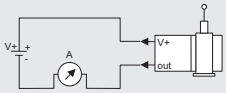
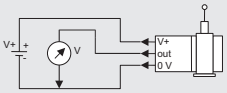
Operating principle

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.



Electrical characteristics (analog sensor, scaled to measuring range)

Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 µA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1]	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1]	-20°C ... +85°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1] -20°C ... +120°C [-4°F ... +248°F] [1]
Connection diagrams			
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) Optional on request.

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Draw wire mechanics with encoder or analog sensor | **Draw wire encoder A50** | **Measuring length max. 1.25 m Traverse speed max. 10 m/s**

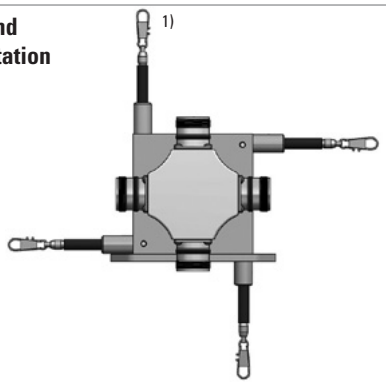
Technology in detail

Various wire types and wire fastenings

Wire types:
- 0.5 mm (V2A) [1]
- 0.51 mm (V4A)
- 0.6 mm (Coramid)

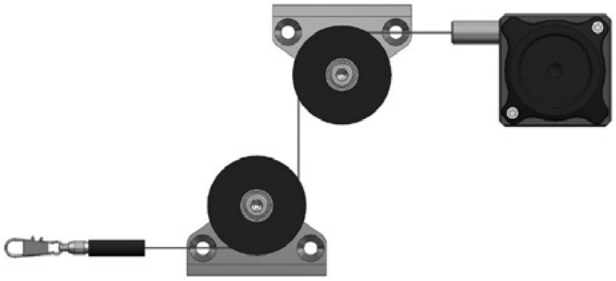
Wire fastenings:
Clip [1] M4 thread Eyelet

Individual wire outlet and Cable / connector orientation



Extension wire

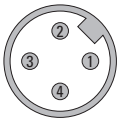
Application-specific installation possibilities



Terminal assignment potentiometer

Pin	1	2	3	4
Cable color	BN	WH	BU	BK
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

1) Standard.

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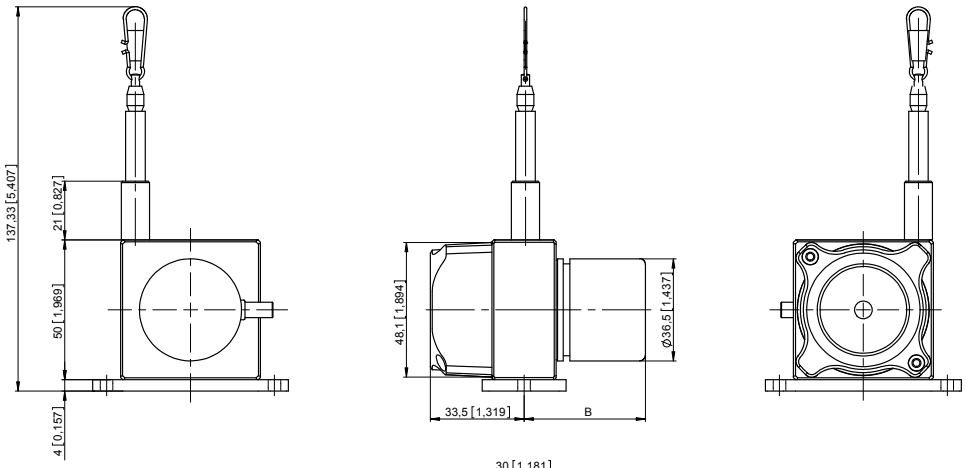
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder A50** | **Measuring length max. 1.25 m Traverse speed max. 10 m/s**

Dimensions

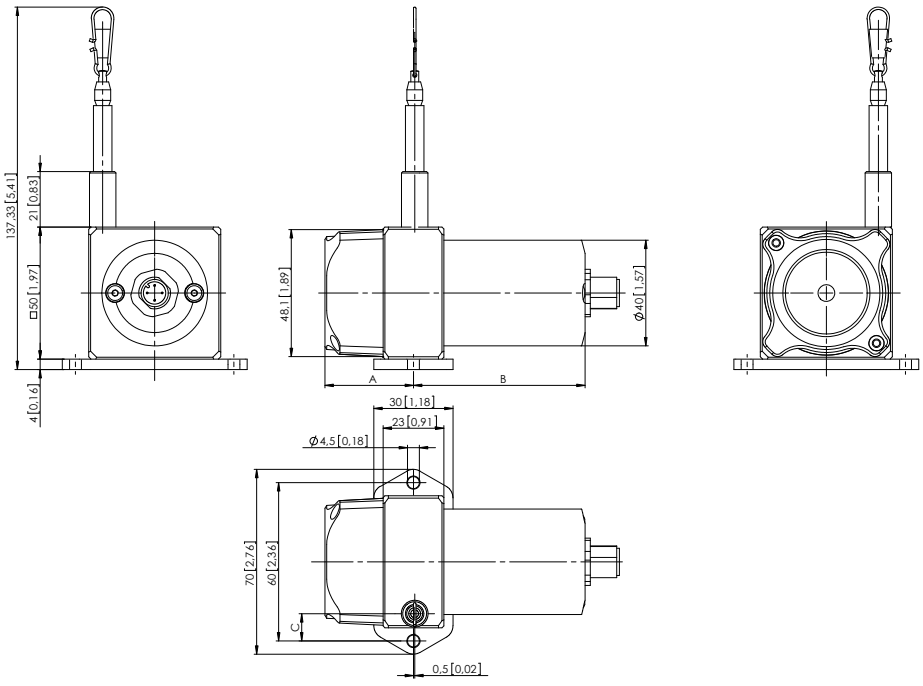
Dimensions in mm [inch]

Draw wire mechanics with encoder



Dimension B depends on the encoder used	
Encoder	**B**
Sendix incremental 3610 D8.6A1.xxxx.36xx.xxxx	43.00 [1.69]
Sendix absolute M366x D8.6A1.xxxx.Mxxx.xxxx	62.45 [2.46]
Sendix absolute F366x D8.6A1.xxxx.Fxxx.xxxx	51.20 [2.02]

Draw wire mechanics with analog sensor (scaled on measuring range)



Sensor type	Measuring length	A	B	C
Potentiometer	250 mm	26.5 [1.04]	65 [2.56]	21.3 [0.84]
	500 mm	26.5 [1.04]	65 [2.56]	21.3 [0.84]
	1250 mm	33.5 [1.32]	65 [2.56]	10.3 [0.41]

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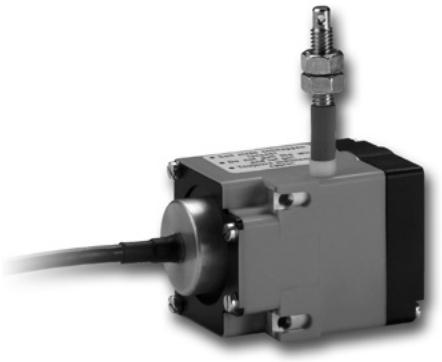
Draw wire mechanics with incremental encoder | Draw wire encoder A40 | Measuring length max. 2 m Traverse speed max. 0.8 m/s



The draw wire system A40 with incremental encoder excels with its compact construction.

Compact and simple

- Measuring length up to 2000 mm.
- For applications with low traverse speeds.
- Easy mounting.

Order code draw wire encoder

D5.2	XXX	.	24	XX	.	1000
Type	a			b		

a *Steel wire, length*
501 = 1000 mm
102 = 2000 mm

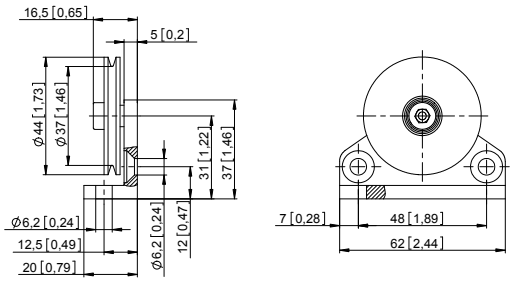
b *Output circuit / power supply*
21 = Push-pull with inverted signal / 5 ... 24 V DC
41 = Push-pull with inverted signal / 8 ... 30 V DC

Stock types
D5.2102.2421.1000 D5.2501.2421.1000
D5.2102.2441.1000 D5.2501.2441.1000

Accessories for draw wire encoder

Dimensions in mm [inch]

Guide pulley

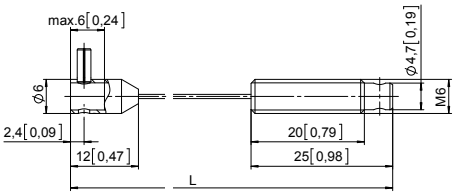


Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

Order no. **8.0000.7000.0045**

Extension cable



	Order no.
Steel wire 2 m [6.56']	**8.0000.7000.0033**
Steel wire 5 m [16.40']	**8.0000.7000.0034**
Steel wire 10 m [32.81']	**8.0000.7000.0035**
Paraleine 2 m [6.56']	**8.0000.7000.0032**

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Draw wire mechanics with incremental encoder | **Draw wire encoder A40** | **Measuring length max. 2 m**
Traverse speed max. 0.8 m/s

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range		up to 2000 mm
Absolute accuracy		±0.1 % for the whole measuring range
Repetition accuracy		±0.15 mm per direction of travel
Resolution (incremental)		0.1 mm standard encoder with 1000 ppr
Traversing speed		max. 800 mm/s
Required force		approx. 10 N (on wire)
Material	housing	reinforced plastic
	wire	stainless steel ø 0.45 mm
Weight		approx. 210 g [7.41 oz]

Electrical characteristics (encoder)

Output circuits		Push-pull	Push-pull
Power supply		5 ... 24 V DC	8 ... 30 V DC
Current consumption (no load)		max. 50 mA	max. 50 mA
Permissible load / 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 - 3.0 V
	LOW	max. 0.5 V	max. 2.5 V
Rising edge time t_r		max. 1 µs	max. 1 µs
Falling edge time t_f		max. 1 µs	max. 1 µs
Short-circuit protected outputs		yes	yes
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Mechanical characteristics (encoder)

Protection acc. to EN 60529	IP54
Working temperature	-20°C ... +85°C [-4°F ... +185°F]
Shock resistance acc. to EN 60068-2-27	1000 m/s², 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s², 55 ... 2000 Hz

Description of the incremental encoder (connected on load side)

- Compensation for temperature and ageing
- Short-circuit protected outputs
- Reverse polarity protected power supply input
- Push-pull output

Terminal assignment of the encoder

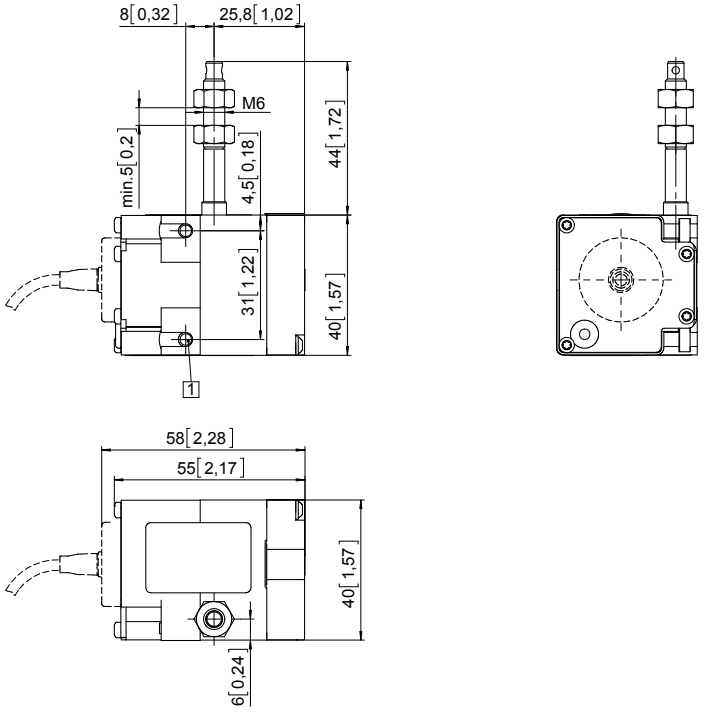
Signal	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
Cable color	WH	BN	GN	YE	GY	PK	BU	RD

Isolate unused outputs before initial start-up.

Dimensions

Dimensions in mm [inch]

1 2 x M4, max. screw-in depth 8 mm [0.32"]



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Draw wire mechanics with absolute encoder

Draw wire encoder A41

Measuring length max. 2 m
Traverse speed max. 1 m/s

The draw wire mechanics A41 with absolute encoder excels with its compact construction.

These draw wire mechanics can be equipped with multiturn encoders of the F366x series. The maximum measuring length is 2 meters.

RoHS Analog output SSI IBiSS INTERFACE CANopen

Compact and simple

- Measuring length up to 2000 mm.
- Scalable analog output with limit switch function.
- For applications with low traverse speeds.
- Easy mounting.
- Robust design.

Order code with encoder (absolute)

D5.55	02	.	XX	X	X	.	XXXX
Type	a		b	c	d		e

Standard variants are represented **bold underlined**

a *Measuring range*
02 = 2000 mm

b *Encoder used*
M3 = Sendix M3663, absolute, SSI
F3 = Sendix F3663, absolute, SSI
M8 = Sendix M3668, absolute, CANopen
F8 = Sendix F3668, absolute, CANopen

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

Standard resolutions for draw wire with absolute encoder Sendix F3663/ M3663 (12 bit ST) or F3668/M3668 (12 bit ST, programmable via bus)	
Drum circumference [mm]	100
Pulses / revolution [ppr]	4096
Pulses / mm	41
Resolution [mm]	0.02

Recommended standard variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D5.5502.M324.G222	Sendix M3663 (8.M3663.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D5.5502.M824.2122	Sendix M3668 (8.M3668.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-
D5.5502.F321.G222	Sendix F3663 (8.F3663.4121.G222)	SSI	10 ... 30 V DC	tangential cable, 1 m	4096 ppr / SSI-Gray-Code	-
D5.5502.F821.2122	Sendix F3668 (8.F3668.4121.2122)	CANopen	10 ... 30 V DC	tangential cable, 1 m	CANopen encoder profile DS406 V3.2	-

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Draw wire mechanics with absolute encoder

Draw wire encoder A41

Measuring length max. 2 m
Traverse speed max. 1 m/s

Order code with encoder (analog, scalable with limit switch function)

D5.55	02	.	M1	X	X	.	XXXX
Type	a		b	c	d		e

Standard variants are represented **bold underlined**

a *Measuring range*
02 = 2000 mm

b *Encoder used*
M1 = Sendix M3661, absolute, analog [1]

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

Recommended standard variants (with encoder analog, scalable with limit switch function)

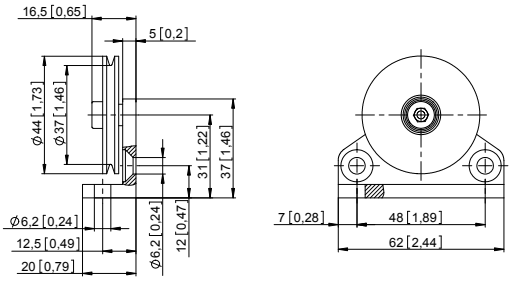
Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D5.5502.M134.3512	Sendix M3661 (8.M3661.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function [2]
D5.5502.M144.4512	Sendix M3661 (8.M3661.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function [2]
D5.5502.M134.3612	Sendix M3661 (8.M3661.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function [2]
D5.5502.M144.4612	Sendix M3661 (8.M3661.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function [2]

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley

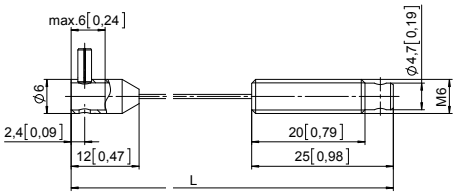


Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



Steel wire 2 m [6.56']	**8.0000.7000.0033**
Steel wire 5 m [16.40']	**8.0000.7000.0034**
Steel wire 10 m [32.81']	**8.0000.7000.0035**
Paraleine 2 m [6.56']	**8.0000.7000.0032**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range		up to 2000 mm
Traversing speed		max. 1000 mm/s
Working temperature		-10°C ... +80°C [+14°F ... +176°F]
Weight		approx. 200 g [7.06 oz]
Required force		≥ 2 N (on wire)
Linearity		±0.35 % for the whole measuring range
Repetition accuracy		±0.15 mm per direction of travel
Material	housing	zinc die-cast
	wire	stainless steel ø 0.45 mm

Electrical characteristics (encoder)

The electrical characteristics can be found in the data sheets of the encoders.

1) With ccw option.
2) Delivery condition: unscaled.
Description for scaling and limit switch function see data sheet M3661.

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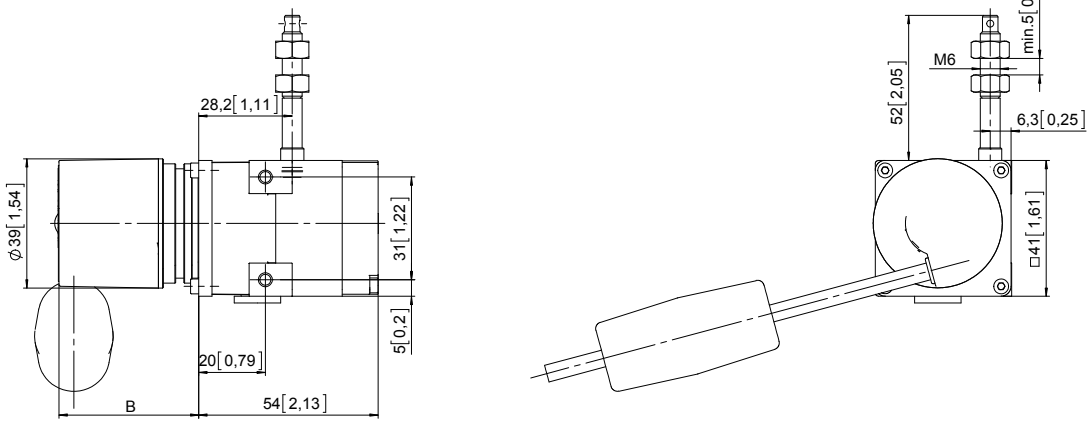
Draw wire mechanics with absolute encoder | **Draw wire encoder A41** | **Measuring length max. 2 m, Traverse speed max. 1 m/s**

Dimensions

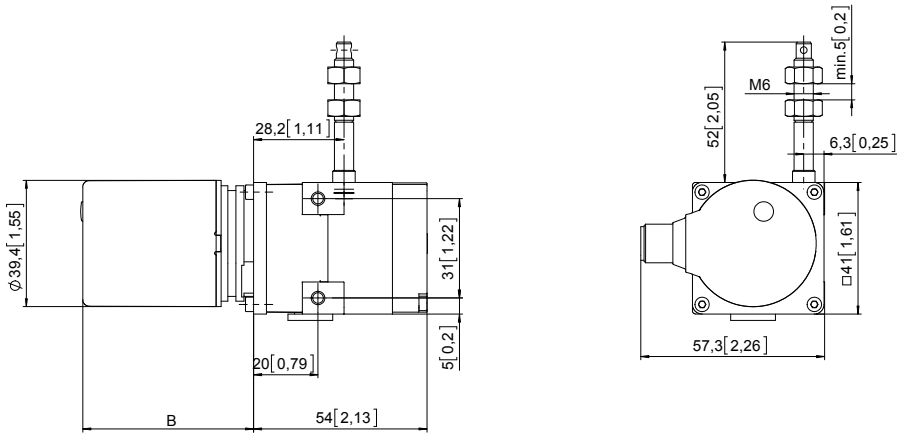
Dimensions in mm [inch]

Draw wire mechanics with encoder (tangential cable)



Dimension B depends on the encoder used	
Encoder	**B**
Sendix absolute (M366x) D5.5502.Mxxx.xxxx	50.25 [1.98]
Sendix absolute (F366x) D5.5502.Fxxx.xxxx	39.70 [1.56]

Draw wire mechanics with encoder (M12 connector)



Dimension B depends on the encoder used	
Encoder	**B**
Sendix absolute (F3663, SSI) D5.5502.Fxxx.xxxx	42,20 [1.66]
Sendix absolute (F3668, CANopen) D5.5502.Fxxx.xxxx	42,20 [1.66]
Sendix absolute (M3661, analog) D5.5502.Mxxx.xxxx	53,25 [2.10]

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder B75

Measuring length max. 3 m
Traverse speed max. 0.8 m/s

The draw wire mechanics B75 can be used up to a measuring length of 3 meters.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.

SSI · PROFIBUS · PROFINET · EtherCAT Conformance tested · RoHS · Analog output · CANopen · EtherNet/IP

Compact and versatile

- Compact housing.
- Variable mounting possibilities.
- Low-wear wire exit.
- Scalable analog interface with limit switch function.
- Various field bus interfaces.

Order code with encoder (incremental, absolute)

D8.15	03	.	XX	X	X	.	XXXX
Type	a		b	c	d		e

Standard variants are represented **bold underlined**

a *Measuring range*
03 = 3000 mm

b *Encoder used*
2Z = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
M8 = Sendix M5868, absolute
63 = Sendix 5863, absolute
F8 = Sendix F5868, absolute
68 = Sendix 5868, absolute

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges

Standard resolutions for draw wire with incremental encoder Sendix 5000			
Drum circumference [mm]	200	200	200
Pulses / revolution [ppr]	200	2000	4000
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	200
Pulses / revolution [ppr]	4096
Pulses / mm	20.5
Resolution [mm]	0.05

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1503.2Z54.2000	Sendix 5000 (8.5000.B154.2000)	Push-pull with inverted signal	10 ... 30 V DC	radial M12 connector	2000 ppr	-
D8.1503.M324.G222	Sendix M5863 (8.M5863.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.1503.M824.2122	Sendix M5868 (8.M5868.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1503.F326.G223	Sendix F5863 (8.F5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1503.6326.G223	Sendix 5863 (8.5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1503.F82E.2123	Sendix F5868 (8.F5868.212E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1503.6822.2123	Sendix 5868 (8.5868.2122.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1503.6832.3113	Sendix 5868 (8.5868.2132.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.1503.68B2.B212	Sendix 5868 (8.5868.21B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.1503.68C2.C212	Sendix 5868 (8.5868.21C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.1503.F8AN.A222	Sendix F5868 (8.F5868.21AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder B75

Measuring length max. 3 m
Traverse speed max. 0.8 m/s

Order code with encoder (analog, scalable with limit switch function)

D8.15 Type | 03 a | . | M1 b | X c | X d | . | XXXX e

Standard variants are represented **bold underlined**

a *Measuring range*
03 = 3000 mm

b *Encoder used*
M1 = Sendix M5861, absolute [1]

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1503.M134.3512	Sendix M5861 (8.M5861.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function [2]
D8.1503.M144.4512	Sendix M5861 (8.M5861.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function [2]
D8.1503.M134.3612	Sendix M5861 (8.M5861.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function [2]
D8.1503.M144.4612	Sendix M5861 (8.M5861.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function [2]

Order code with analog sensor (scaled to measuring range)

D8.35 Type | 03 a | . | XXX b | 2 c | . | 0000

a *Measuring range*
03 = 3000 mm

b *Analog sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V DC / 12 ... 30 V DC
A33 = potentiometer 10 kΩ / max. 30 V DC

c *Type of connection*
2 = radial M12 connector, 4-pin (wire outlet direction)

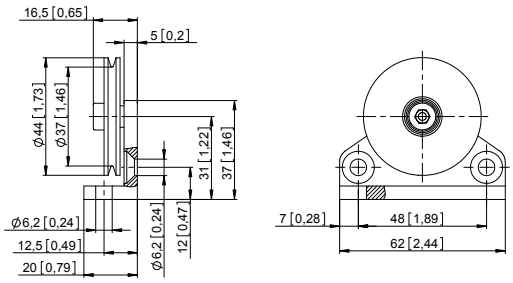
Optional on request
- Other measuring ranges

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley

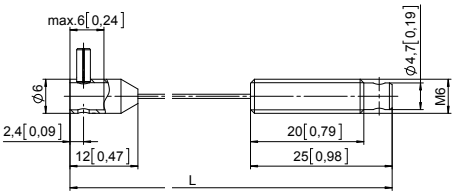


Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



Steel wire 2 m [6.56']	**8.0000.7000.0033**
Steel wire 5 m [16.40']	**8.0000.7000.0034**
Steel wire 10 m [32.81']	**8.0000.7000.0035**
Paraleine 2 m [6.56']	**8.0000.7000.0032**

Connection technology for analog sensor

Order no.

Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

1) With ccw option.
2) Delivery condition: unscaled.
Description for scaling and limit switch function see data sheet M5861.

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Draw wire mechanics with encoder or analog sensor | **Draw wire encoder B75** | **Measuring length max. 3 m Traverse speed max. 0.8 m/s**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range		3000 mm
Traversing speed		max. 0.8 m/s
Working temperature		-40°C ... +80°C [-40°F ... +176°F]
Protection acc. to EN 60529		IP65
Weight		approx. 500 g [17.67 oz]
Required force F_{min}		3 N
Linearity		±0.35 %
Repetition accuracy		±0.15 mm
Material	housing	plastic / zinc die-cast
	wire	stainless steel ø 0.9 mm, plastic-coated

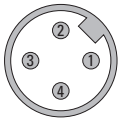
Electrical characteristics

Analog output	0 ... 10 V DC	4 ... 20 mA	potentiometer 10 kΩ
Power supply	15 ... 28 V DC	–	–
Operating range	–	15 ... 28 V DC	max. 48 V DC
Load	max. 500 Ω	max. 500 Ω	–
Temperature range	-40°C ... +80°C [-40°F ... +176°F]		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Terminal assignment (analog output)

Color	BN	WH	GN	
Pin M12	1	2	3	4
0 ... 10 V DC	+24 V DC	0 V	U_{out}	n.c.
4 ... 20 mA	+I	-I	n.c.	n.c.
Potentiometer 10 kOhms	Po	Pe	S	n.c.

Top view of mating side, male contact base

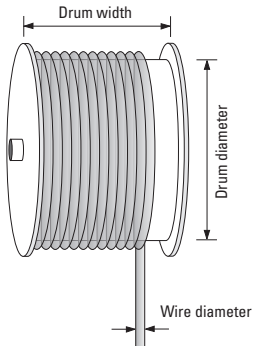


M12 connector, 4-pin

Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

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.

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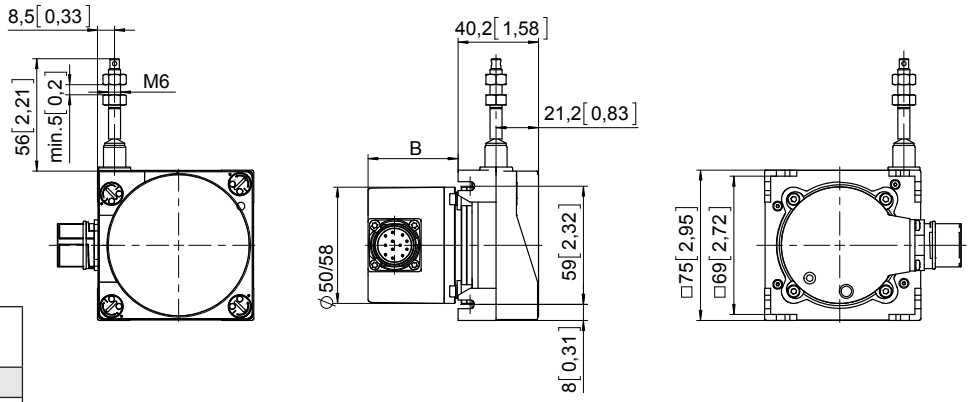
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder B75** | **Measuring length max. 3 m, Traverse speed max. 0.8 m/s**

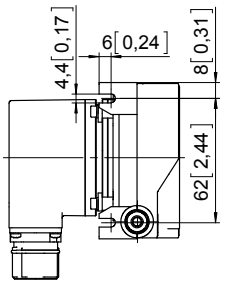
Dimensions

Dimensions in mm [inch]

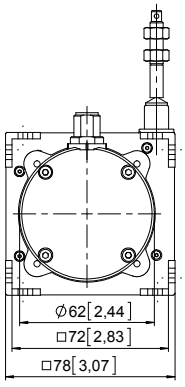
Draw wire mechanics with encoder

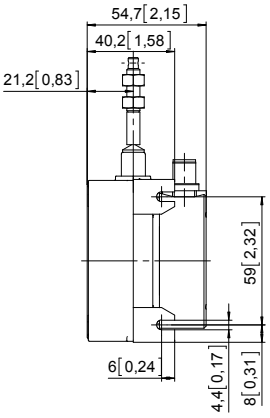


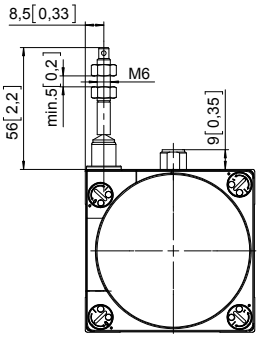
Dimension B depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.1503.xxxx.2Zxx.xxxx	43.00 [1.69]
Sendix absolute (F5863) D8.1503.xxxx.F3xx.xxxx	55.50 [2.19]
Sendix absolute (5863) D8.1503.xxxx.63xx.xxxx	55.50 [2.19]
Sendix absolute (F5868, CANopen) D8.1503.xxxx.F8xx.21xx	65.50 [2.58]
Sendix absolute (F5868, EtherNet/IP) D8.1503.xxxx.F8xx.A2xx	65.50 [2.58]
Sendix absolute (5868) D8.1503.xxxx.68xx.xxxx	83.20 [3.28]
Sendix absolute (M586x) D8.1503.xxxx.Mxxx.xxxx	55.80 [2.20]

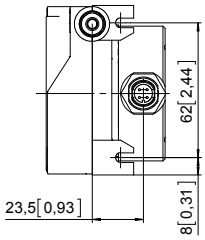


Draw wire mechanics with analog sensor (scalable on measuring range)









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Draw wire mechanics with encoder or analog sensor

Draw wire encoder B80

Measuring length max. 3 m
Traverse speed max. 10 m/s

The draw wire mechanics B80 can be used up to a measuring length of 3 meters.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.

SSI · PROFIBUS · PROFINET · EtherCAT Conformance tested · RoHS · Analog output · CANopen · EtherNet/IP

Max. acceleration · Long service life · Wide temperaturerange · High protection level · Reverse polarity protection

Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 140 m/s².
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Interchangeable encoders (Interchangeable installation).

Order code with encoder (incremental, absolute)

D8.	X (a)	B1	.	XXXX (b)	.	XX (c)	X (d)	X (e)	.	XXXX (f)

Standard variants are represented **bold underlined**

a *Mechanics*
2 = interchangeable installation [1]
4 = fixed installation [2]

b *Measuring range*
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm

c *Encoder used*
00 = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
63 = Sendix 5863, absolute
M8 = Sendix M5868, absolute
F8 = Sendix F5868 absolute
68 = Sendix 5868, absolute

d *Output circuit*
depends on the encoder used

e *Type of connection*
depends on the encoder used

f *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 5000			
Drum circumference [mm]	200	200	200
Pulses / revolution [ppr]	200	2000	4000
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	200
Pulses / revolution [ppr]	4096
Pulses / mm	20.5
Resolution [mm]	0.05

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.
2) The encoder can only be replaced at the factory.

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder B80

Measuring length max. 3 m
Traverse speed max. 10 m/s

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xB1.xxxx.0054.2000	Sendix 5000 (8.5000.8354.2000)	Push-pull with inverted signal	10 ... 30 V DC	radial M12 connector	2000 ppr	-
D8.xB1.xxxx.M324.G222	Sendix M5863 (8.M5863.3524.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.xB1.xxxx.M824.2122	Sendix M5868 (8.M5868.3524.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xB1.xxxx.F326.G223	Sendix F5863 (8.F5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xB1.xxxx.6326.G223	Sendix 5863 (8.5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xB1.xxxx.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xB1.xxxx.6822.2123	Sendix 5868 (8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xB1.xxxx.6832.3113	Sendix 5868 (8.5868.1232.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.xB1.xxxx.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.xB1.xxxx.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.xB1.xxxx.F8AN.A222	Sendix F5868 (8.F5868.12AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Order code with encoder (analog, scalable with limit switch function)

D8.	X ⓐ	B1	.	XXXX ⓑ	.	M1 ⓒ	X ⓓ	X ⓔ	.	XXXX ⓕ

Standard variants are represented **bold underlined**

ⓐ *Mechanics*
2 = interchangeable installation [1]
4 = fixed installation [2]

ⓑ *Measuring range*
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm

ⓒ *Encoder used*
M1 = Sendix M5861, absolute [3]

ⓓ *Output circuit*
depends on the encoder used

ⓔ *Type of connection*
depends on the encoder used

ⓕ *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xB1.xxxx.M134.3512	Sendix M5861 (8.M5861.3534.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function [4]
D8.xB1.xxxx.M144.4512	Sendix M5861 (8.M5861.3544.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function [4]
D8.xB1.xxxx.M134.3612	Sendix M5861 (8.M5861.3534.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function [4]
D8.xB1.xxxx.M144.4612	Sendix M5861 (8.M5861.3544.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function [4]

Order code with analog sensor (scaled to measuring range)

D8.3B1 Type	.	XXXX ⓐ	.	XXX ⓑ	X ⓒ	.	0000

ⓐ *Measuring range*
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm

ⓑ *Analog sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

ⓒ *Type of connection*
1 = axial cable, 2 m PVC
3 = axial M12 connector, 4-pin

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)
- Increased temperature range -40°C ... +85°C and -20°C ... +120°C

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.
2) The encoder can only be replaced at the factory.
3) With ccw option.
4) Delivery condition: scaled to measuring range.
Description for scaling and limit switch function see data sheet M5861.

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder B80

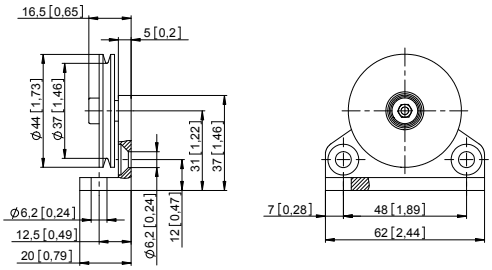
Measuring length max. 3 m
Traverse speed max. 10 m/s

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analog sensor

Order no.

Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range		1000 mm	2000 mm	3000 mm
Extension force	F_{min}	6.9 N	6.4 N	6.9 N
	F_{max}	8.3 N	7.8 N	9.8 N
Max. speed		10 m/s	10 m/s	10 m/s
Max. acceleration		140 m/s²	140 m/s²	140 m/s²
Linearity (of the measuring range)				
with analog sensor		±0.15 %	±0.1 %	±0.1 %
with encoder		±0.05 %	±0.05 %	±0.05 %
		±0.02 % [1]	±0.02 % [1]	±0.02 % [1]
Weight		approx. 750 g [26.45 oz] (dep. on the sensor/encoder used)		
Material	housing	titanium-anodized aluminum		
	wire	stainless steel ø 0.5 mm ø 1 mm can be supplied as a special up to measuring range 1500 mm (other wire types on request)		
Protection acc. to EN 60529		IP65 (sensor)		

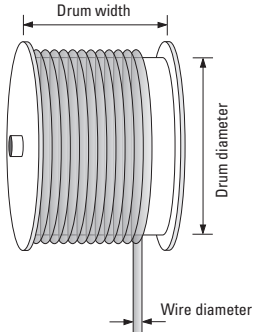
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

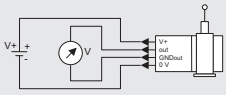
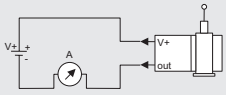
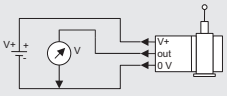
Operating principle

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.



Electrical characteristics (analog sensor, scaled to measuring range)

Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 µA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1]	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1]	-20°C ... +85°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1] -20°C ... +120°C [-4°F ... +248°F] [1]
Connection diagrams			
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) On request for encoder version: **00, F3, 63, F8, 68** (see order code C).

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Draw wire mechanics with encoder or analog sensor | **Draw wire encoder B80** | **Measuring length max. 3 m Traverse speed max. 10 m/s**

Technology in detail

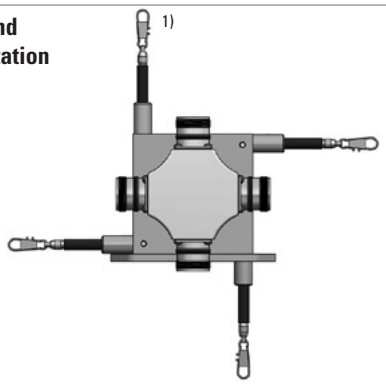
Various wire types and wire fastenings

Wire types:
- 0.5 mm (V2A) [1)]
- 0.51 mm (V4A)
- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:

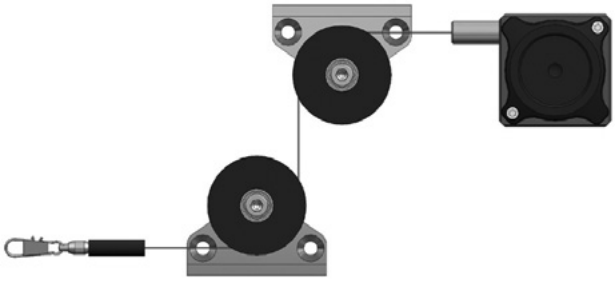
Clip [1)] | M4 thread | Eyelet

Individual wire outlet and cable / connector orientation



Extension wire

Application-specific installation possibilities



1) Standard.

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Draw wire mechanics with encoder or analog sensor | Draw wire encoder B80 | Measuring length max. 3 m Traverse speed max. 10 m/s

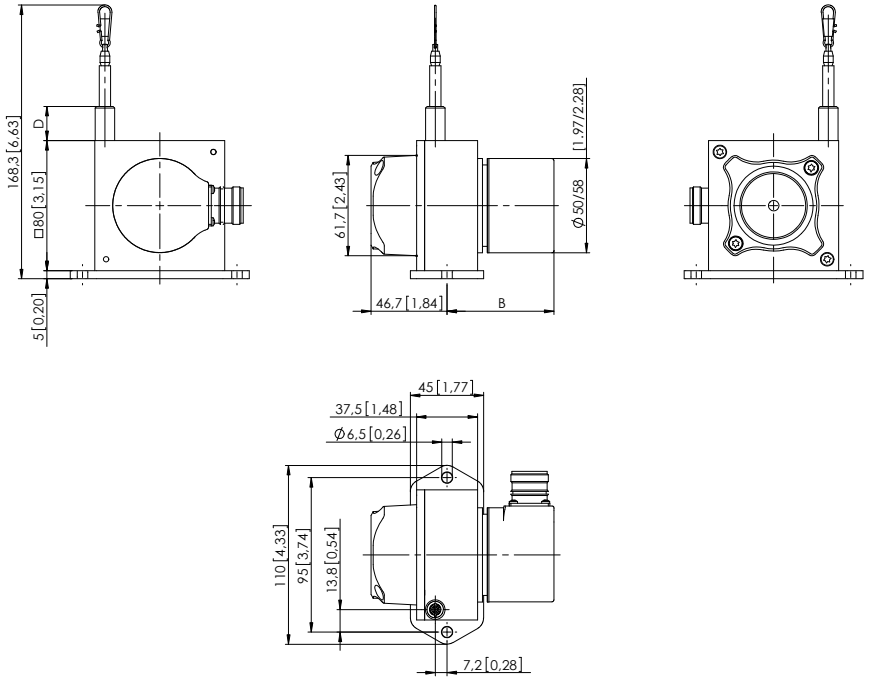
Dimensions

Dimensions in mm [inch]

Draw wire mechanics with encoder
Fixed installation

Dimension D depends on the measuring range of the draw wire	
Measuring range	**D**
1000 mm	21 [0.83]
2000 mm	21 [0.83]
3000 mm	35 [1.38]

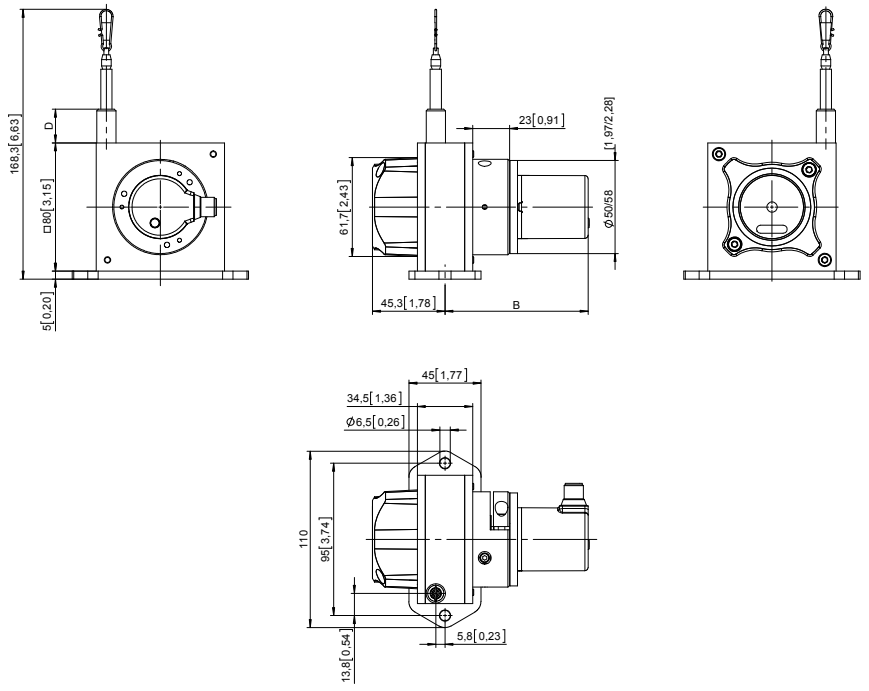
Dimension B depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.4B1.xxxx.00xx.xxxx	55.75 [2.19]
Sendix absolute (F5863) D8.4B1.xxxx.F3xx.xxxx	68.25 [2.69]
Sendix absolute (5863) D8.4B1.xxxx.63xx.xxxx	68.25 [2.69]
Sendix absolute (F5868, CANopen) D8.4B1.xxxx.F8xx.21xx	88.25 [3.47]
Sendix absolute (F5868, EtherNet/IP) D8.4B1.xxxx.F8xx.A2xx	76.75 [3.02]
Sendix absolute (5868) D8.4B1.xxxx.68xx.xxxx	95.35 [3.75]
Sendix absolute (M586x) D8.4B1.xxxx.Mxxx.xxxx	68.45 [2.69]



Draw wire mechanics with encoder
Interchangeable installation, clamping flange

Dimension D depends on the measuring range of the draw wire	
Measuring range	**D**
1000 mm	21 [0.83]
2000 mm	21 [0.83]
3000 mm	35 [1.38]

Dimension B depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.2B1.xxxx.00xx.xxxx	78.75 [3.10]
Sendix absolute (F5863) D8.2B1.xxxx.F3xx.xxxx	91.25 [3.59]
Sendix absolute (5863) D8.2B1.xxxx.63xx.xxxx	91.25 [3.59]
Sendix absolute (F5868, CANopen) D8.2B1.xxxx.F8xx.21xx	111.25 [4.40]
Sendix absolute (F5868, EtherNet/IP) D8.2B1.xxxx.F8xx.A2xx	99.75 [3.93]
Sendix absolute (5868) D8.2B1.xxxx.68xx.xxxx	118.35 [4.66]
Sendix absolute (M586x) D8.2B1.xxxx.Mxxx.xxxx	91.45 [3.60]



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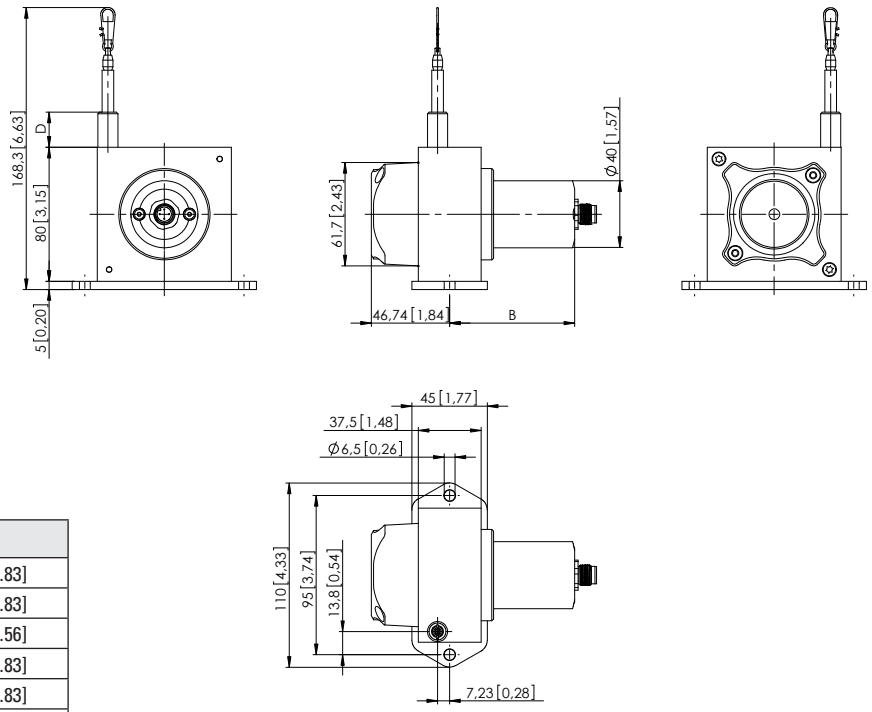
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder B80** | **Measuring length max. 3 m Traverse speed max. 10 m/s**

Dimensions

Dimensions in mm [inch]

Draw wire mechanics with analog sensor (scaled on measuring range)

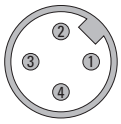


Sensor type	Measuring length	B	D
Potentiometer	1000 mm	74 [2.91]	21 [0.83]
	2000 mm	74 [2.91]	21 [0.83]
	3000 mm	102.5 [4.04]	65 [2.56]
4 ... 20 mA 0 ... 10 V	1000 mm	87.5 [3.44]	21 [0.83]
	2000 mm	87.5 [3.44]	21 [0.83]
	3000 mm	102.3 [4.03]	78.5 [3.09]

Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Cable color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

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Draw wire mechanics with encoder

Draw wire encoder C105

Measuring length max. 6 m
Traverse speed max. 3 m/s

The draw wire encoder C105 can be combined with all encoders having a size 58 synchro flange and 6 mm shaft.

Kübler's encoders portfolio offers the suitable Sendix encoder for every application.

SSI · PROFIBUS · PROFINET · EtherCAT Conformance tested · RoHS · Analog output · CANopen · EtherNet/IP

Flexible and simple

- Possibility for user to exchange encoder.
- Measuring lengths 2800 mm or 6000 mm.
- Simple installation.
- Scalable analog output with limit switch function.

Order code with encoder (incremental, absolute)

D8.1	XXX	.	XX	X	X	.	XXXX
Type	a		b	c	d		e

Standard variants are represented **bold underlined**

a *Measuring range*
106 = 6000 mm
2A1 = 2800 mm

b *Encoder used*
2Z = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
63 = Sendix 5863, absolute
M8 = Sendix M5868, absolute
F8 = Sendix F5868 absolute
68 = Sendix 5868, absolute

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

Standard resolutions for draw wire with incremental encoder			
Drum circumference [mm]	200	200	200
Pulses / revolution [ppr]	200	2000	4000
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	200
Pulses / revolution [ppr]	4096
Pulses / mm	20.5
Resolution [mm]	0.05

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1xxx.2Z54.2000	Sendix 5000 (8.5000.B154.2000)	Push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	-
D8.1xxx.M324.G222	Sendix M5863 (8.M5863.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.1xxx.M824.2122	Sendix M5868 (8.M5868.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoderprofil DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1xxx.F326.G223	Sendix F5863 (8.F5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1xxx.6326.G223	Sendix 5863 (8.5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1xxx.F82E.2123	Sendix F5868 (8.F5868.212E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1xxx.6822.2123	Sendix 5868 (8.5868.2122.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1xxx.6832.3113	Sendix 5868 (8.5868.2132.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.1xxx.68B2.B212	Sendix 5868 (8.5868.21B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.1xxx.68C2.C212	Sendix 5868 (8.5868.21C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.1xxx.F8AN.A222	Sendix F5868 (8.F5868.21AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

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Draw wire mechanics with encoder | **Draw wire encoder C105** | **Measuring length max. 6 m, Traverse speed max. 3 m/s**

Order code with encoder (analog, scalable with limit switch function)

D8.1	XXX	.	M1	X	X	.	XXXX
Type	a		b	c	d		e

Standard variants are represented **bold underlined**

a *Measuring range*
106 = 6000 mm
2A1 = 2800 mm

b *Encoder used*
M1 = Sendix M5861, absolute [1]

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

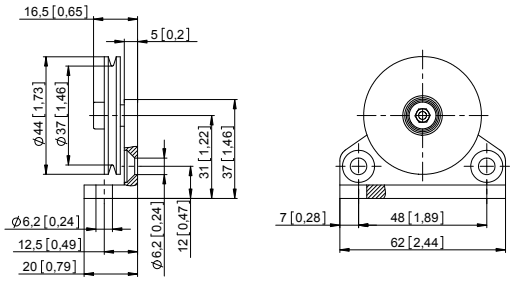
Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1xxx.M134.3512	Sendix M5861 (8.M5861.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function [2]
D8.1xxx.M144.4512	Sendix M5861 (8.M5861.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function [2]
D8.1xxx.M134.3612	Sendix M5861 (8.M5861.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function [2]
D8.1xxx.M144.4612	Sendix M5861 (8.M5861.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function [2]

Accessories for draw wire encoder

Dimensions in mm [inch] | Order no.

Guide pulley

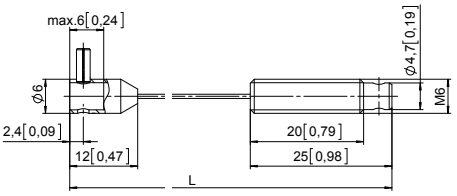


Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



Steel wire 2 m [6.56']	**8.0000.7000.0033**
Steel wire 5 m [16.40']	**8.0000.7000.0034**
Steel wire 10 m [32.81']	**8.0000.7000.0035**
Paraleine 2 m [6.56']	**8.0000.7000.0032**

Technical data

Mechanical characteristics

Measuring range		2800 mm / 6000 mm
Traversing speed		max. 3000 mm/s
Extension force F_{min}		8 N
Repeat accuracy		±0.15 mm
Working temperature		-20°C ... +80°C [-4°F ... +176°F]
Weight		approx. 700 g [24.69 oz]
Drum circumference		200 mm
Wire	2800 mm 6000 mm	paraleine– with ø 1.05 mm steel wire – with ø 0.54 mm

For the electrical characteristics as well as for the terminal assignment, please refer to the data sheet of the encoder used.

1) With ccw option.
2) Delivery condition: unscaled.
Description for scaling and limit switch function see data sheet M5861.

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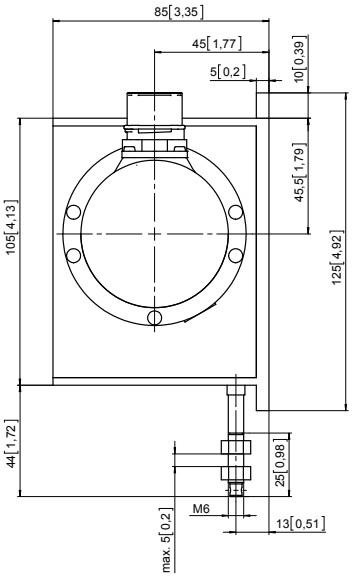
Draw wire mechanics with encoder | Draw wire encoder C105 | Measuring length max. 6 m Traverse speed max. 3 m/s

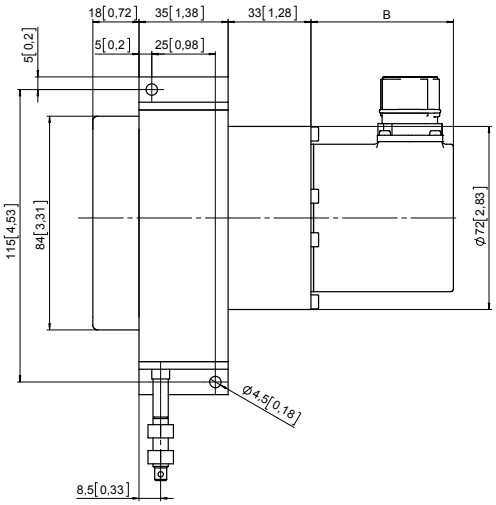
Dimensions

Dimensions in mm [inch]

Draw wire mechanics with encoder

Dimension B depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.1xxx.2Zxx.xxxx	37.0 [1.46]
Sendix absolute (F5863) D8.1xxx.F3xx.xxxx“	49.5 [1.95]
Sendix absolute (5863) D8.1xxx.63xx.xxxx	49.5 [1.95]
Sendix absolute (F5868, CANopen) D8.1xxx.F8xx.21xx	70.0 [2.76]
Sendix absolute (F5868, EtherNet/IP) D8.1xxx.F8xx.A2xx	59.5 [2.34]
Sendix absolute (F5868, EtherNet/IP) D8.1xxx.68xx.A2xx	77.2 [3.04]
Sendix absolute (F5868, EtherNet/IP) D8.1xxx.Mxxx.xxxx	49.8 [1.96]





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Draw wire mechanics with encoder or analog sensor | **Draw wire encoder C120** | **Measuring length max. 6 m Traverse speed max. 10 m/s**

These draw wire mechanics C120 can be used up to a measuring length of 6 meters.

This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.

SSI · PROFIBUS · PROFINET · EtherCAT Conformance tested · RoHS · Analog output · CANopen · EtherNet/IP

Max. acceleration | Long service life | Wide temperature range | High protection level | Reverse polarity protection

Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 140 m/s².
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Interchangeable encoders (interchangeable installation).

Order code with encoder (incremental, absolute)

D8.	X ⓐ	C1	.	0600 ⓑ	.	XX ⓒ	X ⓓ	X ⓔ	.	XXXX ⓕ

Standard variants are represented **bold underlined**

ⓐ *Mechanics*
2 = interchangeable installation [1]
4 = fixed installation [2]

ⓑ *Measuring range*
0600 = 6000 mm

ⓒ *Encoder used*
00 = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
63 = Sendix 5863, absolute
M8 = Sendix M5868, absolute
F8 = Sendix F5868 absolute
68 = Sendix 5868, absolute

ⓓ *Output circuit*
depends on the encoder used

ⓔ *Type of connection*
depends on the encoder used

ⓕ *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 5000			
Drum circumference [mm]	317.68	317.68	317.68
Pulses / revolution [ppr]	1000	2000	4000
Pulses / mm	3.1	6.3	12.6
Resolution [mm]	0.32	0.16	0.08

Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	317.68
Pulses / revolution [ppr]	4096
Pulses / mm	12.9
Resolution [mm]	0.08

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.
2) The encoder can only be replaced at the factory.

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder C120

Measuring length max. 6 m
Traverse speed max. 10 m/s

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xC1.0600.0054.2000	Sendix 5000 (8.5000.8354.2000)	Push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	-
D8.xC1.0600.M324.G222	Sendix M5863 (8.M5863.3524.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.xC1.0600.M824.2122	Sendix M5868 (8.M5868.3524.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoderprofil DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xC1.0600.F326.G223	Sendix F5863 (8.F5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xC1.0600.6326.G223	Sendix 5863 (8.5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xC1.0600.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xC1.0600.6822.2123	Sendix 5868 (8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xC1.0600.6832.3113	Sendix 5868 (8.5868.1232.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.xC1.0600.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.xC1.0600.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.xC1.0600.F8AN.A222	Sendix F5868 (8.F5868.12AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Order code with encoder (analog, scalable with limit switch function)

D8.	X (a)	C1	.	0600 (b)	.	M1 (c)	X (d)	X (e)	.	XXXX (f)

Standard variants are represented **bold underlined**

a *Mechanics*
2 = interchangeable installation [1]
4 = fixed installation [2]

b *Measuring range*
0600 = 6000 mm

c *Encoder used*
M1 = Sendix M5861, absolute [3]

d *Output circuit*
depends on the encoder used

e *Type of connection*
depends on the encoder used

f *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xC1.0600.M134.3512	Sendix M5861 (8.M5861.3534.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function [4]
D8.xC1.0600.M144.4512	Sendix M5861 (8.M5861.3544.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function [4]
D8.xC1.0600.M134.3612	Sendix M5861 (8.M5861.3534.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function [4]
D8.xC1.0600.M144.4612	Sendix M5861 (8.M5861.3544.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function [4]

Order code with analog sensor (scaled to measuring range)

D8.3C1 Type	.	0600 (a)	.	XXX (b)	X (c)	.	0000

a *Measuring range*
0600 = 6000 mm

b *Analog sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

c *Type of connection*
1 = axial cable, 2 m PVC
3 = axial M12 connector, 4-pin

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)
- Increased temperature range -40°C ... +85°C and -20°C ... +120°C

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.
2) The encoder can only be replaced at the factory.
3) With ccw option.
4) Delivery condition: scaled to measuring range.
Description for scaling and limit switch function see data sheet M5861.

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder C120

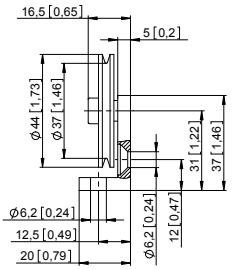
Measuring length max. 6 m
Traverse speed max. 10 m/s

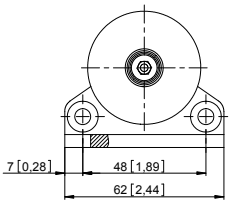
Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley





Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analog sensor

Order no.

Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range		6000 mm
Extension force	F_{min}	8.8 N
	F_{max}	12.3 N
Max. speed.		10 m/s
Max. acceleration		140 m/s²
Linearity (of the measuring range)		
	with analog sensor	±0.10 %
	with encoder	±0.05 % ±0.02 % [1]
Weight		approx. 1600 g [56.44 oz] (depending on the sensor/encoder used)
Material	housing	titanium-anodized aluminum
	wire	stainless steel ø 0.5 mm ø 1 mm can be supplied as a special up to measuring range 3000 mm (other wire types on request)
Protection acc. to EN 60529		IP65 (sensor)

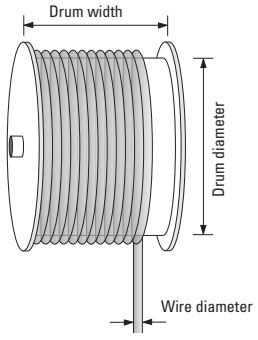
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders

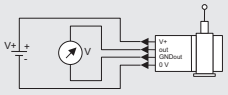
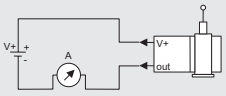
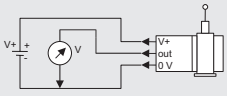
Operating principle

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.



Electrical characteristics (analog sensor, scaled to measuring range)

Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 µA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1]	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1]	-20°C ... +85°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] [1] -20°C ... +120°C [-4°F ... +248°F] [1]
Connection diagrams			
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) On request for encoder version: **00, F3, 63, F8, 68** (see order code **C**).

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Draw wire mechanics with encoder or analog sensor | **Draw wire encoder C120** | **Measuring length max. 6 m Traverse speed max. 10 m/s**

Technology in detail

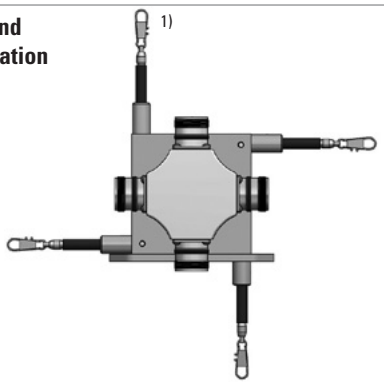
Various wire types and wire fastenings

Wire types:
- 0.5 mm (V2A) [1)]
- 0.51 mm (V4A)
- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:

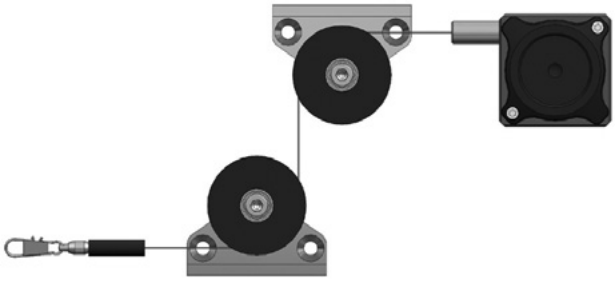
Clip [1)] | M4 thread | Eyelet

Individual wire outlet and cable / connector orientation



Extension wire

Application-specific installation possibilities



1) Standard.

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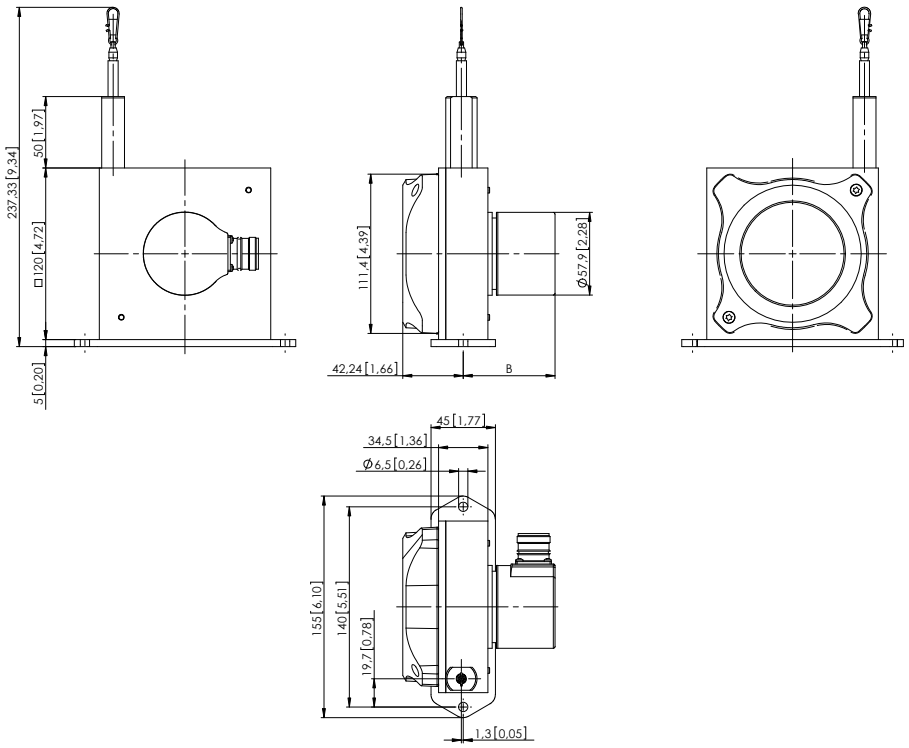
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder C120** | **Measuring length max. 6 m Traverse speed max. 10 m/s**

Dimensions

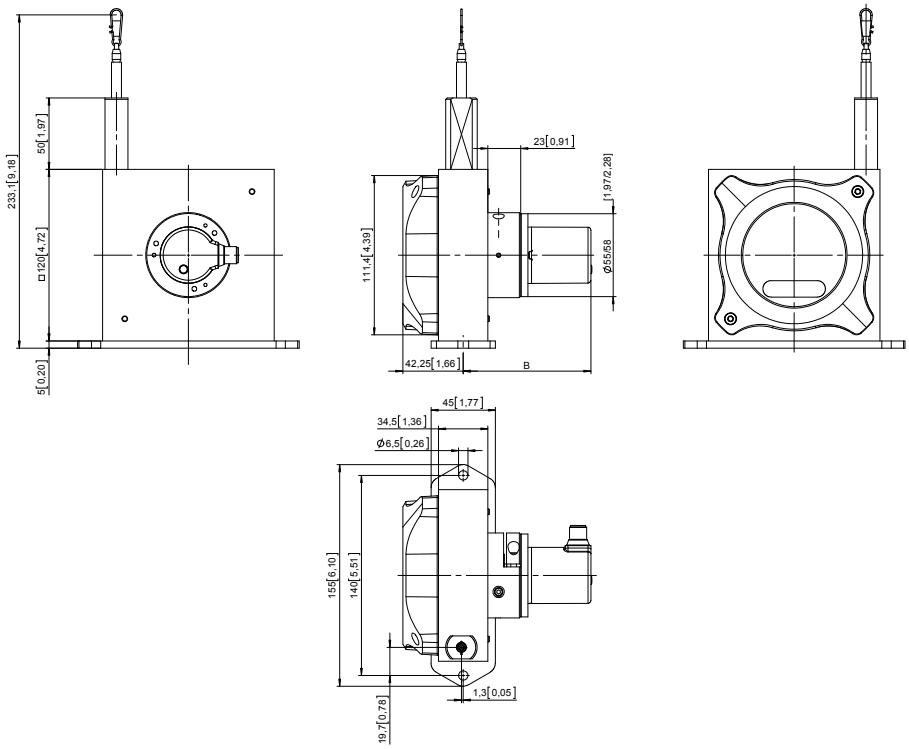
Dimensions in mm [inch]

Draw wire mechanics with encoder
Fixed installation



Dimension B depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.4C1.0600.00xx.xxxx	54.25 [2.14]
Sendix absolute (F5863) D8.4C1.0600.F3xx.xxxx	66.75 [2.63]
Sendix absolute (5863) D8.4C1.0600.63xx.xxxx	66.75 [2.63]
Sendix absolute (F5868, CANopen) D8.4C1.0600.F8xx.21xx	88.25 [3.47]
Sendix absolute (F5868, EtherNet/IP) D8.4C1.0600.F8xx.A2xx	76.75 [3.02]
Sendix absolute (5868) D8.4C1.0600.68xx.xxxx	67.35 [2.65]
Sendix absolute (M586x) D8.4C1.0600.Mxxx.xxxx	67.05 [2.64]

Draw wire mechanics with encoder
Interchangeable installation, clamping flange



Dimension B depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.2C1.0600.00xx.xxxx	77.25 3.04]
Sendix absolute (F5863) D8.2C1.0600.F3xx.xxxx	89.75 [3.53]
Sendix absolute (5863) D8.2C1.0600.63xx.xxxx	89.75 [3.53]
Sendix absolute (F5868, CANopen) D8.2C1.0600.F8xx.21xx	111.25 [4.38]
Sendix absolute (F5868, EtherNet/IP) D8.2C1.0600.F8xx.A2xx	99.75 [1.69]
Sendix absolute (5868) D8.2C1.0600.68xx.xxxx	90.35 [3.93]
Sendix absolute (M586x) D8.2C1.0600.Mxxx.xxxx	90.05 [3.54]

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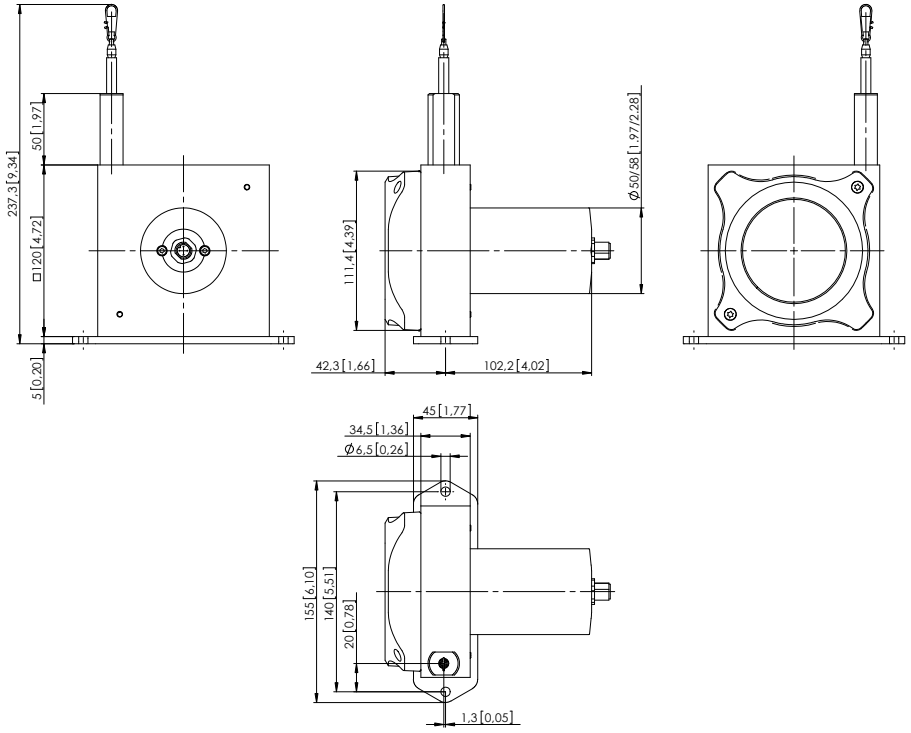
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder C120** | **Measuring length max. 6 m Traverse speed max. 10 m/s**

Dimensions

Dimensions in mm [inch]

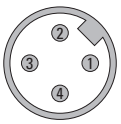
Draw wire mechanics with analog sensor (scaled on measuring range)



Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Cable color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

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Draw wire encoder for outdoor applications | **Draw wire encoder D120** | **Measuring length up to 10 m Linearity up to ±0.1 %**

Their extremely robust construction, their high IP69k protection level and their wide temperature range make these new draw wire encoders particularly reliable and durable. Their flexibility and adaptability reflects in the wide range of housing and wire types, the long measuring range and the various interfaces. The possibility of redundancy must be particularly pointed out.

RoHS CANopen Analog output

Long service life | Wide temperaturerange | High protection level

Robust

- Protection level up to IP69k and wide temperature range from -40°C ... +85°C.
- The titanium-anodized aluminum housing and the stainless steel wires allow using the mechanics even in harsh conditions.
- Wire diameter (stainless steel, V4A) up to ø 1.5 mm - ideal for outdoor applications.

Versatile

- Measuring length up to 10 m.
- Redundant outputs (mA, V, R, CANopen).
- The right measuring wire and the right wire fastening for every application.
- Linearity up to ±0.1 % of the measuring range.
- Various constructions: open, closed housing or housing with perforated sheet steel cover.

Order code

D8.D120 . X X X X . XXX X . 0000
Type — a b c d — e — f

Standard variants are represented **bold underlined**

a *Measuring length*
3 = 3 m
4 = 4 m
5 = 5 m
6 = 6 m
7 = 7 m
8 = 8 m
9 = 9 m
A = 10 m

b *Wire types* [1]
1 = V4A, ø 0.5 mm
2 = V4A, ø 1.0 mm (measuring length 3 ... 8 m)
3 = V4A, ø 1.5 mm (measuring length 3 ... 6 m)

c *Linearity*
1 = 0.5 %
2 = 0.25 %
3 = 0.1 %

d *Housing*
1 = open housing, open wire guide
3 = housing with perforated sheet metal cover, open wire guide
4 = housing with perforated sheet metal cover, closed wire guide
6 = closed housing, closed wire guide

e *Sensor type*
A11 = 4 ... 20 mA / 12 ... 30 VDC
A22 = 0 ... 10 V / 12 ... 30 VDC
A33 = 1 kΩ / max. 30 VDC
A44 = CANopen [2]
R11 = 2 x 4 ... 20 mA / 12 ... 30 VDC
R22 = 2 x 0 ... 10 V / 12 ... 30 VDC
R33 = 2 x 1 kΩ / max. 30 V
R44 = 2 x CANopen [2]

f *Type of connection / protection level sensor*
1 = radial cable, 2 m [6.56'] TPE / IP69k [3]
3 = radial M12 connector / IP67
4-pin for sensor type A11 ... A33
8-pin for sensor type R11 ... R33

1) Wire type availability depends on the selected measuring range, refer to the technical data.
2) In preparation, available end of the first quater of 2017.
3) Other cable length on request.

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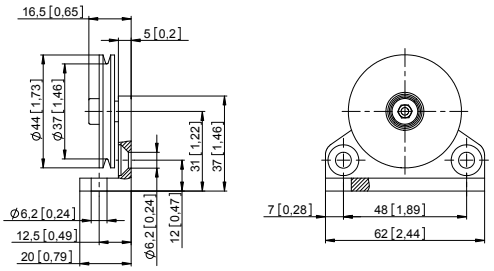
Draw wire encoder for outdoor applications | **Draw wire encoder D120** | **Measuring length up to 10 m Linearity up to ±0.1 %**

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Technical data

General technical data

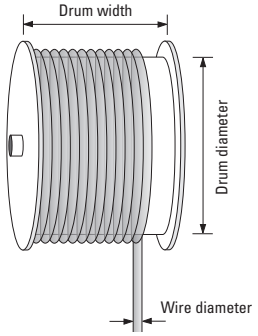
Linearity	±0.5 %
Improved linearity	±0.25 % or ±0.1 %
Resolution	see electrical characteristics
Sensor element	potentiometer
Output signal (others on request)	4 ... 20 mA, 0 ... 10 V, potentiometer, CANopen (in preparation)
Redundant output signal	optional for: 4 ... 20 mA, 0 ... 10 V, potentiometer, CANopen (in preparation)
Connection	radial M12 connector or radialer cable outlet (TPE cable), standard length 2 m
Protection	IP67, optional IP69K (only with cable outlet)
Humidity	max. 90 % relative, no condensing
Wire pull-out speed	max. 3.0 m/s
Acceleration	max. 50 m/s^2
Weight	1300 ... 1600 g [45.87 ... 56.44 oz] depending on measuring range
Housing	aluminum, spring housing PA6

Characteristics measuring wire

V4A, ø 0.5 mm	measuring range	3 ... 10 m
	no.	1.4401
	breaking force	280 N
	TK	16 x 10^{-6} K^{-1}
V4A, ø 1.0 mm	measuring range	3 ... 8 m
	no.	1.4401
	breaking force	942 N
	TK	16 x 10^{-6} K^{-1}
V4A, ø 1.5 mm	measuring range	3 ... 6 m
	no.	1.4401
	breaking force	1.890 N
	TK	16 x 10^{-6} K^{-1}

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. The single-layer wire winding ensuring the best linearity possible is a specific feature of Kübler draw wire encoders.



Note
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.

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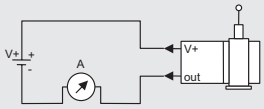
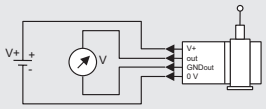
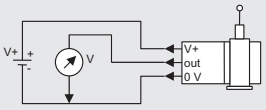
Draw wire encoder for outdoor applications | **Draw wire encoder D120** | **Measuring length up to 10 m Linearity up to ±0.1 %**

Electrical characteristics (analog sensor, scaled to measuring range)

Version	A11 / R11	A22 / R22	A33 / R33
Output	4 ... 20 mA	0 ... 10 V	1 kΩ, potentiometer
Output current	max. 50 mA in case of a failure	max. 10 mA, min. load 10 kΩ	–
Max. current consumption	–	22.5 mA (non load)	–
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Response time	< 1 ms from 0 ... 100 % and 100 ... 0 %	< 3 ms from 0 ... 100 % and 100 ... 0 %	–
Resolution	limited by the noise	limited by the noise	theoretically unlimited
Noise	0.03 mA_{pp} = 6 mV_{pp} at 200 Ω	typ. 3 mV_{pp}, max. 37 mV_{pp}	depending on the supply voltage
Recommended slider current	–	–	< 1 µA
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]
Short circuit proof	–	yes, sustained short-circuit proof	–
Temperature coefficient	0.0079 %/K	0.0037 %/K	±0.0025 %/K
Connection diagrams			
Electromagnetic compatibility	acc. to EN 61326-1:2006	acc. to EN 61326-1:2006	–
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Options

Protection class IP69k	All relevant sensor components are entirely encapsulated. Suitable for steam and high-pressure cleaning (only in connection with cable outlet).
Extended temperature range	The use of special components allows an operating temperature of -40°C ... +85°C [-40°F ... +185°F]
Redundant output signal	The use of a double potentiometer allows the sensor to provide two independent output signals: • 2 x 4 ... 20 mA • 2 x 0 ... 10 V • 2 x 1 kΩ • 2 x CANopen (in preparation)
Wire fastening (with swivel, on ball bearing)	• eyelet, internal diameter 20 mm (standard) • M4 thread, length 22 mm • wire clip
Wire cleaner	In preparation

Order code – extensions for the following options

Wire fastening M4 [1]	D8.D120.xxxx.xxxx.xxxx.**S001**
Wire fastening clip	D8.D120.xxxx.xxxx.xxxx.**S002**
Extended temperature range -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.**S003**
Wire fastening M4 and -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.**S004**
Wire fastening clip and -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.**S005**

1) Not available with wire type V4A, ø 1,5 mm – order option b = 3.

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Draw wire encoder for outdoor applications | **Draw wire encoder D120** | **Measuring length up to 10 m**
Linearity up to ±0.1 %

Terminal assignment

Type of connection	Sensor type	M12 connector, 4-pin					
3	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	⏚
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	⏚
	A33 (1 kΩ)	Signal:	+V	Slider	0 V	n.c.	⏚
		Pin:	1	2	3	4	PH

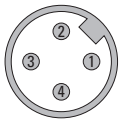
Type of connection	Sensor type	M12 connector, 8-pin									
3	R11 (4 ... 20 mA)	Signal:	$+V_1$	n.c.	Signal 1	n.c.	$+V_2$	n.c.	Signal 2	n.c.	⏚
	R22 (0 ... 10 V)	Signal:	$+V_1$	Signal 1	$0\ V_1$	0 V Signal 1	$+V_2$	Signal 2	$0\ V_2$	0 V Signal 2	⏚
	R33 (1 kΩ)	Signal:	$+V_1$	Slider 1	$0\ V_1$	n.c.	$+V_2$	Slider 2	$0\ V_2$	n.c.	⏚
		Pin:	1	2	3	4	5	6	7	8	PH

Type of connection	Sensor type	Cable (isolate unused wires individually before initial start-up)					
1	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	⏚
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	⏚
	A33 (1 kΩ)	Signal:	+V	Slider	0 V	n.c.	⏚
		Pin:	BN	WH	BU	SW	shield

Type of connection	Sensor type	Cable (isolate unused wires individually before initial start-up)									
1	R11 (4 ... 20 mA)	Signal:	$+V_1$	n.c.	Signal 1	n.c.	$+V_2$	n.c.	Signal 2	n.c.	⏚
	R22 (0 ... 10 V)	Signal:	$+V_1$	Signal 1	$0\ V_1$	0 V Signal 1	$+V_2$	Signal 2	$0\ V_2$	0 V Signal 2	⏚
	R33 (1 kΩ)	Signal:	$+V_1$	Slider 1	$0\ V_1$	n.c.	$+V_2$	Slider 2	$0\ V_2$	n.c.	⏚
		Color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Top view of mating side, male contact base

M12 connector, 8-pin



M12 connector, 4-pin

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Draw wire encoder for outdoor applications | **Draw wire encoder D120** | **Measuring length up to 10 m Linearity up to ±0.1 %**

Technology in detail

Various wire types and wire fastenings

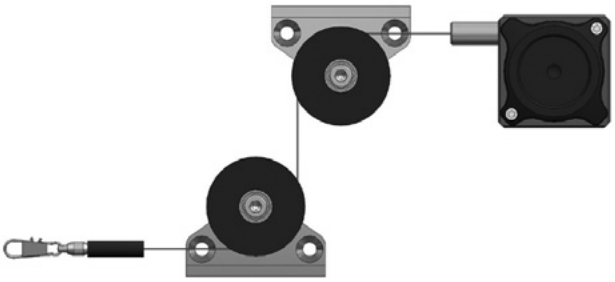
Wire types:
- ø 0.5 mm (V4A) [1)]
- ø 1.0 mm (V4A)
- ø 1.5 mm (V4A)

Wire fastenings:
Clip | M4 thread | Eyelet [1)]

Extension wire

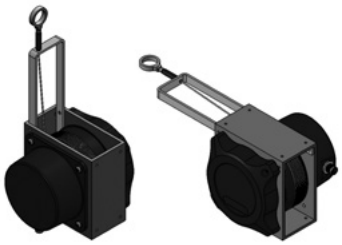
available on request with clip or M4 cable fastening

Application-specific installation possibilities

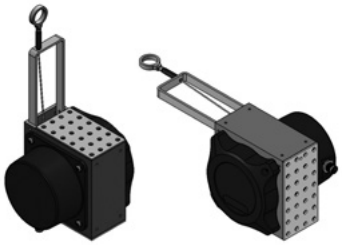


Housing types (the suitable housing type fir every application)

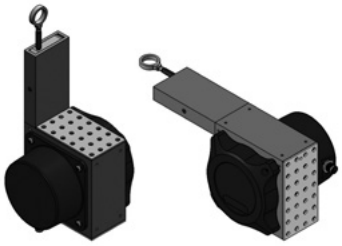
Open



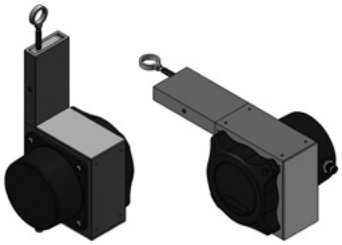
Perforated sheet metal cover, open wire guide



Perforated sheet metal cover, closed wire guide



Closed



1) Standard.

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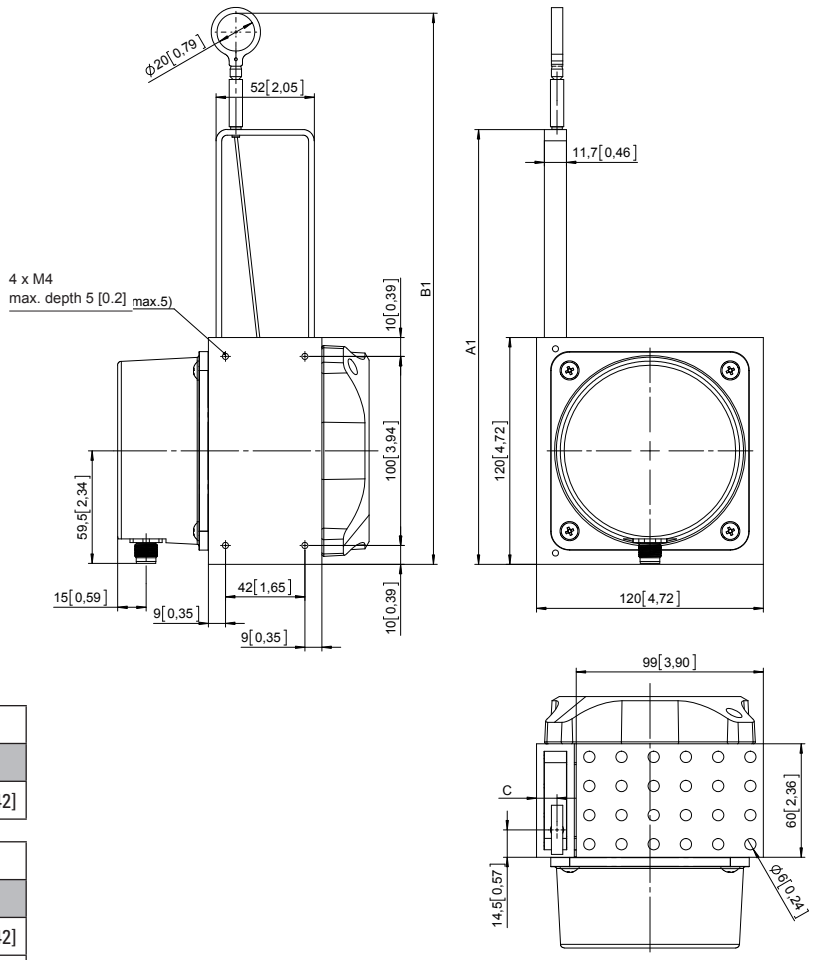
Draw wire encoder for outdoor applications | **Draw wire encoder D120** | **Measuring length up to 10 m Linearity up to ±0.1 %**

Dimensions

Dimensions in mm [inch]

Open wire guide



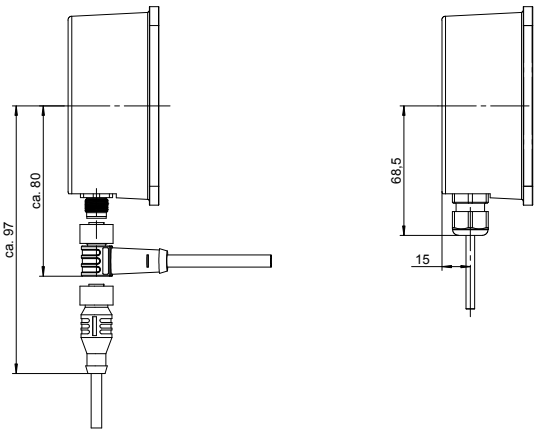
Wire diameter ø 0.5 mm			
Measuring length	**A1**	**B1**	**C**
3 ... 10 m	230 [9.06]	~291.5 [11.5]	10.75 [0.42]

Wire diameter ø 1.0 mm			
Measuring length	**A1**	**B1**	**C**
3 ... 5 m	230 [9.06]	~291.5 [11.5]	10.75 [0.42]
6 ... 8 m	320 [12.6]	~381.5 [15.0]	12.25 [0.48]

Wire diameter ø 1.5 mm			
Measuring length	**A1**	**B1**	**C**
3 ... 4 m	230 [9.06]	~291.5 [11.5]	10.75 [0.42]
5 ... 6 m	320 [12.6]	~381.5 [15.0]	12.25 [0.48]

Connector output / Cable outlet

The cable must be protected in case of steam and high-pressure clean ing.



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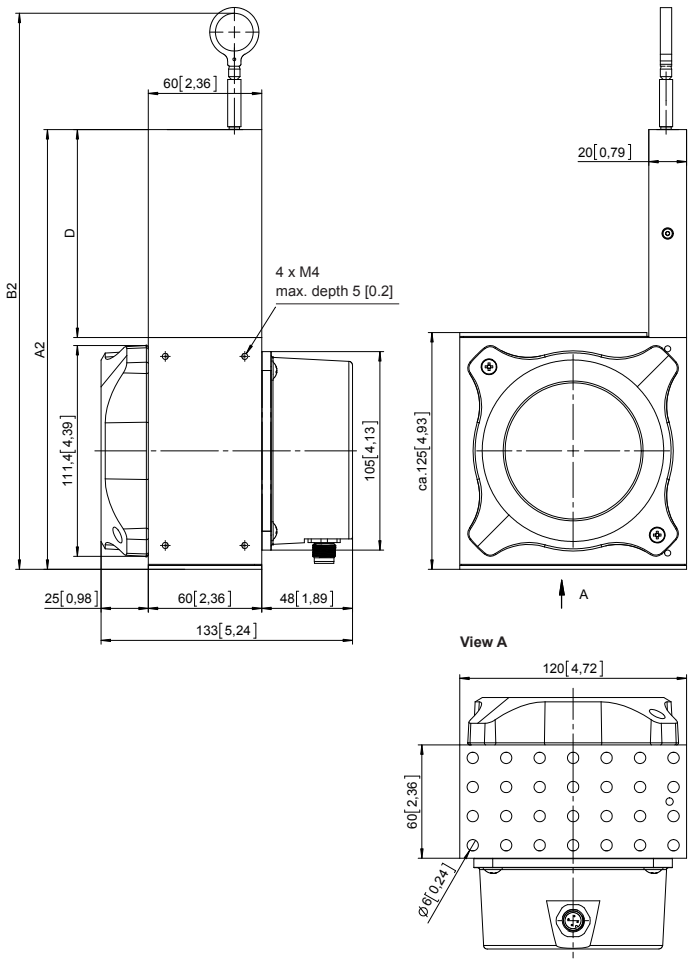
Draw wire encoder for outdoor applications | **Draw wire encoder D120** | **Measuring length up to 10 m Linearity up to ±0.1 %**

Dimensions

Dimensions in mm [inch]

Closed wire guide



Wire diameter ø 0.5 mm			
Measuring length	**A2**	**B2**	**D**
3 ... 10 m	233 [9.17]	~291.5 [11.5]	110 [4.33]

Wire diameter ø 1.0 mm			
Measuring length	**A2**	**B2**	**D**
3 ... 5 m	233 [9.17]	~291.5 [11.5]	110 [4.33]
6 ... 8 m	323 [12.7]	~381.5 [15.0]	200 [7.87]

Wire diameter ø 1.5 mm			
Measuring length	**A2**	**B2**	**D**
3 ... 4 m	233 [9.17]	~291.5 [11.5]	110 [4.33]
5 ... 6 m	323 [12.7]	~381.5 [15.0]	200 [7.87]

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder D135

Measuring length max. 42.5 m
Traverse speed max. 5 m/s

These draw wire mechanics D135 can be used up to a measuring length of 42.5 meters. This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.

With its compact construction, the D135 suits perfectly all measuring tasks from 8 up to 42.5 meters.

SSI · PROFIBUS · PROFINET · EtherCAT Conformance tested · RoHS · Analog output · CANopen · EtherNet/IP

Max. acceleration · Long service life · Temperature · High protection level · Reverse polarity protection

Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed and high acceleration.
- Flexible mounting thanks to fastening tabs or fastening grooves.
- Various connection possibilities available.
- Interchangeable encoders (interchangeable installation).

Order code with encoder (incremental, absolute)

D8.4D1	.	XXXX	.	XX	X	X	.	XXXX
Type		ⓐ		ⓑ	ⓒ	ⓓ		ⓔ

Standard variants are represented **bold underlined**

ⓐ *Measuring range*
0800 = 8 000 mm
1000 = 10 000 mm
1200 = 12 000 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
4250 = 42 500 mm

ⓑ *Encoder used*
00 = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
63 = Sendix 5863, absolute
M8 = Sendix M5868, absolute
F8 = Sendix F5868 absolute
68 = Sendix 5868, absolute

ⓒ *Output circuit*
depends on the encoder used

ⓓ *Type of connection*
depends on the encoder used

ⓔ *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 5000			
Drum circumference [mm]	333.33	333.33	333.33
Pulses / revolution [ppr]	1000	2000	4000
Pulses / mm	3	6	12
Resolution [mm]	0.33	0.17	0.08

Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	333.33
Pulses / revolution [ppr]	4096
Pulses / mm	12.3
Resolution [mm]	0.08

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder D135

Measuring length max. 42.5 m
Traverse speed max. 5 m/s

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xD1.xxxx.0054.2000	Sendix 5000 (8.5000.8354.2000)	Push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	-
D8.xD1.xxxx.M324.G222	Sendix M5863 (8.M5863.3524.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.xD1.xxxx.M824.2122	Sendix M5868 (8.M5868.3524.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profil DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xD1.xxxx.F326.G223	Sendix F5863 (8.F5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xD1.xxxx.6326.G223	Sendix 5863 (8.5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xD1.xxxx.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xD1.xxxx.6822.2123	Sendix 5868 (8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xD1.xxxx.6832.3113	Sendix 5868 (8.5868.1232.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.xD1.xxxx.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.xD1.xxxx.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.xD1.xxxx.F8AN.A222	Sendix F5868 (8.F5868.12AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Order code with encoder (analog, scalable with limit switch function)

D8.4D1	.	XXXX	.	M1	X	X	.	XXXX
Type		a		b	c	d		e

Standard variants are represented **bold underlined**

a *Measuring range*
0800 = 8 000 mm
1000 = 10 000 mm
1200 = 12 000 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
4250 = 42 500 mm

b *Encoder used*
M1 = Sendix M5861, absolute [1]

c *Output circuit*
depends on the encoder used

d *Type of connection*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xD1.xxxx.M134.3512	Sendix M5861 (8.M5861.3534.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function [2]
D8.xD1.xxxx.M144.4512	Sendix M5861 (8.M5861.3544.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function [2]
D8.xD1.xxxx.M134.3612	Sendix M5861 (8.M5861.3534.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function [2]
D8.xD1.xxxx.M144.4612	Sendix M5861 (8.M5861.3544.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function [2]

Order code with analog sensor (scaled to measuring range)

D8.3D1	.	XXXX	.	XXX	X	.	0000
Type		a		b	c		

a *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

b *Analog sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

c *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
3 = axial M12 connector, 4-pin

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)
- Increased temperature range -40°C ... +85°C and -20°C ... +120°C

1) With ccw option.

2) Delivery condition: scaled to measuring range.
Description for scaling and limit switch function see data sheet M5861.

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder D135

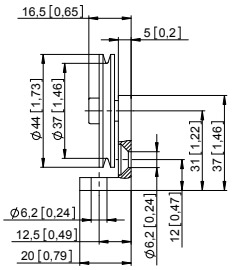
Measuring length max. 42.5 m
Traverse speed max. 5 m/s

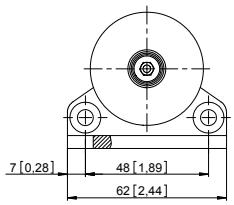
Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley





Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analog sensor

Order no.

Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range		**8000 mm**	**10000 mm** **12000 mm** **15000 mm**	**20000 mm**	**25000 mm** **30000 mm**	**35000 mm** **40000 mm** **42500 mm**
Extension force	F_{min} F_{max}	7.2 N 16.0 N	8.7 N 16.9 N	7.0 N 12.4 N	7.3 N 15.7 N	7.0 N 14.1 N
Max. speed		10 m/s	6 m/s	5 m/s	5 m/s	5 m/s
Max. acceleration		140 m/s²	80 m/s²	60 m/s²	60 m/s²	60 m/s²
Linearity	with analog output with encoder	±0.1 % (of the measuring range) ±0.05 % (of the measuring range) ±0.02 % (of the measuring range) [1]				
Weight		depending on the measuring and the sensor/encoder used				
Material	housing wire	titanium-anodized aluminum stainless steel ø 0.5 mm (ø 1 mm can be supplied as a special up to measuring range 20000 mm)				
Protection acc. to EN 60529		IP65 (sensor)				

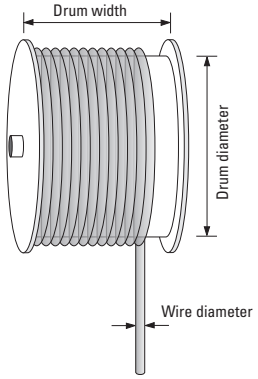
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

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.



1) On request for encoder version: **00, F3, 63, F8, 68** (see order code **b**).

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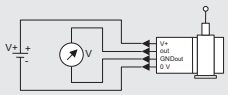
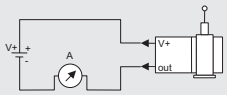
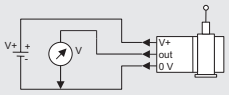
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder D135** | **Measuring length max. 42.5 m**
Traverse speed max. 5 m/s

Electrical characteristics (analog sensor, scaled to measuring range)

Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 µA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] 1)	-20°C ... +60°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] 1)	-20°C ... +85°C [-4°F ... +140°F] -40°C ... +85°C [-40°F ... +185°F] 1) -20°C ... +120°C [-4°F ... +248°F] 1)
Connection diagrams			
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Technology in detail

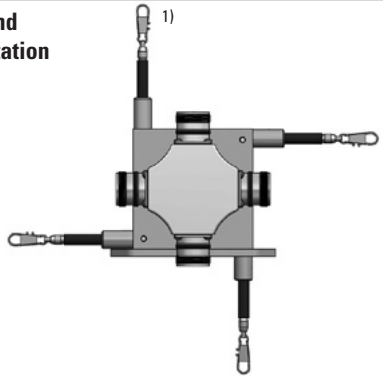
Various wire types and wire fastenings

Wire types:
- 0.5 mm (V2A) 1)
- 0.51 mm (V4A)
- 1.0 mm (V4A)
- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:
Clip 1) M4 thread Eyelet

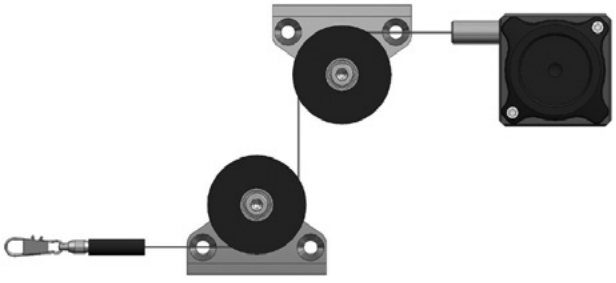
Individual wire outlet and cable / connector orientation

1)



Extension wire

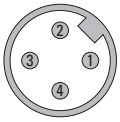
Application-specific installation possibilities



Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Cable color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

1) Standard.

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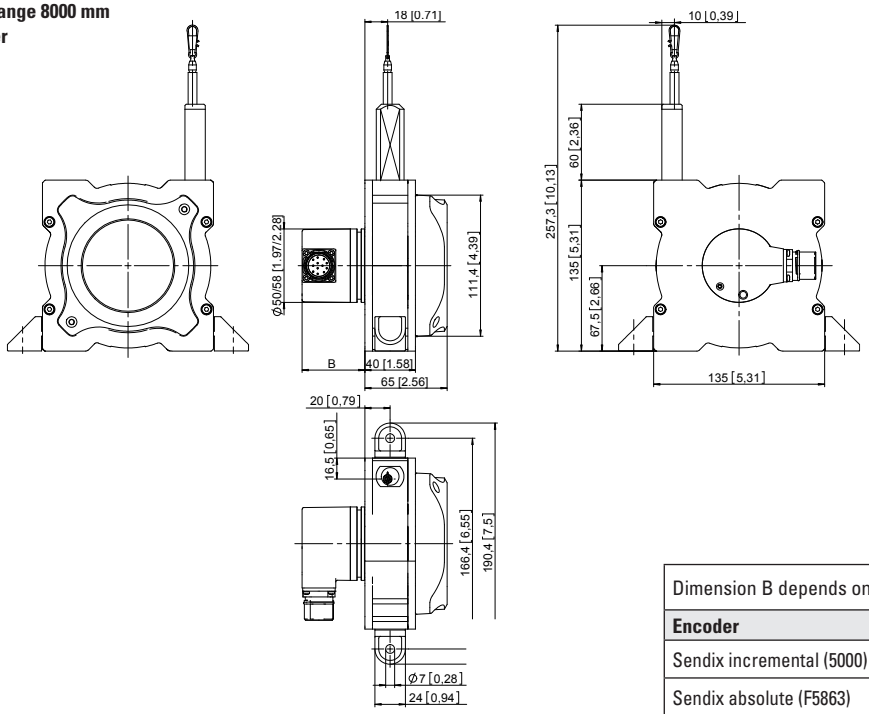
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder D135** | **Measuring length max. 42.5 m Traverse speed max. 5 m/s**

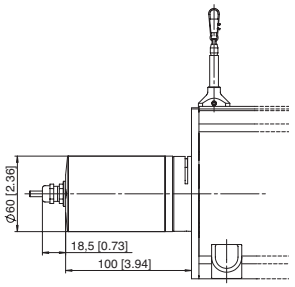
Dimensions

Dimensions in mm [inch]

Draw wire mechanics, measuring range 8000 mm with encoder



with analog output



Dimension B depends on the encoder used		
Encoder		**B**
Sendix incremental (5000)	D8.4D1.xxxx.00xx.xxxx	37.0 [1.46]
Sendix absolute (F5863)	D8.4D1.xxxx.F3xx.xxxx	49.5 [1.95]
Sendix absolute (5863)	D8.4D1.xxxx.63xx.xxxx	49.5 [1.95]
Sendix absolute (F5868, CANopen)	D8.4D1.xxxx.F8xx.21xx	70.0 [2.76]
Sendix absolute (F5868, EtherNet/IP)	D8.4D1.xxxx.F8xx.A2xx	59.5 [2.34]
Sendix absolute (5868)	D8.4D1.xxxx.68xx.xxxx	77.2 [3.04]
Sendix absolute (M586x)	D8.4D1.xxxx.Mxxx.xxxx	49.8 [1.96]

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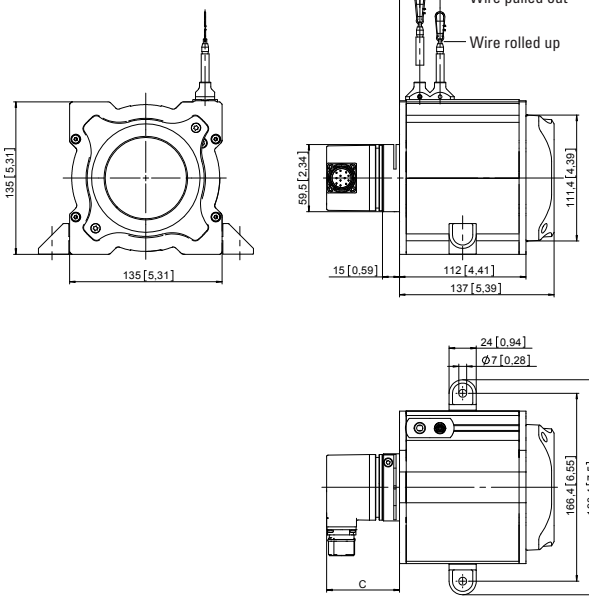
Draw wire mechanics with encoder or analog sensor | **Draw wire encoder D135** | **Measuring length max. 42.5 m Traverse speed max. 5 m/s**

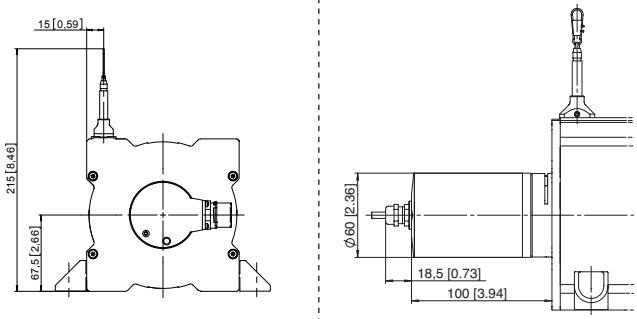
Dimensions

Dimensions in mm [inch]

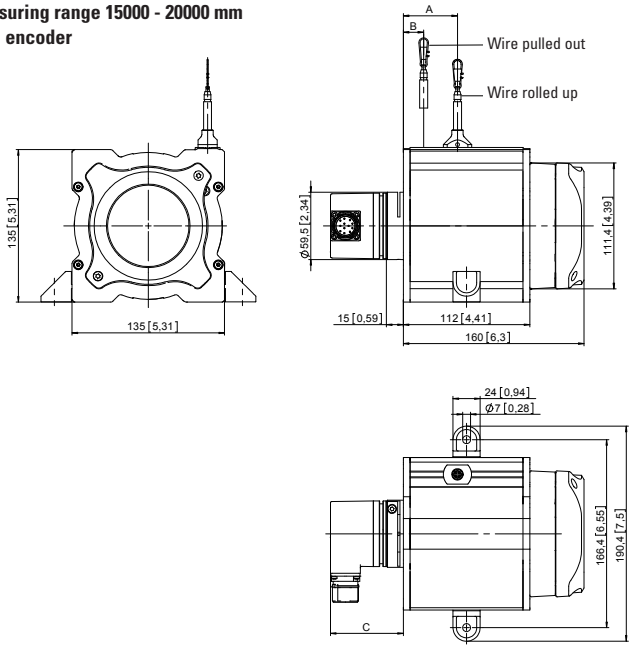
Draw wire mechanics, measuring range 10000 - 12000 mm with encoder



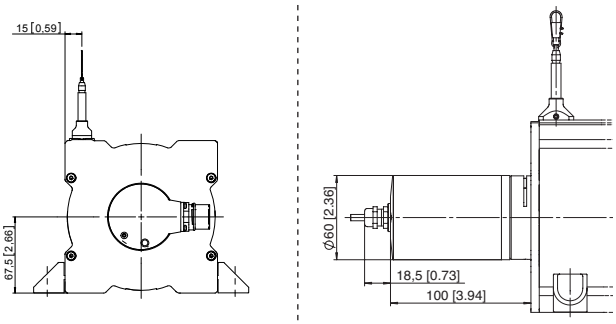
with analog output



Draw wire mechanics, measuring range 15000 - 20000 mm with encoder



with analog output



Measuring range	**A** - Wire rolled up	**B** - Wire pulled out
10000 mm	33 [1.30]	18 [0.71]
12000 mm	36 [1.42]	18 [0.71]
15000 mm	41 [1.61]	18 [0.71]
20000 mm	48 [1.89]	18 [0.71]

Dimension **C** depends on the encoder used

Encoder		**C**
Sendix incremental (5000)	D8.4D1.xxxx.00xx.xxxx	60.0 [2.36]
Sendix absolute (F5863)	D8.4D1.xxxx.F3xx.xxxx	72.5 [2.85]
Sendix absolute (5863)	D8.4D1.xxxx.63xx.xxxx	72.5 [2.85]
Sendix absolute (F5868, CANopen)	D8.4D1.xxxx.F8xx.21xx	93.0 [3.66]
Sendix absolute (F5868, EtherNet/IP)	D8.4D1.xxxx.F8xx.A2xx	82.5 [3.25]
Sendix absolute (5868)	D8.4D1.xxxx.68xx.xxxx	100.2 [3.94]
Sendix absolute (M586x)	D8.4D1.xxxx.Mxxx.xxxx	72.8 [2.87]

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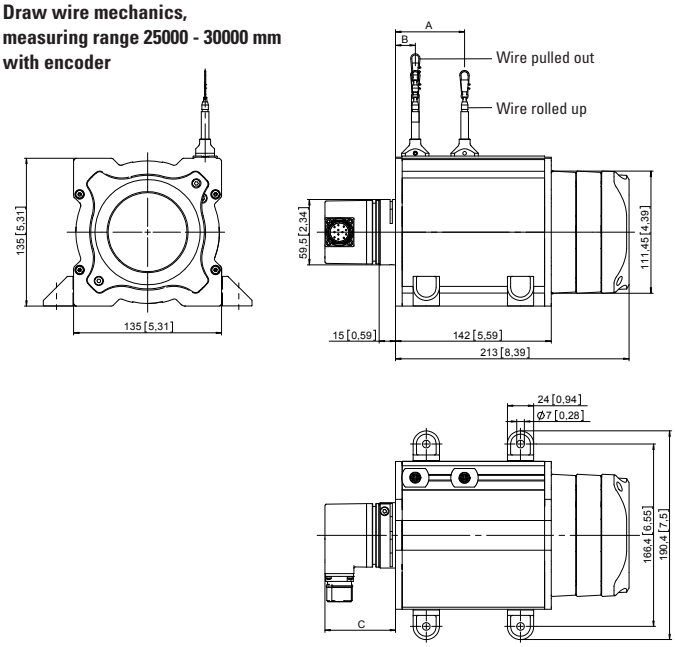
Draw wire mechanics with encoder or analog sensor | Draw wire encoder D135 | Measuring length max. 42.5 m Traverse speed max. 5 m/s

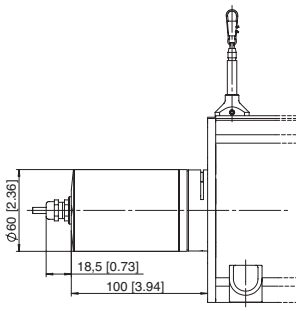
Dimensions

Dimensions in mm [inch]

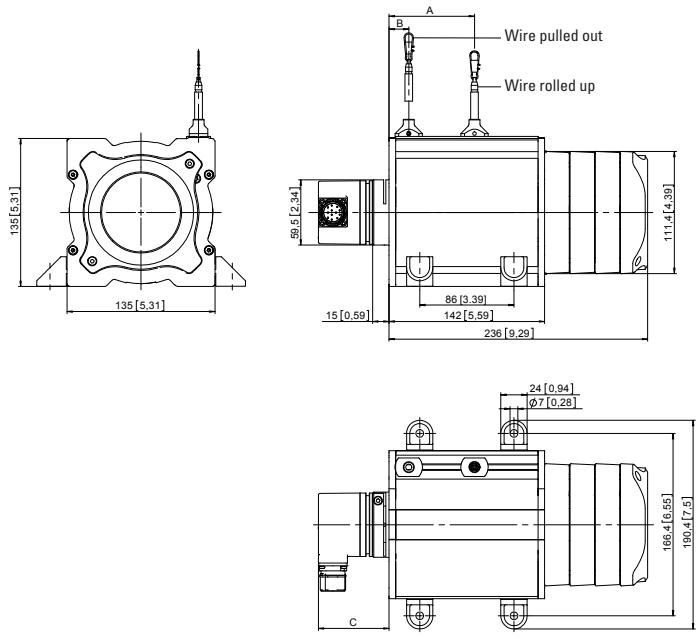
Draw wire mechanics, measuring range 25000 - 30000 mm with encoder



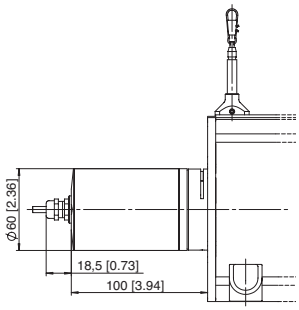
with analog output



Draw wire mechanics measuring range 35000 - 42500 mm with encoder



with analog output



Measuring range	**A** - Wire rolled up	**B** - Wire pulled out
25000 mm	56 [2.02]	18 [0.71]
30000 mm	63 [2.48]	18 [0.71]
35000 mm	71 [2.80]	18 [0.71]
40000 mm	78 [3.07]	18 [0.71]
42500 mm	82 [3.23]	18 [0.71]

Dimension **C** depends on the encoder used

Encoder		**C**
Sendix incremental (5000)	D8.4D1.xxxx.00xx.xxxx	60.0 [2.36]
Sendix absolute (F5863)	D8.4D1.xxxx.F3xx.xxxx	72.5 [2.85]
Sendix absolute (5863)	D8.4D1.xxxx.63xx.xxxx	72.5 [2.85]
Sendix absolute (F5868, CANopen)	D8.4D1.xxxx.F8xx.21xx	93.0 [3.66]
Sendix absolute (F5868, EtherNet/IP)	D8.4D1.xxxx.F8xx.A2xx	82.5 [3.25]
Sendix absolute (5868)	D8.4D1.xxxx.68xx.xxxx	100.2 [3.94]
Sendix absolute (M586x)	D8.4D1.xxxx.Mxxx.xxxx	72.8 [2.87]

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Lift measuring system for shaft-copying | Encoder mounting fixture, guided-belt, LM3 | max. height 53 m

System for shaft-copying, with complete mechanical kit in proven toothed belt technology.

A smooth-running toothed belt and a vibration-resistant encoder mounting fixture ensure quiet operation. The belt pulley benefits from separate bearing supports in the mounting fixture, so protecting the installed encoder from mechanical overloading. With the guided-belt system, the encoder mounting fixture and the measuring wheels are located on the lift car.

Ideal for use in passenger lifts, freight lifts, automatic storage systems.

Complete system

- Fast and easy installation with accessories from one single source.
- Reduced load on encoder bearings due to separate belt pulley-bearings.
- Non-slip.
- Tensioning rollers with belt guide.

Minimal noise generation

- Smooth-running toothed-belt ensures extremely quiet operation.
- Vibration-free operation.

Order code 8.LM3.01

Encoder mounting fixture with measuring wheels for fixing on the lift car

Consists of:

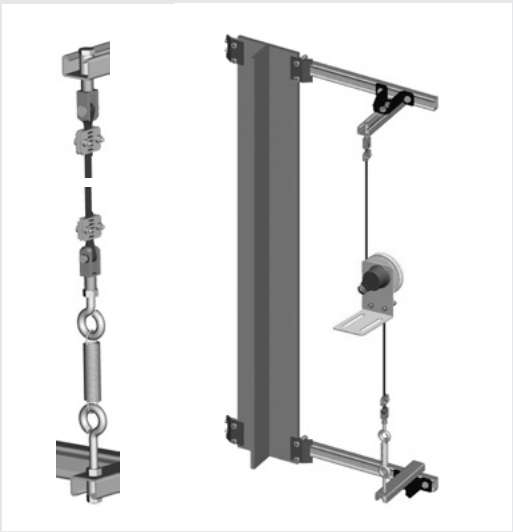
- Encoder mounting fixture
- Mounted measuring wheel
- Belt guide
- Belt fixing and tensioning set
- Screws and other small components

Suitable encoders:

- Incremental encoder: 8.5000.83XX.XXXX
  calculation of pulse rate ppr =

$$\frac{300\ \text{mm}}{\text{resolution, e.g. 0.5 mm}} = 600$$

- Absolute encoders:
  SSI: 8.5863.12XX.XXXX
  CANopen / CANopenLift: 8.5868.12XX.XXXX



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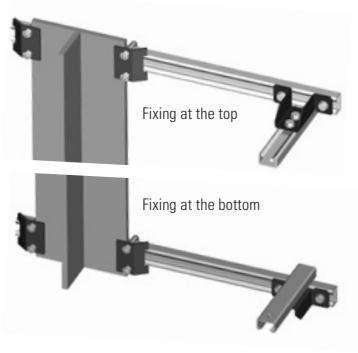
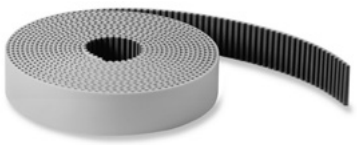
Elevator measuring system for shaft-copying | Encoder mounting fixture, guided-belt, LM3 | max. height 53 m

Accessories for encoder mounting fixture LM3

		Order no.
Fixing kit	Complete kit consists of: - C-rails, 700 mm - Bracket - Screws - Other small components	**8.BLM2.01**
Toothed belt	- Width 10 mm - Polyurethane, with single parallel steel cords - Low belt-stretch - High resistance to abrasive wear - Resistant to the effects of UV radiation - Maintenance-free - Resistant to ageing - Temperature range -10°C ... +80°C [+14°F ... +176°F] Calculation of the required length of toothed belt = Elevator height + approx. 5 m (depending on the distance between top and bottom fixing)	**05.ZAR1.XXX** XXX = Length in meters Standard delivery lengths: 20 m, 25 m, 30 m, 35 m, 40 m, 45 m, 50 m, 55 m, 60 m, 70 m, 80 m, 90 m, 100 m, 120 m, 250 m, 300 m Other lengths on request



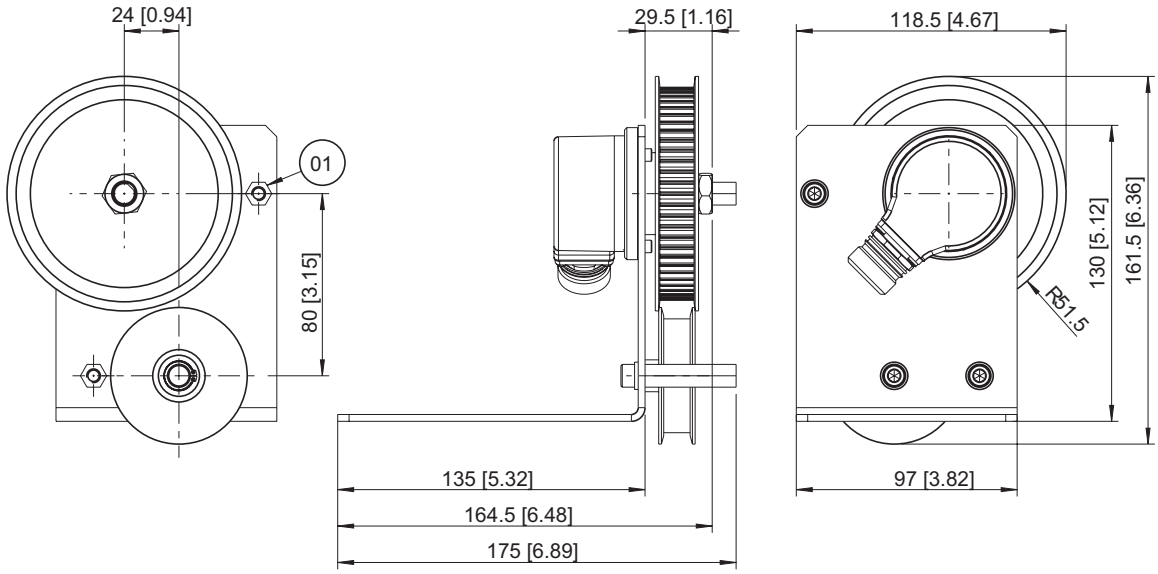


Technical data

Resolution in the shaft	depends on the resolution of the encoder (e.g. incremental encoder with 3000 ppr = 0.1 mm; absolute encoder 12 x 12 bit < 0.1 mm)
Elevator car speed	max. 1.6 m/s
Max. height of lift	53 m
Effective circumference of belt pulley	300 mm

Dimensions

Dimensions in mm [inch]



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Length measuring kit with spring encoder arm | **Limes Kit TB1** | **Measuring length to 400 m Application-specific adaptation**

Limes Kit TB is a flexible length measuring kit for the measurement of positions and speeds. The complete system is easy to mount and compensates unevennesses and mounting tolerances in the application.

The length measuring kit is available in many variants and can be adapted for the specific requirements of your application. Moreover, our Sendix encoder portfolio offers the suitable interface for every application. Both incremental and absolute encoders can be used.

Versatile

- Large measuring range (up to 400 m).
- Usable for linear and rotary movements.
- Incremental or absolute measurement.
- All usual interfaces/field buses.
- Application-specific adaptation of the spring encoder arm (adjustable pressing force).
- Compensation of application tolerances.

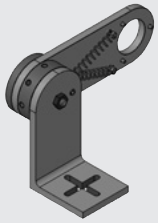
Robust and cost-efficient

- Simple mounting.
- Steel-reinforced plastic belt.
- Robust Sendix encoders.
- Wide temperature range of -10°C ... +80 °C.
- High traversing speed up to 5 m/s.

Single components Limes Kit TB1:

Spring encoder arm

8.0010 . 7000 . 0010



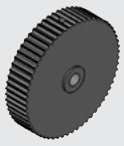
Encoder

(See the table of recommended encoders)

All incremental or absolute Sendix encoders with clamping flange (centering collar 36 mm) and 10 mm shaft diameter (shaft 10x20 mm) can be used.

Pulley

8.0000 . A **X**ⓐ **X**ⓑ 1 . **XXXX**ⓒ



ⓐ *Material*
1 = aluminum
2 = plastic

ⓑ *Width*
1 = 10 mm [0.39“]
2 = 20 mm [0.79“]

ⓒ *Pitch circumference*
0360 = 360 mm
0300 = 300 mm
0240 = 240 mm
0220 = 220 mm
0150 = 150 mm
0120 = 120 mm
0100 = 100 mm

Toothed belt

8.0000 . B 1 **X**ⓐ 1 . **XXXX**ⓑ

ⓐ *Width*
1 = 10 mm [0.39“]
3 = 25 mm [0.94“]
4 = 50 mm [1.97“]

ⓑ *Length [in dm] [1], ex.:*
0010 = 1 m [3.28´]
0020 = 2 m [6.56]
...
4000 = 400 m [1312.34´]

1) Yard ware (1 m, 2 m, ... 400 m), lengths > 400 m on request.

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Length measuring kit with spring encoder arm | Limes Kit TB1 | Measuring length to 400 m Application-specific adaptation

Recommended encoders, incremental

Encoder	Interface	Power supply	Type of connection	Pulley circumference [mm]	Recommended encoder resolution (pulse number)	mm / pulse	Order no.
Sendix 5000	push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	360	3600	0.1	8.5000.8354.3600
				300	3000	0.1	8.5000.8354.3000
				240	240	1.0	8.5000.8354.0240
				220	2500	0.088	8.5000.8354.2500
				150	1500	0.1	8.5000.8354.1500
				120	1200	0.1	8.5000.8354.1200
				100	1000	0.1	8.5000.8354.1000

Recommended encoders, absolute

Encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option	Order no.
Sendix M5861	analog, 4 ... 20 mA	10 ... 30 V DC	1x radial M12 connector	12 bit (4096)	scalable with limit switch function	8.M5861.3534.3312
	analog, 0 ... 10 V	10 ... 30 V DC	1x radial M12 connector	12 bit (4096)	scalable with limit switch function	8.M5861.3544.4312
	analog, 0 ... 5 V	10 ... 30 V DC	1x radial M12 connector	11 bit (2048)	scalable with limit switch function	8.M5861.3544.5312
Sendix M5863	SSI	10 ... 30 V DC	1x radial M12 connector	4096 ppr / SSI Gray code	–	8.M5863.3524.G222
Sendix M5868	CANopen	10 ... 30 V DC	1x radial M12 connector	CANopen encoder profil DS406 V4.0	–	8.M5868.3524.2122

Further encoders, absolut

Encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option	Order no.
Sendix F5863	SSI	10 ... 30 V DC	1x radial M12 connector	4096ppr / SSI Gray code	SET button + status LED	8.F5863.1226.G223
Sendix 5863	SSI	10 ... 30 V DC	1x radial M12 connector	4096ppr / SSI Gray code	SET button + status LED	8.5863.1226.G233
Sendix F5868	CANopen	10 ... 30 V DC	1x radial M12 connector	CANopen encoder profil DS406 V3.2	SET button	8.F5868.122E.2123
Sendix 5868	CANopen	10 ... 30 V DC	2x radial M12 connector	CANopen encoder profil DS406 V3.2	SET button	8.5868.1222.2123
Sendix 5868	PROFIBUS	10 ... 30 V DC	3x radial M12 connector	Profibus-DP V0 encoder profil class 2	SET button	8.5868.1232.3113
Sendix 5868	EtherCAT	10 ... 30 V DC	3x radial M12 connector	EtherCAT with CoE 3.2.10	-	8.5868.12B2.B212
Sendix 5868	PROFINET IO	10 ... 30 V DC	3x radial M12 connector	PROFINET encoder profil version 4.1	-	8.5868.12C2.C212
Sendix F5868	EtherNet/IP	10 ... 30 V DC	3x radial M12 connector	EtherNet/IP	-	8.F5868.12AN.A222

Technical data

Total system

Temperature range	-10°C ... +80°C [+14°F ... +176°F]
Max. traversing speed	5 m/s
IP protection	depends on the encoder used (refer to the encoder data sheet)

Spring encoder arm

Material	aluminum
Spring force = maximum pressing force on the toothed belt	max. 40 N
Minimum pressing force of the pulley on the toothed belt	min. 20 N (ca. 20 N = 1 notch/position)

Encoder

Technical data	depends on the encoder used (refer to the encoder data sheet)
Flange type	All encoders with clamping flange (centering collar 36 mm) and 10 mm shaft can be used

Pulley

Material	aluminum or plastic (POM-C)
Width	10 / 20 mm
Pitch circumference	100 ... 360 mm
Number of teeth	20 ... 72
Toothing type	HD60 – 5M
Pitch	5 mm

Toothed belt

Material	steel-reinforced PU with polyamide fabric on the teeth side
Adhesive basis	Modified acrylate
Toothing type	RTD 5M
Tooth strength	37.8 N/cm belt width
Bend radius	min. 30 mm
Width	10 mm, 25 mm, 50 mm (others on request)
Height	3.8 mm

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Length measuring kit with spring encoder arm | **Limes Kit TB1** | **Measuring length to 400 m Application-specific adaptation**

Technic in detail

Overview belt pulley

Number of teeth	Pitch [mm]	Diameter in mm ["]	Pitch diameter [1] in mm ["] (pitch x no of teeth) / π	Pitch circumference in mm (pitch x no of teeth) or (Pitch diameter x π)	Order no. B = pulley width x = material (1 = aluminum, 2 = plastic)	
					B = 10 mm	B = 20 mm
72	5	112.65 [4.44]	114.59 [4.51]	360	8.000.Ax11.0360	8.000.Ax21.0360
60	5	93.55 [3.68]	95.49 [3.76]	300	8.000.Ax11.0300	8.000.Ax21.0300
48	5	74.45 [2.93]	76.39 [3.01]	240	8.000.Ax11.0240	8.000.Ax21.0240
44	5	68.09 [2.68]	70.03 [2.76]	220	8.000.Ax11.0220	8.000.Ax21.0220
30	5	45.81 [1.80]	47.75 [1.88]	150	8.000.Ax11.0150	8.000.Ax21.0150
24	5	36.27 [1.43]	38.19 [1.50]	120	8.000.Ax11.0120	8.000.Ax21.0120
20	5	29.90 [1.18]	31.83 [1.25]	100	8.000.Ax11.0100	8.000.Ax21.0100

Resolution examples with encoder (incremental / absolut)

Incremental encoder Sendix 5000		
Pitch circumference [mm]	360	360
Pulses / revolution [ppr]	360	3600
Pulses / mm	1	10
Resolution	1	0.1

Absolut encoder Sendix 5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)		
Pitch circumference [mm]	360	
Pulses / revolution [ppr]	4096	
Pulses / mm	~ 11.5	
Resolution	~ 0.088	

1) The pitch diameter of the pulley is always larger than the diameter of the pulley, as the height of the belt must be considered

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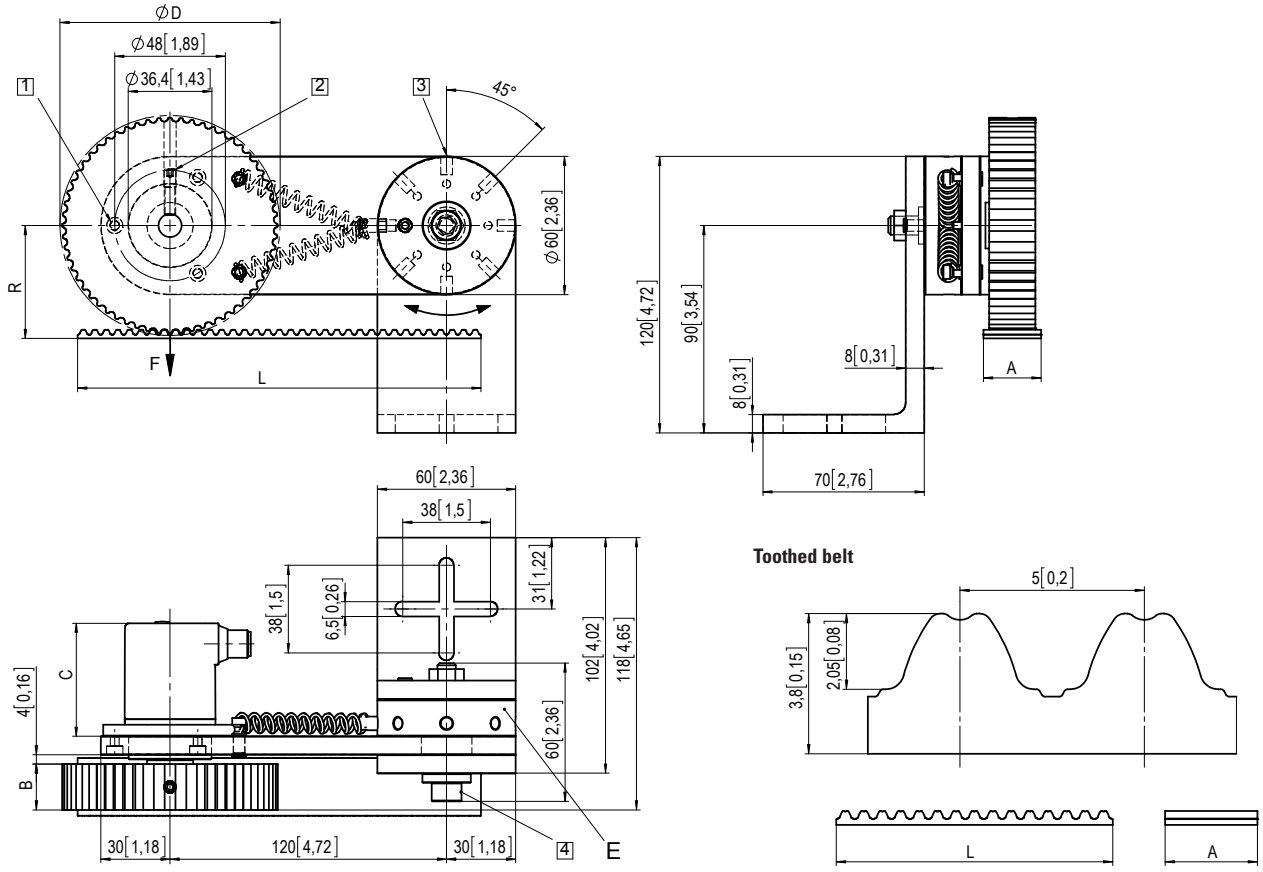
Length measuring kit with spring encoder arm | **Limes Kit TB1** | **Measuring length to 400 m Application-specific adaptation**

Dimensions

Dimensions in mm [inch]



Toothed belt

1 3 M3x8 DIN912 (SW2.5) screws
recommended tightening torque 2.0 Nm (attached)

2 Set screw M5 DIN913 (SW2.5)
recommended tightening torque 2.0 Nm

3 Setting with a screwdriver
size 0 or 1

4 M8x60 DIN912 (SW6) screws
recommended tightening torque 20 Nm

Proceed as follows to adjust the required pressing force **F** (pulley / toothed belt):

1. Loosen screw 4 (SW6) on the spring encoder arm.
2. Adjust the required angle of the spring encoder arm.
3. Turn adjusting wheel **E** to set the required pressing force **F** (max. 2 positions ≙ 40 N).
4. Tighten screw 4 (SW6) on the spring encoder arm (recommended torque 20 Nm).

Width toothed belt A	Width pulley B	Pitch diameter øD	Distance to toothed belt R ±1
10 [0.39] 25 [0.98] 50 [1.97]	10 [0.39] 20 [0.79]	114.59 [4.51]	58.6 [2.31]
		95.49 [3.76]	49.0 [1.93]
		76.39 [3.01]	40.9 [1.61]
		70.03 [2.76]	36.3 [1.43]
		47.75 [1.88]	25.1 [0.99]
		38.19 [1.50]	20.4 [0.80]
		31.83 [1.25]	17.2 [0.68]

C = see encoder data sheet

L = yard ware (1 m, 2 m, ... 400 m)
other lengths > 400 m on request

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Length measuring kit with rack and pinion

Rack system incl. encoder / preset counter

Incremental / absolute

Measuring system with mobile encoder holder, mounted on springs, (with rack and pinion) for an optimum contact pressure and protection of the encoder shaft.

Components suited optimally to each other. One rotation of the pinion corresponds to a movement of 50 mm.

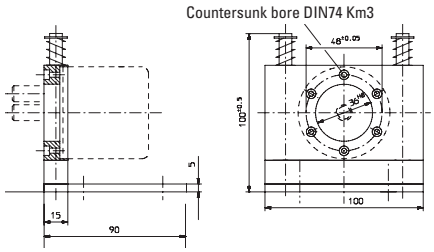
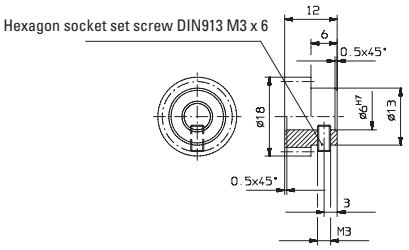
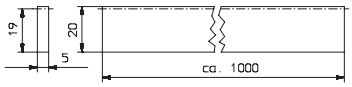
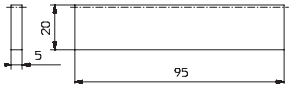
The holding device for the encoder (8.0010.7000.0004) is a movable support for encoders, to the shaft of which, for instance, a measuring wheel or pinion can be attached. Due to the fact that it is movable, optimum contact pressure is ensured and overload on the bearings of the encoder prevented.

When used in conjunction with a pulse generating unit, the rack and pinion combination (8.0010.7000.0001 and ...02) serves as a simple length and displacement measuring system. One rotation of the pinion on the rack corresponds to a displacement of 50 mm. Moreover the racks are designed in such a way that they can be butt-mounted without pitch error.

The absolute accuracy is 0.5 mm per meter. The resolution / repetition accuracy is 0.1 mm. Holding device, rack and pinion are available as a set for the purpose of displacement measurement (8.0010.7000.0005).

The installation aid (8.0010.7000.0003) is required to maintain exact pitch when butt-mounting racks.

Typical areas of application are:
- Wood working industry
- Textile industry
- Handling and automation technology
- Mechanical engineering / special machines

Single components			Order no.
Flexible holding device for encoders		**Guide rods** stainless steel **Flange** Al	**8.0010.7000.0004**
Pinion for displacement measuring device		**Material** free-cutting steel **Surface** burnished **Module pitch** approx. 1 **No of teeth** 16 with bore diameter ø 6 mm [0.24"] with bore diameter ø 10 mm [0.39"]	 **8.0010.7000.0002** **8.0010.7000.0006**
Rack		**Material** S235JR **Surface** uncoated **Module pitch** approx. 1	**8.0010.7000.0001**
Installation aid		**Material** S235JR **Surface** uncoated **Module pitch** approx. 1	**8.0010.7000.0003**
Encoder		Sendix 5000, for rack and pinion, 0.1 mm resolution	**8.5000.8354.0500**
Standard cordset		with 2 m [6.56'] PVC cable, M12	**05.00.6041.8211.002M**
Preset counter		923 LCD preset counter, 10 ... 30 V DC, 1 preset 923 LCD preset counter 100 ... 240 V AC, 1 preset	**6.923.0100.300** **6.923.0100.000**

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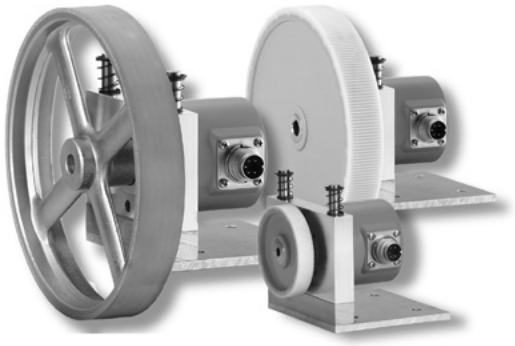
Length measuring kits with measuring wheel | Measuring wheelsystem incl. encoder / preset counter | Incremental / absolute



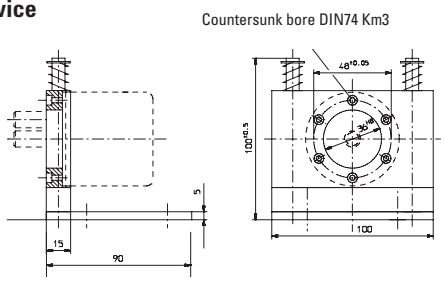
The (metric) measuring kit is a complete solution for the quick and simple implementation of length measurements on products in movement.

Flexible

- Various measuring wheels for various applications:
  - Hytrel for the textile industry.
  - Vulkollan for the wood, paper, metal and plastics industry.
- Resolution 1 mm.

Easy operation

- The encoder support ensures an optimal load on the encoder shaft.
- No additional power supply is required for the encoder, since it can be powered directly by the preset counter.

Single components		Order no.
Flexible holding device for encoders 	**Guide rods** stainless steel **Flange** Al	**8.0010.7000.0004**
Spring encoder arm		**8.0010.7000.0010**
Measuring wheels	0.2 m measuring wheel, plastic corrugated	**8.0000.3297.0010**
	0.5 m measuring wheel, plastic smooth	**8.0000.3547.0010**
	0.5 m measuring wheel, plastic corrugated	**8.0000.3597.0010**
Encoder	Sendix 5000 for 0.2 m measuring wheel, 1 mm resolution	**8.5000.8354.0200**
	Sendix 5000 for 0.5 m measuring wheel, 1 mm resolution	**8.5000.8354.0500**
Standard cordset	with 2 m [6.56'] PVC cable, M12	**05.00.6041.8211.002M**
Preset counter	923 LCD preset counter, 10 ... 30 V DC, 1 preset	**6.923.0100.300**

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Length measuring kit mini measurement system | **Measuring wheel system, incl. encoder** | **Incremental**

Very compact mini measurement system with incremental interface.

Easy to install

- The measuring wheel, the sensor and the fastening are pre-assembled and thus easy to install:
  fix – connect – ready-to-go.

Compact construction

- Dimensions of the whole unit 74 x 50 x 52 mm.
- Measuring wheel circumference 100 mm.

Order code

05.2400.0040.1000.50	XX ⓐ

Resolution
0.1 mm

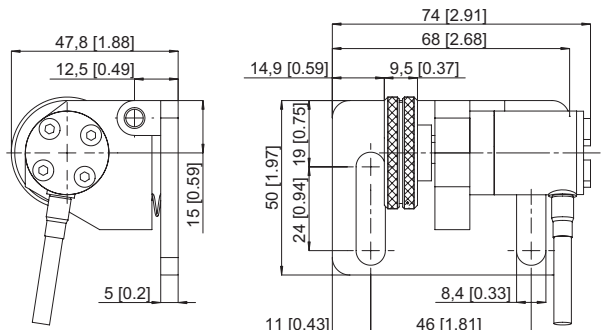
Cable outlet
radial cable, 2 m [6.56'] PVC

ⓐ *Measuring wheel*
45 = knurled aluminum
49 = rubber, Shure hardness 60

Technical data	
Maximum speed	2000 min^{-1}
Protection acc. to EN 60529	IP64
Output circuit	Push-pull with inverted signal
Power supply	8 ... 30 V DC
Current	≤ 20 mA
Load channel max.	20 mA
Output frequency max.	≥ 100 kHz

Dimensions

Dimensions in mm [inch]



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Length measuring kits flexible fastening

Spring encoder arm

Robust and reliable

- Max. 40 N, adjustable spring pressure available in any position.

  Pressure for each notch appr. 20 N
  (first notch between 0 and appr. 20 N).
- Wide temperature range -40°C ... +120°C.

Versatile

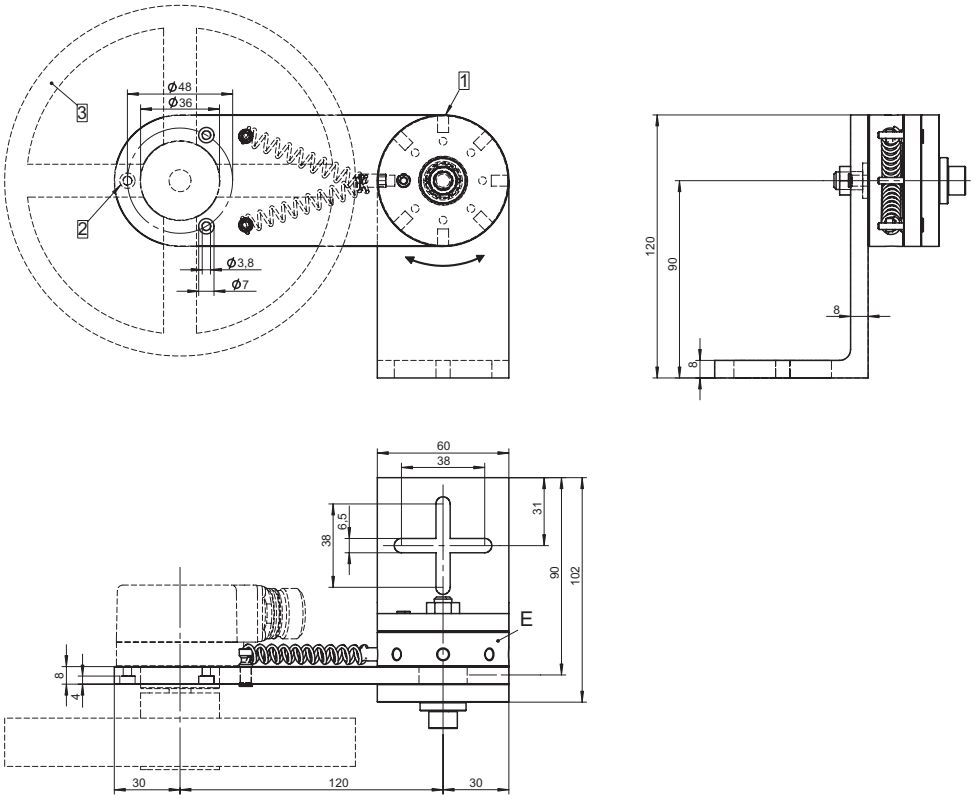
- Can be installed in any mounting position 8 setting positions in 45° steps.
- Base plate – variable in 4 directions.

Order code 8.0010.7000.0010

Dimensions

Dimensions in mm

1 Setting with a size 0 or 1 screwdriver
2 3 pcs. screws M3 x 8 DIN 912 included
3 Measuring wheel



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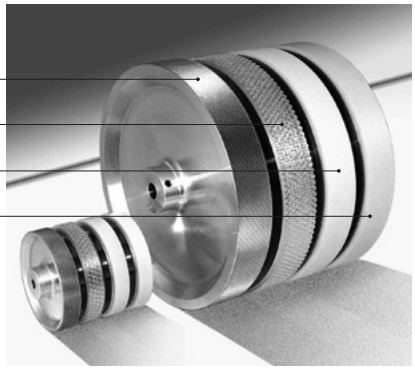
Length measuring kits measuring wheels

Various wheel coatings

	ⓐ
Diamond knurl	217 / 517
Tufted rubber	267 / 567
Plastic corrugated	297 / 597
Plastic smooth	247 / 547



Measuring wheels for measuring the length of products in movement, e.g. in the paper, metal, textile, wood or plastic industry.

Various tires to meet the requirements of the various surfaces of the product to be measured – various diameters, designed for use with Kübler encoders, available for metric and imperial systems.

Selection of the measuring wheel profile according to the surface of the measured material

Surface of the measured material	**Recommended profile no.**
Cardboard	**1, 2, 3, 4, 5**
Wood	**1, 2, 3, 4, 5**
Textile	**1, 2, 3, 4**
Plastic (e.g. PVC, PE, ...)	**2, 3, 4, 5**
Paper	**2, 3, 4, 5**
Wire, greased metals, steel profiles, leather	**2**
Carpet, cables, nonwoven	**3**
Greased metals, glass, floor coverings	**4**
Painted surfaces	**2, 4**
Rubber, soft plastic	**1**

Please note:

If a measuring wheel is mounted directly on the shaft of a rotary encoder, the pressure force between the measuring wheel and measured material should not exceed the radial shaft load listed in the data sheet of the encoder.

In addition, the measuring wheels can only be used for in-house purposes which are not subject to the stipulations of the German calibration code.

Order code Measuring wheels

8.0000	.	3	XXX ⓐ	.	00	XX ⓑ

Measuring wheel Circumference / ø / width	Profile measuring wheels (see above)	Coating	Coating hardness Shore A	*Wheel no.* ⓐ	Weight	*Standard bore* ⓑ [1]	Material of wheel body	Working temperature
0.2 m / ø 63.7 mm / 12 mm [7.87" / ø 2.51" / 0.47"]	**1**	diamond knurl (aluminum)		**217**	60 g [2.12 oz]	**06** = 6 mm [0.24"] **10** = 10 mm [0.39"]	aluminum	-30°C ... +80°C [-22°F ... +176°F]
	2	plastic (polyurethane) smooth	90	**247**	60 g [2.12 oz]			
	3	tufted rubber (polyurethane)	60	**267**	60 g [2.12 oz]			
	4	plastic (polyurethane) corrugated	90	**297**	60 g [2.12 oz]			
0.5 m / ø 159.2 mm / 25 mm [19.69" / ø 6.27 / 0.98"]	**1**	diamond knurl (aluminum)		**517**	775 g [27.34 oz]	**10** = 10 mm [0.39"]	aluminum	-30°C ... +80°C [-22°F ... +176°F]
	2	plastic (polyurethane) smooth	90	**547**	700 g [24.69 oz]			
	3	tufted rubber (polyurethane)	60	**567**	700 g [24.69 oz]			
	4	plastic (polyurethane) corrugated	90	**597**	700 g [24.69 oz]			
12" / ø 3.82" / 0.38"	**5**	natural rubber (NR) smooth		**751**	100 g [3.53 oz]	**10** = 10 mm [0.39"]	aluminum	-30°C ... +80°C [-22°F ... +176°F]

1) Other bore diameters on request

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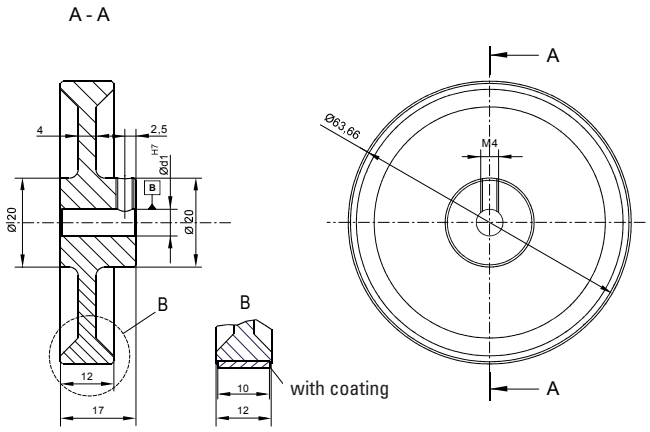
Length measuring kits measuring wheels

Various wheel coatings

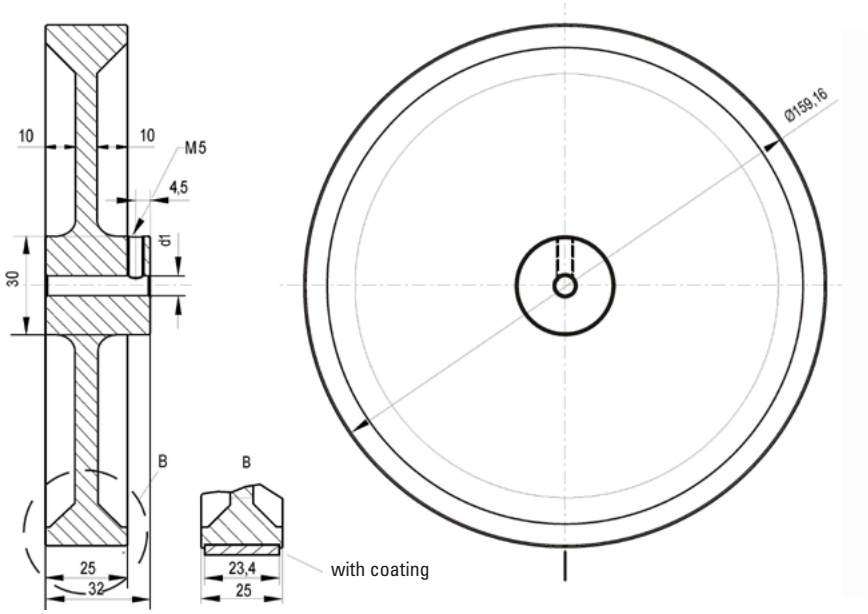
Dimensions

Dimensions in mm [inch]

Measuring wheel no. 2XX



Measuring wheel no. 5XX



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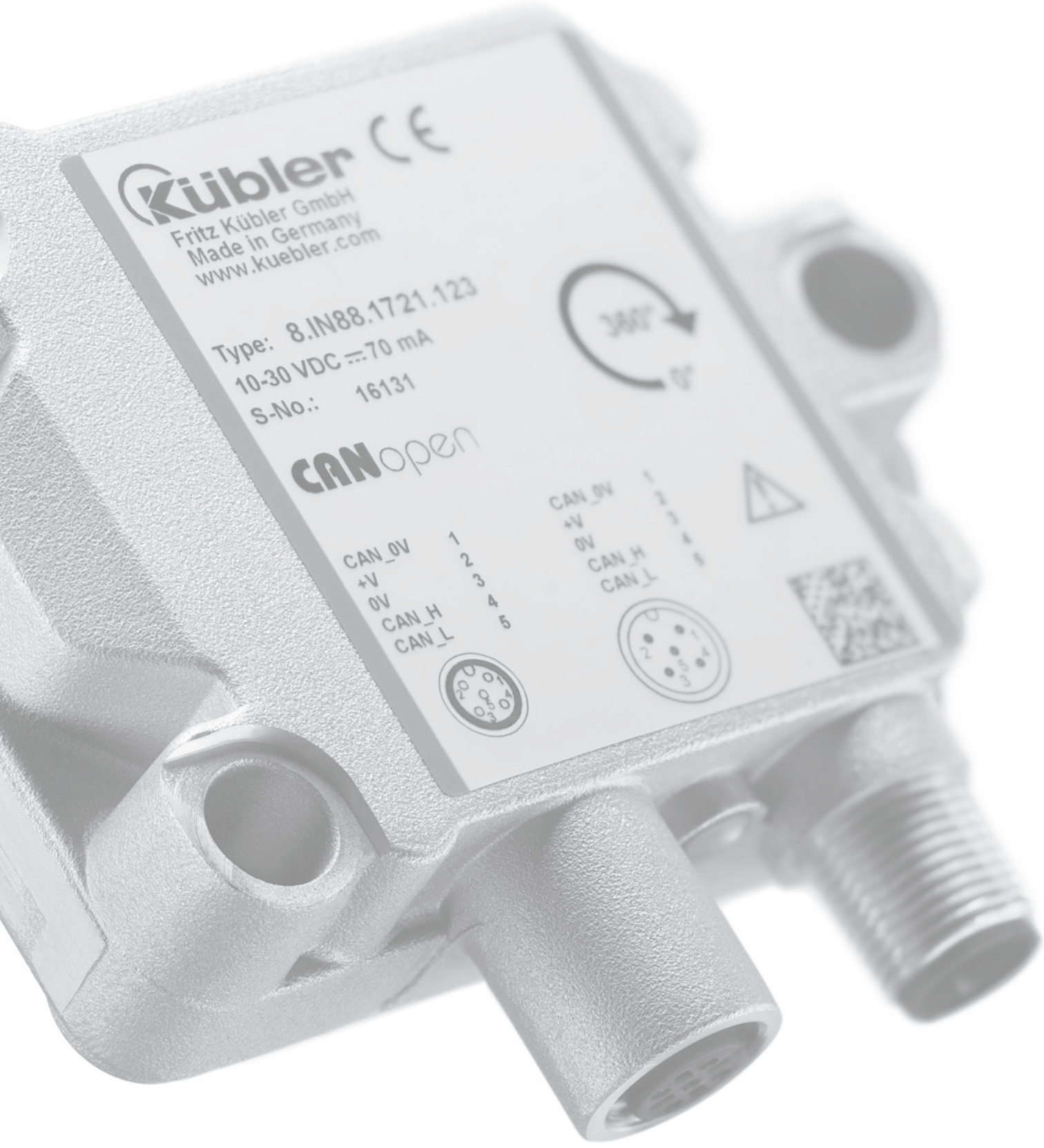
Kübler
Fritz Kübler GmbH
Made in Germany
www.kuebler.com
Type: 8.IN88.1721.123
10-30 VDC ⎓ 70 mA
S-No.: 16131
CANopen
CAN_0V
+V
0V
CAN_H
CAN_L
360°
0°

Inclinometers

		Type	Interface	Page
Inclinometers, MEMS / capacitive	new	IN81, 1- and 2-dimensional	Analog	**576**
	new	IN88, 1- and 2-dimensional	CANopen	**581**
	new	IN88, 1- and 2-dimensional	Modbus	**584**
		IS40, 1-dimensional	Analog	**588**
		IS40, 2-dimensional	Analog	**590**
		IS60, 1-dimensional	CANopen	**592**
		IS60, 2-dimensional	CANopen	**594**

Inclinometer MEMS / capacitive | IN81, 1- and 2-dimensional | Analog

The inclinometers of the IN81 series allow measuring 2-dimensional inclinations in the range of ±85° or 1-dimensional inclinations up to 360°.

With their high robustness, their protection level up to max. IP69k and their wide temperature range from -40°C to +85°C, these devices are ideally suitable for outdoor use – e.g. for mobile automation applications.

E1 pending | cULus pending | RoHS

Analog output

High protection level | Shock / vibration resistant | Reverse polarity protection | Redundancy | Temperature range

Robust

- High protection rating IP67 and IP69k in one device.
- Highest robustness thanks to metal housing.
- Stable accuracy over the whole temperature range from -40°C up to +85°C.
- Non long-term drift thanks to sensor array technique.

Versatile

- Preset and teach function.
- Measuring direction 1- or 2-dimensional.
- With switch outputs.
- Stacked installation possible for redundancy.

Order code [1]

8.IN81	.	X	X	X	X	.	X	2	X
Type		a	b	c	d		e	f	g

a *Measuring direction*
1 = 1-dimensional
2 = 2-dimensional

b *Measuring range*
1 = ±10° [2]
2 = ±15° [2]
3 = ±30° [2]
4 = ±45° [2]
5 = ±60° [2]
6 = ±85° [2]
7 = 0 ... 360° (±180°) [3]
8 = 0 ... 180° (±90°) [3]

c *Interface*
1 = 4 ... 20 mA / 12 bit
2 = 0.1 ... 4.9 V / 12 bit
3 = 0.5 ... 4.5 V / 12 bit
4 = 0 ... 5 V / 12 bit
5 = 0 ... 10 V / 12 bit

d *Filter*
1 = no filter
2 = filter value 0.1 Hz
3 = filter value 0.3 Hz
4 = filter value 0.5 Hz
5 = filter value 1.0 Hz
6 = filter value 2.0 Hz
7 = filter value 5.0 Hz
8 = filter value 10.0 Hz

e *Optional switching outputs*
1 = none
2 = 2 switch outputs

f *Power supply*
2 = 10 ... 30V / 40 mA
15 ... 30 V for interface 5

g *Type of connection*
1 = 1 x M12 connector, 8-pin
3 = 2 x M12 connector, 8-pin + 5-pin [4]

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 5 m [16.40'] PVC cable	**05.00.6041.8211.005M**
	M12 male connector with external thread, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A411.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	**05.CMB 8181-0**
	M12 male connector with external thread, 5-pin	**8.0000.5111.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

1) Series availability as from April 2017.
2) Can only be ordered in conjunction with measuring direction 2-dimensional.
3) Can only be ordered in conjunction with measuring direction 1-dimensional.
4) Can only be ordered in connection with option 2 switching outputs.
5) For variant with switching outputs.

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Inclinometer
MEMS / capacitive | **IN81, 1- and 2-dimensional** | **Analog**

Technical data

Mechanical characteristics

Connection	1 x M12 connector	8-pin, male connector
	2 x M12 connector	8-pin, male connector / 5-pin, female connector
Weight		approx. 185 g
Protection acc. to EN 60529		IP67 + IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	housing	aluminum
Shock resistance		1000 m/s², 6 ms
Vibration resistance		100 m/s², 10 ... 2000 Hz
Dimensions		80 x 60 x 23 mm [3.15 x 2.36 x 0.91"]

EMC

Relevant standards	EN 61326-1	Electrical equipment for measurement, control and laboratory use
	EN 61000-6-2	Immunity for industrial environments
	EN 55011 Klasse B, EN 61000-6-3	Emitted interferences for residential environments
	EN ISO 14982	Agricultural and forestry machinery, electromagnetic compatibility, test methods and acceptance criteria [1]
	EN 13309	Construction machinery - Electromagnetic compatibility of machines with internal power supply [1]

Electrical characteristics current interface

Power supply		10 ... 30 V DC
Current consumption (no load)		max. 40 mA
Reverse polarity protection of the power supply		yes
PowerON Time (PowerOn until valid output value)		< 0.5 s
Measuring axes		1 or 2
Measuring range	1-dimensional	180° / 360°
	2-dimensional	max. ±85° (see order code)
Resolution		12 bit
Absolute accuracy at 25°C [2]		
version 2 dim, ±10°,±15°, ±30°		typ. ±0.4°
version 2 dim, ±45°, ±60°		typ. ±0.5°
version 2 dim, ±85°		typ. ±0.5°
version 1 dim, 0 ... 180°		typ. ±0.5°
version 1 dim, 0 ... 360°		typ. ±0.5°
Temperature coefficient		
2 dim up to ±30°		typ. ±0.015°/K
2 dim up to ±60°		typ. ±0.018°/K
2 dim ±85°		typ. ±0.023°/K
1 dim		typ. ±0.03°/K
Repeat accuracy		±0.2°
Transverse sensitivity [3]		max. ±0.6°
Output load	at 10 VDC	max. 200 Ohm
	at 24 VDC	max. 900 Ohm
	at 30 VDC	max. 1200 Ohm
Setting time		< 1 ms (R_{Burden} = 900 Ohm, 25°C)
Sampling rate		50 Hz (20 ms)
Limit frequency	with Butterworth filter	0.1 ... 10 Hz, 8th order
	factory setting	10 Hz
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
E1 type-approval		in preparation

Electrical characteristics voltage interface

Power supply		
0.1 ... 4.9 V / 0.5 ... 4.5 V / 0 ... 5 V		10 ... 30 V
0 ... 10 V		15 ... 30 V
Current consumption (no load)		max. 40 mA
Reverse polarity protection of the power supply		yes
PowerON Time (PowerOn until valid output value)		< 0.5 s
Measuring axes		1 or 2
Measuring range	1-dimensional	180° / 360°
	2-dimensional	max. ±85° (see order code)
Resolution	0 ... 5 V / 0 ... 10 V	12 bit
	0.1 ... 4.9 V / 0.5 ... 4.5 V	11 bit
Absolute accuracy at 25°C [4]		
version 2 dim, ±10°,±15°, ±30°		typ. ±0.4°
version 2 dim, ±45°, ±60°		typ. ±0.5°
version 2 dim, ±85°		typ. ±0.5°
version 1 dim, 0 ... 180°		typ. ±0.5°
version 1 dim, 0 ... 360°		typ. ±0.5°
Temperature coefficient		
2 dim		typ. ±0.005°/K
1 dim		typ. ±0.01°/K
Repeat accuracy		±0.2°
Transverse sensitivity [3]		max. ±0.6°
Output load		max. 10 mA
Setting time		< 1 ms (R_{Burden} = 1000 Ohm, 25°C)
Sampling rate		50 Hz (20 ms)
Limit frequency	with Butterworth filter	0.1 ... 10 Hz, 8th order
	factory setting	10 Hz
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
E1 type-approval		in preparation

1) Without pulse 5.
2) Over the whole temperature and measuring range; 1 dim ≤ ±2.3°, 2 dim ≤ ±1.9°.
3) Only for 2-dimensional measuring direction.
4) Over the whole temperature and measuring range; 1 dim ≤ ±1.2°, 2 dim ≤ ±0.8°.

A full description of the technical data can be found in the relevant product manual at **www.kuebler.com.**

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Inclinometer MEMS / capacitive	IN81, 1- and 2-dimensional	Analog

Control inputs

Fuctions: Preset (reference point setting)
Teaching (measuring range)
Filter setting
Switching points setting

Switch output

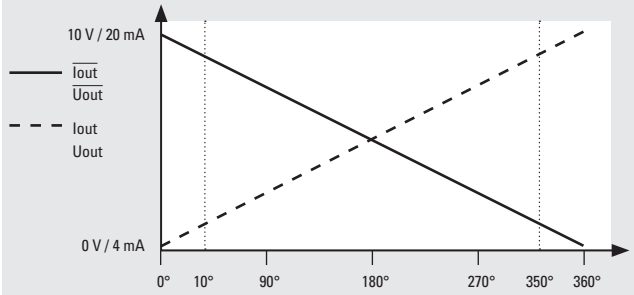
optional: 2 switch outputs

Electrical characteristics		
Input		active HIGH
Signal level	High	min. 60% of +V, max. +V
	Low	max. 30% of +V
Min. pulse duration		+V for min. 1 s

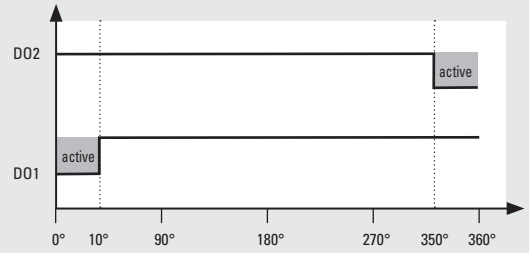
Electrical characteristics		
Permissible load		max. 100 mA
Signal level (under max. load)	High	min. +V - 2,0 V
	Low	max. 0,5 V
Short circuit proof outputs		yes

Course of the output signal – factory setting

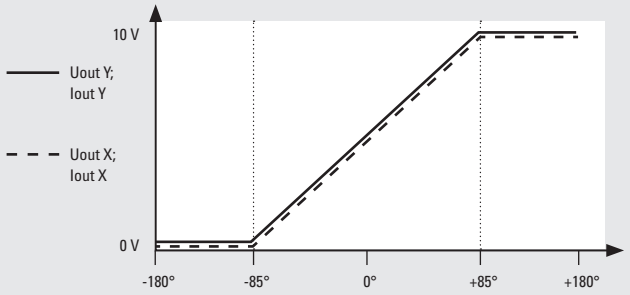
1-dimensional sensor
Example with a measuring range of 360°



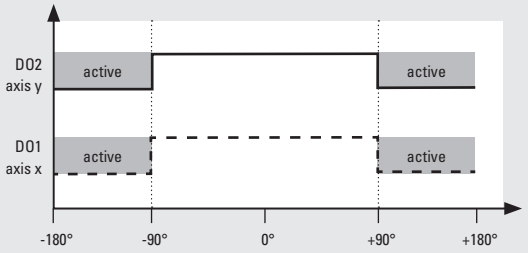
Optional with 2 switching outputs
(factory setting can be changed via the teach-function)



2-dimensional sensor
Example with a measuring range of ±85°



Optional with 2 switching outputs
(factory setting can be changed via the teach-function)



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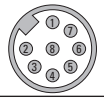
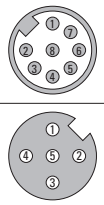
Inclinometer MEMS / capacitive | **IN81, 1- and 2-dimensional** | **Analog**

Terminal assignment, 1 dimensional

Interface	Type of connection	M12 connector, 8-pin								
1 current	1	Signal:	0 V	+V	Iout+	Iout-	$\overline{\text{Iout+}}$	$\overline{\text{Iout-}}$	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8

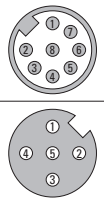


Interface	Type of connection	M12 connector, 8-pin								
1 current	2	Signal:	0 V	+V	Iout+	Iout-	$\overline{\text{Iout+}}$	$\overline{\text{Iout-}}$	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8
		Switching outputs option – M12 connector, 5-pin								
		Signal:	n.c.	DO1	DO2	n.c.	0 V			
		Pin:	1	2	3	4	5			



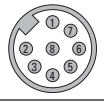
Interface	Type of connection	M12 connector, 8-pin								
2, 3, 4, 5 voltage	1	Signal:	0 V	+V	Uout+	Uout-	$\overline{\text{Uout+}}$	$\overline{\text{Uout-}}$	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8

Interface	Type of connection	M12 connector, 8-pin								
2, 3, 4, 5 voltage	2	Signal:	0 V	+V	Uout+	Uout-	$\overline{\text{Uout+}}$	$\overline{\text{Uout-}}$	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8
		Switching outputs option – M12 connector, 5-pin								
		Signal:	n.c.	DO1	DO2	n.c.	0 V			
		Pin:	1	2	3	4	5			

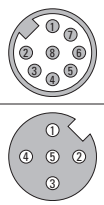


Terminal assignment, 2 dimensional

Interface	Type of connection	M12 connector, 8-pin								
1 current	1	Signal:	0 V	+V	Iout+ X	Iout- X	Iout+ Y	Iout- Y	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8

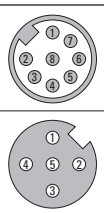


Interface	Type of connection	M12 connector, 8-pin								
1 current	2	Signal:	0 V	+V	Iout+ X	Iout- X	Iout+ Y	Iout- Y	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8
		Switching outputs option – M12 connector, 5-pin								
		Signal:	n.c.	DO1	DO2	n.c.	0 V			
		Pin:	1	2	3	4	5			



Interface	Type of connection	M12 connector, 8-pin								
2, 3, 4, 5 voltage	1	Signal:	0 V	+V	Uout+ X	Uout- X	Uout+ Y	Uout- Y	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8

Interface	Type of connection	M12 connector, 8-pin								
2, 3, 4, 5 voltage	2	Signal:	0 V	+V	Uout+ X	Uout- X	Uout+ Y	Uout- Y	Teach 1	Teach 2
		Pin:	1	2	3	4	5	6	7	8
		Switching outputs option – M12 connector, 5-pin								
		Signal:	n.c.	DO1	DO2	n.c.	0 V			
		Pin:	1	2	3	4	5			



+V: Power supply +V DC
0V Power supply ground GND (0 V)

Teach 1 Input 1 for various teaching functions
Teach 2 Input 2 for various teaching functions

DO1 Digital output 1
DO2 Digital output 2

Uout+ X X axis voltage output
Uout- X X axis voltage output GND
Uout+ Y Y axis voltage output
Uout- Y Y axis voltage output GND

1-axis version
Uout+ Voltage output
Uout- Voltage output GND
$\overline{\text{Uout+}}$ Inverted voltage output
$\overline{\text{Uout-}}$ Inverted voltage output GND

Iout+ X X axis current output
Iout- X X axis current output GND
Iout+ Y Y axis current output
Iout- Y Y axis current output GND

1-axis version
Iout+ Current output
Iout- Current output GND
$\overline{\text{Iout+}}$ Inverted current output
$\overline{\text{Iout-}}$ Inverted current output GND

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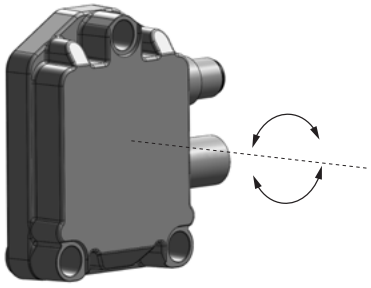
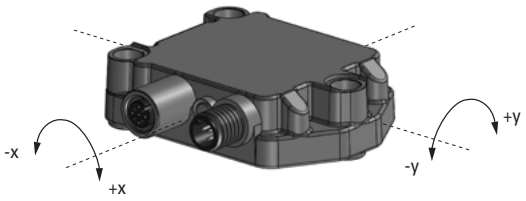
Inclinometer MEMS / capacitive	IN81, 1- and 2-dimensional	Analog

Direction of inclination

1-dimensional



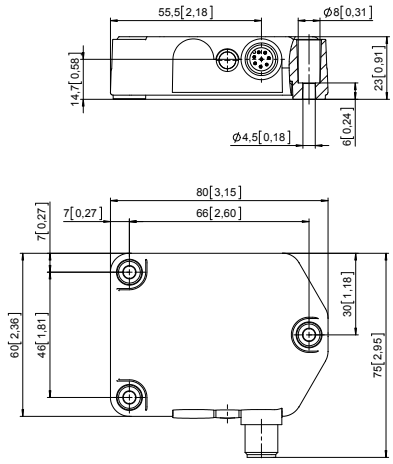
2-dimensional



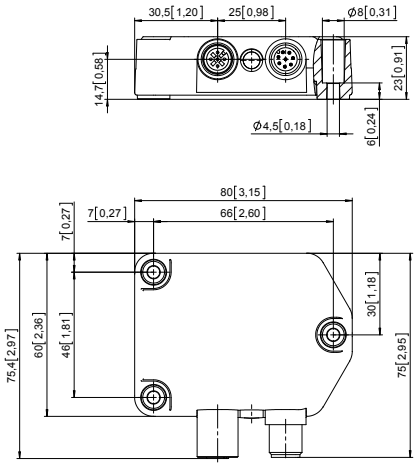
Dimensions

Dimensions in mm [inch]

1 x M12 connector 8-pin, male contacts



1 x M12 connector 8-pin, male contacts
1 x M12 connector 5-pin, female contacts



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Inclinometer MEMS / capacitive | **IN88, 1- and 2-dimensional** | **CANopen**

The inclinometers of the IN88 series allow measuring 2-dimensional inclinations in the range of ±85° or 1-dimensional inclinations up to 360°.

With their high robustness, their protection level up to max. IP69k and their wide temperature range from -40°C to +85°C, these devices are ideally suitable for outdoor use – e.g. for mobile automation applications.

pending

High protection level | Shock / vibration resistant | Reverse polarity protection | Redundancy | Temperature range

Robust

- High protection rating IP67 and IP69k in one device.
- Highest robustness thanks to metal housing.
- Stable accuracy over the whole temperature range from -40°C up to +85°C.
- Non long-term drift thanks to sensor array technique.

Versatile

- Parameterizable filter.
- Measuring direction 1- or 2-dimensional.
- With 1 x M12 connector or 2 x M12-connector.
- Stacked installation possible for redundancy.

Order code

8.IN88	.	X	X	2	1	.	1	2	X
Type		a	b	c				d	e

a *Measuring direction*
1 = 1-dimensional
2 = 2-dimensional

b *Measuring range*
6 = ±85° [1]
7 = 0° ... 360° [2]

c *Interface*
2 = CANopen

d *Power supply*
2 = 10 ... 30 V DC

e *Type of connection*
1 = 1 x M12 connector, 5-pin
3 = 2 x M12 connector, 5-pin

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for Bus in, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
	M12 male connector with external thread for Bus out, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A411.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for Bus in, 5-pin	**05.B-8151-0/9**
	M12 male connector with external thread for Bus out, 5-pin	**05.BS-8151-0/9**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

1) Can only be ordered in conjunction with measuring direction 2-dimensional.
2) Can only be ordered in conjunction with measuring direction 1-dimensional.

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Inclinometer MEMS / capacitive | **IN88, 1- and 2-dimensional** | **CANopen**

Technical data

General electrical characteristics

Power supply		10 ... 30 V DC
Power consumption		max. 70 mA
Reverse polarity protection		yes
Measuring axes		1 or 2
Measuring range	1-dimensional	360°, no limit stop
	2-dimensional	±85°
Resolution		0.01°
Absolute accuracy (at 25°C over the whole measuring range) [1]		
	1-dimensional	±0,2°
	2-dimensional	±0,4°
Transverse sensitivity [2]		max. ±0.6°
Repeat accuracy		±0.2°
Temperature drift		typ. ±0,006°/K
Sampling rate		50 Hz (20 ms)
Limit frequency	with Butterworth filter	0.1 ... 10 Hz, 8th order
	factory setting	typ. 10 Hz
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
E1 type-approval		10R-057989

EMC

Relevant standards	EN 61326-1	Electrical equipment for measurement, control and laboratory use
	EN 61000-6-2	Immunity for industrial environments
	EN 55011 Klasse B, EN 61000-6-3	Emitted interferences for residential environments
	EN ISO 14982	Agricultural and forestry machinery, electromagnetic compatibility, test methods and acceptance criteria
	EN 13309:2010-07	Construction machinery - Electromagnetic compatibility of machines with internal power supply

Mechanical characteristics

Connection CAN	1 x M12 connector	5-pin, male connector
	2 x M12 connector	5-pin, male connector / 5-pin, female connector
Weight		approx. 185 g [6.53 oz]
Protection acc. to EN 60529		IP67 / IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	housing	Aluminium
Shock resistance		1000 m/s², 6 ms
Vibration resistance		100 m/s², 10 ... 2000 Hz
Dimensions		80 x 60 x 23 mm [3.15 x 2.36 x 0.91"]

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

Interface characteristics CANopen

Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN CAN specification 2.0 B
Protocol	CANopen profile DS410 V1.3 with manufacturer-specific add-ons, communication profile DS301 V4.2
Baud rate	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s software configurable
Node address	1 ... 127 software configurable
Termination switchable	software configurable
LSS protocol	DS305 layer setting services 2.2

General information on CANopen

The CANopen inclinometers support the latest CANopen communications profile according to DS301. In addition, device-specific profiles such as the inclinometer profile DS410 and DS305 (LSS) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values and many other additional parameters can be programmed via the CAN bus. When switching the appliance on, all parameters are loaded from a flash memory. These parameters have previously been stored in a zero-voltage secure manner. The output values **position, position raw value, sensor temperature and sensor information** can be combined very variably as a PDO (PDO mapping). The inclinometers are available with one or two connectors.

The device address and baud rate can be set/modified by means of the software.

The two-color LED indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

LSS layer setting services DS305 V2.2

- Global command support for node address and baud rate configuration.
- Selective protocol via identity object (1018h).

CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated (Class C2 functionality):

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping, 2 sending PDO's.
- Node address, baud rate and programmable CANbus termination.

CANopen inclinometer profile DS410 V1.3

The following parameters can be programmed:

- Variable PDO mapping of position, position raw value, sensor temperature and sensor information.
- Extended failure management.
- User interface with visual display of bus and failure status - 1 LED two-color.
- Customer-specific protocol.
- "Watchdog controlled" device.

1) Over the whole temperature and measuring range 1-dimensional ≤ ±0,4°; 2-dimensional ≤ ±1°.
2) Only for 2-dimensional measuring direction.

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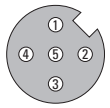
Inclinometer MEMS / capacitive	IN88, 1- and 2-dimensional	CANopen

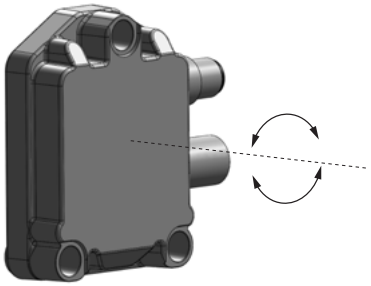
Terminal assignment

Interface	Type of connection	1 x M12 connector, 5-pin					
2	1		Bus IN				
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

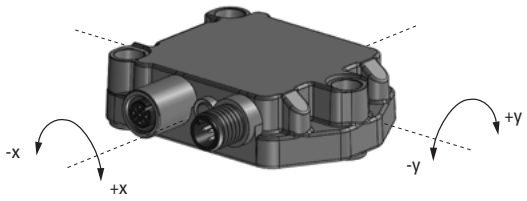
Interface	Type of connection	2 x M12 connector, 5-pin					
2	3		Bus OUT				
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5
			Bus IN				
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Direction of inclination

1-dimensional



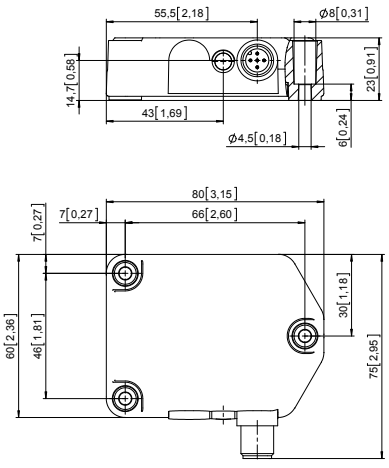
2-dimensional



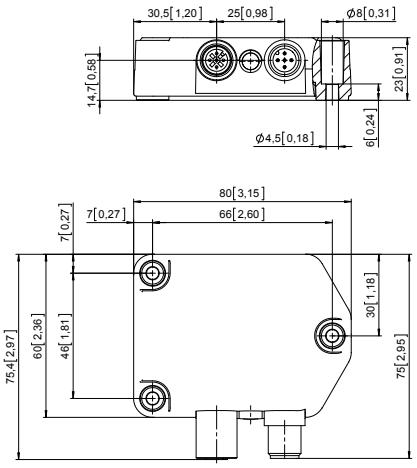
Dimensions

Dimensions in mm [inch]

1 x M12 connector 5-pin, male contacts



1 x M12 connector 5-pin, male contacts
1 x M12 connector 5-pin, female contacts



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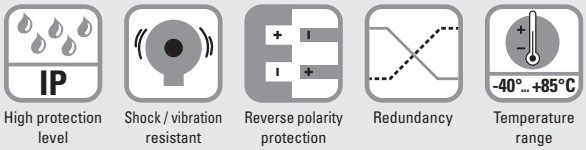
Inclinometer MEMS / capacitive | **IN88, 1- and 2-dimensional** | **Modbus**

The inclinometers of the IN88 series allow measuring 2-dimensional inclinations in the range of ±85° or 1-dimensional inclinations up to 360°.

With their high robustness, their protection level up to max. IP69k and their wide temperature range from -40°C to +85°C, these devices are ideally suitable for outdoor use – e.g. for mobile automation or solar applications.

pending



High protection level | Shock / vibration resistant | Reverse polarity protection | Redundancy | Temperature range

Robust

- High protection rating IP67 and IP69k in one device.
- Highest robustness thanks to metal housing.
- Stable accuracy over the whole temperature range from -40°C up to +85°C.
- Non long-term drift thanks to sensor array technique.

Versatile

- Parameterizable filter.
- Measuring direction 1- or 2-dimensional.
- With 1 x M12 connector or 2 x M12-connector.
- Stacked installation possible for redundancy.

Order code

8.IN88	.	X	X	6	1	.	1	2	X
Type		a	b	c				d	e

a *Measuring direction*
1 = 1-dimensional
2 = 2-dimensional

b *Measuring range*
6 = ±85° [1]
7 = 0° ... 360° [2]

c *Interface*
6 = Modbus RTU

d *Power supply*
2 = 10 ... 30 V DC

e *Type of connection*
1 = 1 x M12 connector, 5-pin
3 = 2 x M12 connector, 5-pin

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for Bus in, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A211.005M**
	M12 male connector with external thread for Bus out, 5-pin 5 m [16.40'] PVC cable	**05.00.6091.A411.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for Bus in, 5-pin	**05.B-8151-0/9**
	M12 male connector with external thread for Bus out, 5-pin	**05.BS-8151-0/9**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

1) Can only be ordered in conjunction with measuring direction 2-dimensional.
2) Can only be ordered in conjunction with measuring direction 1-dimensional.

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Inclinometer
MEMS / capacitive | **IN88, 1- and 2-dimensional** | **Modbus**

Technical data

General electrical characteristics

Power supply		10 ... 30 V DC
Power consumption		max. 70 mA
Reverse polarity protection		yes
Measuring axes		1 or 2
Measuring range	1-dimensional	360°, no limit stop
	2-dimensional	±85°
Resolution		0.01°
Absolute accuracy (at 25°C over the whole measuring range) [1]		
	1-dimensional	±0,2°
	2-dimensional	±0,4°
Transverse sensitivity [2]		max. ±0.6°
Repeat accuracy		±0.2°
Temperature drift		typ. ±0,006°/K
Sampling rate		50 Hz (20 ms)
Limit frequency	with Butterworth filter	0.1 ... 10 Hz, 8th order
	factory setting	typ. 10 Hz
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
E1 type-approval		10R-057989

EMC

Relevant standards	EN 61326-1	Electrical equipment for measurement, control and laboratory use
	EN 61000-6-2	Immunity for industrial environments
	EN 55011 Klasse B, EN 61000-6-3	Emitted interferences for residential environments
	EN ISO 14982	Agricultural and forestry machinery, electromagnetic compatibility, test methods and acceptance criteria
	EN 13309	Construction machinery - Electromagnetic compatibility of machines with internal power supply

Mechanical characteristics

Connection MB	1 x M12 connector	5-pin, male connector
	2 x M12 connector	5-pin, male connector / 5-pin, female connector
Weight		approx. 185 [6.53 oz]
Protection acc. to EN 60529		IP67 / IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	housing	aluminium
Shock resistance		1000 m/s², 6 ms
Vibration resistance		100 m/s², 10 ... 2000 Hz
Dimensions		80 x 60 x 23 mm [3.15 x 2.36 x 0.91"]

Interface characteristics Modbus

Code	binary
Interface	Modbus V1.02
Protocol	Modbus RTU V1.1b3
Baud rate	4800 ... 115200 kbit/s software configurable
Node address	1 ... 63 software configurable
Termination	software configurable

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

1) Over the whole temperature and measuring range
1-dimensional ≤ ±0,4°; 2-dimensional ≤ ±1°.
2) Only for 2-dimensional measuring direction.

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Inclinometer MEMS / capacitive | **IN88, 1- and 2-dimensional** | **Modbus**

Modbus communication profile V 1.02

Node number, baudrate and bus termination programmable.

Modbus application protocol V1.1b3

Read Holding Register – Function code 03 [1)]

Reg.	Data name	ATT	Value	Default
00001	LOTWINKEL X-ACHSE	I16	Inclination angle in 0.01 °	-85.00 ... +85.00
00002	LOTWINKEL Y-ACHSE	I16	Rotation angle in 0.01 °	-85.00 ... +85.00
00003	EULERWINKEL X-ACHSE	I16	Euler angle (1 axis)	0 ... 180.99°
00004	EULERWINKEL Y-ACHSE	U16	Euler angle (1 axis)	0 ... 359.99°
00007	VERSORGUNG VCC	U16	VCC in 0.1 VDC	240
00008	TEMPERATURE IN 0.1°C	U16	Temp. in 0.1°	210
00016	SIDEVIEW	U16	Back = 0, Front = 1	0
00023	SYSTEM STATE	U16	No errors = 0	0
00140	BAUDRATE	U16	Current baudrate	19200 Baud (2)
00144	NODE-ID	U16	Current node address	63
00145	TERMINIERUNG	U16	Termination on/off	2 (on)
00146	FILTER AKTIVIERUNG	U16	Filter on/off	1 (on)
00147	FILTER EINSTELLUNG	F32	Filter value in HZ	5.0
00148	SERIENNUMMER	U32	Serial number	16DDDNNNNN
00149	PRODUCT CODE	U32	Device type	x88616100
00150	AUFLÖSUNG	U16	Resolution X/Y axis	0.01° (10)
00151	OPERATING PARAMETER	U16	Setting X axis	0
00152	PRESET X-ACHSE	U16	Preset X axis	0
00153	OFFSET X-ACHSE	U16	Offset X axis	0
00154	DIFF.OFFSET X-ACHSE	U16	Differential offset	0
00155	Operating Parameter	U16	Setting Y axis	0
00156	PRESET Y-ACHSE	U16	Preset Y axis	0
00157	OFFSET Y-ACHSE	U16	Offset Y axis	0
00158	DIFF.OFFSET Y-ACHSE	U16	Differential offset	0
00159	OFFSET EULERWINKEL	U16	Offset Euler axis Y	0

Write Holding Register – Function code 16 (0x10)

Reg.	Value	R/W	Format	Content	Default
300	VAR	W	U16	Baudrate	19200 Baud (2)
301	VAR	W	U16	Parity	1 = none 2 = odd 3 = even
302	VAR	W	U16	Stopbit	1 = 1 Stopbit 3 = 2 Stopbit
304	VAR	W	U16	Node Number	0x3F (63d)
305	VAR	W	U16	Termination	2 = ON 1 = Off
306	VAR	W	U16	Digital Filter Active	1 = ON
307	VAR	W	F32	Digital Filter Coefficient	5.0
310	VAR	W	U16	Resolution of axis	10
311	VAR	W	U16	Slope long16 operating parameter	0
312	VAR	W	I16	Slope long16 preset value	0
313	VAR	W	I16	Slope long16 offset	0
314	VAR	W	I16	Differential Slope long16 offset	0
315	VAR	W	U16	Slope lateral16 operating parameter	0
316	VAR	W	I16	Slope lateral16 preset value	0
317	VAR	W	I16	Slope lateral16 offset	0
318	VAR	W	I16	Differential Slope lateral16 offset	0
320	VAR	W	U16	Preset Euleraxis (only 0)	0
261	VAR	W	U16	Delaytime for Transmission	1
360	VAR	W	U16	Save All Application Parameters	0x1010
361	VAR	W	U16	Load All Parameters (Factory default)	0x10101

1) Reads the binary contents of holding registers (4XXXX references) in the encoder slave. Broadcast is not supported.

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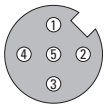
Inclinometer
MEMS / capacitive | **IN88, 1- and 2-dimensional** | **Modbus**

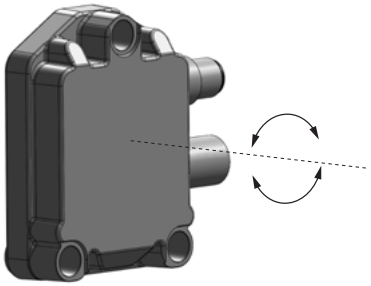
Terminal assignment

Interface	Type of connection	1 x M12 connector, 5-pin					
6	1		Bus IN				
		Signal:	+V	0 V	D0	D1	TG
		Pin:	2	3	5	4	1

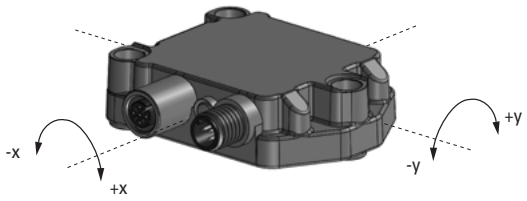
Interface	Type of connection	2 x M12 connector, 5-pin					
6	3		Bus OUT				
		Signal:	+V	0 V	D0	D1	TG
		Pin:	2	3	5	4	1
			Bus IN				
		Signal:	+V	0 V	D0	D1	TG
		Pin:	2	3	5	4	1

Direction of inclination

1-dimensional



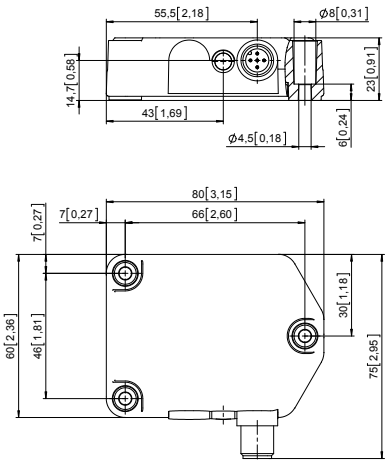
2-dimensional



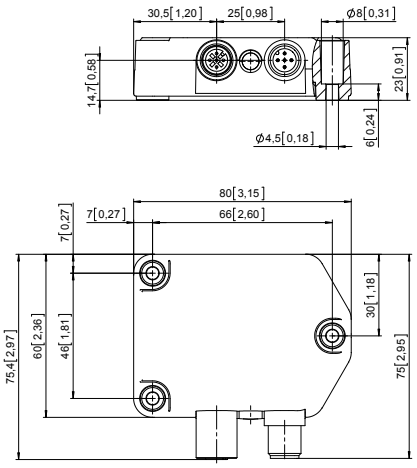
Dimensions

Dimensions in mm [inch]

1 x M12 connector 5-pin, male contacts



1 x M12 connector 5-pin, male contacts
1 x M12 connector 5-pin, female contacts



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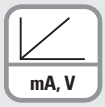
Inclinometers

Inclinometer MEMS / capacitive | IS40, 1-dimensional | Analog

With the IS40 inclinometer 1-dimensional inclinations in the measuring range 0 - 360° can be measured.

The compact robust construction makes this sensor the ideal device for measuring angles in harsh environments.

RoHS



Output

High protection level

Shock / vibration resistant

Reverse polarity protection

Innovative

- Rugged construction – high shock resistance.
- High resolution and accuracy.
- Current or voltage interface.
- Adjusting of the measuring range via teach adapter.

Compact / Many applications

- Small design – minimal space requirement.
- For use in vehicle technology, solar installations, cranes and hoists or in commercial vehicles.

Order code Inclinometer IS40

8.IS40	.	1	4	X	2	1
Type		a	b	c	d	e

a *Measuring direction*
1 = 1-dimensional

b *Measuring range*
4 = 0 ... 360°

c *Interface*
1 = 4 ... 20 mA
3 = 0.1 ... 4.9 V DC

d *Power supply*
2 = 10 ... 30 V DC

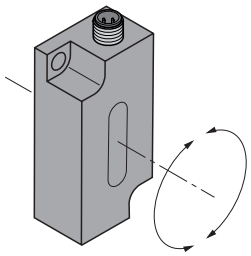
e *Type of connection*
1 = M12 connector

Accessories		Order no.
Teach adapter	for inductive encoders, linear position, angle and ultrasonic sensors	**05.TX40.1**

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



Adjusting the measuring range via 05.TX40.1 teach adapter

- Setting the angular range in CW direction:
  - Move sensor to start position ■
  - Press and hold Teach-GND until the output is set to < 4 mA / 0.1 V (approx. 1 s)
  - Move sensor to end position
  - Press and hold Teach-GND until the output is set to 20 mA / 4.9 V (approx. 3 s)
- Resetting the angular range: ■
  - Press and hold Teach-GND until the output is set to 12 mA (approx. 6 s) ■
  - The angular range is reset to 360°

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Inclinometer
MEMS / capacitive | **IS40, 1-dimensional** | **Analog**

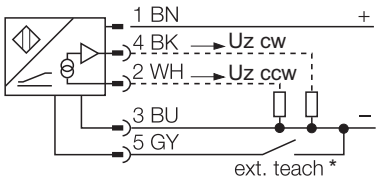
Technical data

Mechanical characteristics	
Connection	M12 connector
Weight	50 g [1.76 oz]
Protection acc. to EN 60529	IP68 / IP69k
Working temperature range	-30°C ... +70°C [-22°F ... +158°F]
Material	plastic PBT-GF20-V0
Shock resistance	300 m/s², 11 ms
Vibration resistance	100 m/s², 10 ... 2000 Hz
Dimensions	60 x 30 x 20 mm [2.36 x 1.18 x 0.79"]

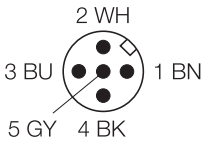
Interface characteristics	
Voltage output	0.1 ... 4.9 V DC short-circuit protected to +V
Load resistance voltage output	≥ 40 kΩ
Output impedance voltage output	99 ... 105 Ω
Current output	4 ... 20 mA
Load resistance current output	≤ 200 Ω

Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption	50 ... 105 mA (depending on voltage)
Reverse polarity protection	yes
Measuring axes	1
Measuring range	0 ... 360°
Resolution	≤ 0.14°
Repeat accuracy	≤ 0.2 % of measuring range ≤ 0.1 % after a warm-up period of 30 min
Temperature drift	0.03°/K
Reaction time	0.1 s – Time that the output signal requires to reach 90 % full scale
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Connections



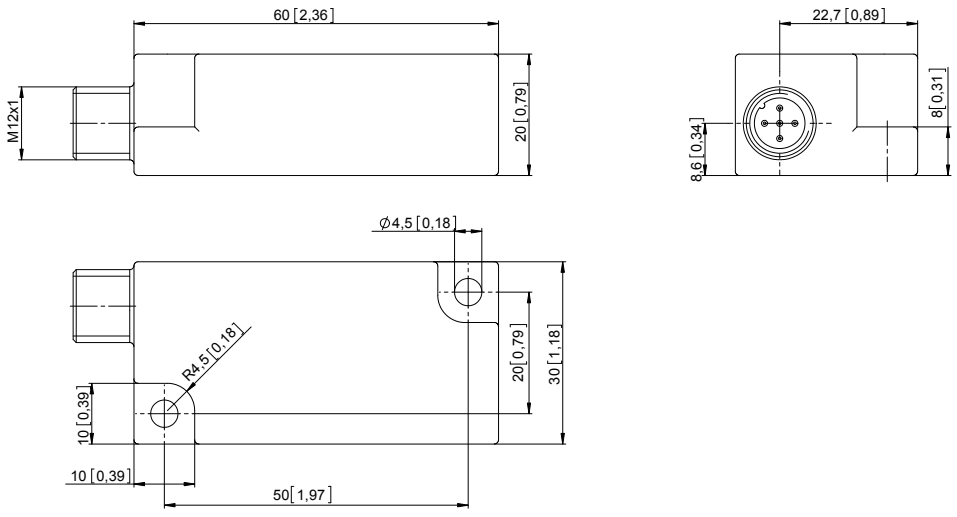
Terminal assignment



*) Teach adapter, accessory (Order no. 05.TX40.1)

Dimensions

Dimensions in mm [inch]



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Inclinometer MEMS / capacitive | **IS40, 2-dimensional** | **Analog**

The inclinometer IS40 permits 2-dimensional inclinations to be measured.

Versions are available for the measuring ranges ±10°, ±45° or ±60°. The compact robust construction makes this sensor the ideal device for measuring angles in harsh environments.

Output | High protection level | Shock / vibration resistant | Reverse polarity protection

Innovative

- Rugged construction.
- High resolution and accuracy.
- Current or voltage interface.
- High shock resistance.
- Zero point adjustment.

Compact / Many applications

- Small design – minimal space requirement.
- For use in vehicle technology, solar installations, commercial vehicles, cranes and hoists.

Order code Inclinometer IS40

8.IS40	.	2	X	X	X	1
Type		a	b	c	d	e

a *Measuring direction*
2 = 2-dimensional x/y

b *Measuring range*
1 = ±10°
2 = ±45°
3 = ±60°

c *Interface*
1 = 4 ... 20 mA [1]
3 = 0.1 ... 4.9 V DC [1]
4 = ratiometric 2 % ... 98 % [2]

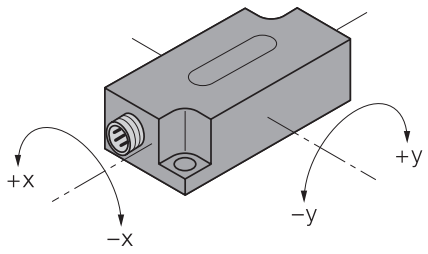
d *Power supply*
1 = 5 V DC
2 = 10 ... 30 V DC

e *Type of connection*
1 = M12 connector

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	**8.0000.5116.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



1) Available only in combination with power supply 10 ... 30 V DC
2) In relation to the power supply 5 V DC (available only in combination with power supply 5 V DC)

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Inclinometer MEMS / capacitive | **IS40, 2-dimensional** | **Analog**

Technical data

Mechanical characteristics

Connection	M12 connector
Weight	50 g [1.76 oz]
Protection acc. to EN 60529	IP68 / IP69k
Working temperature range	-30°C ... +70°C [-22°F ... +158°F]
Material	plastic PBT-GF20-V0
Shock resistance	300 m/s², 11 ms
Vibration resistance	100 m/s², 10 ... 2000 Hz
Dimensions	60 x 30 x 20 mm [2.36 x 1.18 x 0.79"]

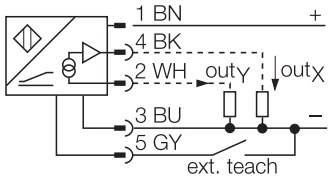
Interface characteristics

Voltage output	
at +V 10 ... 30 V DC	0.1 ... 4.9 V short-circuit protected to +V
at +V 5 V DC	2 ... 98 % ratiometric (in relation to +V)
Load resistance voltage output	≥ 40 kΩ
Output impedance voltage output	99 ... 105 Ω
Current output	4 ... 20 mA
Load resistance current output	≤ 200 Ω

Electrical characteristics

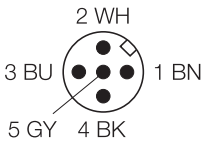
Power supply		5 V DC ±0.25 V or 10 ... 30 V DC (depending on version)
Power consumption (no load)		≤ 20 mA
Reverse polarity protection		yes
Measuring axes		2 (x/y)
Measuring range		±10°, ±45°, ±60°
Resolution	for version ±10° for version ±45° for version ±60°	≤ 0.05° ≤ 0.1° ≤ 0.15°
Repeat accuracy		≤ 0.2 % of measuring range ≤ 0.1 % after a warm-up period of 30 min
Absolute accuracy		
	for version ±10°	0.3°
	for version ±45° and ±60°	0.5°
Cross sensitivity		3 %
Temperature drift		
	for version ±10°	typ. 0.01°/K
	for version ±45° and ±60°	0.03°/K
Reaction time		0.1 s – time that the output signal requires to reach 90 % full scale, if the angle is changed from -60° to +60°
Zero point adjustment		
	for version ±10°	±5°
	for version ±45° and ±60°	±15°
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Connections



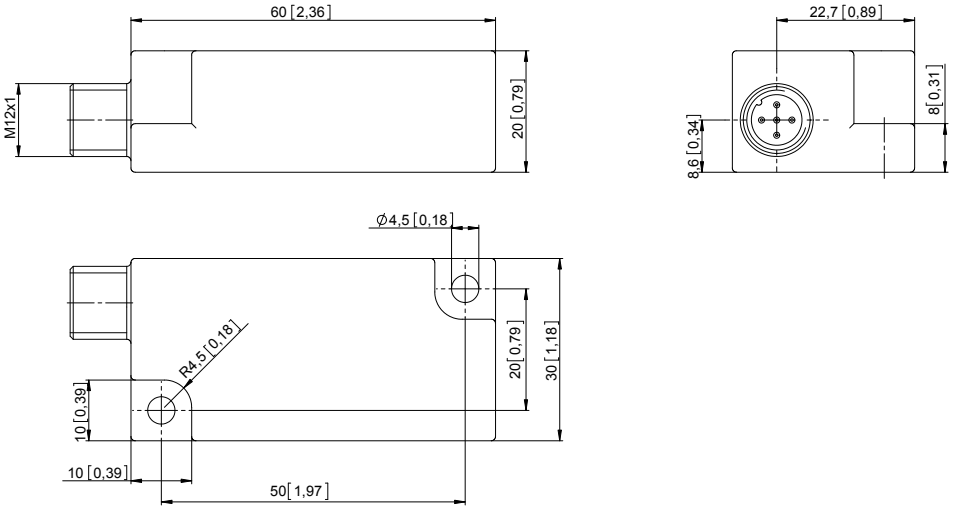
ext. teach: if this input is connected to 0 V, then the output of the inclinometer is reset to 0°.

Terminal assignment



Dimensions

Dimensions in mm [inch]



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Inclinometer MEMS / capacitive | IS60, 1-dimensional | CANopen

With the IS60 inclinometer 1-dimensional inclinations in the measuring range 360° can be measured.

The sensor has a standardized CANopen interface, which enables easy configuration and start-up. All the parameters are stored in the internal permanent memory.

RoHS CANopen

IP High protection level

Shock / vibration resistant

Reverse polarity protection

Robust and reliable

- Protection rating IP68 / IP69k.
- Robust plastic housing.
- High shock resistance.

User-friendly and accurate

- High resolution and accuracy.
- Programmable vibration suppression.
- High sampling rate and bandwidth.

Order code Inclinometer IS60

8.IS60	.	1	4	5	2	3
Type		a	b	c	d	e

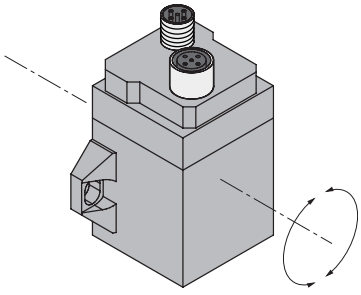
Attention:
This is not a standard product. Delivery on request.
Min. order quantity / frame order required.

a *Measuring direction*	b *Measuring range*	c *Interface*	d *Power supply*	e *Type of connection*
1 = 1-dimensional	4 = 360°	5 = CANopen	2 = 10 ... 30 V DC	3 = 2 x M12 connector

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for Bus in, 5-pin 5 m [16.40'] PVC cable	**05.00.6021.2211.005M**
	M12 male connector with external thread for Bus out, 5-pin 5 m [16.40'] PVC cable	**05.00.6021.2411.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for Bus in, 5-pin	**05.B-8151-0/9**
	M12 male connector with external thread for Bus out, 5-pin	**05.BS-8151-0/9**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



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Inclinometer MEMS / capacitive | **IS60, 1-dimensional** | **CANopen**

Technical data

Mechanical characteristics

Connection CAN	M12 connector, 5-pin
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	IP68 / IP69k
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	plastic PA12-GF30
Shock resistance	300 m/s², 11 ms
Vibration resistance	100 m/s², 10 ... 2000 Hz
Dimensions	68 x 42.5 x 42.5 mm [2.68 x 1.67 x 1.67“]

Interface characteristics CANopen

Interface	CANopen according to CiA DS-301, Profile to CiA DSP-410
Data rates	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s
Functions	TPDO (RTR, cyclic, event-driven, synchronized), parametrization per SDO and object register, digital filter (Butterworth Low pass, 8th order), SYNC Consumer, EMCY Producer, output and control of internal device temperature (±2.0 K accuracy), failure control with the help of Heartbeat or Nodeguarding / Lifeguarding

General electrical characteristics

Power supply	10 ... 30 V DC
Power consumption	40 ... 105 mA
Reverse polarity protection	yes
Measuring axes	1
Measuring range	360°, no limit stop
Resolution	0.1°
Linearity deviation	max. ±0.4°
Calibration accuracy (at 25°C)	±0.1° (Zero point and final values)
Temperature drift (Zero point)	typ. ±0.008°/K
Sampling rate	100 Hz
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

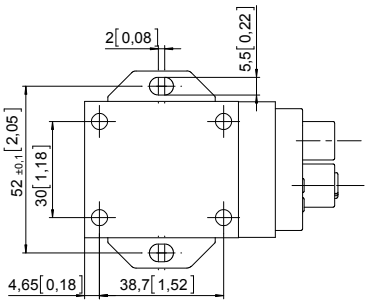
A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

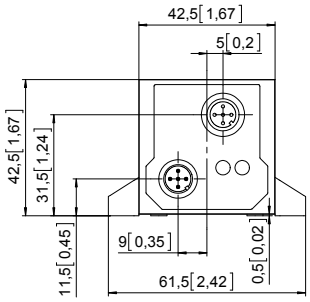
Terminal assignment

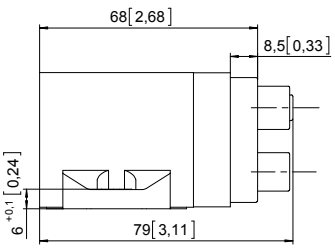
PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Supply voltage (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L-Bus cable

Dimensions

Dimensions in mm [inch]







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Inclinometer MEMS / capacitive | IS60, 2-dimensional | CANopen

The inclinometer IS60 permits 2-dimensional inclinations to be measured. Versions are available for the measuring ranges ±10°, ±45° or ±60°.

The sensor has a standardized CANopen interface, which enables easy configuration and start-up. All the parameters are stored in the internal permanent memory.

Can be supplied with customer-specific parametrization.

RoHS

CANopen

High protection level | Shock / vibration resistant | Reverse polarity protection

Robust and reliable

- Protection rating IP68 / IP69k.
- Robust plastic housing.
- High shock resistance.

User-friendly and accurate

- High resolution and accuracy.
- Programmable vibration suppression.
- High sampling rate and bandwidth.

Order code Inclinometer IS60

8.IS60	.	2	X	5	2	3
Type		a	b	c	d	e

a *Measuring direction*
2 = 2-dimensional x/y

b *Measuring range*
1 = ±10°
2 = ±45°
3 = ±60°

c *Interface*
5 = CANopen

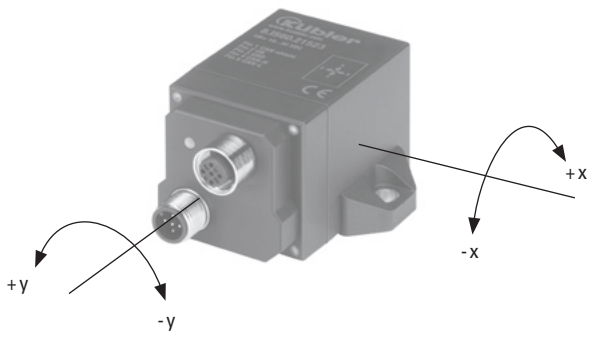
d *Power supply*
2 = 10 ... 30 V DC

e *Type of connection*
3 = 2 x M12 connector

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for Bus in, 5-pin 5 m [16.40'] PVC cable	**05.00.6021.2211.005M**
	M12 male connector with external thread for Bus out, 5-pin 5 m [16.40'] PVC cable	**05.00.6021.2411.005M**
Connector, self-assembly (straight)	M12 female connector with coupling nut for Bus in, 5-pin	**05.B-8151-0/9**
	M12 male connector with external thread for Bus out, 5-pin	**05.BS-8151-0/9**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



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Inclinometer
MEMS / capacitive | **IS60, 2-dimensional** | **CANopen**

Technical data

Mechanical characteristics

Connection CAN	M12 connector, 5-pin
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	IP68 / IP69k
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	plastic PA12-GF30
Shock resistance	300 m/s², 11 ms
Vibration resistance	100 m/s², 10 ... 2000 Hz
Dimensions	68 x 42.5 x 42.5 mm [2.68 x 1.67 x 1.67"]

Interface characteristics CANopen

Interface	CANopen according to CiA DS-301, Profile to CiA DSP-410
Data rates	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s
Functions	TPDO (RTR, cyclic, event-driven, synchronized), parameterization per SDO and object register, digital filter (Butterworth Low pass, 8th order), SYNC Consumer, EMCY Producer, output and control of internal device temperature (±2.0 K accuracy), failure control with the help of Heartbeat or Nodeguarding / Lifeguarding
Note ID	1 ... 127

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	40 ... 105 mA
Reverse polarity protection	yes
Measuring axes	2 (x/y)
Measuring range	±10°, ±45°, ±60°
Resolution	0.1°
Linearity deviation	max. ±0.4°
Calibration accuracy – at 25°C [77°F]	±0.1° (Zero point and final values)
Temperature drift (Zero point)	typ. ±0.008°/K
Sampling rate	100 Hz
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

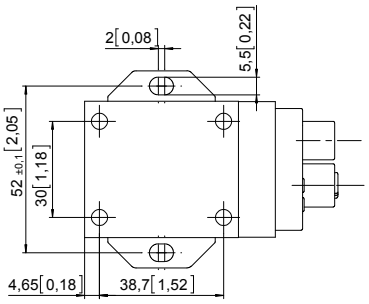
A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

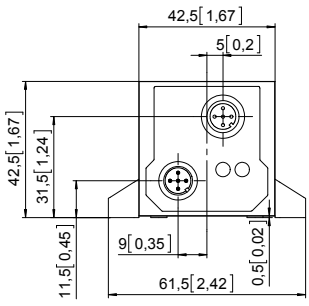
Terminal assignment

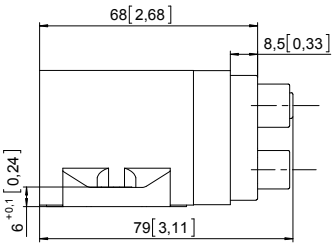
PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Power supply (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L Bus cable

Dimensions

Dimensions in mm [inch]







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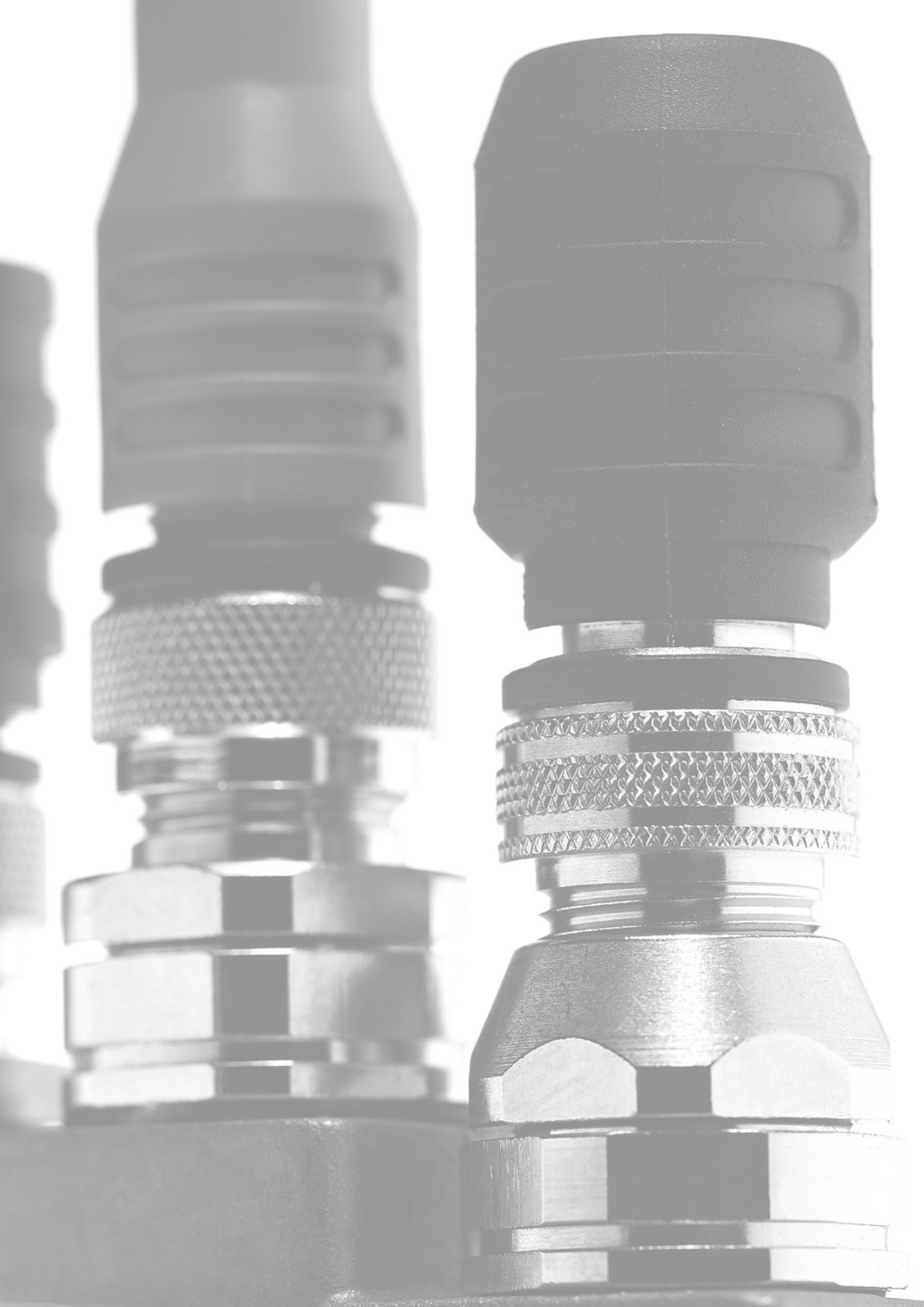

Connection technology

			Page
Cable	Unprepared, cut to length		**598**
M12 connection technology	Connectors, self-assembly		**601**
	Cordsets, pre-assembled		**607**
M23 connection technology	Connectors, self-assembly		**619**
	Cordsets, pre-assembled		**621**
MIL connection technology	Connectors, self-assembly		**625**
Sub-D connection technology	Cordsets, pre-assembled		**626**
Optical fiber transmission modules	Optical fiber transmitter and receiver	RS422 / HTL	**634**
	Optical fiber transmitter and receiver	SSI	**636**

The idea behind our Connection Technology System

Connection Technology from Kübler = System Safety!

All the products in the Connection Technology section have been tested and approved with the relevant compatible Kübler sensors.

They ensure the full functionality and high signal quality of our sensors.

Your benefit:

- Elimination of connection errors
  – no laborious fault finding
- Optimal shielding
  – avoids EMC problems
- Shorter installation times
  – saves time, cuts costs
- No time-consuming search for the right connector or cable
  – saves time, eliminates errors

Cable — Unprepared, cut to length

5 core + shield

				Order no.
PVC electronic cable LiYCY	**Cross section**	5 x 0.14 mm² [AWG25]	suitable for: incremental encoders without inversions	**8.0000.6300.XXXX** 1)
	Permanent working temperature range flexible installation	-5°C ... +70°C [+23°F ... +158°F]		
	Permanent working temperature range secure installation	-30°C ... +70°C [-22°F ... +158°F]		
	Bending radius flexible installation	min. 70 mm [2.76“]		
	Bending radius secure installation	min. 45 mm [1.77“]		
	Cable diameter	approx. 4.7 mm ±0.2 mm		
PE-X electronic trailing cable halogen-free, silicon-free	**Cross section**	5 x 0.75 mm² [AWG18]	suitable for: H100 with speed switch, robust incremental encoders without inversions	**8.0000.6600.XXXX** 1)
	Permanent working temperature range flexible installation	-35°C ... +100°C [-31°F ... +212°F]		
	Permanent working temperature range secure installation	-40°C ... +100°C [-40°F ... +212°F]		
	Bending radius flexible installation	min. 40 mm [1.57“]		
	Bending radius secure installation	min. 25 mm [0.98“]		
	Cable diameter	approx. 7.5 mm ±0.3 mm		

8 core + shield

				Order no.
PUR trailing cable halogen-free	**Cross section**	8 x 0.14 mm² [AWG25]	suitable for: Limes, 365X, 368X SSI and analog Safety-M	**8.0000.6P00.XXXX** 1)
	Permanent working temperature range flexible installation	-20°C ... +90°C [-4°F ... +194°F]		
	Permanent working temperature range secure installation	-40°C ... +90°C [-40°F ... +194°F]		
	Bending radius flexible installation	min. 65 mm [2.56“]		
	Bending radius secure installation	min. 45 mm [1.77“]		
	Cable diameter	approx. 5.5 mm ±0.2 mm		
PUR trailing cable halogen-free	**Cross section**	3 x 2 x 0.14 mm² [AWG25] + 2 x 0.5 mm² [AWG20]	suitable for: Limes, 365X, 368X SSI and analog Safety-M	**8.0000.6F00.XXXX** 1)
	Permanent working temperature range flexible installation	-40°C ... +90°C [-40°F ... +194°F]		
	Permanent working temperature range secure installation	-50°C ... +90°C [-58°F ... +194°F]		
	Bending radius flexible installation	min. 111 mm [4.37“]		
	Bending radius secure installation	min. 55 mm [2.17“]		
	Cable diameter	approx. 7.4 mm ±0.3 mm		

10 core + shield

				Order no.
PUR electronic trailing cable halogen-free	**Cross section**	4 x 2 x 0.25 mm² [AWG23] + 2 x 1 mm² [AWG17]	suitable for: H100, H120 LA10, LA50 Safety-M	**8.0000.6400.XXXX** 1)
	Permanent working temperature range flexible installation	-40°C ... +90°C [-40°F ... +194°F]		
	Permanent working temperature range secure installation	-50°C ... +90°C [-58°F ... +194°F]		
	Bending radius flexible installation	min. 95 mm [3.74“]		
	Bending radius secure installation	min. 40 mm [1.57“]		
	Cable diameter	approx. 7.9 mm ±0.8 mm		

1) XXXX = cable length in meters (e.g. 10 m = 0010)

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Cable — Unprepared, cut to length

12 core + shield

				Order no.
PUR electronic trailing cable halogen-free	**Cross section**	10 x 0.14 mm² [AWG25] + 2 x 0.5 mm² [AWG20]	suitable for:	**8.0000.6100.XXXX** [1]
	Permanent working temperature range flexible installation / secure installation	-30°C ... +80°C [-22°F ... +176°F] / -50°C ... +90°C [-58°F ... +194°F]	robust incremental encoders	
	Bending radius flexible installation / secure installation	min. 50 mm [1.97"] / min. 35 mm [1.38"]		
	Cable diameter	approx. 6.9 mm ±0.3 mm		
PVC electronic cable LiYCY	**Cross section**	12 x 0.14 mm² [AWG25]	suitable for:	**8.0000.6200.XXXX** [1]
	Permanent working temperature range flexible installation / secure installation	-10°C ... +90°C [+14°F ... +194°F] / -30°C ... +90°C [-22°F ... +194°F]	incremental encoders standard cable	
	Bending radius flexible installation / secure installation	min. 100 mm [3.94"] / min. 65 mm [2.56"]		
	Cable diameter	approx. 6.7 mm ±0.2 mm		
PUR electronic trailing cable halogen-free	**Cross section**	6 x 2 x 0.14 mm² [AWG25]	suitable for:	**8.0000.6Y00.XXXX** [1]
	Permanent working temperature range flexible installation / secure installation	-30°C ... +90°C [-22°F ... +194°F] / -40°C ... +90°C [-40°F ... +194°F]	robust incremental encoders LA10	
	Bending radius flexible installation / secure installation	min. 90 mm [3.54"] / min. 40 mm [1.57"]		
	Cable diameter	approx. 7.5 mm ±0.2 mm		
PE-X electronic cable halogen-free	**Cross section**	5 x 2 x 0.14 mm² + 2 x 0.5 mm²	suitable for: high temperatures or encoders with sine wave output	**8.0000.6E00.XXXX** [1]
	Permanent working temperature range flexible installation / secure installation	-25°C ... +110°C [-13°F ... +230°F] / -40°C ... +135°C [-40°F ... +275°F]		
	Bending radius flexible installation / secure installation	min. 90 mm [3.54"] / min. 70 mm [2.76"]		
	Cable diameter	approx. 8.5 mm ±0.9 mm		
PVC electronic cable LiYCY	**Cross section**	6 x 2 x 0.14 mm² [AWG25]	suitable for:	**8.0000.6900.XXXX** [1]
	Permanent working temperature range flexible installation / secure installation	-5°C ... +70°C [+23°F ... +158°F] / -30°C ... +80°C [-22°F ... +176°F]	absolute encoders with SSI or 4 ... 20 mA analog output, twisted pair conductors	
	Bending radius flexible installation / secure installation	min. 110 mm [4.33"] / min. 75 mm [2.95"]		
	Cable diameter	approx. 7.3 mm ±0.2 mm		
PUR electronic cable halogen-free	**Cross section**	6 x 2 x 0,14 mm² [AWG25]	suitable for:	**8.0000.6Q00.XXXX** [1]
	Permanent working temperature range flexible installation / secure installation	-10°C ... +90°C [+14°F ... +194°F] / -30°C ... +90°C [-22°F ... +194°F]	ATEX zone 2/22 encoders	
	Bending radius flexible installation / secure installation	min. 120 mm [4.72"] / min. 80 mm [3.15"]		
	Cable diameter	ca. 7,8 mm ±0,2 mm		

18 core + shield

				Order no.
PVC electronic cable LiYCY	**Cross section**	18 x 0.14 mm² [AWG25]	suitable for:	**8.0000.6700.XXXX** [1]
	Permanent working temperature range flexible installation / secure installation	-5°C ... +70°C [+23°F ... +158°F] / -30°C ... +80°C [-22°F ... +176°F]	absolute encoders with parallel output, twisted pair conductors	
	Bending radius flexible installation / secure installation	min. 120 mm [4.72"] / min. 100 mm [3.94"]		
	Cable diameter	approx. 7.8 mm ±0.2 mm		

1) XXXX = cable length in meters (e.g. 10 m = 0010)

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Cable — Unprepared, cut to length

PROFIBUS DP - cable

PUR outer jacket, PE wire insulation halogen-free

Cross section		2 x 0.34 mm² [AWG22]	suitable for:
Permanent working temperature range	flexible installation	-25°C ... +60°C [-13°F ... +140°F]	all Profibus fieldbus encoders, Safety-M modular SMBU and SMBS
	secure installation	-50°C ... +90°C [-58°F ... +194°F]	
Bending radius	flexible installation	min. 80 mm [3.15"]	
	secure installation	min. 40 mm [1.57"]	
Cable diameter		approx. 7.6 mm ±0.2 mm	

Order no.: **05.KABEL451.XXX** [1]

DeviceNet - cable

PUR outer jacket, PE wire insulation

Cross section		2 x 0.52 mm² [AWG24] + 2 x 1.04 mm² [AWG17]	suitable for:
Permanent working temperature range	flexible installation	-30°C ... +70°C [-22°F ... +158°F]	all DeviceNet fieldbus encoders
	secure installation	-40°C ... +80°C [-40°F ... +176°F]	
Bending radius	flexible installation	min. 70 mm [2.76"]	
	secure installation	min. 50 mm [1.97"]	
Cable diameter		approx. 8.4 mm ±0.2 mm	

Order no.: **05.KABEL5723.XXX** [1]

CANopen - cable

PVC electronic cable

Cross section		3 x 2 x 0.25 mm² [AWG23]	suitable for:
Permanent working temperature range	flexible installation	-10°C ... +90°C [+14°F ... +194°F]	all CANopen field-bus encoders, Safety-M modular SMBU
	secure installation	-30°C ... +90°C [-22°F ... +194°F]	
Bending radius	flexible installation	min. 130 mm [5.12"]	
	secure installation	min. 60 mm [2.36"]	
Cable diameter		approx. 6.2 mm ±0.2 mm	

Order no.: **8.0000.6V00.XXXX** [1]

Industrial Ethernet - cable

PUR electronic cable

Cross section		2 x 2 x 0.34 mm² [AWG22]	suitable for:
Permanent working temperature range	flexible installation	-30°C ... +70°C [-22°F ... +158°F]	all EtherCAT / PROFINET IO / EtherNet/IP encoders, Safety-M modular SMBU and SMBS
	secure installation	-40°C ... +80°C [-40°F ... +176°F]	
Bending radius	flexible installation	min. 50 mm [1.97"]	
	secure installation	min. 25 mm [0.98"]	
Cable diameter		approx. 4.8 mm ±0.2 mm	

Order no.: **05.00.6031.1111.XXXM** [1]

1) XXXX = cable length in meters (e.g. 10 m = 0010)

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M12 connection technology | Connectors, self-assembly

4 pin			Order no.
Female connector with coupling nut A coded, straight power supply Housing: plastic, IP67	screw connections, for cable ø 4 ... 6 mm [0.16 ... 0.24“]	suitable for our series: EMIO.SIO.10xP F5858 / F5878 F5868 / F5888 5858 / 5878 5868 / 5888 9080	**05.B8141-0**
Female connector with coupling nut A coded, right-angle power supply Housing: plastic, IP67	screw connections, for cable ø 4 ... 6 mm [0.16 ... 0.24“]	suitable for our series: EMIO.SIO.10xP 5858 / 5878 5868 / 5888 9080	**05.B8241-0**
Male connector with external thread A coded, straight power supply Housing: metal / plastic, IP67	screw connections, for cable ø 4 ... 6 mm [0.16 ... 0.24“]	suitable for: versions with cable outlet	**05.BS8141-0**
Male connector with external thread D coded, straight Housing: metal, IP67	screw connections, for cable ø 4 ... 9 mm [0.16 ... 0.35“]	suitable for our series: F5858 / F5878 F5868 / F5888 5858 / 5878 5868 / 5888 EtherCAT Conformance tested PROFINET EtherNet/IP	**05.WASCSY4S**

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M12 connection technology | Connectors, self-assembly

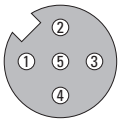
5 pin

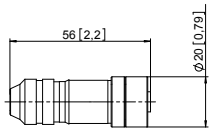
Order no.

Female connector with coupling nut
A coded, straight

Housing: metal, IP67

screw connections,
for cable ø 6 ... 8 mm [0.24 ... 0.32“]





suitable for our series:

A50, B80, C120, D135
IS40, IS60, IN88

3651 / 3671	M3658 / M3678
F3658 / F3658	5858 / 5878
M3661 / M3681	M3661R
M3668 / M3688	M3668R
F3668 / F3688	F5868 / F5888
M5861	M5868
5868 / 5888	9080

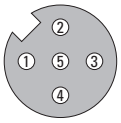
CANopen
DeviceNet

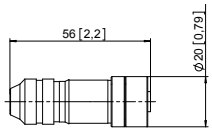
8.0000.5116.0000

Female connector with coupling nut
A coded, straight

Housing: metal, IP67

screw connections,
for cable ø 6 ... 8 mm [0.24 ... 0.32“]





suitable for our series:

ATEX zone 2/22 encoders

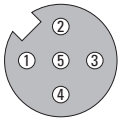
Ex 2/22

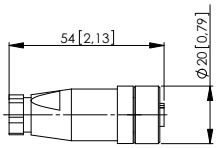
8.0000.5116.0000.Ex

Female connector with coupling nut
A coded, straight

Housing: plastic, IP67

screw connections,
for cable ø 6 ... 8 mm [0.24 ... 0.32“]





suitable for our series:

A50, B80, C120, D135,
IS40, IS60, IN88
3651 / 3671
9080

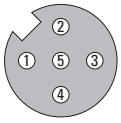
DeviceNet

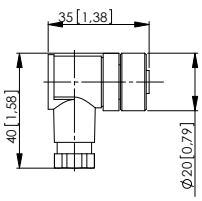
05.B-8151-0/9

Female connector with coupling nut
A coded, right-angle

Housing: plastic , IP67

screw connections,
for cable ø 6 ... 8 mm [0.24 ... 0.32“]





suitable for our series:

A50, B80, C120, D135
IS40, IS60, IN88
3651 / 3671
9080

DeviceNet

05.B-8251-0/9

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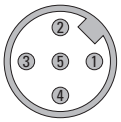
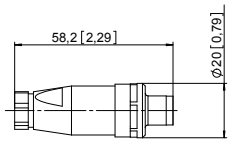
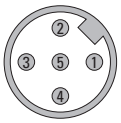
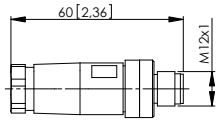
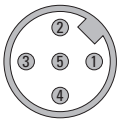
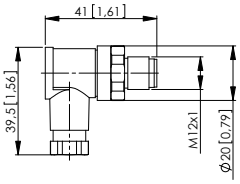
M12 connection technology | Connectors, self-assembly

5 pin

			Order no.
Male connector with external thread **A coded, straight** Housing: metal, IP67 	screw connections, for cable ø 6 ... 8 mm [0.24 ... 0.32“]  	suitable for our series: F3658 / F3658 M3658 / M3678 M3668R / M3688R 5858 / 5878 9080 IS60 F3668 /F3688 M3668 / M3688 F5868 / F5888 5868 / 5888 CANopen DeviceNet	**8.0000.5111.0000**
Male connector with external thread **A coded, straight** Housing: metal / plastic, IP67 	screw connections, for cable ø 6 ... 8 mm [0.24 ... 0.32“]  	suitable for our series: 9080 IS60, IN88 EMIO.SIO.10xP DeviceNet	**05.BS-8151-0/9**
Male connector with external thread **A coded, right-angle** Housing: metal / plastic , IP67 	screw connections, for cable ø 6 ... 8 mm [0.24 ... 0.32“]  	suitable for our series: 9080 IS60, IN88 DeviceNet	**05.BS-8251-0/9**

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M12 connection technology | Connectors, self-assembly

5 pin			Order no.
Female connector with coupling nut B coded, straight Housing: metal, IP67	screw connections, for cable ø 4 ... 9 mm [0.16 ... 0.35“]	suitable for our series: 5858 / 5878 5868 / 5888 9080	**05.BMWS 8151-8.5**
Female connector with coupling nut B coded, right-angle Housing: metal, IP67	screw connections, for cable ø 4 ... 9 mm [0.16 ... 0.35“]	suitable for our series: 5858 / 5878 5868 / 5888 9080	**05.BMWS 8251-8.5**
Male connector with external thread B coded, straight Housing: metal, IP67	screw connections, for cable ø 4 ... 9 mm [0.16 ... 0.35“]	suitable for our series: 5858 / 5878 5868 / 5888 9080	**05.BMSWS 8151-8.5**
Male connector with external thread B coded, right-angle Housing: metal, IP67	screw connections, for cable ø 4 ... 9 mm [0.16 ... 0.35“]	suitable for our series: 5858 / 5878 5868 / 5888 9080	**05.BMSWS 8251-8.5**

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M12 connection technology | Connectors, self-assembly

8 pin

			Order no.
Female connector with coupling nut **A coded, straight** Housing: metal, IP67	screw connections, for cable ø 6 ... 8 mm [0.24 ... 0.32"]	suitable for our series: 3610 / 3620 5814 / 5834 F3653 / F3673 5853 / 5873 F3663 / F3683 5863 / 5883 M3663 / M3683 58x4FSx M3663R F5883M M5863 5000 / 5020 5821 5006 / 5026 5876 KIS40 / KIH40 KIS50 / KIH50 A020 / A02H H120	**05.CMB 8181-0**
Male connector with external thread **A coded, straight** Housing: metal, IP67	screw connections, for cable ø 6 ... 8 mm [0.24 ... 0.32"]	suitable for: versions with cable outlet	**05.CMBS 8181-0**
Female connector with coupling nut **A coded, straight** Housing: metal, IP67	screw connections, for cable ø 6 ... 9 mm [0.24 ... 0.35"]	suitable for our series: ATEX zone 2/22 encoders	**8.0000.5136.0000.Ex**

12 pin

			Order no.
Female connector with coupling nut **A coded, straight** Housing: metal, IP67	screw connections, for cable ø 6 ... 8 mm [0.24 ... 0.32"]	suitable for: LA10	**8.0000.5162.0000**

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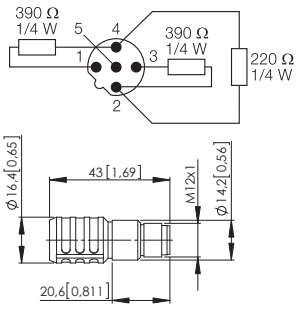
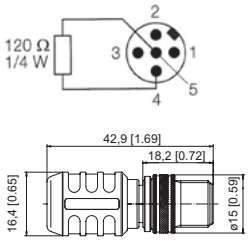
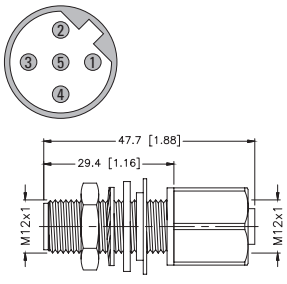
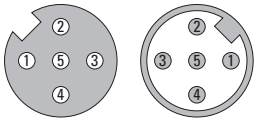
M12 connection technology | Connectors, self-assembly

Accessories			Order no.
Securing clip for M12 connectors Material: plastic 	against accidental disconnection under load working temperature range -25°C ... +90°C [-13°F ... +194°F]		**8.0000.5000.0006**
Terminating resistor **Male connector with external thread** **B coded, straight** Housing: metal / plastic, IP67 		suitable for our series: 5858 / 5878 5868 / 5888 9080 PROFIBUS®	**05.RSS4.5-PDP-TR**
Terminating resistor **Male connector with external thread** **A coded, straight** Housing: metal / plastic, IP67 		suitable for our series: F5868 / F5888 5858 / 5878 5868 / 5888 9080 CANopen DeviceNet	**05.RSE 57 TR2**
M12 lead-through **B coded, straight** Housing: metal, IP67 		suitable for our series: 5858 / 5878 5868 / 5888 9080 PROFIBUS®	**05.FKW-FSW45/M12**
T-junction **A coded, 5 pin** Housing: metal / plastic, IP67 	2 x female connector with coupling nut 1 x male connector with external thread 	suitable for: M12 connectors CANopen DeviceNet	**05.FKM5-FKM5-FSM5**

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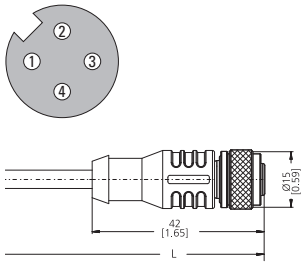
M12 connection technology | Cordsets, pre-assembled

With connector, 4 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended
A coded, straight
power supply

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Terminal assignment

Pin female contacts:	1	2	3	4
Wire color:	BN	WH	BU	BK

suitable for our series:

EMIO.SIO.10xP

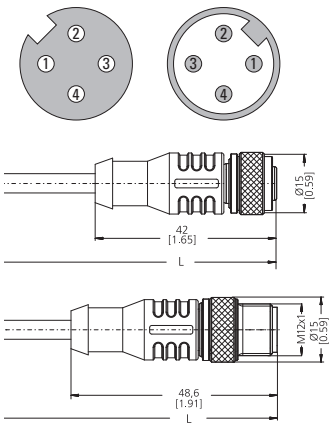
5858 / 5878 | 5868 / 5888
F5858 / F5878 | F5868 / F5888
9080
H120

cable length [1)]

standard cable length	2 m [6.56']	**05.00.6061.6211.002M**
(available from 1 piece)	5 m [16.40']	**05.00.6061.6211.005M**
	10 m [32.81']	**05.00.6061.6211.010M**
	15 m [49.21']	**05.00.6061.6211.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6061.6211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + male connector with external thread
A coded, straight
power supply

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



suitable for our series:

EMIO.SIO.10xP

5858 / 5878 | 5868 / 5888
9080

cable length [1)]

standard cable length	2 m [6.56']	**05.00.6061.6462.002M**
(available from 1 piece)	5 m [16.40']	**05.00.6061.6462.005M**
	10 m [32.81']	**05.00.6061.6462.010M**
	15 m [49.21']	**05.00.6061.6462.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6061.6462.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.

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M12 connection technology | Cordsets, pre-assembled

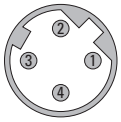
With connector, 4 pin

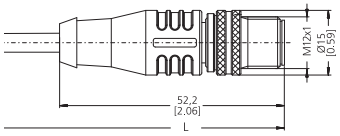
Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Male connector with external thread
single-ended
D coded, straight

Cable: PUR, 2 x 2 x 0.34 mm² [AWG22]
Housing: metal /plastic, IP67

Port A (1) and B (2)





suitable for our series:

5858 / 5878 5868 / 5888
F5858 / F5878 F5868 / F5888

EtherCAT Conformance tested

PROFINET

EtherNet/IP

Terminal assignment

Pin male contacts:	1	2	3	4
Wire color:	YE	OG	WH	BU

cable length [1]

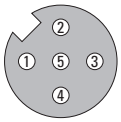
standard cable length	2 m [6.56']	**05.00.6031.4411.002M**
(available from 1 piece)	5 m [16.40']	**05.00.6031.4411.005M**
	10 m [32.81']	**05.00.6031.4411.010M**
	15 m [49.21']	**05.00.6031.4411.015M**
other cable lengths		**05.00.6031.4411.0xxM**
(minimum order quantity 4 pieces)		xx = length in meters: 1, 3, 8, 12, 20, 25, 30

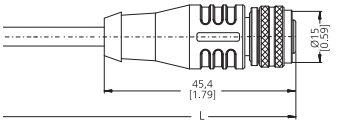
With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut +
single-ended
A coded, straight

Cable: PVC, 5 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67





suitable for our series:

M3661 / M3681 M3661R
M5861

A50, B80, C120, D135
IS40

Terminal assignment

Pin female contacts:	1	2	3	4	5	PH [2]
Wire color:	BN	WH	BU	BK	GY	PH [2]

cable length [1]

standard cable length	2 m [6.56']	**05.00.6081.2211.002M**
(available from 1 piece)	5 m [16.40']	**05.00.6081.2211.005M**
	10 m [32.81']	**05.00.6081.2211.010M**
	15 m [49.21']	**05.00.6081.2211.015M**
other cable lengths		**05.00.6081.2211.0xxM**
(minimum order quantity 4 pieces)		xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.

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M12 connection technology | Cordsets, pre-assembled

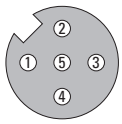
With connector, 5 pin

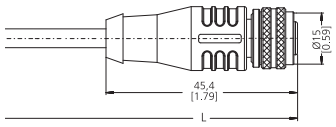
Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended
A coded, straight

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67

Bus-in





suitable for our series:

9080
IS60, IN88

DeviceNet

Terminal assignment

Pin female contacts:	1	2	3	4	5
Wire color:	⏚ 3)	RD	BK	WH	BU

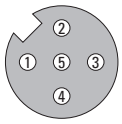
cable length 1)

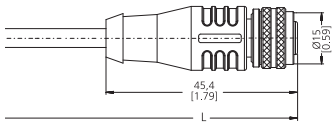
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6021.2211.002M**
	5 m [16.40']	**05.00.6021.2211.005M**
	10 m [32.81']	**05.00.6021.2211.010M**
	15 m [49.21']	**05.00.6021.2211.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6021.2211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended
A coded, straight

Cable: PVC, 3 x 2 x 0.25 mm²
Housing: metal / plastic, IP67

Bus-in





suitable for our series:

M3658 / M3678 M3668 / M3688
M3668R F5868 / F5888
5858 / 5878 5868 / 5888
M5868 9080

CANopen

Terminal assignment

Pin female contacts:	1	2	3	4	5	PH 2)
Wire color:	GY	BN	WH	GN	YE	PH 2)

cable length 1)

standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6091.A211.002M**
	5 m [16.40']	**05.00.6091.A211.005M**
	10 m [32.81']	**05.00.6091.A211.010M**
	15 m [49.21']	**05.00.6091.A211.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6091.A211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

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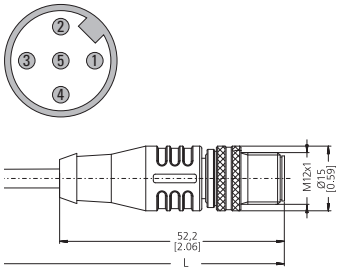
M12 connection technology | Cordsets, pre-assembled

With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Male connector with external thread + single-ended
A coded, straight

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Terminal assignment

Pin male contacts:	1	2	3	4	5
Wire color:	⏚ 3)	RD	BK	WH	BU

Bus out

suitable for our series:

9080
IS60, IN88

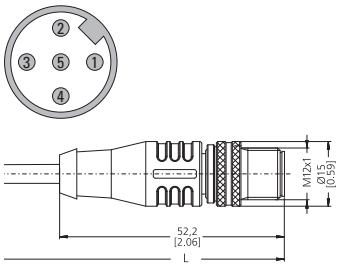
DeviceNet

cable length 1)

standard cable length (available from 1 piece)	2 m [6.56′]	**05.00.6021.2411.002M**
	5 m [16.40′]	**05.00.6021.2411.005M**
	10 m [32.81′]	**05.00.6021.2411.010M**
	15 m [49.21′]	**05.00.6021.2411.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6021.2411.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Male connector with external thread + single-ended
A coded, straight

Cable: PVC, 3 x 2 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



Terminal assignment

Pin male contacts:	1	2	3	4	5	PH 2)
Wire color:	GY	BN	WH	GN	YE	PH 2)

Bus out

suitable for our series:

EMIO.SIO.10xP

M3658 / M3678 F5868 / F5888
5858 / 5878 5868 / 5888
9080

CANopen

cable length 1)

standard cable length (available from 1 piece)	2 m [6.56′]	**05.00.6091.A411.002M**
	5 m [16.40′]	**05.00.6091.A411.005M**
	10 m [32.81′]	**05.00.6091.A411.010M**
	15 m [49.21′]	**05.00.6091.A411.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6091.A411.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

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M12 connection technology | Cordsets, pre-assembled

With connector, 5 pin

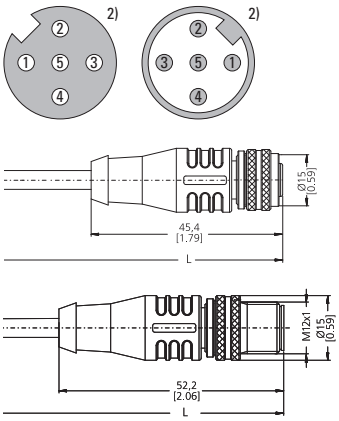
Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

Female connector with coupling nut + male connector with external thread
A coded, straight

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67

Bus in / out



suitable for our series:

EMIO.SIO.10xP

9080

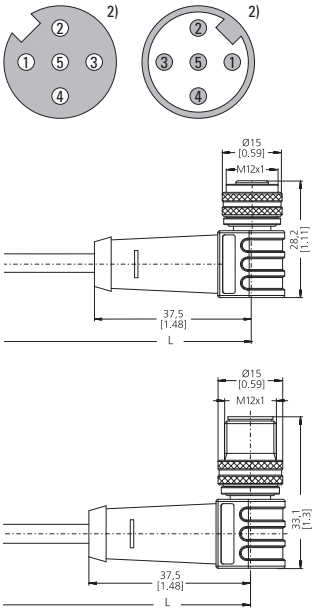
DeviceNet

	cable length [1]	
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6021.2422.002M**
	5 m [16.40']	**05.00.6021.2422.005M**
	10 m [32.81']	**05.00.6021.2422.010M**
	15 m [49.21']	**05.00.6021.2422.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6021.2422.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + male connector with external thread
A coded, right-angle

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67

Bus in / out



suitable for our series:

9080

DeviceNet

	cable length [1]	
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6021.2523.002M**
	5 m [16.40']	**05.00.6021.2523.005M**
	10 m [32.81']	**05.00.6021.2523.010M**
	15 m [49.21']	**05.00.6021.2523.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6021.2523.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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M12 connection technology | Cordsets, pre-assembled

With connector, 5 pin

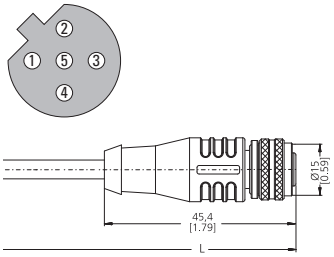
Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

Female connector with coupling nut + single-ended
B coded, straight

Bus-in

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67



suitable for our series:

5858 / 5878
5868 / 5888
9080

PROFIBUS®

Terminal assignment

Pin female contacts:	1	2	3	4	5	PH 2)
Wire color:	n.c.	GN	n.c.	RD	n.c.	PH 2)

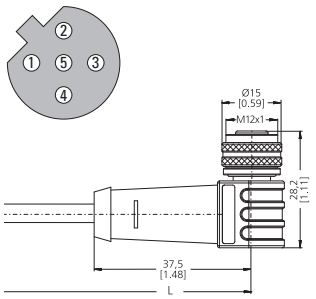
cable length 1)

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6011.3211.002M**
	5 m [16.40']	**05.00.6011.3211.005M**
	10 m [32.81']	**05.00.6011.3211.010M**
	15 m [49.21']	**05.00.6011.3211.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6011.3211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended
B coded, right-angle

Bus-in

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



suitable for our series:

5858 / 5878
5868 / 5888
9080

PROFIBUS®

Terminal assignment

Pin female contacts:	1	2	3	4	5	PH 2)
Wire color:	n.c.	GN	n.c.	RD	n.c.	PH 2)

cable length 1)

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6011.3311.002M**
	5 m [16.40']	**05.00.6011.3311.005M**
	10 m [32.81']	**05.00.6011.3311.010M**
	15 m [49.21']	**05.00.6011.3311.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6011.3311.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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M12 connection technology | Cordsets, pre-assembled

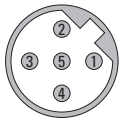
With connector, 5 pin

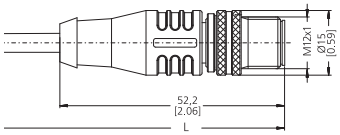
Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Male connector with external thread + single-ended
B coded, straight

Bus-out

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67





suitable for our series:

5858 / 5878
5868 / 5888
9080

PROFIBUS

Terminal assignment

Pin male contacts:	1	2	3	4	5	PH [2]
Wire color:	n.c.	GN	n.c.	RD	n.c.	PH [2]

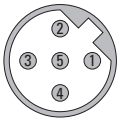
cable length [1]

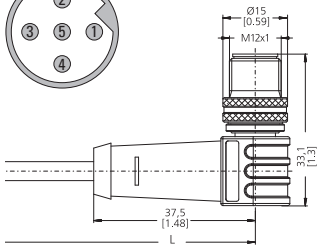
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6011.3411.002M**
	5 m [16.40']	**05.00.6011.3411.005M**
	10 m [32.81']	**05.00.6011.3411.010M**
	15 m [49.21']	**05.00.6011.3411.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6011.3411.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Male connector with external thread + single-ended
B coded, right-angle

Bus-out

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67





suitable for our series:

5858 / 5878
5868 / 5888
9080

PROFIBUS

Terminal assignment

Pin male contacts:	1	2	3	4	5	PH [2]
Wire color:	n.c.	GN	n.c.	RD	n.c.	PH [2]

cable length [1]

standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6011.3511.002M**
	5 m [16.40']	**05.00.6011.3511.005M**
	10 m [32.81']	**05.00.6011.3511.010M**
	15 m [49.21']	**05.00.6011.3511.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6011.3511.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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M12 connection technology — Cordsets, pre-assembled

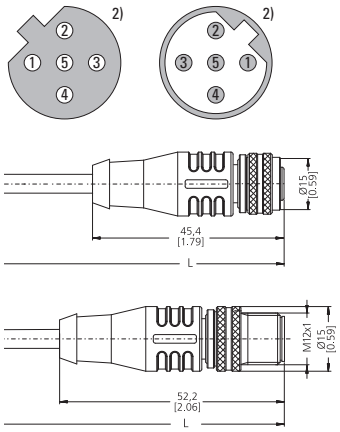
With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Female connector with coupling nut + male connector with external thread
B coded, straight

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67

Bus in / out



suitable for our series:

5858 / 5878
5868 / 5888
9080

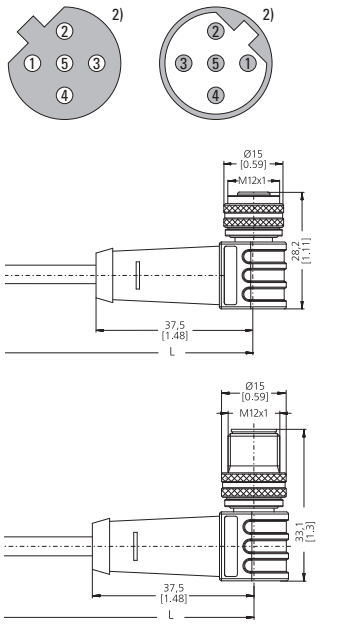
PROFIBUS®

	cable length [1]	Order no.
standard cable length (available from 1 piece)	2 m [6.56′]	**05.00.6011.3432.002M**
	5 m [16.40′]	**05.00.6011.3432.005M**
	10 m [32.81′]	**05.00.6011.3432.010M**
	15 m [49.21′]	**05.00.6011.3432.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6011.3432.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + male connector with external thread
B coded, right-angle

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67

Bus in / out



suitable for our series:

5858 / 5878
5868 / 5888
9080

PROFIBUS®

	cable length [1]	Order no.
standard cable length (available from 1 piece)	2 m [6.56′]	**05.00.6011.3533.002M**
	5 m [16.40′]	**05.00.6011.3533.005M**
	10 m [32.81′]	**05.00.6011.3533.010M**
	15 m [49.21′]	**05.00.6011.3533.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6011.3533.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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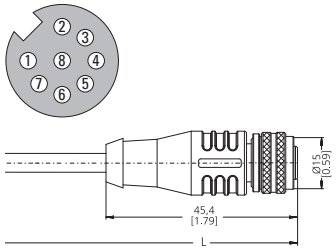
M12 connection technology | Cordsets, pre-assembled

With connector, 8 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended
A coded, straight

Cable: PVC, 8 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



suitable for our series:

3610 / 3620 | KIS50 / KIH50
5000 / 5020 | 5006 / 5026
5814 / 5834 | 5814FSx / 5834FSx
5821 | A020 / A02H
F3653 / F3673 | 5853 / 5873
5876
M3663 / M3683 | M3663R / M3683R
F3663 / F3683 | F5863 / F5883
5863 / 5883 | F5883M

Terminal assignment

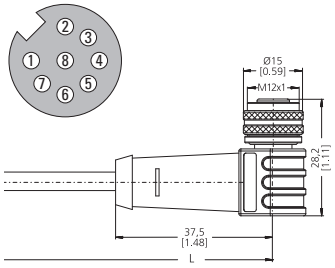
Pin female contacts:	1	2	3	4	5	6	7	8	PH [2]
Wire color:	WH	BN	GN	YE	GY	PK	BU	RD	PH [2]

cable length [1]

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6041.8211.002M**
	5 m [16.40']	**05.00.6041.8211.005M**
	10 m [32.81']	**05.00.6041.8211.010M**
	15 m [49.21']	**05.00.6041.8211.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6041.8211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended
A coded, right-angle

Cable: PVC, 8 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



suitable for our series:

3610 / 3620 | 5000 / 5020
5814 / 5834 | 5814FSx / 5834FSx
5006 / 5026 | 5821
A020 / A02H
F3653 / F3673 | 5853 / 5873
5876
M3663 / M3683 | M3663R / M3683R
F3663 / F3683 | F5863 / F5883
5863 / 5883

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH [2]
Wire color:	WH	BN	GN	YE	GY	PK	BU	RD	PH [2]

cable length [1]

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6041.8311.002M**
	5 m [16.40']	**05.00.6041.8311.005M**
	10 m [32.81']	**05.00.6041.8311.010M**
	15 m [49.21']	**05.00.6041.8311.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6041.8311.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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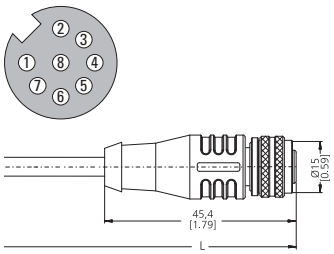
M12 connection technology | Cordsets, pre-assembled

With connector, 8 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended
A coded, straight

Cable: PUR, 8 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



suitable for our series:

3610 / 3620 5000 / 5020
5814 / 5834 5814FSx / 5834FSx
5006 / 5026 5821
A020 / A02H
F3653 / F3673
5853 / 5873
M3663 / M3683 M3663R / M3683R
F3663 / F3683 F5863 / F5883
5863 / 5883 M5863
5876

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH [2]
Wire color:	WH	BN	GN	YE	GY	PK	BU	RD	PH [2]

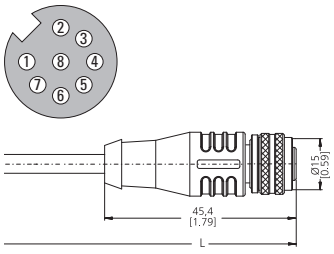
cable length [1]

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.6051.8211.002M**
	5 m [16.40']	**05.00.6051.8211.005M**
	10 m [32.81']	**05.00.6051.8211.010M**
	15 m [49.21']	**05.00.6051.8211.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.6051.8211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended
A coded, straight

Twisted-pair cables - for particularly interference-free transmission

Cable: PUR, 4 x 2 x 0,25 mm² [AWG23]
Housing: metal / plastic, IP67



suitable for our series with RS422, RS485 or SinCos output:

3610 / 3620 5000 / 5020
5814 / 5834 5814FSx / 5834FSx
5006 / 5026 5821
A020 / A02H
F3653 / F3673
5853 / 5873
M3663 / M3683 M3663R / M3683R
F3663 / F3683 F5863 / F5883
5863 / 5883 5876

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH [2]
Wire color:	WH	BN	GN	YE	GY	PK	BU	RD	PH [2]

cable length [1]

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**05.00.60E1.8211.002M**
	5 m [16.40']	**05.00.60E1.8211.005M**
	10 m [32.81']	**05.00.60E1.8211.010M**
	15 m [49.21']	**05.00.60E1.8211.015M**
other cable lengths (minimum order quantity 4 pieces)		**05.00.60E1.8211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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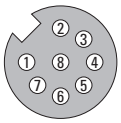
M12 connection technology | Cordsets, pre-assembled

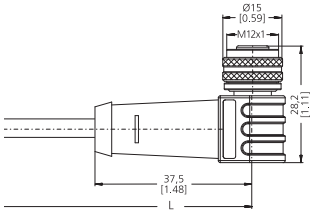
With connector, 8 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Female connector with coupling nut + single-ended
A coded, right-angle
with integrated control LEDs

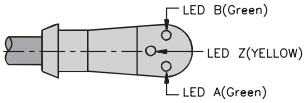
Cable: PVC, 8 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67





suitable for our series:

3610 / 3620	5006
5000 / 5020	5821
A020	A02H



Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH [2]
Wire color:	WH	BN	YE	GN	PK	GY	RD	BU	PH [2]

cable length [1]	Order no.
2 m [6.56']	**05.E-WKC 8T-PX3-930-0002**
5 m [16.40']	**05.E-WKC 8T-PX3-930-0005**
10 m [32.81']	**05.E-WKC 8T-PX3-930-0010**
15 m [49.21']	**05.E-WKC 8T-PX3-930-0015**

1) Other cable lengths on request.
2) Shield on housing.

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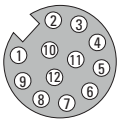
M12 connection technology | Cordsets, pre-assembled

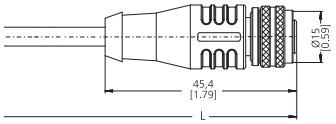
With connector, 12 pin

Working temp. -30°C ... +90°C [-22°F ... +194°F]

Female connector with coupling nut + single-ended
A coded, straight

Cable: PUR, 6 x 2 x 0.14 mm²
Housing: metal / plastic, IP67





Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	PH [2]

suitable for our series:

LA10

cable length [1]	Order no.
standard cable length 2 m [6.56']	**05.00.60B1.B211.002M**
(available from 1 piece) 5 m [16.40']	**05.00.60B1.B211.005M**
10 m [32.81']	**05.00.60B1.B211.010M**
15 m [49.21']	**05.00.60B1.B211.015M**
other cable lengths (minimum order quantity 4 pieces)	**05.00.60B1.B211.0xxM** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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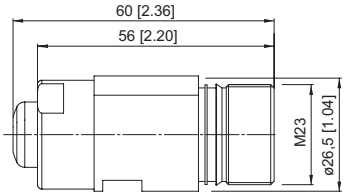
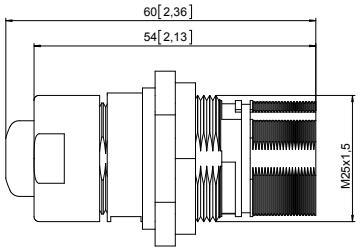
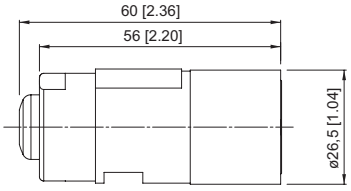
M23 connection technology | Connectors, self-assembly

12 pin			Order no.
Male connector with external thread **pin assignment ccw** Housing: metal, IP67 	solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41“]  	suitable for: versions with cable outlet	**8.0000.5015.0001**
Male connector with external thread **pin assignment ccw** **central fastening** Housing: metal, IP67 	solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41“]  	suitable for: versions with cable outlet	**8.0000.5015.0000**
Female connector with coupling nut **pin socket assignment cw** Housing: metal, IP67 	solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41“]  	suitable for: KIS50 / KIH50 5000 / 5020 5814 / 5834 5814FSx / 5834FSx 580X / 582X F5863 / F5883 F5883M 585x / 587x 5853FSx /5873FSx 586x / 588x 5863FSx /5883FSx 9000 908x A02x	**8.0000.5012.0000**

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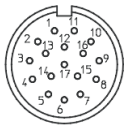
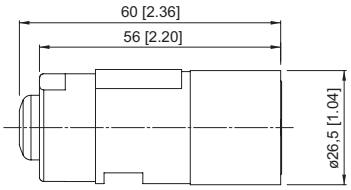
M23 connection technology | Connectors, self-assembly

17 pin			Order no.
Female connector with coupling nut **pin socket assignment ccw** Housing: metal, IP67	solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41"]	suitable for: 5850 / 5870 5852 / 5872	**8.0000.5042.0000**





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M23 connection technology | Cordsets, pre-assembled

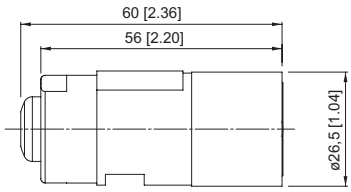
With connector, 12 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67

pin socket
assignment cw



suitable for our series with RS422 or SinCos output:

KIS50 / KIH50 — 5000 / 5020
5805 / 5825 [3]
5814 / 5834 — 5814FSx / 5834FSx [3]
A020 / A02H — H120

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire color:	PK	RD-BU	BU	RD	GN	YE	–	GY	–	WH	GY-PK	BN	PH [2]

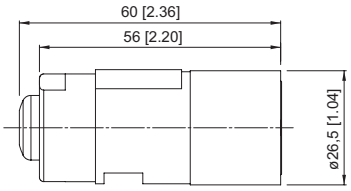
cable length [1]

standard cable length (available from 1 piece)	2 m [6.56']	**8.0000.6901.0002**
	5 m [16.40']	**8.0000.6901.0005**
	10 m [32.81']	**8.0000.6901.0010**
	15 m [49.21']	**8.0000.6901.0015**
other cable lengths (available from 1 piece)		**8.0000.6901.00xx** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended

Cable: PUR, 10 x 0.14 mm² [AWG25] + 2 x 0.5 mm² [AWG20]
Housing: metal, IP67

pin socket
assignment cw



suitable for our series with RS422 or SinCos output:

KIS50 / KIH50 [3] — 5000 / 5020 [3]
5803 / 5823 — 5804 / 5824
5805 / 5825
5814 / 5834 [3] — 5814FSx / 5834FSx
A020 / A02H [3] — H120 [3]

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire color:	PK	BN	BU	RD	GN	YE	–	GY	–	WH 0.5 mm²	WH	BN 0.5 mm²	PH [2]

cable length [1]

standard cable length (available from 1 piece)	2 m [6.56']	**8.0000.6101.0002**
	5 m [16.40']	**8.0000.6101.0005**
	10 m [32.81']	**8.0000.6101.0010**
	15 m [49.21']	**8.0000.6101.0015**
other cable lengths (available from 1 piece)		**8.0000.6101.00xx** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.
3) Connector color assignment is different from encoder color assignment.

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M23 connection technology | Cordsets, pre-assembled

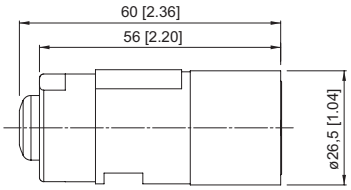
With connector, 12 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67

pin socket
assignment cw



suitable for our series with SSI or analog output:

5850 / 5870
F5863 / F5883 F5883M
5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
9081

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	PH [2]

cable length [1]

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**8.0000.6901.0002.0031**
	5 m [16.40']	**8.0000.6901.0005.0031**
	10 m [32.81']	**8.0000.6901.0010.0031**
	15 m [49.21']	**8.0000.6901.0015.0031**
other cable lengths (available from 1 piece)		**8.0000.6901.00xx.0031** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

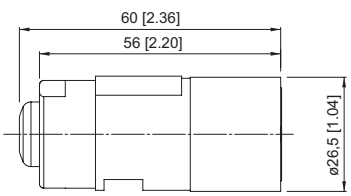
With connector, 12 pin

Working temp. -40°C ... +135°C [-40°F ... +275°F] | Order no.

Female connector with coupling nut + single-ended

Cable: PE-X, 5 x 2 x 0,14 mm² [AWG25] + 2 x 0,5 mm² [AWG20]
Housing: metal, IP67

pin socket
assignment cw



suitable for our series with RS422 or SinCos output:

KIS50 / KIH50 [3] 5000 / 5020 [3]
5803 / 5823 5804 / 5824
5805 / 5825
5814 / 5834 [3] 5814FSx / 5834FSx
A020 / A02H [3] H120 [3]

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire color:	PK	BN	BU	RD	GN	YE	–	GY	–	WH 0.5 mm²	WH	BN 0.5 mm²	PH [2]

cable length [1]

		Order no.
standard cable length (available from 1 piece)	2 m [6.56']	**8.0000.6E01.0002**
	5 m [16.40']	**8.0000.6E01.0005**
	10 m [32.81']	**8.0000.6E01.0010**
	15 m [49.21']	**8.0000.6E01.0015**
other cable lengths (available from 1 piece)		**8.0000.6E01.00xx** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.
3) Connector color assignment is different from encoder color assignment.

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M23 connection technology | Cordsets, pre-assembled

With connector, 12 pin

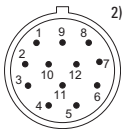
Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

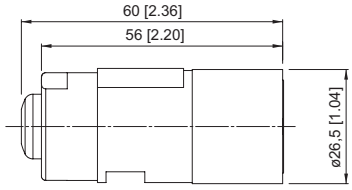
Female connector with coupling nut + male connector with external thread

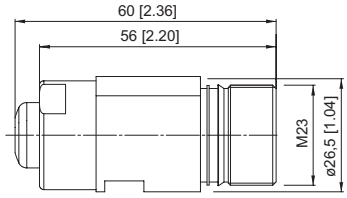
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67

pin socket assignment cw

pin socket assignment ccw







suitable for our series:

5000 / 5020 5803 / 5823
5804 / 5824 5805 / 5825
5814 / 5834 5814FSx / 5834FSx
A020 / A02H H120

cable length [1]

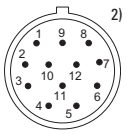
standard cable length (available from 1 piece)	2 m [6.56']	**8.0000.6905.0002**
	5 m [16.40']	**8.0000.6905.0005**
	10 m [32.81']	**8.0000.6905.0010**
	15 m [49.21']	**8.0000.6905.0015**
other cable lengths (available from 1 piece)		**8.0000.6905.00xx** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

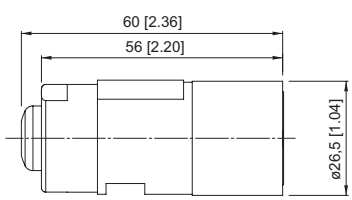
Female connector with coupling nut + male connector with external thread

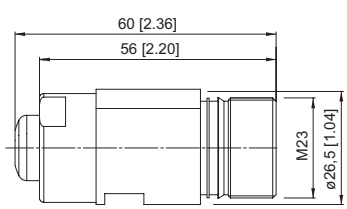
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67

pin socket assignment cw

pin socket assignment ccw







suitable for our series:

5850 / 5870 F5863 / F5883
5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
9081

cable length [1]

standard cable length (available from 1 piece)	2 m [6.56']	**8.0000.6905.0002.0.032**
	5 m [16.40']	**8.0000.6905.0005.0.032**
	10 m [32.81']	**8.0000.6905.0010.0.032**
	15 m [49.21']	**8.0000.6905.0015.0.032**
other cable lengths (available from 1 piece)		**8.0000.6905.00xx.0032** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

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M23 connection technology | Cordsets, pre-assembled

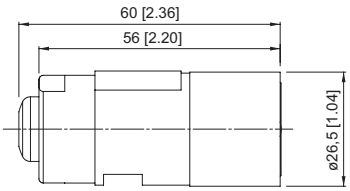
With connector, 17 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended

pin socket
assignment ccw

Cable: PVC, 18 x 0.14 mm² [AWG25]
Housing: metal, IP67



suitable for our series:
5850 / 5870
5852 / 5872

	cable length [1]	
standard cable length (available from 1 piece)	2 m [6.56'] 5 m [16.40'] 10 m [32.81'] 15 m [49.21']	**8.0000.6741.0002** **8.0000.6741.0005** **8.0000.6741.0010** **8.0000.6741.0015**
other cable lengths (available from 1 piece)		**8.0000.6741.00xx** xx = length in meters: 1, 3, 8, 12, 20, 25, 30

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Wire 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

1) Other cable lengths on request.

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MIL connection technology | Connectors, self-assembly

7 pin

Order no.

Female connector with coupling nut

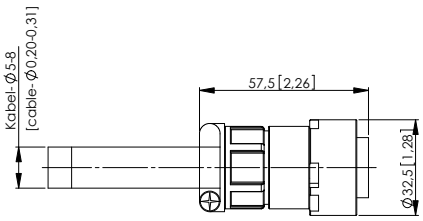
solder connections,
for cable ø 5 ... 8 mm [0.20 ... 0.32"]

suitable for our series:

5803 / 5823

8.0000.5052.0000

Housing: metal, IP67



10 pin

Order no.

Female connector with coupling nut

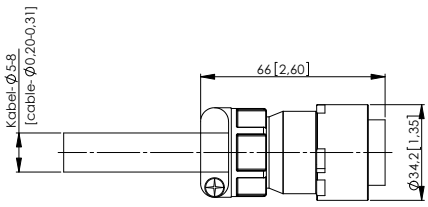
solder connections,
for cable ø 5 ... 8 mm [0.20 ... 0.32"]

suitable for our series:

5000 / 5020 5803 / 5823
A02H LM3

8.0000.5062.0000

Housing: metal, IP67



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Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M12 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

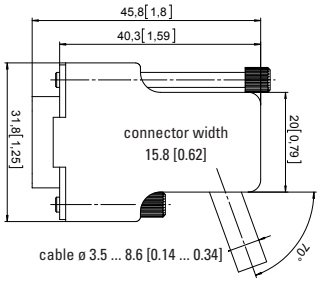
Order no.

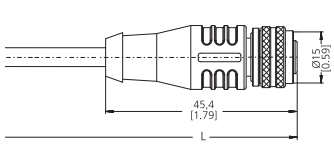
Sub-D female connector, 9 pin, cable outlet 70°
+ M12 female connector with coupling nut,
8 pin, A coded

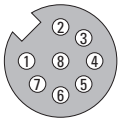
Cable: PVC, 3 x 2 x 0.25 mm² [AWG 23]
Housing Sub-D: ABS, metalized, IP20
Housing M12: metal / plastic, IP67

suitable for our series:

5000 / 5020 5006 / 5026
5814 / 5834 5814FSx / 5834FSx
5821
SMC1, SMC2







Terminal assignment

Pin Sub-D:	5	4	1	9	3	2	PH [2]
Pin M12:	1	2	3	4	5	6	PH [2]
	pins arranged below each other are connected internally						

cable length [1]

for terminal X6, X7 at SMC1, SMC2

2 m [6.56']	**8.0000.6V00.0002.0084**
5 m [16.40']	**8.0000.6V00.0005.0084**
10 m [32.81']	**8.0000.6V00.0010.0084**
15 m [49.21']	**8.0000.6V00.0015.0084**

1) Other cable lengths on request.
2) Shield on housing.

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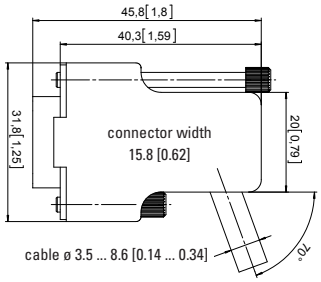
Sub-D connection technology | Cordsets, pre-assembled

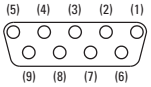
With Sub-D connector + M23 connector

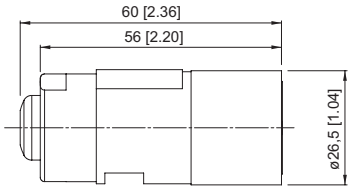
Working temp. -30°C ... +80°C [-22°F ... +176°F]

Sub-D female connector, 9-pin, cable outlet 70° + M23 female connector with coupling nut, 12 pin

Cable: PVC, 3 x 2 x 0.25 mm² [AWG 23]
Housing Sub-D: ABS, metalized, IP20
Housing M23: metal, IP67







pin socket assignment cw

suitable for our series:

5000 / 5020 5006 / 5026
5814 / 5834 5814FSx / 5834FSx
5821
SMC1, SMC2

Terminal assignment

Pin Sub-D:	5	4	1	9	3	2	PH [2]
Pin M23:	10	12	5	6	8	1	PH [2]
	pins arranged below each other are connected internally						

for terminal X6, X7 at SMC1, SMC2

cable length [1]	Order no.
2 m [6.56']	**8.0000.6V00.0002.0085**
5 m [16.40']	**8.0000.6V00.0005.0085**
10 m [32.81']	**8.0000.6V00.0010.0085**
15 m [49.21']	**8.0000.6V00.0015.0085**

1) Other cable lengths on request.
2) Shield on housing.

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Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M23 connector

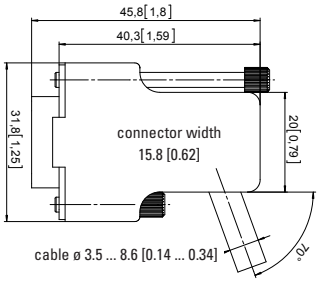
Working temp. -30°C ... +80°C [-22°F ... +176°F]

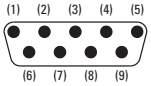
Sub-D male connector, 9-pin, cable outlet 70° + M23 female connector with coupling nut, 12 pin

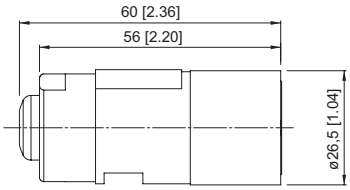
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing Sub-D: ABS, metalized, IP20
Housing M23: metal, IP67

suitable for our series:

5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
F5863 / F5883







pin socket assignment cw

Terminal assignment

Pin Sub-D:	2	9	8	4	5	6	PH [2]
Pin M23:	1	2	3	4	5	6	PH [2]
	pins arranged below each other are connected internally						

cable length [1]

2 m [6.56′]	**8.0000.6900.0002.0068**
5 m [16.40′]	**8.0000.6900.0005.0068**
10 m [32.81′]	**8.0000.6900.0010.0068**
15 m [49.21′]	**8.0000.6900.0015.0068**

Pin Sub-D:	2	9	3	7	5	6	PH [2]
Pin M23:	1	2	3	4	5	6	PH [2]
	pins arranged below each other are connected internally						

2 m [6.56′]	**8.0000.6900.0002.0072**
5 m [16.40′]	**8.0000.6900.0005.0072**
10 m [32.81′]	**8.0000.6900.0010.0072**
15 m [49.21′]	**8.0000.6900.0015.0072**

1) Other cable lengths on request.
2) Shield on housing.

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Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

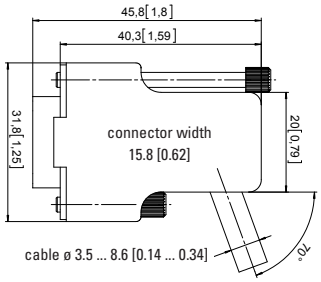
Order no.

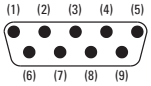
2 x Sub-D male connector, 9-pin, cable outlet 70° +
M23 female connector with coupling nut, 12 pin

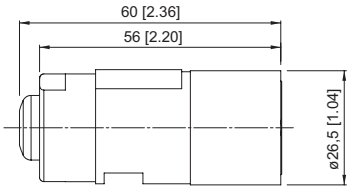
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing Sub-D: ABS, metalized, IP20
Housing M23: metal, IP67

suitable for our series:

5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx







pin socket
assignment cw

Terminal assignment

Pin Sub-D 1:	2	9	3	7	5	6	-	-	-	-	PH [2]
Pin Sub-D 2:	-	-	-	-	-	-	8	4	5	6	PH [2]
Pin M23:	1	2	3	4	5	6	9	10	11	12	PH [2]
	pins arranged below each other are connected internally										

cable length [1]	Order no.
2 m [6.56']	**8.0000.6900.0002.0070**
5 m [16.40']	**8.0000.6900.0005.0070**
10 m [32.81']	**8.0000.6900.0010.0070**
15 m [49.21']	**8.0000.6900.0015.0070**

1) Other cable lengths on request.
2) Shield on housing.

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Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

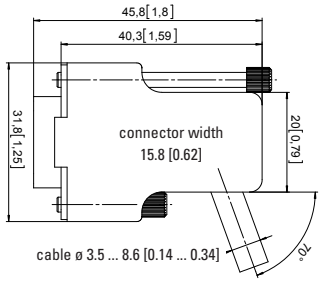
Order no.

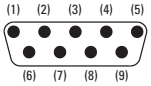
2 x Sub-D male connector, 9-pin with SET and DIR, cable outlet 70° + M23 female connector with coupling nut, 12 pin

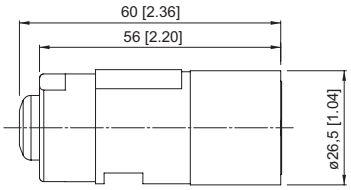
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing Sub-D: ABS, metalized, IP20
Housing M23: metal, IP67

suitable for our series:

5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx







pin socket assignment cw

Terminal assignment

Pin Sub-D 1:	2	9	3	7	5	6	-	-	-	-	-	-	PH [2]
Pin Sub-D 2:	-	-	-	-	-	-	-	-	8	4	5	6	PH [2]
Pin M23:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire color:							BU SET	RD DIR					
	pins arranged below each other are connected internally												

cable length [1]

2 m [6.56']	**8.0000.6900.0002.0080**
5 m [16.40']	**8.0000.6900.0005.0080**
10 m [32.81']	**8.0000.6900.0010.0080**
15 m [49.21']	**8.0000.6900.0015.0080**

1) Other cable lengths on request.
2) Shield on housing.

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Sub-D connection technology | Cordsets, pre-assembled

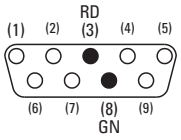
With Sub-D connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

Sub-D female connector, cable outlet 90° + single-ended
Profibus master with terminating resistor

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing: metal / plastic



suitable for our series:

5858 / 5878
5868 / 5888
9080

SMBU.031
SMBS.S31

Terminal assignment

Pin Sub-D:	1	2	3	4	5	6	7	8	9	PH [2]
Wire color:	–	–	RD	–	–	–	–	GN	–	

cable length [1]

2 m [6.56']	**05.00.6011.5511.002M**
5 m [16.40']	**05.00.6011.5511.005M**
10 m [32.81']	**05.00.6011.5511.010M**
15 m [49.21']	**05.00.6011.5511.015M**

1) Other cable lengths on request.
2) Shield on housing.

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Sub-D connection technology Cordsets, pre-assembled

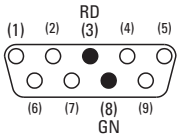
With Sub-D connector + M12 connector

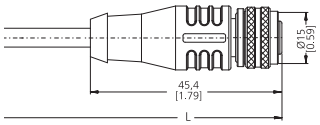
Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

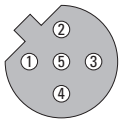
Sub-D male connector, 9 pin, cable outlet 90° Profibus master with terminating resistor + M12 female connector with coupling nut, 5 pin, B coded — Bus in

suitable for our series: 5858 / 5878, 5868 / 5888, 9080

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing Sub-D: ABS, metalized
Housing M12: metal / plastic







Terminal assignment

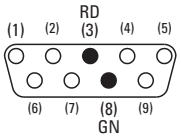
Pin Sub-D:		3		8		PH [2]
Pin M12:	1	2	3	4	5	PH [2]
	pins arranged below each other are connected internally					

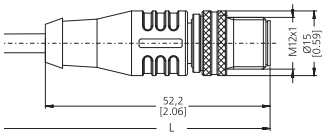
cable length [1]	
2 m [6.56']	**05.00.6011.5532.002M**
5 m [16.40']	**05.00.6011.5532.005M**
10 m [32.81']	**05.00.6011.5532.010M**
15 m [49.21']	**05.00.6011.5532.015M**

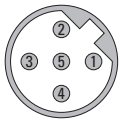
Sub-D male connector, 9 pin, cable outlet 90° Profibus master with terminating resistor + M12 male connector with external thread, 5 pin, B coded — Bus out

suitable for our series: 5858 / 5878, 5868 / 5888, 9080

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing Sub-D: ABS, metalized
Housing M12: metal / plastic







Terminal assignment

Pin Sub-D:		8		3		PH [2]
Pin M12:	1	2	3	4	5	PH [2]
	pins arranged below each other are connected internally					

cable length [1]	
2 m [6.56']	**05.00.6011.5534.002M**
5 m [16.40']	**05.00.6011.5534.005M**
10 m [32.81']	**05.00.6011.5534.010M**
15 m [49.21']	**05.00.6011.5534.015M**

1) Other cable lengths on request.
2) Shield on housing.

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Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M12 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

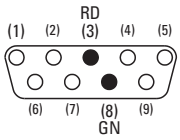
Sub-D male connector, 9 pin, cable outlet 90°
Profibus master with terminating resistor +
M12 male connector with external thread and
M12 female connector with coupling nut,
5 pin, B coded

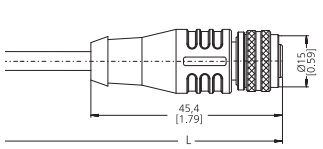
Bus in, Bus out

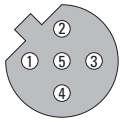
suitable for our series:

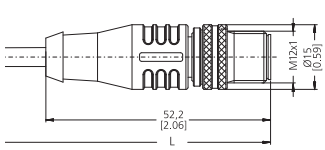
Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing Sub-D: ABS, metalized
Housing M12: metal / plastic

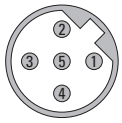
5858 / 5878
5868 / 5888
9080











Terminal assignment

Pin Sub-D:		8		3		PH [2]
Pin M12 female contacts:	1	2	3	4	5	PH [2]
Pin M12 male contacts:	1	2	3	4	5	PH [2]
	pins arranged below each other are connected internally					

cable length [1]	
2 x 2 m [6.56']	**05.00.6012.5536.002M**
2 x 5 m [16.40']	**05.00.6012.5536.005M**
2 x 10 m [32.81']	**05.00.6012.5536.010M**
2 x 15 m [49.21']	**05.00.6012.5536.015M**

1) Other cable lengths on request.
2) Shield on housing.

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Optical fiber transmission modules | Transmitter and receiver | RS422/HTL

eco plus

Cost advantage compared to conventional wiring over 150 m length*

The solution where signal transmission is difficult.

The system is made up of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals of a normal incremental encoder into a light signal for transmission by means of an glass fiber.

The receiving module converts the optical signal back into electrical signals. Up to 4 channels with inverted signals may be transmitted safely.

Innovative

- Signal transmission via just a single glass fiber.
- Safe signal transmission up to 2000 m.
- Input frequency up to 400 kHz.
- Input level 10 ... 30 V or RS422.
- Inverted input signals.
- Resists extremely strong electromagnetic fields.

Application areas

- Process control technology and automation technology.
- Applications sensitive to interference.
- High voltage plants.
- Plants with long transmission distances.
- Potential separation.
- Explosive areas.

Compact

- Can be installed even where space is tight.
- Minimal installation depth.
- Connections plug-in HD-Sub D15 or terminal clamp.

Order code Optical fiber transmitter / receiver

6.LWL X (a) . X (b) X (c)

(a)
S = Optical fiber transmitter
E = Optical fiber receiver

(b) *Input or output circuit / Power supply*
1 = RS422 / 10 ... 30 V DC
2 = HTL, without inverted signals / 10 ... 30 V DC (only for optical fiber transmitter)
4 = RS422 / 5 V DC
5 = HTL / 10 ... 30 V DC, input

(c) *Type of connection*
0 = Terminal clamp
1 = Plug-in connector HD-Sub D15

Scope of delivery:
- Optical fiber module
- Multilingual operating manual

Optical fiber transmitter versions can be combined with any version of the optical fiber receivers.

Accessories		Order no.
Simplex Patch cable ST-ST - Multimode	Connector: 2 x ST/PC, glass fiber: 1 x 50/125	**05.B09-B09-821-XXXX** XXXX = Length in m Standard lengths: 2 m, 5 m, 8 m, 10 m, 15 m, 20 m, ... (in 5 m steps)
ST Multimode coupling	Barrel: ceramic, slotted	**05.LWLK.001**

* Comparison of costs:
Costs per meter standard copper cable compared to costs per meter optical fiber signal cable + costs of transmitter + costs of receiver.

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Optical fiber transmission modules | Transmitter and receiver | RS422/HTL

Technical data

General technical data		
Power supply		10 ... 30 DC V eg. 5 V DC ±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 and output frequency optical fiber receiver		400 kHz
Input level optical fiber transmitter		10 ... 30 V or RS 422
Optical wavelength		850 nm
Optical transmission rate		120 Mbit/s
Optical fiber synchronization display		LED on the receiver
Optical fiber connection		ST connector, ø 9 mm [0.35] on the bottom side of the housing
Glass fiber		multimode fiber, 50/125 µm, 62.5/125 µm

Input signals sampling rate		10 MSamples/s
Optical fiber transmission distance		max. 2000 m [6561']
Dimensions (W x L x H)	Terminal clamp	22.5 x 110.8 x 88.4 mm [0.89 x 4.36 x 3.48"]
	Plug-in connector	19.0 x 110.8 x 88.4 mm [0.75 x 4.36 x 3.48"]
Protection acc. to EN 60529		IP40, terminals IP20
Terminals	max. conductor diameter	protected against contact 2.5 mm² [AWG 23]
Temperature range		-10°C ... +60°C [+14°F ... +140°F]
Weight		approx. 95 g [3.35 oz]

EMC		
Standards	Emitted interference	EN 55011 class B1
	Immunity to interference	EN 61000-6-2

Terminal assignment

Type of connection	Terminal clamp, optical fiber transmitter and optical fiber receiver											
0	Signal	$\overline{A}$	$\overline{B}$	$\overline{0}$ ($\overline{C}$)	A	B	0 (C)	$\overline{D}$	D	+V	0 V linked internally	Shield
	Terminal	1	2	3	4	5	6	7	10	8	9, 11, 12	–

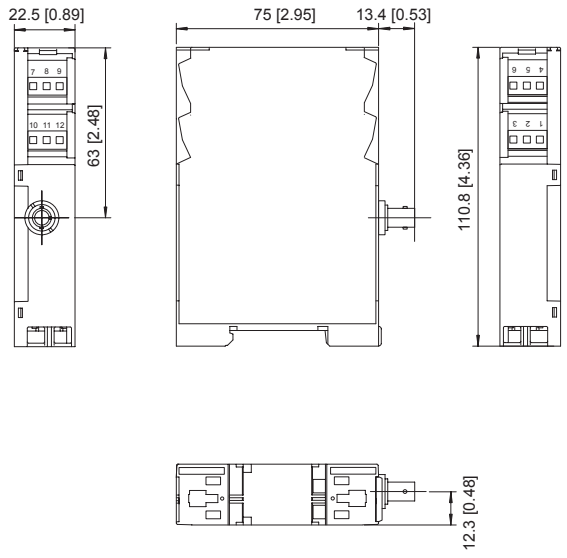
Type of connection	HD-Sub D15, optical fiber transmitter												Terminal	
1	Signal	$\overline{A}$	$\overline{B}$	$\overline{0}$ ($\overline{C}$)	A	B	0 (C)	$\overline{D}$	D	$+V_{out}$ to encoder	0 V linked internally	Shield	0 V linked internally	$+V_{out}$ to encoder, linked internally
	Terminal	8	6	3	9	7	4	1	2	15	11, 12	13	1	2

Type of connection	HD-Sub D15, optical fiber receiver												Terminal	
1	Signal	$\overline{A}$	$\overline{B}$	$\overline{0}$ ($\overline{C}$)	A	B	0 (C)	$\overline{D}$	D	$+V_{in}$ power supply	0 V linked internally	Shield	0 V linked internally	$+V_{in}$ power supply, linked internally
	Terminal	8	6	3	9	7	4	1	2	15	11, 12	13	1	2

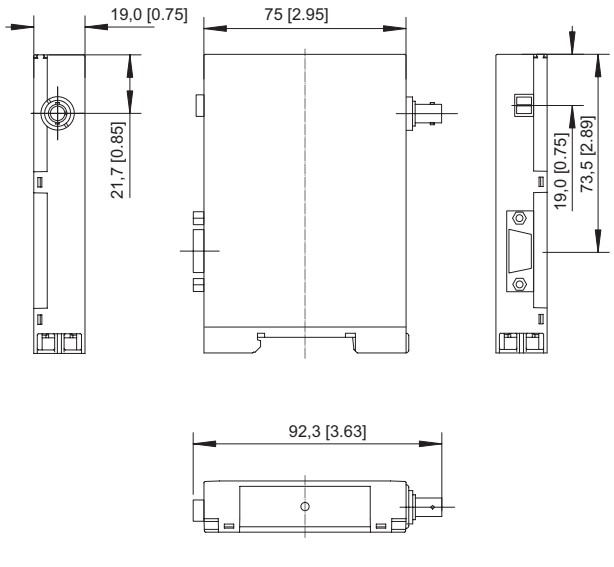
Dimensions

Dimensions in mm [inch]

Terminal clamp



Plug-in connector, HD-Sub D15



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Optical fiber transmission modules | Transmitter and receiver | SSI

eco plus

Cost advantage compared to conventional wiring over 150 m length*

Optical fiber transmission system for SSI absolute encoders

The system is made up of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals of 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 can be transmitted safely through one glass fiber over distances of up to 2000 m. A rotary switch on the front side of the module allows adjusting the SSI clock between 1 and 99 bits.

Reliable transmission

- Safe signal transmission up to 2000 m.
- Resists extremely strong electro-magnetic fields.

Easy installation

- Signal transmission via a single glass fiber.
- Clock of 1 ... 99 bit can be set via rotary switch.
- LED for monitoring of power supply and clock.
- DIN-rail mounting – requires min. installation space – only 19 mm wide.

Application areas

- Process control technology and automation technology.
- Crane systems.
- High voltage plants.
- Heavy industry.
- Wind power plants.
- Drive technology.
- Rolling mills.

Order code Optical fiber transmitter / receiver

6.LWLA . X X X
a b c

a
S = Optical fiber transmitter
E = Optical fiber receiver

b *Power supply*
1 = 10 ... 30 V DC
4 = 5 V DC

c *Type of connection*
0 = Terminal clamp
1 = Plug-in connector Sub-D9

Scope of delivery:
- Optical fiber transmission module
- Operating manual, dual language, German and English

Accessories		Order no.
Simplex Patch cable ST-ST - Multimode	Connector: 2 x ST/PC, glass fiber: 1 x 50/125	**05.B09-B09-821-XXXX** XXXX = Length in m Standard lengths: 2 m, 5 m, 8 m, 10 m, 15 m, 20 m, ... (in 5 m steps)
ST Multimode coupling	Barrel: ceramic, slotted	**05.LWLK.001**

* Comparison of costs:
Costs per meter standard copper cable compared to costs per meter optical fiber signal cable + costs of transmitter + costs of receiver

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Connection technology

Technical data

General technical data

Power supply	10 ... 30 DC V eg. 5 V DC ±5 %
Power consumption per module	< 1 W
Operating voltage reverse connection protection	available
Electrical inputs / outputs (Optical fiber transmitter / receiver)	Clock C+ and C-, RS422 Data D+ and D-, RS422 NPN error input on transmitter Open-Drain output on receiver
SSI clock rate	max. 1 MHz
Optical wavelength	850 nm (infrared)
Optical fiber connection	ST connector, on the bottom side of the housing
Glass fiber	multimode fiber, 50/125 µm, 62.5/125 µm
Optical fiber transmission distance	max. 2000 m [6561']

Dimensions (W x L x H)		19.0 x 110.8 x 92.3 mm [0.75 x 4.36 x 3.63"]
Protection acc. to EN 60529		IP40, terminals IP20
Connection	terminal clamps	11-pin plug-in screw terminal, RM 3.5
	Sub-D9	9-pin Sub-D female contacts (for signals)
	power supply	2-pin plug-in screw terminal
Temperature range		-10°C ... +70°C [+14°F ... +158°F]
Weight		appr. 70 g [2.47 oz]

EMC

Standards	Emitted interference	EN 55011 class B1
	Immunity to interference	EN 61000-6-2

Terminal assignment

Optical fiber transmitter

Type of connection	Terminal clamp											
0	Signal:	0 V	+V	C+	C-	D+	D-	input/error	–	–	–	⏚
	Pin female contact:	1	2	3	4	5	6	7	8	9	10	11

Type of connection	Plug-in connector, Sub-D9									
1	Signal:	0 V	+V	input/error	D-	D+	C-	C+	–	⏚
	Pin female contact:	1	2	3	4	5	6	7	8	9

Optical fiber receiver

Type of connection	Terminal clamp											
0	Signal:	0 V	+V	C+	C-	D+	D-	output/error	–	–	–	⏚
	Pin female contact:	1	2	3	4	5	6	7	8	9	10	11

Type of connection	Plug-in connector, Sub-D9									
1	Signal:	0 V	+V	output/error	D-	D+	C-	C+	–	⏚
	Pin female contact:	1	2	3	4	5	6	7	8	9

Power supply

	Screw terminal, 2 pin		
	Signal:	0 V	+V
	Pin female contact:	1	2

Contacts 1/2 of the 2-pin plug-in screw terminal are connected to contacts 1/2 of the 11-pin plug-in screw terminal or with contacts 1/2 of the Sub-D connector.

+V: Power supply +V DC
0 V: Power supply ground GND (0 V)
C+, C- : Clock signal
D+, D- : Data signal
⏚: Shield

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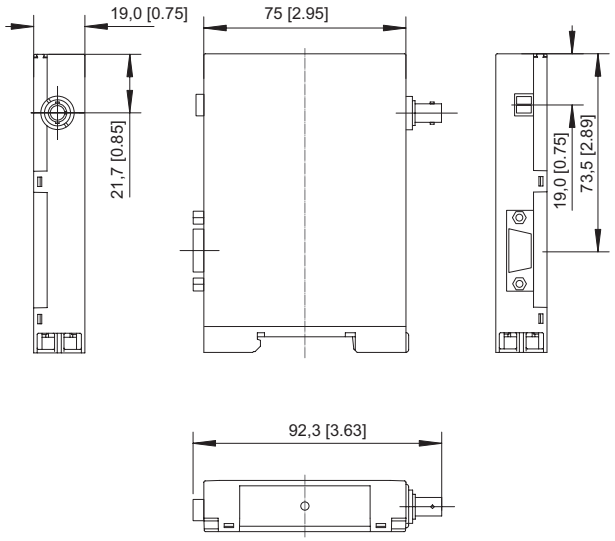
Dimensions

Dimensions in mm [inch]



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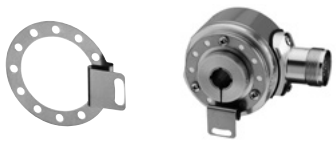
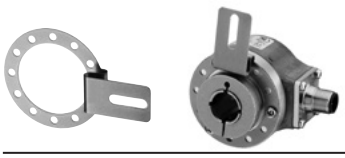
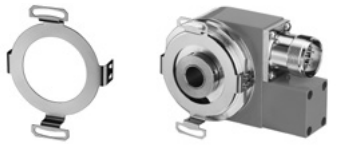
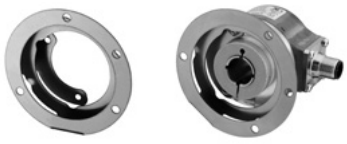
Accessories

			Page
Fixing components for hollow shaft encoders	For encoders up to ø 58 mm	Overview	**642**
	For encoders > ø 58 mm	Overview	**644**
	For encoders up to ø 58 mm	Details	**645**
	For encoders > ø 58 mm	Details	**650**
Fixing components for shaft encoders		Overview	**654**
		Details	**655**
Robust bearing unit		Suitable for Sendix 50xx and 58xx	**660**
Bearing box			**661**
Connection of motor and encoder	Couplings	Bellows- / spring washer-type coupling	**662**
	Couplings	Bellows coupling (FS)	**664**
	Flexible shaft coupling	Double loop coupling	**665**
General accessories			**666**

Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Overview

Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	Incremental encoders: 3620, 3720	Incremental encoders: 5020	Incremental encoders: 5823, 5824, 5825	Absolute singleturn encoders: 3670, 3671, M3678, F3673, F3678	Absolute singleturn encoders: 5873, 5878, F5873 Motor-Line, 5870, 5872	Absolute multiturn encoders: F3683, F3688	Absolute multiturn encoders: M3681, M3683, M3688	Absolute multiturn encoders: 5883, 5888, F5883, F5888, F5883M Motor-Line
	Spring element, short For applications with limited axial play and low dynamics, and reduced mounting space	36XX 42 [1.65] M36XX 42 [1.65] F36XX 42 [1.65] 37XX 40 [1.57] 50XX 42 [1.65] 58XX 42 [1.65] F58XX 42 [1.65]	**8.0010.4H00.0000** *Connection to the application:* cylindrical pin	645	X	X	X	X	X	X	X	X
	Spring element, long For applications with axial play and low dynamics	36XX 60 [2.36] M36XX 60 [2.36] F36XX 60 [2.36] 37XX 63 [2.48] 50XX 44 [1.73] 58XX 65 [2.56] F58XX 65 [2.56]	**8.0010.4I00.0000** *Connection to the application:* cylindrical pin	645	X	X	X	X	X	X	X	X
	**Torque stop, short (flexible)** For applications with axial and radial play, low dynamics	64.5 [2.54]	**8.0010.40M0.0000** *Connection to the application:* 1 screw	645		X	X		X		X	X
	**Torque stop, medium (flexible)** For applications with axial and radial play for constant rotary movements	65 ... 91.5 [2.56 ... 3.60]	**8.0010.40E0.0000** *Connection to the application:* 1 screw	645		X	X		X		X	X
	Torque stop, long (flexible) For applications with axial and radial play and low dynamics	80 ... 170 [3.15 ... 6.69]	**8.0010.4R00.0000** *Connection to the application:* 1 screw	646		X	X		X		X	X
	Stator coupling, double-winged For applications with axial and radial play and high dynamics	46 [1.81]	**8.0010.4C00.0000** *Connection to the application:* 2 screws	646	X			X			X	
	**Stator coupling, double-winged** For applications with high demands for accuracy	63 [2.48]	**8.0010.4D00.0000** *Connection to the application:* 2 screws	646		flange C + D	X		X		X	X
	Stator coupling, for fixing to side of encoder For standard applications with axial and radial play, and high dynamics	65 [2.56]	**8.0010.1602.0000** *Connection to the application:* 3 screws	647		flange C + D	X		X		X	X
	**Stator coupling, for fixing to front of encoder** For applications with axial and radial play and high dynamics	65 [2.56]	**8.0010.40L0.0000** *Connection to the application:* 3 screws	647		X	X		X		X	X
	Spring tether element For applications with low axial and radial play and low dynamics	42 ... 84.5 [1.65 ... 3.33]	**8.0010.40W0.0000** *Connection to the application:* 1 screw	647		X	X		X		X	X

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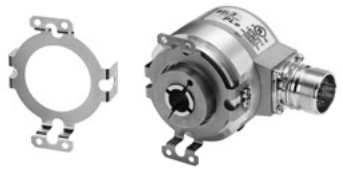
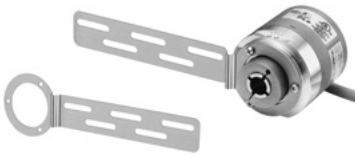
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Overview

Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	Incremental encoders: 5834FSx	Incremental encoders: 5020	Incremental encoders: 5823, 5824, 5825	Absolute singleturn encoders: 5873FSx	Absolute singleturn encoders: 5873, 5878	Absolute singleturn encoders:	Absolute multiturn encoders: 5883FSx	Absolute multiturn encoders: M3681, M3683, M3688	Absolute multiturn encoders: 5883, 5888, 5882 F5883, F5888, F5883M Motor-Line
	**Stator coupling** Designed for functional safety thanks to the 4-screw-principle.	63 [2.48]	**8.0010.4048.00FS** *Connection to the application:* 4 screws	**648**	X	X	X	X	X		X	X	X
	**Torque stop, flexible** Designed for functional safety. For applications with axial and radial play and low dynamics.	77 ... 278 [3.03 ... 10.94]	**8.0010.4047.00FS** *Connection to the application:* 1 screw	**648**	X	X	X	X	X		X	X	X
	Torque stop set, rigid Designed for functional safety. For applications with very low axial and radial play and low dynamics.	71 ... 281 [2.80 ... 11.06]	**8.0010.4051.00FS** *Connection to the application:* 1 screw	**649**	X	X	X	X	X			X	X

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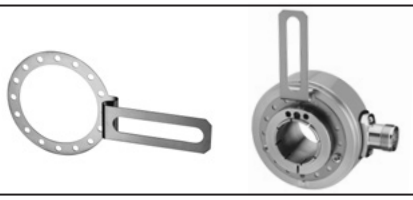
Accessories

Fixing components for hollow shaft encoders | For encoders > ø 58 mm | Overview

Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	A020, A02H	9080, 9081	H120
	Spring element, short For applications with reduced mounting space	76 [2.99]	**8.0010.4J00.0000** *Connection to the application:* cylindrical pin	**650**	X	X	
	Spring element, long For applications with high axial play	110 [4.33]	**8.0010.4K00.0000** *Connection to the application:* cylindrical pin	**650**	X	X	
	Tether square For applications with axial and radial play with low dynamics for constant rotary movements	9080: 120 [4.72] 9081: 120 [4.72]	**8.0010.4G00.0000** *Connection to the application:* 1 screw	**650**		X	
	Torque stop, short For applications with axial play	149 [5.87]	**8.0010.4T00.0000** *Connection to the application:* s. details	**650**	X	X	
	**Torque stop, long** For applications with fastening points located on variable pitch circle diameters	104 ... 206 [4.09 ... 8.11]	**8.0010.4E00.0000** *Connection to the application:* 1 screw	**651**	X	X	
	Tether arm, long For applications with low axial and radial play, flexible in use	Length = 70 [2.75]: Length = 100 [3.94]: Length = 150 [5.91]: 262 ... 422 [10.32 ... 16.61]	**8.0010.40S0.0000** **8.0010.40T0.0000** **8.0010.40U0.0000** *Connection to the application:* 1 screw	**651**	X	X	X
	Tether arm, long For applications with low axial and radial play, flexible in use	Length = 70 [2.75]: Length = 100 [3.94]: Length = 150 [5.91]: 262 ... 422 [10.32 ... 16.61]	**8.0010.40S1.0000** **8.0010.40T1.0000** **8.0010.40U1.0000** *Connection to the application:* 1 screw	**652**			X
	Stator coupling For applications with axial and radial play and high dynamics	119 [4.69]	**8.0010.40V0.0000** *Connection to the application:* 2 screws	**652**	X		X

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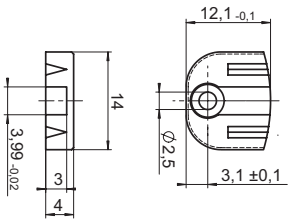
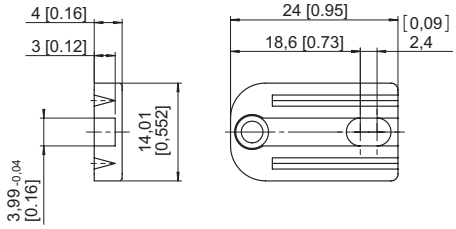
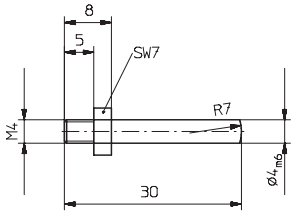
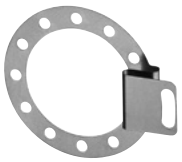
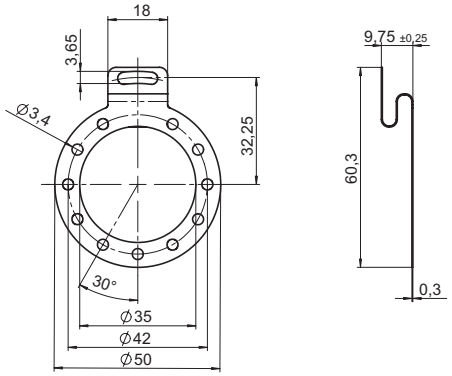
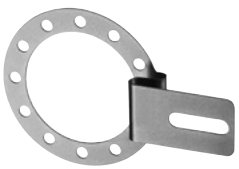
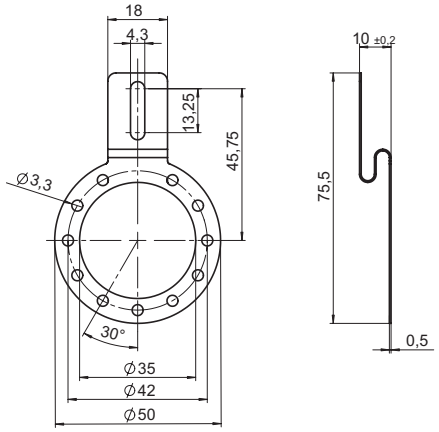
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details	Dimensions in mm [inch]		Order no.
Spring element, short		*Scope of delivery*: - spring element (plastic) - 1 screw for fixing to the encoder *Connection to application:* - cylindrical pin (8.0010.4700.0000) (not supplied)	**8.0010.4H00.0000**
Spring element, long		*Scope of delivery*: - spring element (plastic) - 1 screw for fixing to the encoder *Connection to application:* - cylindrical pin (8.0010.4700.0000) (not supplied)	**8.0010.4I00.0000**
Cylindrical pin, long with fastening thread		suitable for spring element short (8.0010.4H00.0000) and long (8.0010.4I00.0000)	**8.0010.4700.0000**
Torque stop, short 		*Scope of delivery*: - Fastening arm (stainless steel) - 3 screws for fixing to the encoder *Connection to application:* - 1 screw (not supplied)	**8.0010.40M0.0000**
Torque stop, medium 		*Scope of delivery*: - Fastening arm (stainless steel) - 3 screws for fixing to the encoder *Connection to application:* - 1 screw (not supplied)	**8.0010.40E0.0000**

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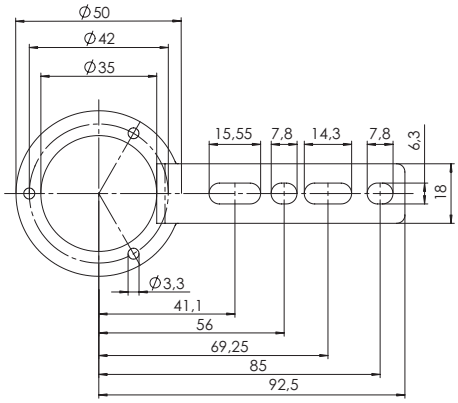
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details	Order no.

Torque stop, long

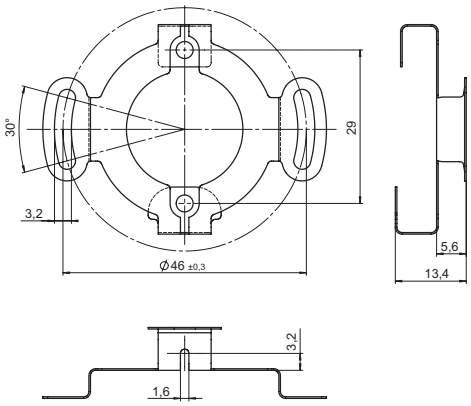


Scope of delivery:
- Fastening arm (stainless steel)
- 3 screws for fixing to the encoder

Connection to application:
- 1 screw (not supplied)

8.0010.4R00.0000

Stator coupling, double-winged
for front fixing onto the encoder flange

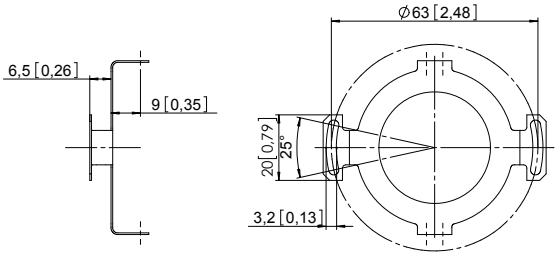


Scope of delivery:
- Stator coupling (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:
- 2 screws (not supplied)

8.0010.4C00.0000

Stator coupling, double-winged
for side fixing onto the encoder flange



Scope of delivery:
- Stator coupling (stainless steel)
- 4 screws M2.5 x 6 [0.24] for fixing to the encoders

Connection to application:
- 2 socket head screws M3 x 8 [0.32] with washer (supplied)

8.0010.4D00.0000

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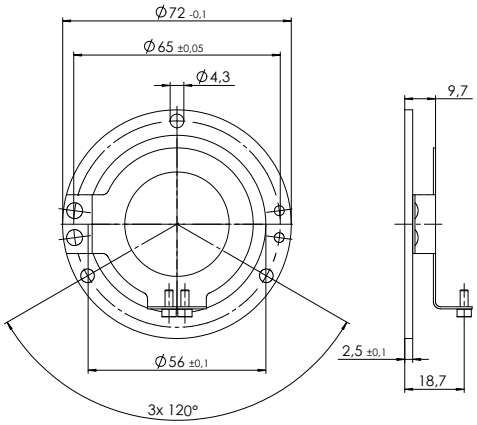
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details	Dimensions in mm [inch]	Order no.

Stator coupling
for side fixing onto the encoder flange

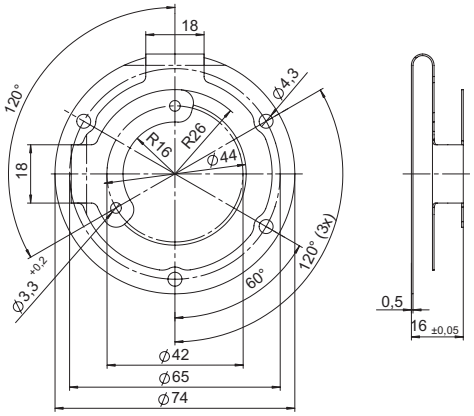


Scope of delivery:
- Stator coupling (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:
- 3 screws (not supplied)

8.0010.1602.0000

Stator coupling
for front fixing onto the encoder flange



Scope of delivery:
- Stator coupling (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:
- 3 screws (not supplied)

8.0010.40L0.0000

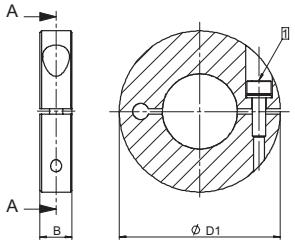
Spring tether element

Scope of delivery:
- spring tether element
- 1 screw for fixing to the encoder

Connection to application:
- 1 screw (not supplied)

8.0010.40W0.0000

Clamping ring
Stainless steel, for high rotational speeds



for encoder	*B*	*D1*	*for hollow shaft ø*	
582X	6 [0.236]	29 [1.14]	10 [0.39]	**8.0000.4V00.0000**
	6.2 [0.244]	30 [1.18]	12 [0.47]	**8.0000.4W00.0000**
5020	6.2 [0.244]	30 [1.18]	12 [0.47]	**8.0010.4W01.0000**

1 screw DIN 912 A2 M2.5, max. tightening torque 0.45 Nm

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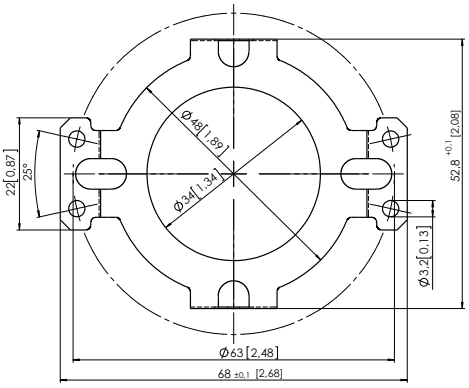
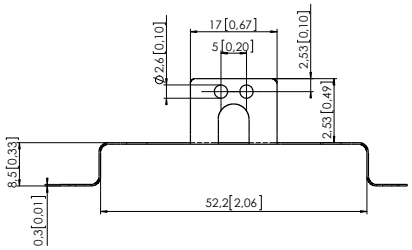
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details	Dimensions in mm [inch]	Order no.

Stator coupling





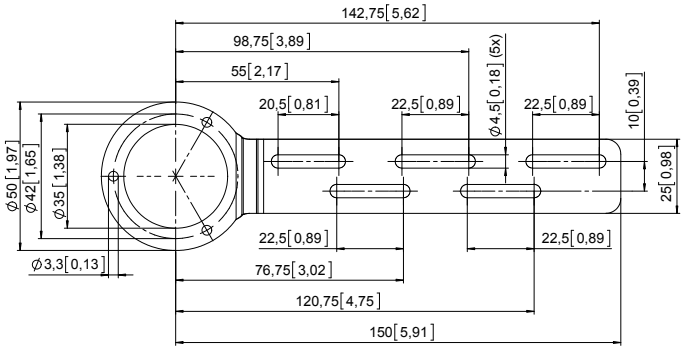
Scope of delivery:
- Stator coupling (stainless steel)
- 4 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder

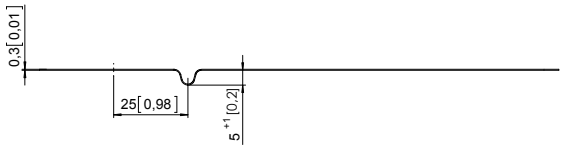
Connection to application:
- 4 screws (not supplied)

Max. permissible shaft connection tolerances:
- Axial offset < ± 0.25 mm
- Radial offset < ± 0.20 mm
- Angular offset < 1°

8.0010.4048.00FS

Torque stop, flexible





Scope of delivery:
- Fastening arm (stainless steel)
- 3 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder

Connection to application:
- 1 screw (not supplied)

Max. permissible shaft connection tolerances:
- Axial offset < ± 0.25 mm
- Radial offset < ± 0.20 mm
- Angular offset < 1°

8.0010.4047.00FS

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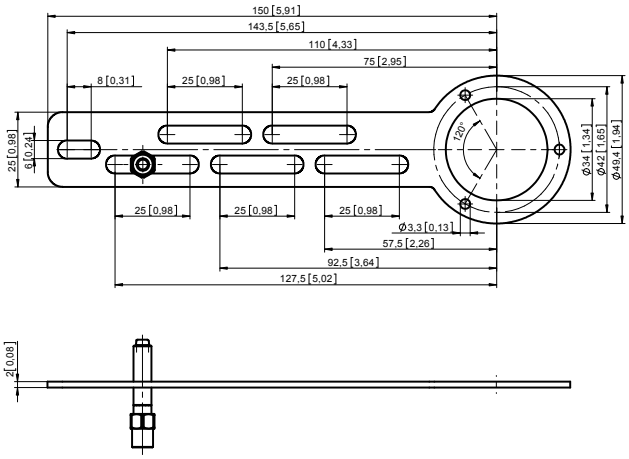
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details	Dimensions in mm [inch]	Order no.

Torque stop set, rigid



Scope of delivery:
- Fastening arm (stainless steel)
- 3 screws M3x6 mm [M3 x 0.24“] for fixing to the encoder

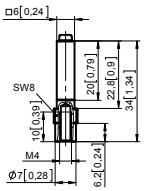
Connection to application:
- 1 screw

(not supplied)

Max. permissible shaft connection tolerances:
- Axial offset < ± 0.25 mm
- Radial offset < ± 0.20 mm
- Angular offset < 1°

8.0010.4051.00FS

Cylindrical pin (replacement)



suitable for:

Fastening arm 8.0010.4051.00FS

8.0010.4049.0075

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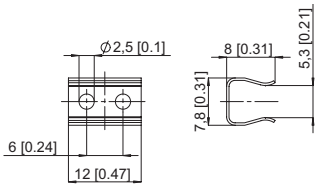
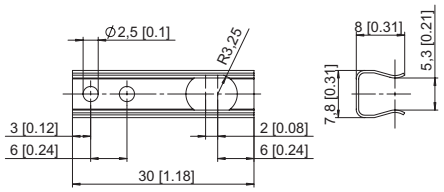
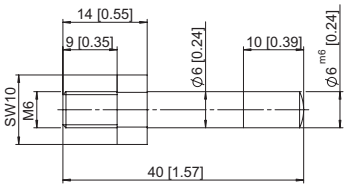
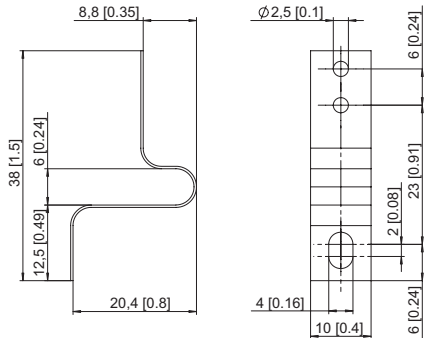
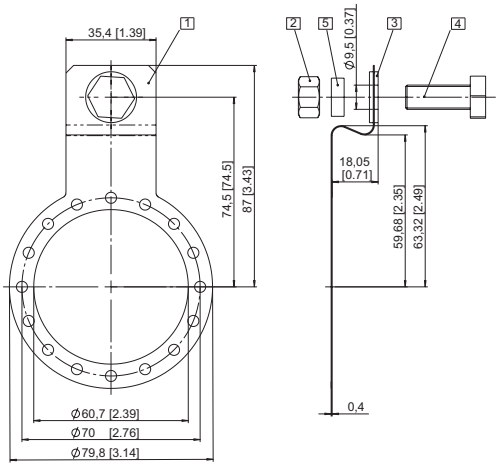
Fixing components for hollow shaft encoders | For encoders > ø 58 mm | Details

Dimensions / Details	Dimensions in mm [inch]		Order no.
Spring element, short		*Scope of delivery*: - Spring element (stainless steel) - 2 screws for fixing to the encoder *Connection to application:* - Cylindrical pin (8.0010.4700.0003) (not supplied)	**8.0010.4J00.0000**
Spring element, long		*Scope of delivery*: - Spring element (stainless steel) - 2 screws for fixing to the encoder *Connection to application:* - Cylindrical pin (8.0010.4700.0003) (not supplied)	**8.0010.4K00.0000**
Cylindrical pin, long with fastening thread		suitable for spring element short (8.0010.4J00.0000) and long (8.0010.4K00.0000)	**8.0010.4700.0003**
Tether square		*Scope of delivery*: - Tether square (stainless steel) - 2 screws for fixing to the encoder *Connection to application:* - 1 screw (not supplied)	**8.0010.4G00.0000**
Torque stop, short		*Scope of delivery*: 1 Fastening arm (stainless steel) - 3 screws for fixing to the encoder *Connection to application:* 2 Hexagonal nut 3/8 - 16 UNC 3 Washer (isolating) 4 Hexagonal screw 3/8 16 UNC x 1" 5 Washer D10.4 x 15 x 15 (supplied)	**8.0010.4T00.0000**

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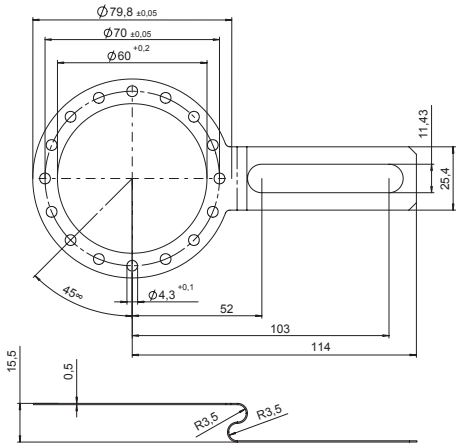
Fixing components for hollow shaft encoders | For encoders > ø 58 mm | Details

Dimensions / Details — Dimensions in mm [inch] — Order no.

Torque stop, short



Scope of delivery:
- Fastening arm (stainless-steel)
- 3 screws for fixing to the encoder

Connection to application:
- 1 screw (not supplied)

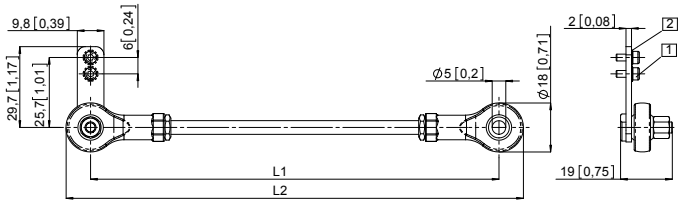
8.0010.4E00.0000

Tether arm, long

Tether arm	*L1*	*L2*	
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]	**8.0010.40S0.0000**
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]	**8.0010.40T0.0000**
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]	**8.0010.40U0.0000**

Scope of delivery:
- Tether arm
- For fixing to the encoder:
  - 1 2 cap screws M2.5 x 6 [0.24]
  - 2 2 lock washers

Connection to application:
- 1 screw (not supplied)



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Fixing components for hollow shaft encoders | For encoders > ø 58 mm | Overview

Dimensions / Details

Dimensions in mm [inch]

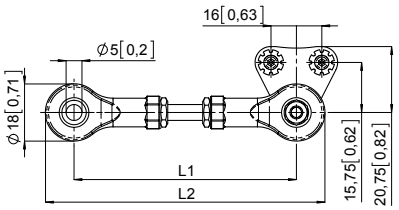
Order no.

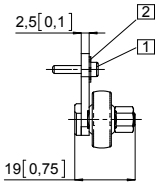
Tether arm, long

Tether arm	*L1*	*L2*	
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]	**8.0010.40S1.0000**
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]	**8.0010.40T1.0000**
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]	**8.0010.40U1.0000**

Scope of delivery:
- Tether arm
- For fixing to the encoder:
  - 1 2 cap screws M2,5 x 12 [0.47]
  - 2 2 lock washers

Connection to application:
- 1 screw (not supplied

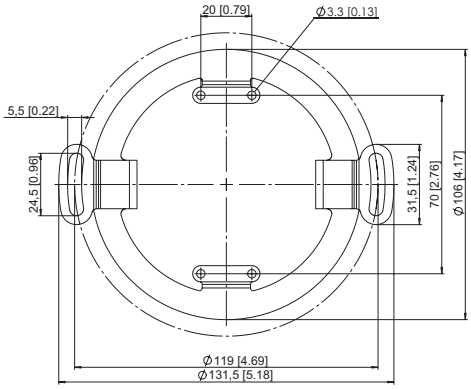


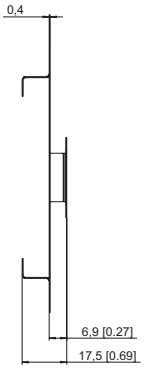


Stator coupling — **8.0010.40V0.0000**

Scope of delivery:
- Stator coupling (stainless steel)
- 4 screws for fixing to the encoder

Connection to application:
- 2 screws (not supplied)





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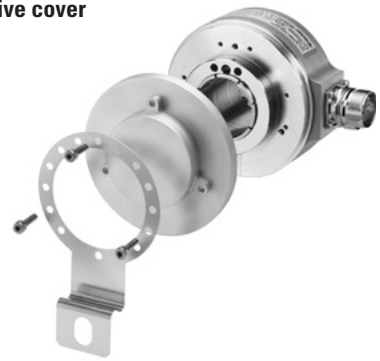
Fixing components for hollow shaft encoders | For encoders > ø 58 mm | Overview

Dimensions / Details	Dimensions in mm [inch]	Order no.

Protective cover



For applications with a very high degree of pollution, Kübler now offers a protective cover for
- Improved reliability
- Extension of the service life of the encoder

Scope of delivery:
- Protective cover
- Fastening arm (8.0010.4T00.0000)
- 3 screws for fixing to the encoder

8.0010.40Y0.0001

Tapered shaft mounting kit

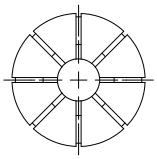
for A02H with hollow shaft, ø 38 mm [1.50"]

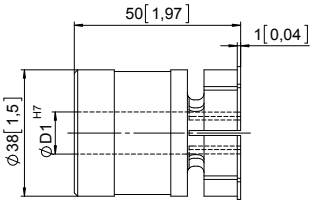
For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling.
An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.
Included in the set:
- Insert for cone blind hole, cone 1:10, 17 mm [0.67"] length
- Isolation insert
- Allen screw for central fixing

8.0010.4028.0000

Isolation insert for hollow shaft, ø 38 mm [1.50"]

Temperature range -40°C ... +115°C [-40°F ... +239°F]





Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC ector motors and considerably shorten the service life of the encoder bearings. For more details please call our technical hotline (+49 7720 3903 92) or send us an email (info@kuebler.com)

ø D1:	
12 mm [0.47"]	**8.0010.4091.0000**
14 mm [0.55"]	**8.0010.4027.0000**
15 mm [0.59"]	**8.0010.4038.0000**
16 mm [0.63"]	**8.0010.4019.0000**
18 mm [0.71"]	**8.0010.4080.0000**
20 mm [0.79"]	**8.0010.4011.0000**
25 mm [0.98"]	**8.0010.4012.0000**
30 mm [1.18"]	**8.0010.4016.0000**
32 mm [1.26"]	**8.0010.4015.0000**
1/2"	**8.0010.4013.0000**
5/8"	**8.0010.4070.0000**
3/4"	**8.0010.4090.0000**
1"	**8.0010.4050.0000**
1 1/4"	**8.0010.4060.0000**

Isolation insert for hollow shaft, ø 42 mm [1.65"]

external diameter 42 mm [1.65"] / internal diameter 38 mm [1.50"]	**8.0010.4017.0000**
external diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]	**8.0010.4029.0000**

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Fixing components for shaft encoders

Overview

Figure	Description	Order no.	Details s.page	Incremental encoders: 5000, 5803, 5804, 5805	Incremental encoders: 7000, 7100	Abs. singleturn encoders: 5853, 5858 5850, 5852	Abs. singleturn encoders: 7053, 7058, 7153, 7158	Abs. multiturn encoders: 5863, 5868, F5863, F5868	Abs. multiturn encoders: M5881, M5883, M5888	Abs. multiturn encoders: 7063, 7068, 7163, 7168
	Flange, square Suitable for shaft encoders with clamping flange									
	☐ 58.0 [2.28“], 4 [0.16“] thick	**8.0010.2100.0000**	**655**	X		X		X	X	
	☐ 63.5 [2.5“], 3 [0.12“] thick	**8.0010.2120.0000**	**655**	X		X		X	X	
	☐ 70.0 [2.76“], 10 [0.39“] thick	**8.0010.2600.0000**	**655**	X		X		X	X	
	☐ 80.0 [3.15“], 4 [0.16“] thick	**8.0010.2800.0000**	**655**	X		X		X	X	
	Flange ø 65 mm [2.56“] With this adapter flange, Küber encoders with size 58 mm [2.28“] can replace encoders with diameter 65 mm [2.56“] and pitch circle diameter 48 mm [1.89“]	**8.0010.2230.0000**	**656**	X		X		X	X	
	Flange, ø 115 mm [4.53“] **Euroflange**	**8.0010.2160.0000** **8.0010.2170.0000**	**656**	X	X	X	X	X	X	X
	Flange, ø 58 mm [2.28“] Converts encoders with a clamping flange into synchro flange.	**8.0010.2180.0000**	**656**	X		X		X	X	
	Flange, ø 90 mm [3.54“] Mechanically compatible with former encoder Type 9000	**8.0010.2270.0000**	**657**	X		X		X	X	
	Angular flange 80 mm x 80 mm x 40 mm [3.15“ x 3.15“ x 1.57“]	**8.0010.2300.0000**	**657**	X		X			X	
	Assembly bell Electrical and thermal isolation by means of glass fiber reinforced plastic and isolating spring washer coupling – supplied as complete set	**8.0010.4D00.0000**	**658**	X		X		X	X	
	Fastening eccentrics For shaft encoders with synchronous flange. Use at least three fastening eccentrics to mount the encoder.	**8.0010.4200.0000** **8.0010.4100.0000**	**659**	see table page 659						

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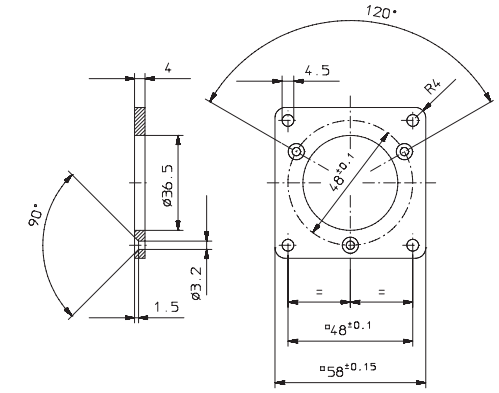
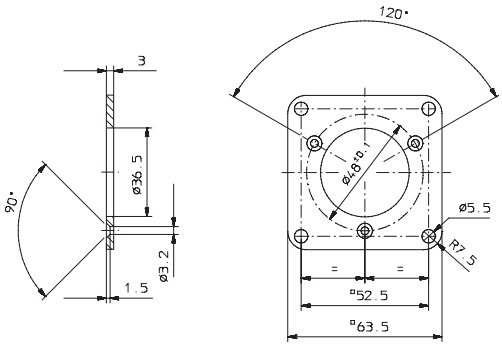
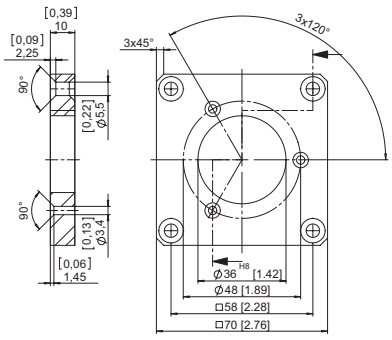
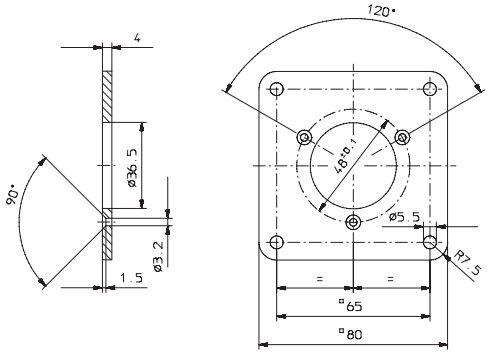
Fixing components for shaft encoders

Details

Dimensions / Details	Dimensions in mm [inch]	Order no.
Flange, square 	 	*Scope of delivery:* - flange (aluminum) - 3 screws for fixing to the encoder *Connection to application:* - 4 screws (not supplied)	**8.0010.2100.0000**
	 		**8.0010.2120.0000**
	 		**8.0010.2600.0000**
	 		**8.0010.2800.0000**

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Fixing components for shaft encoders — Details

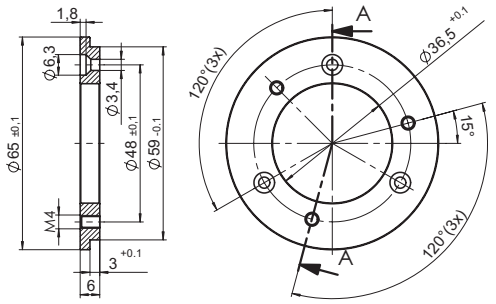
Dimensions / Details

Dimensions in mm [inch]

Order no.

Flange, ø 65 [2.56]

With this adapter flange, Kübler encoders with size 58 [2.28] can replace encoders with diameter 65 [2.56] and pitch circle diameter 48 [1.89].



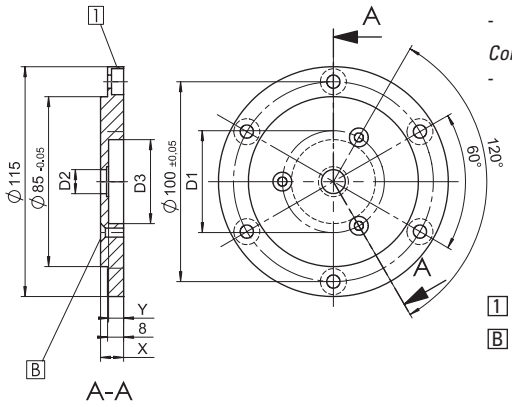
Scope of delivery:
- flange (aluminum)
- 3 screws for fixing to the encoder

Connection to application:
- 3 screws (not supplied)

8.0010.2230.0000

Flange, ø 115 [4.53], Euroflange (Euro REO 444)

encoder type	*D1*	*D2*	*D3*	*X*	*Y*	B	Order no.
580X/5000	48 [1.89]	36 [1.42]	58 [2.28]	11 [0.43]	1 [0.039]	DIN 74-BM3	**8.0010.2160.0000**
70XX	51 [2.01]	12 [0.47]	42 [1.65]	11.5 [0.45]	7.5 [0.30]	DIN 74-BM4	**8.0010.2170.0000**



Scope of delivery:
- flange (aluminum)
- 3 screws for encoder mounting

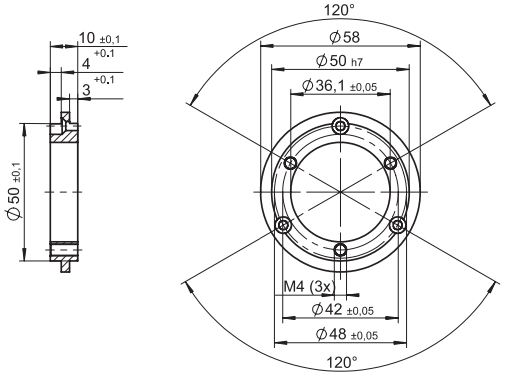
Connection to application:
- 6 screws (not supplied)

1 Countersunk DIN 74-Hm6

B See table

Flange, ø 58 [2.28]

Converts encoders with a clamping flange into synchro flange.



Scope of delivery:
- flange (aluminum)
- 3 screws for encoder mounting

Connection to application:
- 3 screws (not supplied)

8.0010.2180.0000

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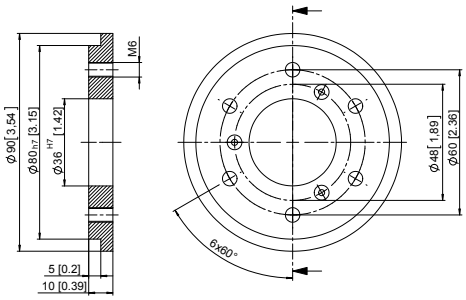
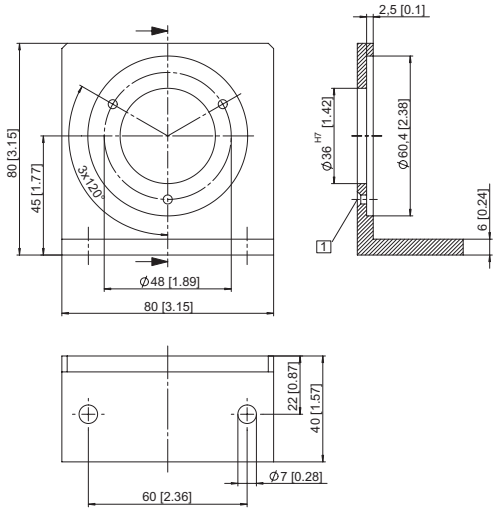
Fixing components for shaft encoders

Details

Dimensions / Details	Dimensions in mm [inch]	Order no.
Flange, ø 90 [3.54] Mechanically compatible with former encoder type 9000 		*Scope of delivery*: - flange - 3 screws for encoder mounting *Connection to application:* - 6 screws (not supplied)	**8.0010.2270.0000**
Angular flange 		*Scope of delivery*: - angular flange (aluminum) - 3 screws for encoder mounting *Connection to application:* - 2 screws (not supplied) 1 Countersunk DIN 74-Hm6	**8.0010.2300.0000**

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Fixing components for shaft encoders

Details

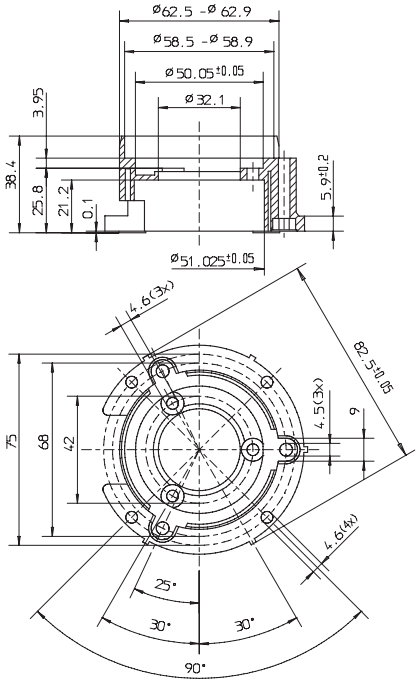
Dimensions / Details

Dimensions in mm [inch]

Order no.

Assembly bell

- Easy and quick encoder mounting
- Electrical and thermal isolation by means of glass fiber reinforced plastic and isolating spring washer coupling
- Supplied as complete set

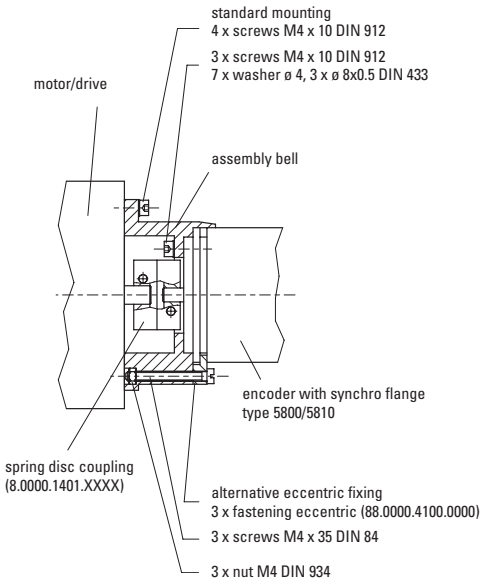


Scope of delivery:

- Assembly bell
- Spring washer type coupling (8.0000.1401.XXXX)
- 4 hexagon socket head cap screws DIN 912 M4 x 12 [0.47]
- 3 hexagon socket head cap screws DIN 912 M4 x 10 [0.39]
- 7 washers DIN 433 ø 4 [0.16]
- 3 fastening eccentrics (8.0000.4B00.0000)
- 3 hexagon head screws DIN 84 M 4 x 35 [0.16 x 1.38]
- 3 hexagon nuts DIN 934 - M4

8.0000.4500.XXYY

XX = Coupling diameter d1 in mm
YY = Coupling diameter d2 in mm



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Fixing components for shaft encoders

Details

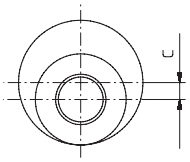
Dimensions / Details

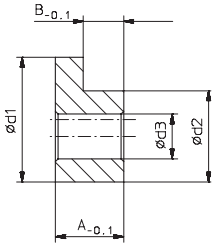
Dimensions in mm [inch]

Order no.

Fastening eccentrics
for encoders with synchro flange

- Suitable for Kübler encoders with synchro flange
- Material ACu Zn 39 Pb 3
- Surface finish: galvanized Ni





encoder type	*D1*	*D2*	*D3*	*A*	*B*	*C*	
3610 3651 M3658 F3653 / F3658 F3663 / F3668	6.8 [0.27]	5 [0.20]	2.8 [0.11]	3.5 [0.14]	2.25 [0.09]	0.9 [0.035]	**8.0010.4200.0000**
5000 5803 / 5804 / 5805 5853 / 5858 5863 / 5868 F5863 / F5868 5850 / 5852 7053 / 7058 7063 / 7068	9.6 [0.38]	6.5 [0.26]	3.2 [0.13]	5,6 [0.22]	2.9 [0.11]	1.55 [0.06]	**8.0010.4100.0000**

Scope of delivery:
- 3 eccentrics
- 3 screws

(Use at least three fastening eccentrics to mount the encoder)

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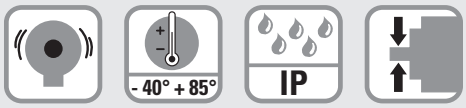
Robust bearing unit

Suitable for Sendix 50xx and 58xx

Quick and simple – more protection

Separating the bearing load and the sensor technology affords the encoder greater protection in harsh environments.

Retrofitting to all encoders with a 58 mm clamping flange is very easy and quick.



Shock / vibration resistant | Temperature | High IP value | High shaft load capacity

Order no. **8.0010.8200.000C**

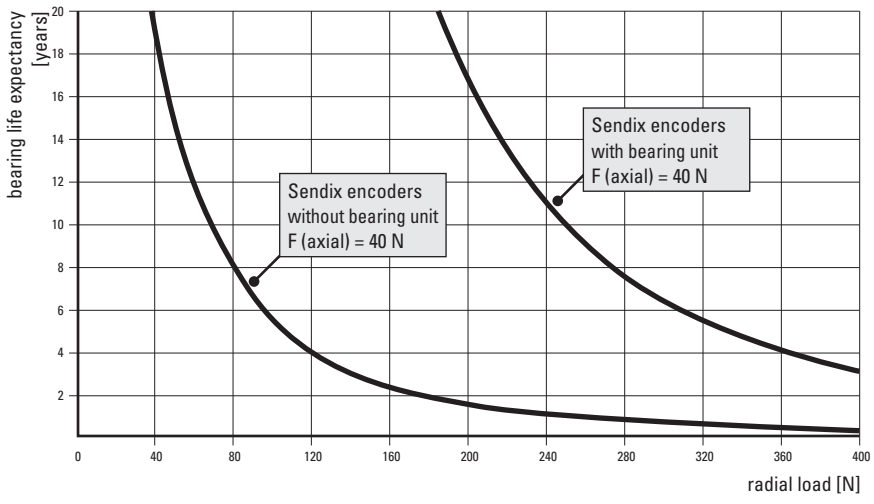
Robust bearing unit

matching shaft encoders with clamping flange and shaft 10 mm [0.39"]

Technical data		
Maximum speed		6000 min^{-1}
Weight		approx. 560 g [19.75 oz]
Protection		IP67
Material	housing	aluminum optional: seawater resistant
	shaft	stainless steel

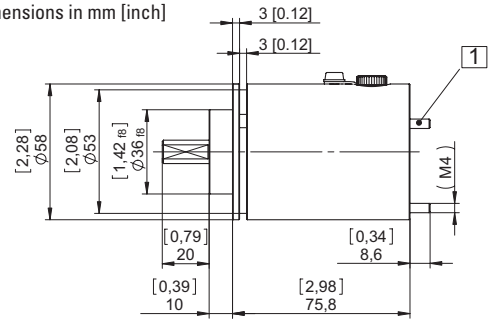
Bearing life expectancy L10

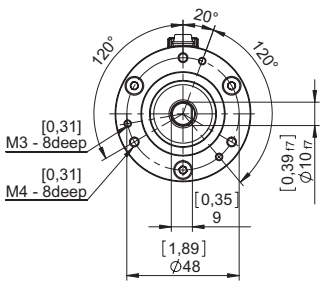
at 3000 revolutions/min with continuous operation

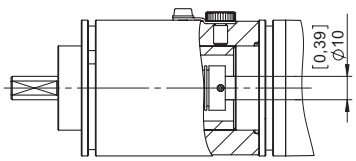


Dimensions

Dimensions in mm [inch]







1 3 x socket cap screw M4x25 (SW3)
1 x washer
included as mounting set

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Bearing box

In applications where the encoder is driven by use of gears, chains, belts etc. and the permitted axial and radial shaft loads are exceeded, we recommend the use of the special designed bearing box which has stronger bearings.

This can be combined with all encoders with a 58 mm clamping flange and shaft ø 10 x 20 mm.

Order no. **8.0010.8200.0004**

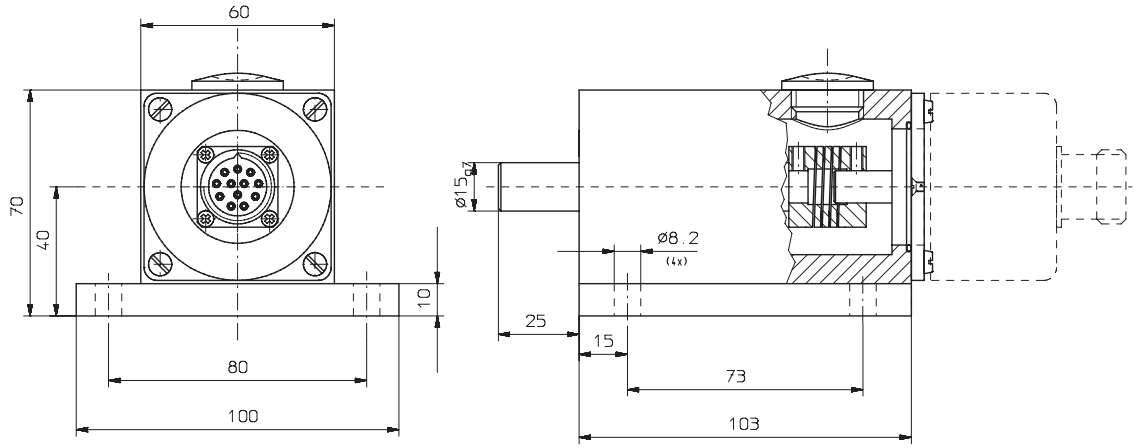
Scope of delivery

- Bearing box with lock cover and sealing
- Coupling for shaft Ø 10 mm
- Flange adapter 8.0010.2100.0000
- 3 x countersunk head screws DIN 63 M 3 x 8
- 4 x slotted cheese head screws DIN 84 M 4 x 8

Technical data		
Shaft load	axial	150 N
	radial	250 N
Lifetime of bearings		50000 h
Protection acc. to EN 60529		IP65
Max. speed		4000 min^{-1}

Dimensions

Dimensions in mm



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Connection of motor and encoder | Couplings | Bellows and spring washer couplings

Bellows couplings provide cost-effective connection of the motor and encoder. They are also able to correct any angular errors between the drive and encoder.

Spring washer couplings are used with high speeds.

Order code Couplings

8.0000	.	1	XXX	.	XX	XX
Type			ⓐ		ⓑ	ⓒ

ⓐ *Type of coupling*
102 = Bellows-type ø 19 mm [0.75“]
202 = Bellows-type ø 15 mm [0.59“]
301 = Spring washer type, ø 30 mm [1.18“], one-part
401 = Spring washer type, ø 30 mm [1.18“], three part, plug-in
502 = Bellows-type ø 25 mm [0.98“]

ⓑ *Bore diameter d1* (see technical data)

Note:
for the bore diameter d1 = 1/4” please enter Code A2

ⓒ *Bore diameter d2* (see technical data)

Example: d1 = 10 mm [0.39“] and d2 = 12 mm [0.47“]
Order no. = 8.0000.1X0X.**1012**

Technical data

Type			8.0000.1**1**02.XXXX	8.0000.1**2**02.XXXX	8.0000.1**3**01.XXXX	8.0000.1**4**01.XXXX	8.0000. 1**5**02.XXXX
Maximum speed		min^{-1}	10000	10000	12000	12000	10000
Maximum torque		Ncm	120	40	80	60	200
Maximum displacement	radial	mm	± 0.3	± 0.25	± 0.4	± 0.3	± 0.35
	axial	mm	± 0.5	± 0.45	± 0.4	± 0.4	± 0.54
	angular	-	± 4°	± 4°	± 3°	± 2.5°	± 4°
Torsion spring stiffness		Nm/rad	150	85	150	30	183
Radial spring stiffness		N/mm	10	20	6	40	17.8
Moment of inertia		gcm^2	9.5	2.1	19	35	20
Max. tightening torque		Ncm	150	70	80	80	120
Working temperature			-30°C ... +120°C [-22°F ... +248°F]	-30°C ... +120°C [-22°F ... +248°F]	-30°C ... +120°C [-22°F ... +248°F]	-10°C ... +80°C [+14°F ... +176°F]	-30°C ... +120°C [-22°F ... +248°F]
Weight approx.			16 g [0.56 oz]	6.5 g [0.23 oz]	16 g [0.56 oz]	30 g [1.06 oz]	24 g [0.85 oz]
Material	flange		Al, anodized	Al, anodized	Al, anodized	Al, anodized	Al, anodized
	bellow or spring washer/casing		stainless steel	stainless steel	stainless steel	PA 6.6 gf.	stainless steel
Diameter d/d1 from ... to		mm [inch]	3 ... 12 [0.12 ... 0.47]	3 ... 9 [0.12 ... 0.35]	3 ... 8 [0.12 ... 0.32]	4 ... 16 [0.16 ... 0.47]	3 ... 16 [0.12 ... 0.63]
Standard bore diameter	(d1 / d2)	mm [inch]	12 / 12 [0.47 ... 0.47] 12 / 10 [0.47 ... 0.39] 10 / 10 [0.39 ... 0.39] 10 / 08 [0.39 ... 0.32] 10 / 06 [0.39 ... 0.24] 08 / 08 [0.32 ... 0.32] 06 / 06 [0.24 ... 0.24]	08 / 06 [0.32 ... 0.24] 06 / 06 [0.24 ... 0.24] 06 / 04 [0.24 ... 0.16] 04 / 04 [0.16 ... 0.16]	06 / 06 [0.24 ... 0.24]	12 / 12 [0.47 ... 0.47] 12 / 10 [0.47 ... 0.39] 10 / 10 [0.39 ... 0.39] 10 / 06 [0.39 ... 0.24] 06 / 06 [0.24 ... 0.24] 1/4” / 10 1/4” / 06	15 / 12 [0.59 ... 0.47] 14 / 12 [0.55 ... 0.47] 14 / 10 [0.55 ... 0.39] 10 / 10 [0.39 ... 0.39] 06 / 06 [0.24 ... 0.24]

Description and applications

Manufacturing and installation tolerances as well as the effects of temperature cause alignment errors between shafts in drive engineering which can sometimes lead to extreme overload on the bearings.

This may result in increased wear of the bearings and may lead to premature failure of the encoder. By using couplings, these alignment errors can be compensated, thereby reducing the load on the bearings to a minimum. A distinction should be made between three different kinds of alignment error: radial, angular and axial displacement.

Whilst with torsion-free but flexible shaft couplings, axial shaft displacements produce only static forces in the coupling, radial and angular displacements produce alternating stresses, restoring forces and moments which may have an impact on adjoining components (shaft bearings).

Depending on the type of coupling, particular attention should be paid to radial shaft displacement which should be kept to a minimum.

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Metal bellows-type couplings (.1102, .1202 und .1502)

Metal bellows-type couplings are recommended as an inexpensive type of coupling. They are also suitable for compensating larger angle displacements.

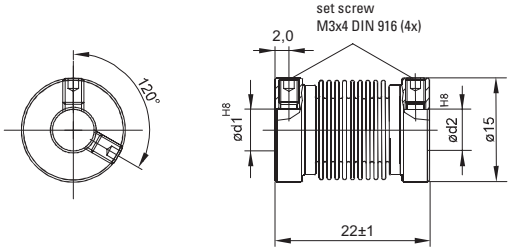
Spring washer-type couplings (.1301 und .1401)

Spring washer couplings are used primarily where high speeds and minimal axial errors occur. For applications requiring potential separation between the encoder and the drive, use the electrically isolating spring washer coupling.

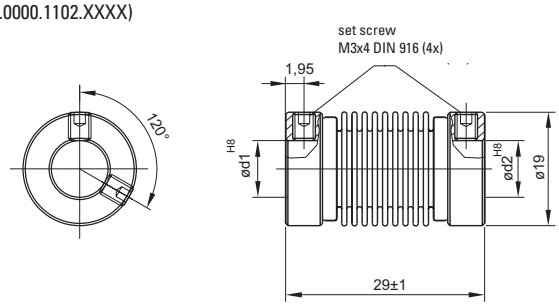
Dimensions

Dimensions in mm

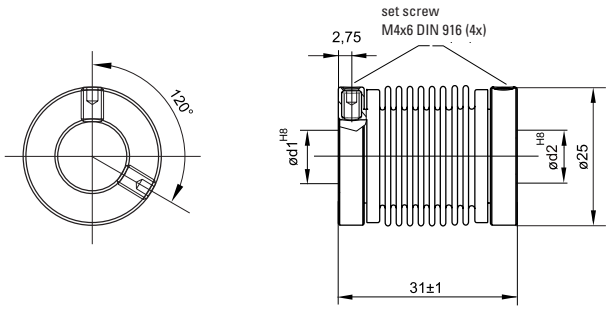
Bellows-type coupling ø 15 [0.59]
(8.0000.1202.XXXX)



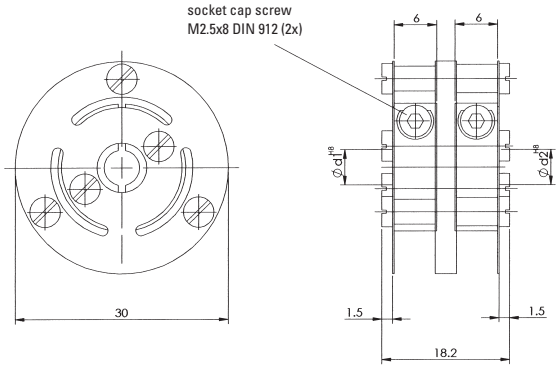
Bellows-type coupling ø 19 [0.75]
(8.0000.1102.XXXX)



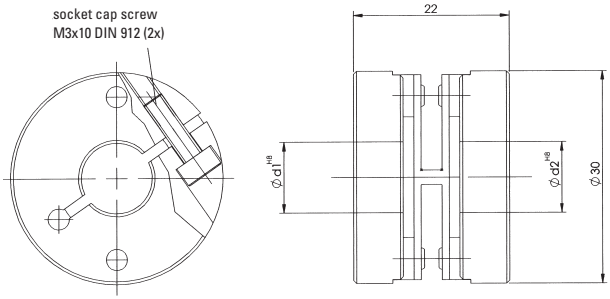
Bellows-type coupling ø 25 [0.98]
(8.0000.1502.XXXX)



Spring washer-type coupling, one-part
(8.0000.1301.XXXX)

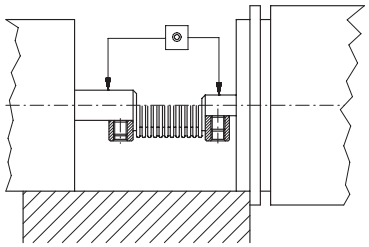


Spring washer-type coupling, three part, plug-in
(8.0000.1401.XXXX)



Installation instructions

1. Check shaft for displacement; see technical data for details.
2. Align and adjust coupling on shafts.
3. Tighten locking screws carefully. Avoid overtightening.
4. During installation protect the coupling from damage and from overbending.



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Connection of motor and encoder | Couplings | Bellows couplings (FS)

Bellows couplings provide cost-effective connection of the motor and encoder. They are also able to correct any angular errors between the drive and encoder.

These bellows couplings (FS) are used for safe connection of applications and Sendix SIL encoders.

The safety-oriented bellows coupling has, in addition to the metallic bellows, internal claws that ensure the driving of the encoder in case of breakage of the bellows connection.

Order code Couplings

8.0000	.	1	X	FS	.	XX	XX
Type			ⓐ			ⓑ	ⓒ

ⓐ *Type of coupling*
5 = bellows coupling ø 25 mm [0.98“]

ⓑ *Bore diameter d1*
(see technical data)

ⓒ *Bore diameter d2*
(see technical data)

Example: d1 = 10 mm and d2 = 12 mm
order no. = 8.0000.15FS.**1012**

Accessory		Order no.
Screw retention	Loctite 243, 5 ml	**8.0000.4G05.0000**

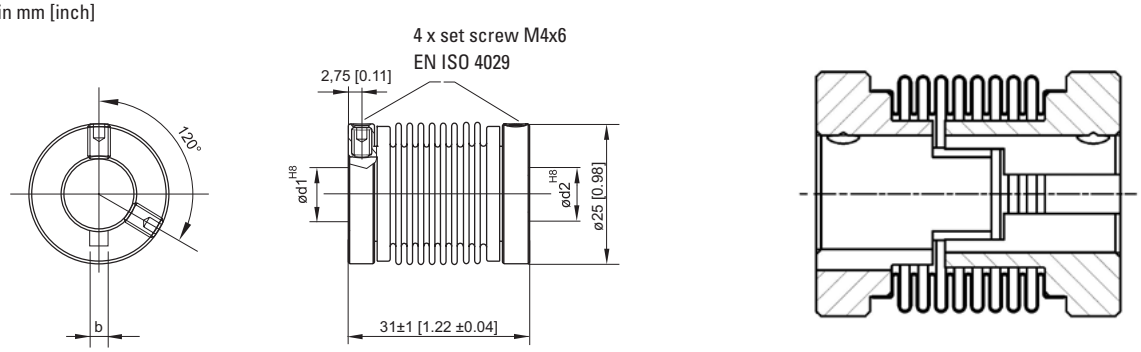
Technical data

Mechanical characteristics		
Max. speed		10000 min^{-1}
Max. torque		200 Ncm
Max. shaft offset	radial	± 0.3 mm
	axial	± 0.45 mm
	angular	± 3°
Torsion spring stiffness		183 Nm/rad
Radial spring stiffness		17.8 N/mm
Moment of inertia		9.1 gcm^2
Headless set screw tightening torque		
	min.	80 Ncm
	max.	100 Ncm

Working temperature range		-30°C ... +120°C [-22 ... +248°F]
Weight approx.		54 g
Material	flange	stainless steel 1.4104
	bellows	stainless steel 1.4571
Standard bore diameter	(d1 / d2)	10 / 10 mm [0.39 / 0.39“]
		10 / 12 mm [0.39 / 0.47“]
		12 / 12 mm [0.47 / 0.47“]
Insertion depth	min.	6 mm [0.24“]
	max.	11 mm [0.43“]

Dimensions

Dimensions in mm [inch]



Nut DIN 6885

nut width b	d1 / d2
3 [0.12]	10 [0.39]
4 [0.16]	12 [0.47]

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Connection of motor and encoder | Flexible shaft coupling | Double loop coupling

The safe, uncomplicated and economical solution, if drive shafts with angular, radial and/or axial displacement are to be friction-locked together.

Order no. size 1

Bore diameter both sides 6 mm [0.24"]	**8.0000.1J01.0606**

Order no. size 2

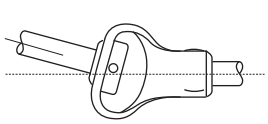
Bore diameter both sides 10 mm [0.39"]	**8.0000.1K01.1010**
Bore diameter 11 mm [0.43"] and 12 mm [0.47"] with keyway	**8.0000.1L01.1112**

Technical data

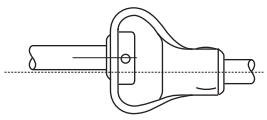
		Size 1	Size 2
Max. speed		3000 min^{-1}	3000 min^{-1}
Max. torque		0.5 Nm	2.0 Nm
Max. offset of shafts	radial	± 2 mm	± 3 mm
	axial	± 2 mm	± 4 mm
	angular	± 10°	± 12°
Torsion spring stiffness		13 Nm/rad	28 Nm/rad
Radial spring stiffness		13 N/mm	7 N/mm
Moment of inertia		41 gcm²	106 gcm²
Max. clamping torque		100 Ncm	100 Ncm
Weight, approx.		33 g [1.16 oz]	85 g [3.35 oz]
Temperature range		-30°C ... + 80°C [-22°F ... +176°F]	
Material	flange	steel galvanized	
	connecting element	Polyurethane	

Functional principle

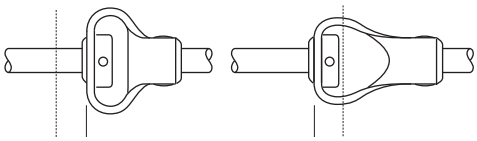
Compensation of an angular misalignment



Compensation of a radial misalignment



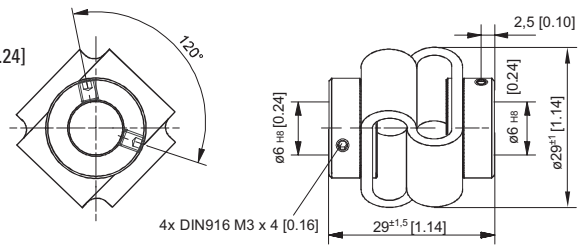
Compensation of a axial misalignment



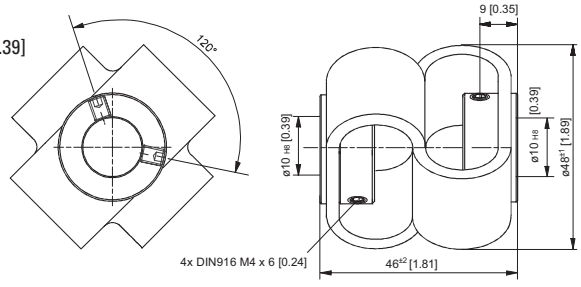
Dimensions

Dimensions in mm

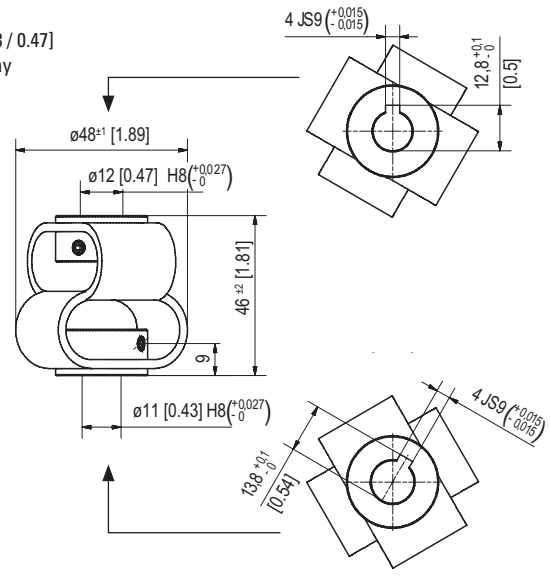
Size 1
6 / 6
[0.24 / 0.24]



Size 2
10 / 10
[0.39 / 0.39]



Size 2
11 / 12 [0.43 / 0.47]
with keyway



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General accessories

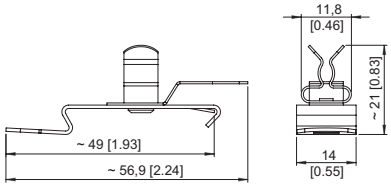
Dimensions / Details	Dimensions in mm [inch]	Order no.

Screw retention Loctite 243 (5 ml)

Chemical basis:	dimethacrylate ester
Components:	single-component (no mixing required)
Viscosity:	medium, thixotrope
Cure:	anaerobic
Secondary cure:	activator
Use:	screw retention
Strength:	medium

8.0000.4G05.0000

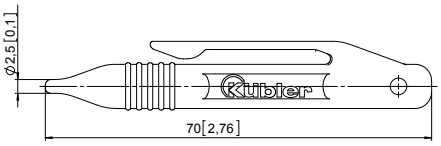
EMC shield terminal



For an EMC-compliant installation of the encoder cable,
top-hat rail mounting,
Shield diameter 3.0 ... 6.0 mm,
Clamp (spring steel, galvanized)
Foot (spring steel)

8.0000.4G06.0000

Stylus for the set key



For easy operation of the set key on the encoder
Material POM (HKS8 orange)

8.0010.4052.0000

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Accessories

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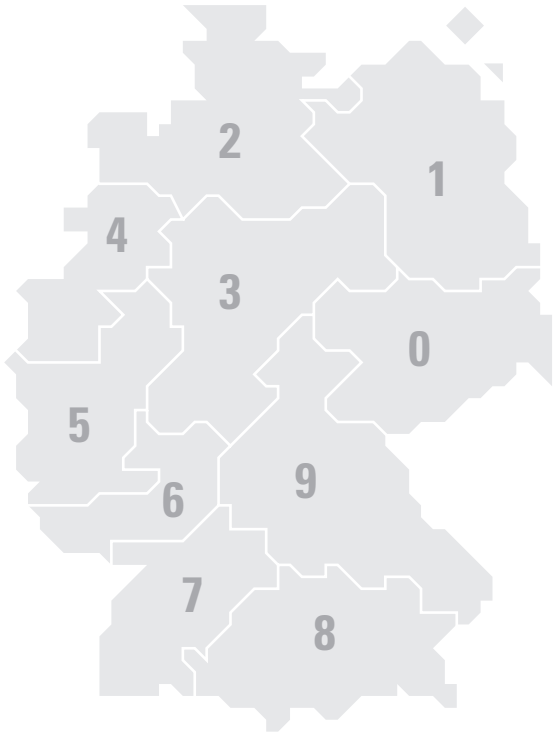

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