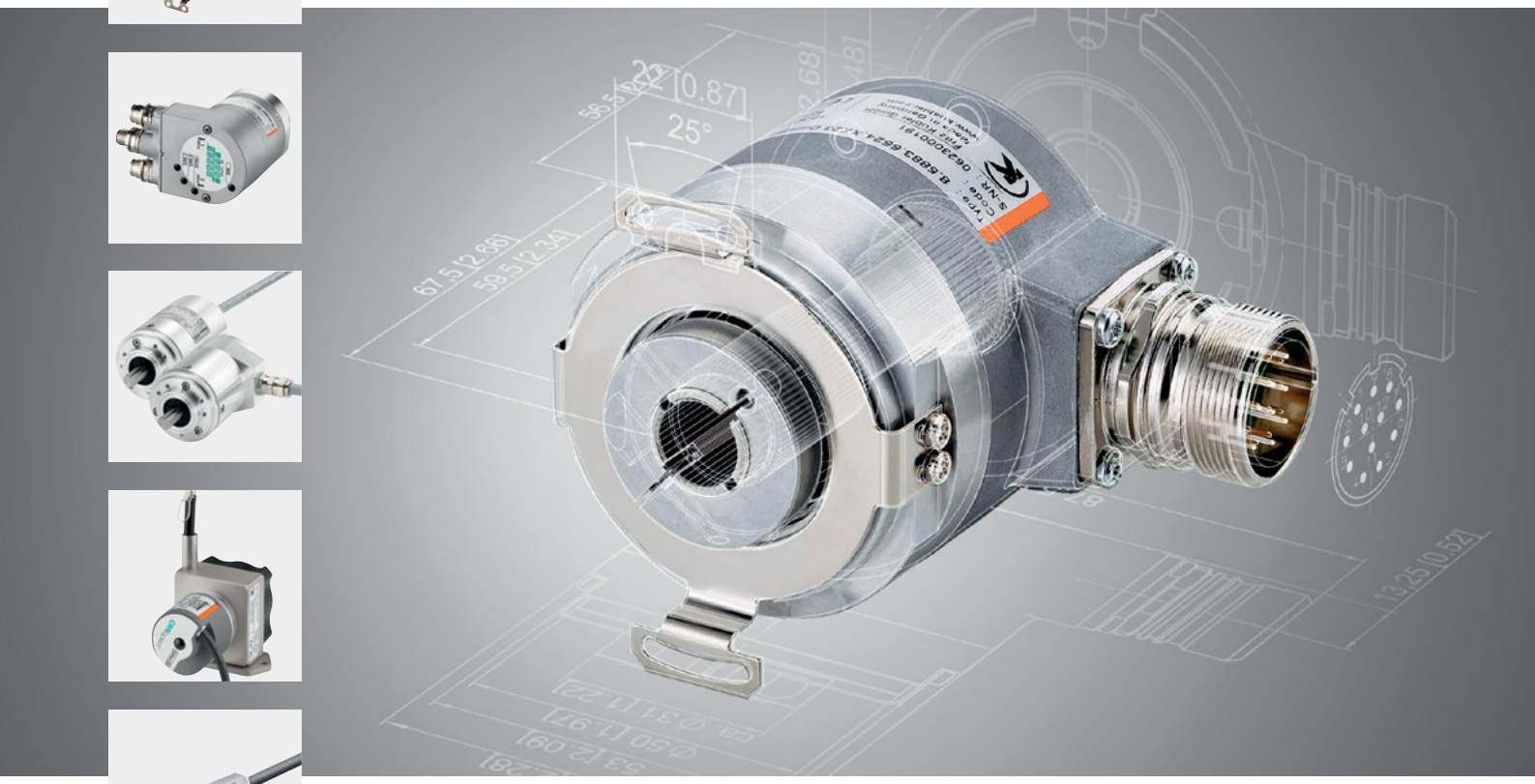
Kübler



- Incremental Encoders
- Absolute Encoders
- Linear Measuring Technology
- Inclinometers
- Connection Technology
- Accessories

pulses for automation

Position and Motion Sensors 2015

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 450 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

Sample and Repair Service

We manufacture samples of special designs or according to customer specification within shortest time. We carry out repair work reliably within a maximum of 5 days.

Kübler online – www.kuebler.com

- Up-to-date product and company information
- Product finder – the selection tool that helps you finding quickly the suitable product
- Download service for CAD data, software, operating instructions, certificates and catalogues
- You will find comprehensive information about the basic technical knowledge relating to our products on our homepage: www.kuebler.com/basics

Safety Services

- Adapted service packages
- Individual customer solutions

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.

- Simplified orders
- Calculable delivery
- Flexible use of small batch sizes

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 (sensors, electronics and mechanics).

Service-Center / Technical Hotline

Whatever your needs, advice, analysis or support for the installation, Kübler is present on site all over the world with its Service Center.

Kübler Germany	+49 7720 3903 952
Kübler France	+33 3 89 53 45 45
Kübler Italy	+39 026 423 345
Kübler Poland	+48 61 84 99 902
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
- Linear Measuring Technology
- Inclinometers
- Connection Technology

Functional Safety

- Encoders certified up to SIL3/PIe
- Modules for safe Drive Monitoring
- System Solutions for safe processing of Safety Sensors
- Adapted Service Packages

Transmission Technology

- Slip Rings
- Optical Fibre 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, Analogue Signals and Strain-Gauge
- Setpoint Adjuster

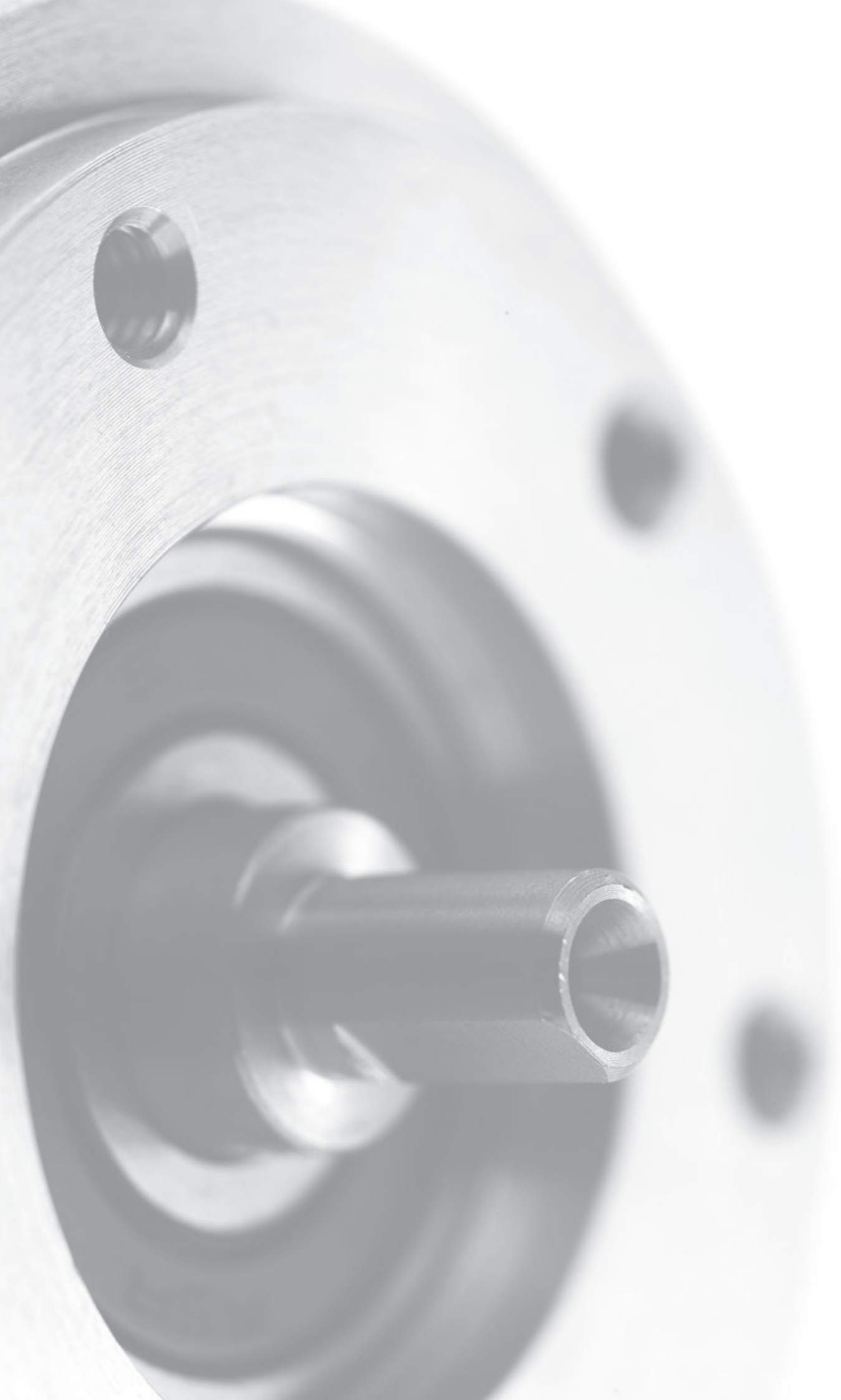
We offer Solutions for the following Industries:

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 2015

Table of contents



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

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	**48**
	Miniature, magnetic **2430** (shaft) **2440** (hollow shaft)	24 [0.94]	•	–	256	–	•	–	–	6 [0.24]	12.000	-20 ... +85 [-4 ... +185]	IP67	cable	5	300	•	–	**51**
new 	Compact, optical **Sendix Base KIS40** (shaft) **Sendix Base KIH40** (hollow s.)	40	–	•	2.500	•	•	–	•	8 [0.31]	4.500	-20 ... +70 [-4 ... +158]	IP64	cable	5 10 ... 30	250	•	cULus	**54**
	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	**57**
	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	**61**
	Standard, optical **Sendix 5000** (shaft) **Sendix 5020** (hollow shaft)	58 [2.28]	–	•	5.000	•	•	–		15 [0.59] 15.87 [5/8"]	12.000	-40 ... +85 [-40 ... +185]	IP67	cable M12 M23 MIL	5 5 ... 30 10 ... 30	300	•	cULus Ex 2/22	**65**
	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	**75**
	Standard, optical sine wave output + 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	**80**
new 	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	**84**
	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	**87**
	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	**93**
	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	**99**

Product overview

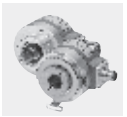
Incremental encoders

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ± 1°)	Optical (Accuracy ≤ ± 0.015°)	Resolution max. in ppr	Push-pull	RS422	SinCos	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
new	 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	**103**
	 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	•	–	**107**
new	 Standard, optical ATEX/IECEx – zone 1/21 **Sendix 7000** (shaft)	70 [2.76]	–	•	5.000	•	•	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 5 ... 30 10 ... 30	300	•	Ex IECEx	**110**
new	 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 5 ... 30 10 ... 30	400	•	Ex IECEx SIL2 PLd	**113**
new	 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 SIL3 PLe	**116**
new	 Standard, optical ATEX / IECEx – mining **Sendix 7100** (shaft)	70 [2.76]	–	•	5.000	•	•	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 10 ... 30	300	•	Ex IECEx	**119**
	 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	**122**
	 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	**126**
	 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	**133**
	 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 LWL	5 10 ... 30	300	•	Ex 2/22	**138**
	 Bearingless, magnetic **RI20/Limes LI20** (hollow shaft)	16x10 [0.63x 0.39]	•	–	3.600	•	•	–	30 [1.18]	12.000	-20 ... +80 [-4 ... +176]	IP67	cable	4.8 ... 26 4.8 ... 30	250	•	–	**143**
	 Bearingless, magnetic with zero pulse **RI50/Limes LI50** (hollow shaft)	16x10 [0.63x 0.39]	•	–	3.600	•	•	–	30 [1.18]	9.000	-20 ... +80 [-4 ... +176]	IP67	cable	4.8 ... 26 4.8 ... 30	250	•	–	**146**

1) With terminal box

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	Analogue / RS485 interface	Paralell 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	•	–	**152**
	Compact, magnetic analogue **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	**155**
	Compact, optical **Sendix F3653** (shaft) **Sendix F3673** (hollow shaft)	36 [1.43]	–	•	17	•	•	–	–	Sin Cos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12	5 10 ... 30	•	cULus	**168**
	Standard, optical paralell / analogue **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	**178**
	Standard, optical paralell, highspeed **5852** (shaft) **5872** (hollow shaft)	58 [2.28]	–	•	14	–	–	–	•	–	12.000	-20 ... +85 [-4 ... +185]	IP66	cable M23	5 10 ... 30	•	cULus	**183**
	Standard, optical **Sendix 5853** (shaft) **Sendix 5873** (hollow shaft)	58 [2.28]	–	•	17	•	•	–	–	Sin Cos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12 M23	5 10 ... 30	•	cULus Ex 2/22	**186**
	Standard, optical SIL2 / PLd **Sendix SIL 5853FS2** (shaft) **Sendix SIL 5873FS2** (Hollow s.)	58 [2.28]	–	•	17	•	•	–	–	Sin Cos	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•	cULus Ex 2/22 SIL 2 PLd	**193**
	Standard, optical SIL3 / PLe **Sendix SIL 5853FS3** (shaft) **Sendix SIL 5873FS3** (hollow s.)	58 [2.28]	–	•	17	•	•	–	–	Sin Cos	9.000/ 12.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•	cULus Ex 2/22 SIL 3 PLe	**199**
	Standard, optical stainless-steel SSI / paralell **5876** (hollow shaft)	58 [2.28]	–	•	14	•	–	–	•	–	6.000	-20 ... +80 [-4 ... +176]	IP67	cable M12	5 10 ... 30	•	cULus Ex 2/22	**228**

Product overview

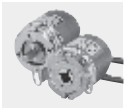
Absolute encoders
Singleturn

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit	SSI interface	BiSS interface	Analogue / RS485 interface	Paralell 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 **Sendix 7053** (shaft)	70 [2.76]	–	•	17	•	•	–	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	**232**
new 	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	•	Ex, IECEx, SIL2 PLd	**235**
new 	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	•	Ex, IECEx, SIL3 PLe	**239**
new 	Standard, optical ATEX / IECEx – mining **Sendix 7153** (shaft)	70 [2.76]	–	•	17	•	•	–	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	**249**

Absolute encoders
Singleturn
Fieldbus

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	CANopen	SAE J1939	PROFIBUS DP	EtherCAT	PROFINET IO	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	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	•	Ex 2/22	**160**
	Compact, optical **Sendix F3658** (shaft) **Sendix F3678** (hollow shaft)	36 [1.43]	–	•	•	–	–	–	–	16	12.000	-40 ... +85 [-40 ... +185]	IP67	cable	10 ... 30	•	cULus	**174**
	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	•	cULus, Ex 2/22	**205**
	Standard, optical ATEX / IECEx – zone 1 / 21 **Sendix 7058** (shaft)	70 [2.76]	–	•	•	–	•	–	–	16	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	**243**
new 	Standard, optical ATEX / IECEx – mining **Sendix 7158** (shaft)	70 [2.76]	–	•	•	–	•	–	–	16	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	**252**

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	Analogue / 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 mechanical 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 pending Ex 2/22	260
new 	Compact, magnetic mechanical 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 pending Ex 2/22	266
	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	276
	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 Ex 2/22	287
	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	294
	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	300
new 	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 Ex 2/22	306

Product overview

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	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 ATEX/IECEx – zone 1/21 **Sendix 7063** (shaft)	70 [2.76]		•	17 +12	•	•	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex IECEx	**348**
new 	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	**351**
new 	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	**355**
new 	Standard, optical mechanical multiturn ATEX/IECEx – mining **Sendix 7163** (shaft)	70 [2.76]		•	17 +12	•	•	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex IECEx	**365**
	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	**381**

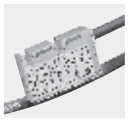
Product overview

Absolute encoders
Multiturn
Fieldbus

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit ST+MT	CANopen	CANopenlift	PROFIBUS DP	DeviceNet	MODBUS RTU	EtherCAT	PROFINET IO	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 mechanical multiturn, **Sendix M3668** (shaft) **Sendix M3688** (hollow shaft)	36	•	–	16 +16	•	–	–	–	–	–	–	6.000	-40 ... +85 [-40... +185]	IP67	cable M12	10 ... 30	•	e1 pending, cULus pending, Ex 2/22	**271**
	Compact, optical electronic multiturn **Sendix F3668** (shaft) **Sendix F3688** (hollow shaft)	36 [1.42]	–	•	16 +16	•	–	–	–	–	–	–	12.000	-40 ... +80 [-40... +176]	IP67	cable	10 ... 30	•	Ex 2/22	**282**
new 	Standard, optical electronic multiturn **Sendix F5868** (shaft) **Sendix F5888** (hollow shaft)	58 [2.28]	–	•	16 +16	•	–	–	–	•	–	–	12.000	-40 ... +85 [-40... +185]	IP67	cable M12	10 ... 30	•	cULus, Ex 2/22	**312**
	Standard, optical mechanical multiturn **Sendix 5868** (shaft) **Sendix 5888** (hollow shaft)	58 [2.28]	–	•	16 +12	•	•	•	–	–	•	•	9.000	-40 ... +60 [-40 ... +140]	IP67	cable M12 Sub-D	10 ... 30	•	cULus, Ex 2/22	**322**
	Standard, optical mechanical multiturn ATEX / IECEx – zone 1/21 **Sendix 7068** (shaft)	70 [2.76]	–	•	16 +12	•	–	•	–	–	–	–	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	Ex, IECEx	**359**
new 	Standard, optical mechanical multiturn ATEX / IECEx – mining **Sendix 7168** (shaft)	70 [2.76]	–	•	16 +12	•	–	•	–	–	–	–	6.000	-10 ... +70 [-14 ... +158]	IP67	cable	10 ... 30	•	Ex, IECEx	**368**
	Large hollow shaft, optical / magnetic **9080** (large hollow shaft)	90 [3.54]	–	•	13 +12	•	–	•	•	–	–	–	6.000	-10 ... +70	IP65	cable M12	10 ... 30	•	cULus	**374**

Product overview

Linear measuring technology
Magnetic measurement system

		Measuring max. in m	**Accuracy** max.	**Resolution** max. in µm	**Dimensions** in mm [inch]	**Incremental RS422/Push-Pull**	**Incremental SinCos**	**Absolute analogue**	**Absolute SSI/BiSS**	**Absolute fieldbus**	**Traverse speed** max. in m/s	**Temperature range** in °C [°F]	**Protection** max.	**Type of connection cable**	**Type of connection connector**	**RoHS compliant**
	Incremental sensor head, magnetic band **Limes LI20/B1**	50	dep. on meas. length 0.08 mm for 1m	10	10 x 25 x 40 [0.39 x 0.98 x 1.57]	•	–	–	–	–	25	-20 ... +80 [-4 ... +176]	IP69k	cable	•	**386**
	Incremental sensor head, magnetic band **Limes LI50/B2**	50	dep. on meas. length 0.1 mm for 1m	5	10 x 25 x 40 [0.39 x 0.98 x 1.57]	•	–	–	–	–	16	-20 ... +80 [-4 ... +176]	IP69k	cable	•	**389**
new 	Absolute sensor head, magnetic band **Limes LA10/BA1**	8	dep. on meas. length 0.03 mm for 1m	1	16 x 30 x 70 [0.63 x 1.18 x 2.76]	–	•	–	•	•	10	-10 ... +70 [+14 ... +158]	IP64	M12	•	**392**
new 	Absolute sensor head, magnetic band **Limes LA50/BA5**	20	dep. on meas. length 0.17 mm for 1m	10	24 x 26 x 75 [0.94 x 1.02 x 2.95]	–	–	–	•	•	4	-10 ... +70 [+14 ... +158]	IP40	cable	•	**396**

Linear measuring technology
Draw wire mechanics

		Measuring max. in m	Accuracy max.	Resolution max. [mm]	Dimensions in mm [inch]	Incremental RS422/Push-Pull	Absolute analogue	Absolute SSI/BiSS	Absolute fieldbus	Traverse speed max. in m/s	Temperature range in °C [°F]	Protection max.	Type of connection	RoHS compliant	Page
new 	Draw wire encoder **A30** with analogue 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	•	**400**
	Draw wire encoder **A40** with analogue 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	•	**402**
	Draw wire encoder **A50** with encoder or analogue sensor	1.25	±0.05 % 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	-20 ... +85 [-4 ... +185]	IP67	cable M12	•	**404**
	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	•	**407**
	Draw wire encoder **A41** with analogue 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	•	**402**
new 	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	•	**409**
new 	Draw wire encoder **B75** with encoder or analogue 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	•	**411**
	Draw wire encoder **B80** with encoder or analogue sensor	3	±0.05 % 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	-20 ... +90 [-4 ... +194]	IP67	cable M12 M23	•	**414**
	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	•	**417**
	Draw wire encoder **C120** with encoder or analogue sensor	6	±0.05 % 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	-20 ... +90 [-4 ... +194]	IP67	cable M12 M23	•	**419**
	Draw wire encoder **D135** with encoder or analogue sensor	42.5	±0.05 % 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	-20 ... +90 [-4 ... +194]	IP67	cable M12 M23	•	**422**

Product overview

Linear measuring technology

		Measuring max. in m	Accuracy max.	Resolution min. in mm	Dimensions in mm [inch]	Incremental RS422/Push-Pull	Incremental SinCos	Absolute analogue	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	•	**427**
	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	•	**429**
	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	•	**430**
	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	•	**431**

Inclinometers

		Measuring angle max.	Accuracy max.	Resolution max.	Dimensions in mm [inch]	Absolute analogue	CANopen	Reaction time in s	Temperature range in °C [°F]	Protection max.	Type of connection connector	RoHS compliant	Page
new 	Inclinometer MEMS, capacitive analogue **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	•	**438**
	Inclinometer MEMS, capacitive analogue **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	•	**440**
new 	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	•	**442**
	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	•	**444**

Product overview

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	•	–	**448**
	8 core + shield	–	•	–	8 x 0.14 [AWG25]	approx. 5.5	–	•	**448**
	10 core + shield	–	•	–	4 x 2 x 0.25 [AWG23] + 2 x 1 [AWG17]	approx. 7.9	•	•	**448**
	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	•	•	**449**
	18 core + shield	•	–	–	18 x 0.14 [AWG25]	approx. 7.8	–	•	**449**
	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	•	•	**450**

Connection technology
Connectors, self-assembly

		Nº 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	•	•	•	•	**451**
	M23	12/17	Metal	Solder pins	5.5 - 10.5	•	–	•	–	**467**
	MIL	7/10	Metal	Solder pins	5 - 8	•	–	–	–	**473**

Product overview

Connection technology
Cordsets, pre-assembled

	PVC cable	PUR cable	TPE cable	Optical fibre	Straight connector	Right angle connector	for incremental encoders	for SSI / BiSS encoders	for fieldbus	for analogue interfaces	Page
 with M12 connector	•	•	–	–	•	•	•	•	•	•	**457**
 with M23 connector	•	•	•	–	•	–	•	•	–	•	**469**
 Simplex patch cable optical fibre	–	–	–	•	•	–	•	•	–	–	**139 483**
 with Sub-D connector	–	•	–	–	–	•	–	–	•	–	**474**

Optical fibre transmission modules (LWL)

	Interface	Transmission distance in m	Input frequency in kHz	Temperature in °C [°F]	Power / Current in VDC	Power consumption in W	Page
 Optical fibre module, incremental **LWL**	RS422 HTL	1.000	400	-10 ... +60 [-14 ... +140]	5 10 ... 30	2	**483**
 Optical fibre module, absolute **LWL.A**	SSI	2.000	1.000	-10 ... +70 [-14 ... +158]	5 10 ... 30	1	**485**

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.

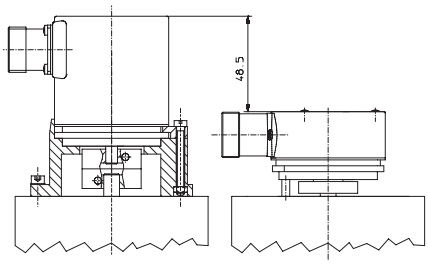
Incremental encoders generate pulses, where the number of pulses can be a measure of speed, length or position.

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.

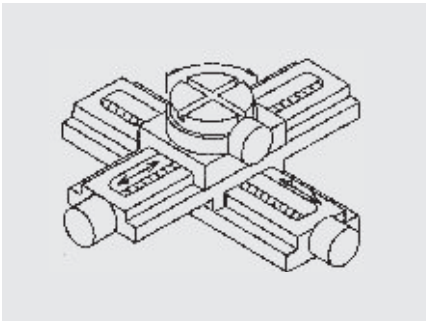
Using a hollow shaft encoder saves up 30 % of costs and up to 50 % of the required space compared to a shaft encoder. This is achieved by avoiding additional couplings, brackets and other assembly aids.

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.

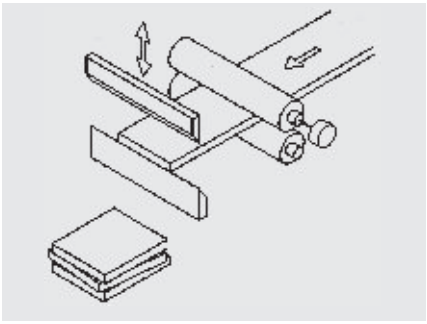


Application examples

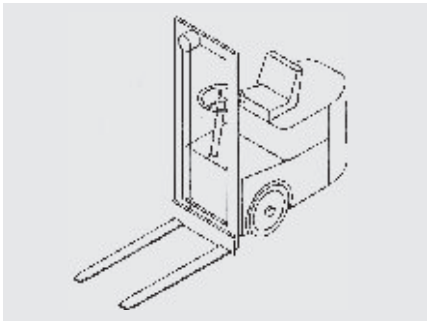
Angular measurement



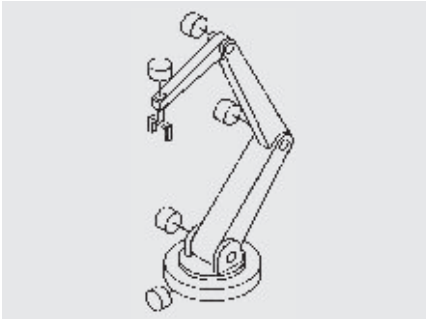
Positioning



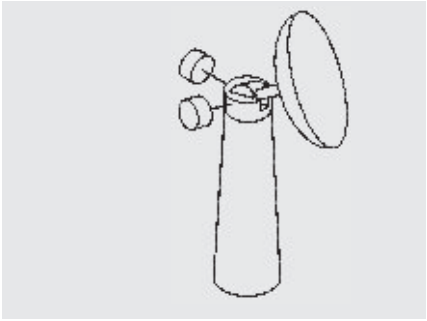
Detecting of fork's position



Detecting of position

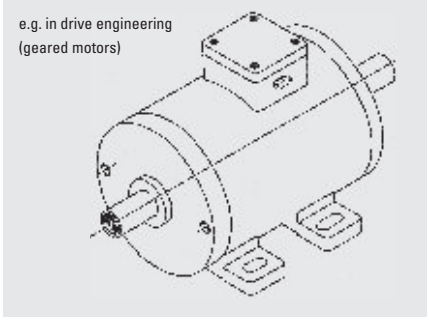


Angular measurement



Velocity measurement

e.g. in drive engineering (geared motors)



Encoders

Functional principle

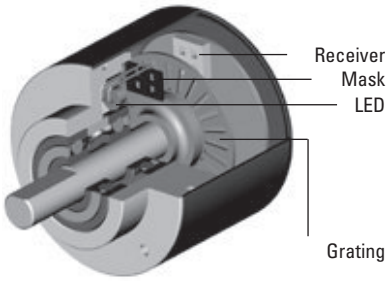
Assembly and function

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 (absolut)

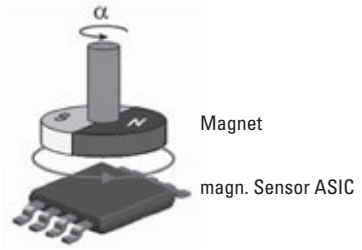
The light that is emitted by an LED is modulated by a code pattern, which is applied to a rotating disc; this is scanned by a special Kübler Opto ASIC. A unique bit pattern is assigned to each position and this is generally available as Gray Code.

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.

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

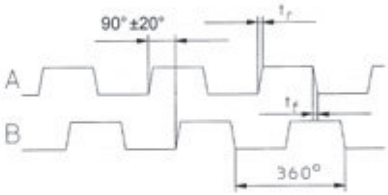
Encoders with one output channel:

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.

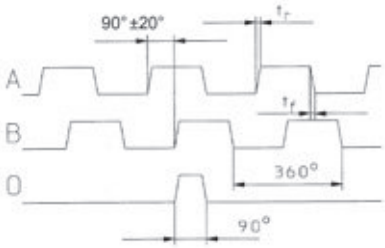
- Shaft turning clockwise, top-view of shaft / for hollow shaft encoders, viewing the flange
- Inverted signals available
  t_r = rise time
  t_f = fall time



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



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:

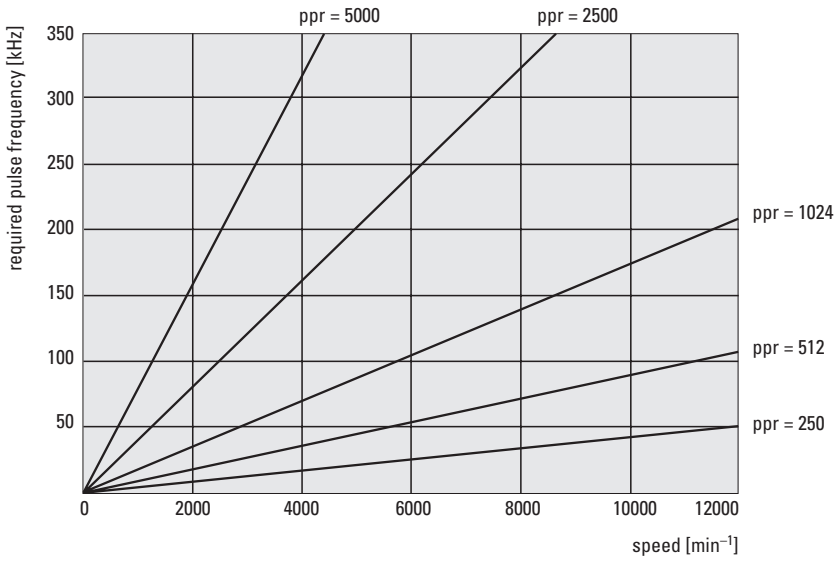
given:
- Speed = 3000 min^{-1}
- Resolution of the encoder= 1000 ppr [1)]

wanted:
- Required pulse frequency of the encoder

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

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

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

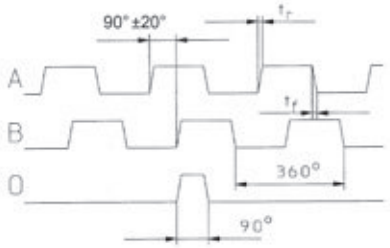
The sine wave signal from the optical system is first digitised to have square wave signals available.

- 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:

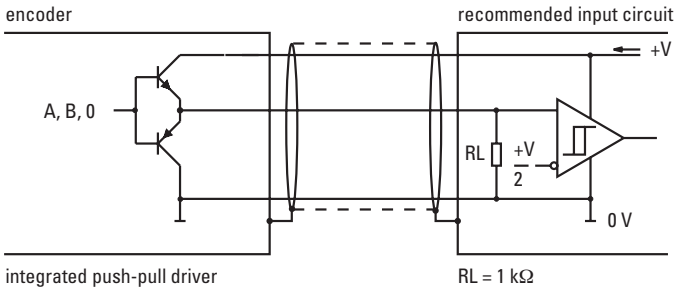
Push-pull:

- 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

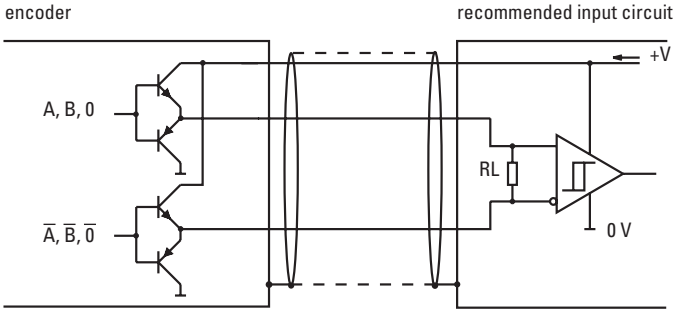
Output circuit and recommended input circuit push-pull without inverted signals (HTL)



Encoders

Incremental encoders

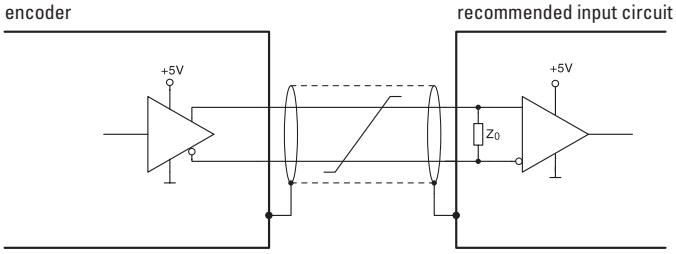
Output circuit and recommended input circuit push-pull with inverted signals (HTL)



Integrated push-pull driver

RL = 1 kΩ

RS422
Output circuit and recommended input circuit (TTL)



RS422 line driver

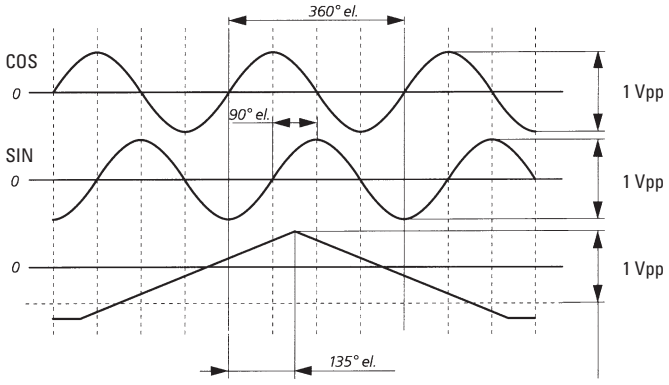
RS422 line receiver
e.g. AM26 C 32 / Z = 120 Ω

Sine wave outputs

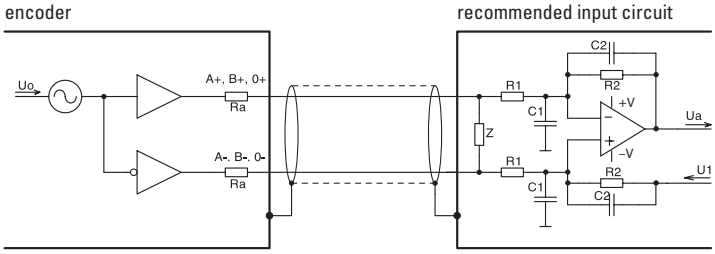
The sine wave signals are available as voltage signals. They can be further processed in the evaluation electronics. Due to the interpolation of the two signals, which are 90° out of phase, a very high resolution can be achieved.

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

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

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

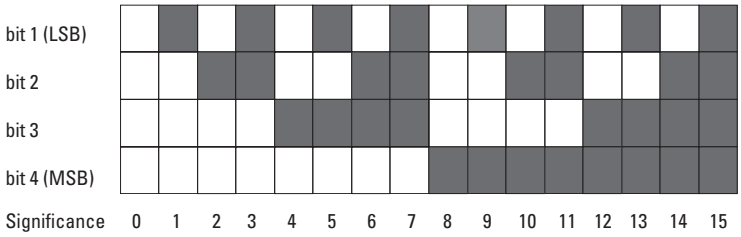
Up to 17 bit unique angular positions per revolution are provided. In addition the number of revolutions is detected. Up to 4096 (12 bit) unique revolutions can be made available on the output.

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

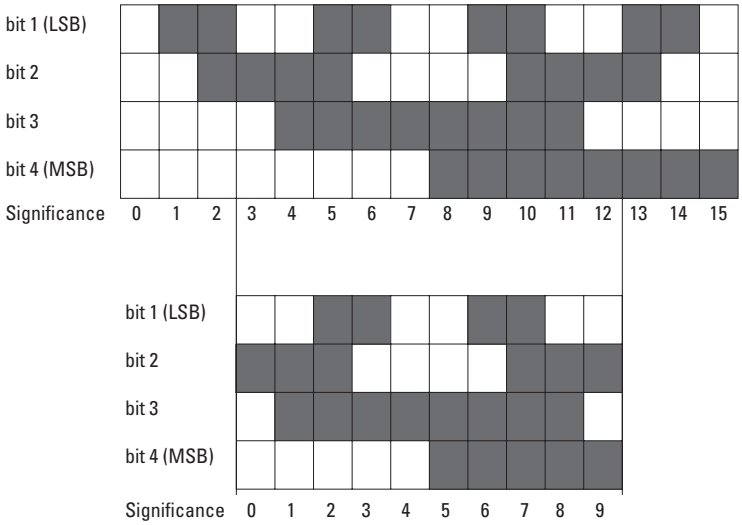
The Gray Code is a single-step code, which guarantees that from one position to the next only 1 bit changes.

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.

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

Outputs

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

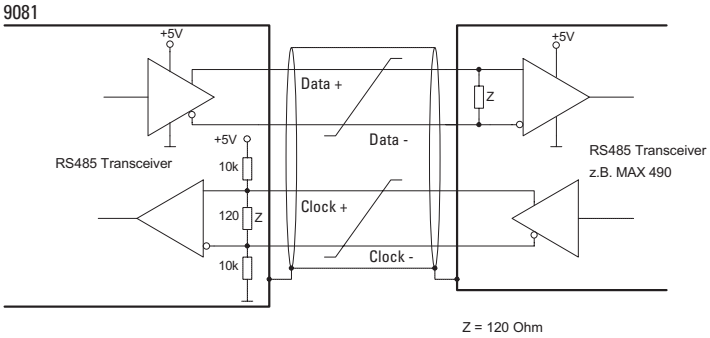
Synchronous serial interface (SSI)

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

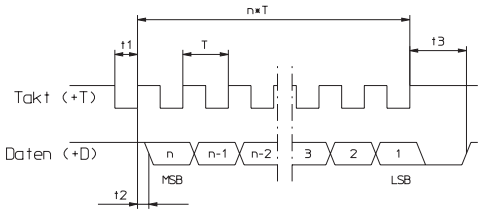
In addition less lines are needed for transmission and the possible cable length is much longer.

Output circuit and recommended input circuit

9081



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 t3 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.

Encoders | Absolute encoders

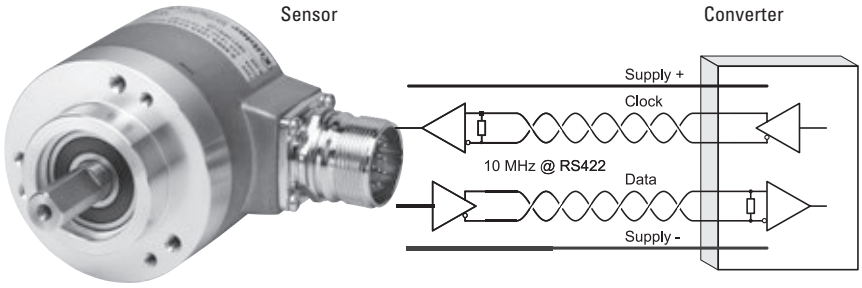
BiSS interface

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.

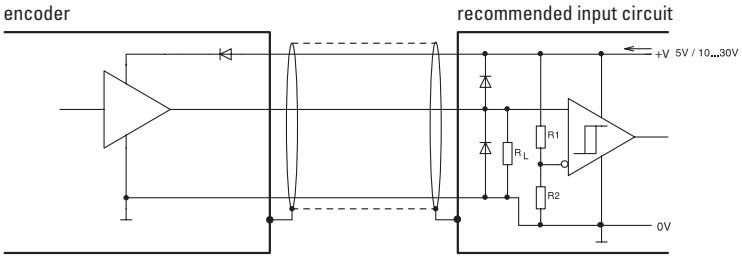
Encoders

Absolute encoders

Parallel output

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

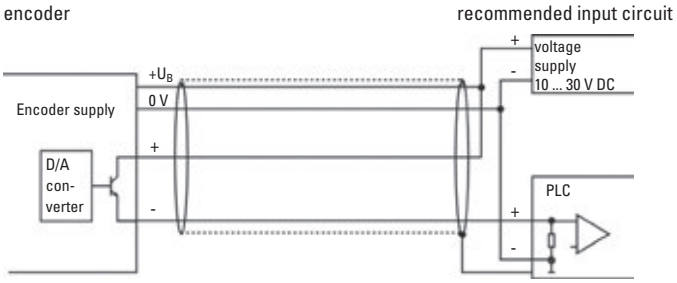
Output circuit and recommended input circuit



Integrated push-pull driver

Analogue 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]
Analogue 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

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.

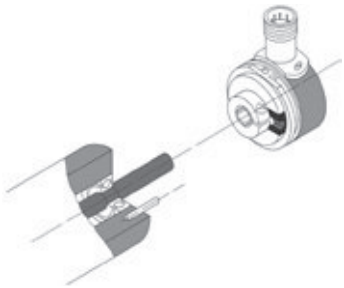
Not making use of a coupling but instead rigidly mounting the shaft and the encoder housing generally leads to unacceptably high loads on the bearings; the ensuing wear will cause the encoder to fail prematurely.

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.

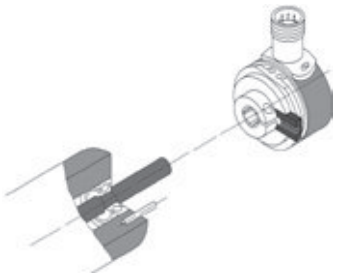
Mounting options for hollow shaft encoders

Hollow shaft encoder with torque stop and pin

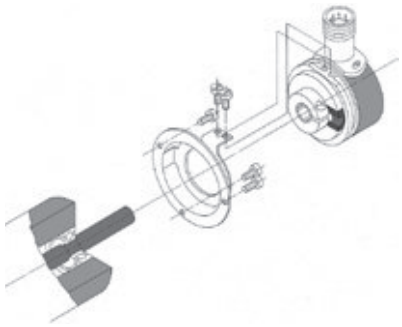
(easiest and fastest mounting)
Standard hollow shaft encoders are equipped with the torque stop (cylindrical pin not supplied).



Extended torque stop and long pin



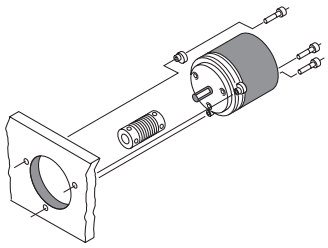
Stator coupling



Mounting examples for shaft encoders with synchronous flange

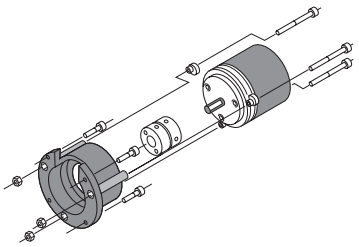
Fastening eccentrics + coupling

(to reduce shaft overload)



Assembly bell, fastening eccentrics + coupling

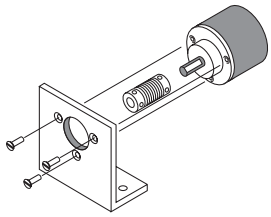
(to prevent shaft overload and to isolate the encoder thermally and electrically)



Mounting examples for shaft encoders with clamping bracket

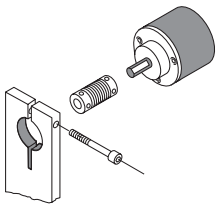
Angular bracket + coupling

(to reduce shaft overload)



Clamping device + coupling

(to reduce shaft overload)



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

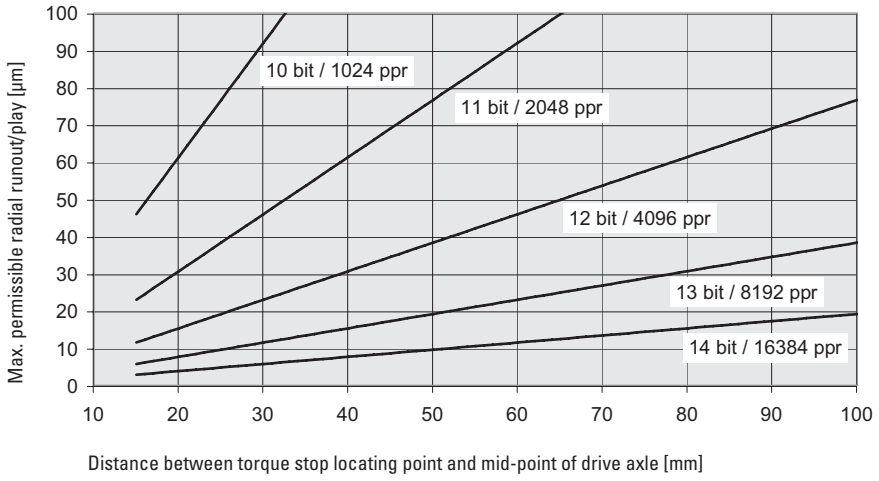
2. Deviations in accuracy caused by radial play in the drive shaft with asymmetrical mounting of the couplings

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



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 catalogue).

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.

Encoders

Functional Safety

Incremental and absolute encoders for Functional Safety

Further information about Functional Safety can be found in our catalogue "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 analogue, 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.

Linear measuring systems

Technology

Magnetic measuring system (incremental)

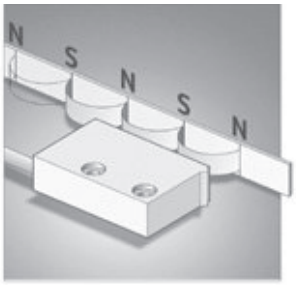
up to 90 m measuring length, up to 0.005 mm resolution

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 90 m!

Linear measuring systems

Technology

Magnetic measuring system Limes (absolute)

up to 8 m measuring lenght, up to 0.001 mm resolution
up to 20 m measuring lenght, 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

Linear measuring systems

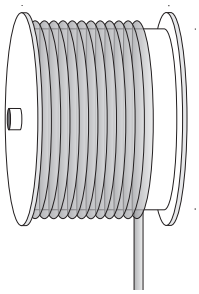
Technology

Draw wire systems

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

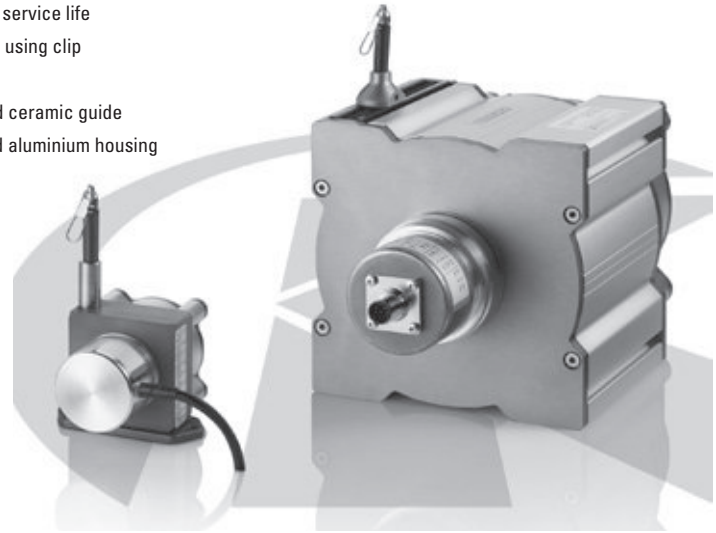
The idea:

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 analogue 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 anodised aluminium housing

Kübler plus



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.

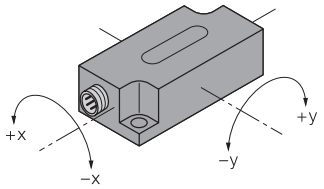
We supply the complete kits.

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

Connection technology

Introduction / Cables and connectors

The idea behind our connection technology system

Kübler plus

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

Introduction

All products of chapter connection technology have been tested and released in relation with the corresponding compatible Kübler sensors.

They ensure the full functionality and high signal quality of our sensors - this guarantee is supported by our competent customer service.

Your advantage:

- Prevents from misconnections
  - No time-consuming search for errors
- Optimal shielding
  - Prevents from EMC problems
- Shorter mounting times
  - Time- and thus cost-savings
- No time-consuming search for the suitable connector or cable
  - Time-savings and error prevention

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 catalogue:

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)

Connection technology | Introduction / Cables and connectors

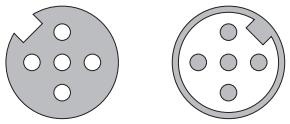
Coding of the M12 x 1 connectors

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.

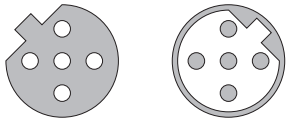
A-coding

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



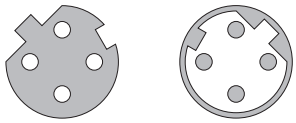
B-coding

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.

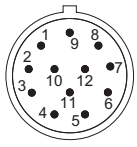
"Allround" shielding with Kübler cordsets

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)

Optical fibre signal transmission

General information

Description

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

The optical fibre transmitter converts the electrical signals of an encoder into optical fibre signals. A simple glass fibre 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 fibre transmission:

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

Mounting of optical fibre modules

The optical fibre 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 fibre 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 fibre cables

The modules can be connected together using 50/125 µm or 62.5/125 µm multimode glass fibre 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 fibre modules as accessories.

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

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.

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	++

Encoders

Technologies

Ageing compensation (optical encoders)

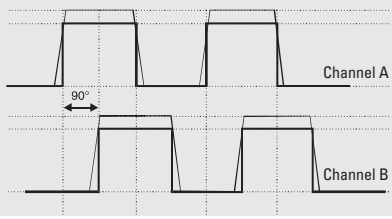
Every LED loses some of its luminosity over time. Without ageing compensation the excellent quality of the output signals would suffer. The phase shift of 90° necessary to detect the direction of rotation would be lost. This effect however is prevented by means of special electronic circuitry.

Benefit:

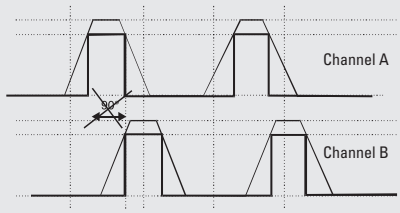
The ageing compensation circuit ensures the same signal, even after many years of operating time.

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 catalogue 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.

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 summarise 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

Designation of colours to DIN IEC 757

Abbreviation	Colour
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


Type:
10-30 8.5020.D85H.1024
S-Nr: 0929502BD4
VDC 100 mA
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	**48**
Miniature, magnetic		2430 / 2440 (shaft / hollow shaft)	RS422	**51**
Compact, optical new		Sendix Base KIS40 / KIH40 (shaft / hollow shaft))	Push-Pull / RS422 open collector	**54**
		3610 / 3620 (shaft / hollow shaft)	Push-Pull / RS422	**57**
	Plastic housing	3700 / 3720 (shaft / hollow shaft)	Push-Pull / RS422	**61**
Standard, optical		Sendix 5000 / 5020 (shaft / hollow shaft)	Push-Pull / RS422	**65**
	High temperature	5803 / 5823 (shaft / hollow shaft)	Push-Pull / RS422	**75**
	Sine wave output, with zero pulse	5804 / 5824 (shaft / hollow shaft)	SinCos	**80**
new	Sine wave output, highly interpolable	Sendix 5814 / 5834 (shaft / hollow shaft)	SinCos	**84**
	Sine wave output, SIL2 / PLd	Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)	SinCos	**87**
	Sine wave output, SIL3 / PLe	Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)	SinCos	**93**
	High resolution	5805 / 5825 (shaft / hollow shaft)	Push-Pull / RS422	**99**
new	Stainless steel	Sendix 5006 / 5026 (shaft / hollow shaft)	Push-Pull / RS422	**103**
	Large hollow shaft	5821 (hollow shaft)	Push-Pull / RS422	**107**
new	ATEX / IECEx	Sendix 7000 (shaft)	Push-Pull / RS422	**110**
new	ATEX / IECEx, SIL2 / PLd	Sendix SIL 7014FS2 (shaft)	SinCos	**113**
new	ATEX / IECEx, SIL3 / PLe	Sendix SIL 7014FS3 (shaft)	SinCos	**116**
new	ATEX / IECEx, mining	Sendix 7100 (shaft)	Push-Pull / RS422	**119**
Large hollow shaft, optical		A020 (hollow shaft)	Push-Pull / RS422 / SinCos	**122**
	Robust	A02H (hollow shaft)	Push-Pull / RS422 / SinCos	**126**
Heavy Duty, optical	Shaft	Sendix Heavy Duty H100 (shaft)	Push-Pull / RS422 / speed switch	**133**
	Hollow shaft	Sendix Heavy Duty H120 (hollow shaft)	Push-Pull / RS422 / optical fibre	**138**
Bearingless, magnetic		RI20 / Limes LI20 (hollow shaft)	Push-Pull / RS422	**143**
	Zero pulse	RI50 / Limes LI50 (hollow shaft)	Push-Pull / RS422	**146**

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.

c UL us RoHS

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 inputs.

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.

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 2004/108/EC RoHS guideline 2011/65/EU	

An independent test laboratory (TTI-PG115/96-01) 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.

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 colour:	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 colour:	WH	BN	GN	YE	GY	PK	BU	RD

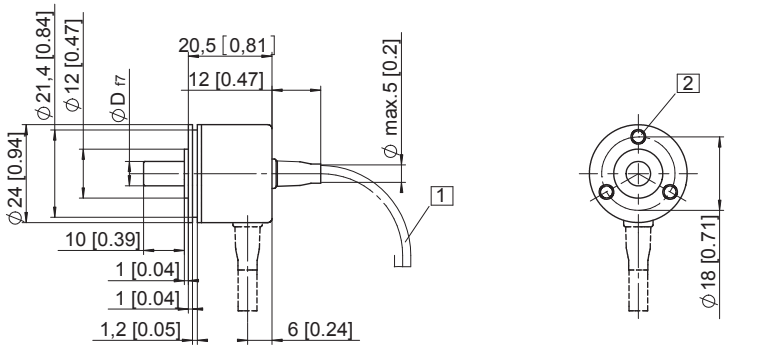
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal

Dimensions shaft version

Dimensions in mm [inch]

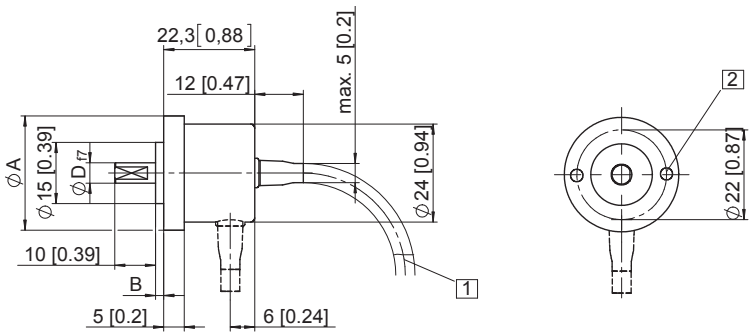
Flange type 1, ø 24 [0.94]

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



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



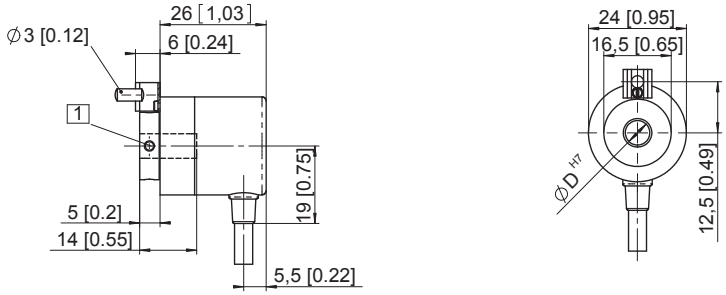
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 4 x M3 DIN 915 - SW1.5



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.

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

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 2004/108/EC 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 colour:	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.

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

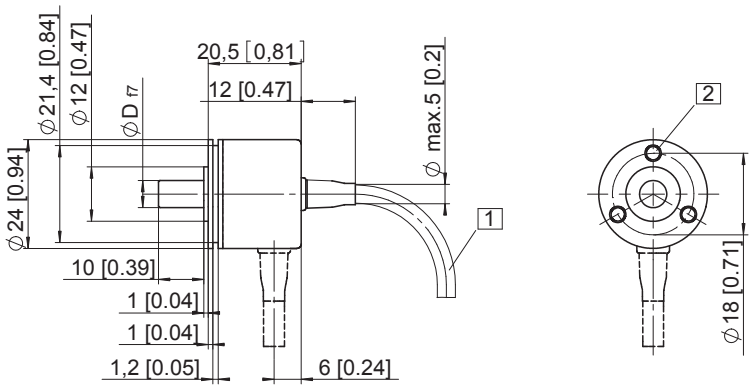
Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 min R50 [1.97]

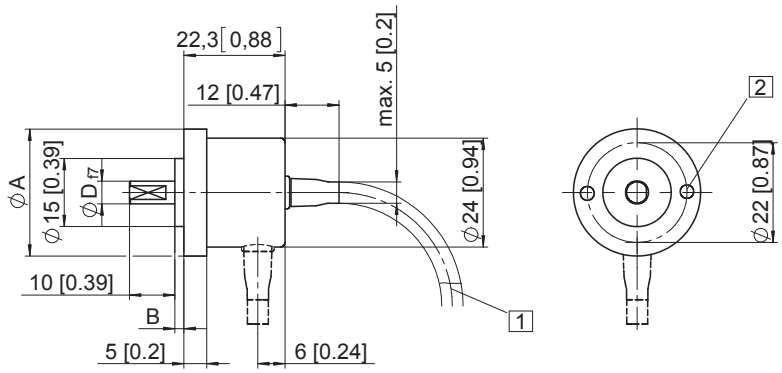
2 3 x M3, 4 [0.16] deep



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



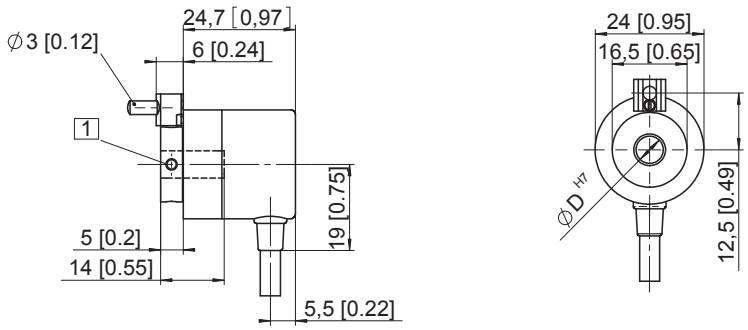
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

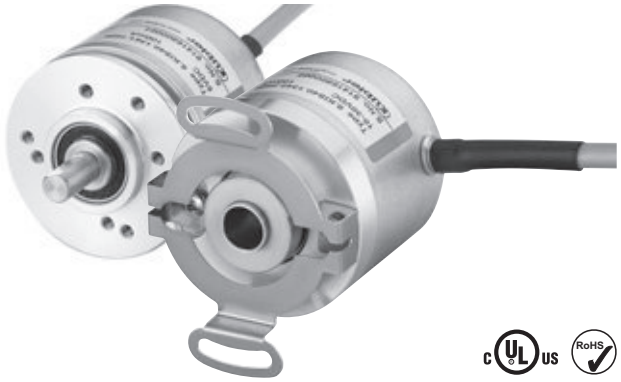
Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 4 x M3 DIN 915 - SW1.5



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 | 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
Type		a	b	c	d		e

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

b *Shaft (ø x L)*
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*
4 = Push-Pull (with inverted signal) / 10 ... 30 V DC
3 = open collector (with inverted signal) / 10 ... 30 V DC
6 = RS422 (with inverted signal) / 5 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)

Optional on request
- other pulse rates

Order code Hollow shaft

8.KIH40	.	X	X	X	X	.	XXXX
Type		a	b	c	d		e

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

b *Blind hollow shaft*
4 = ø 8 mm [0.32"]
3 = ø 1/4"

c *Output circuit / power supply*
4 = Push-Pull (with inverted signal) / 10 ... 30 V DC
3 = open collector (with inverted signal) / 10 ... 30 V DC
6 = RS422 (with inverted signal) / 5 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)

Optional on request
- other pulse rates

Compact optical	Sendix Base KIS40 / KIH40 (shaft / hollow shaft)	Push-Pull / RS422 / open collector

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	**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	aluminium
	housing	aluminium
	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** [1] (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	min. 2.5 V	min. +V - 2.0 V	
	LOW	max. 0.5 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	yes
Reverse polarity protection of the power supply		no	yes	yes
UL approval		file 224618		
CE compliant acc. to		EMC guideline 2004/108/EC RoHS guideline 2011/65/EU		

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 colour:	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) Max. recommended cable length 30 m [98.43‘].
2) 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.

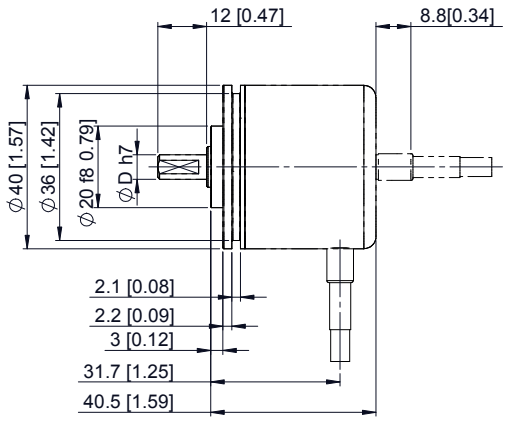
Compact optical | **Sendix Base KIS40 / KIH40 (shaft / hollow shaft)** | **Push-Pull / RS422 / open collector**

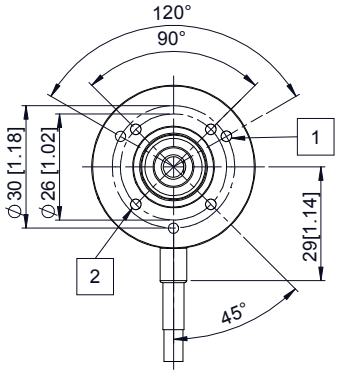
Dimensions shaft version

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



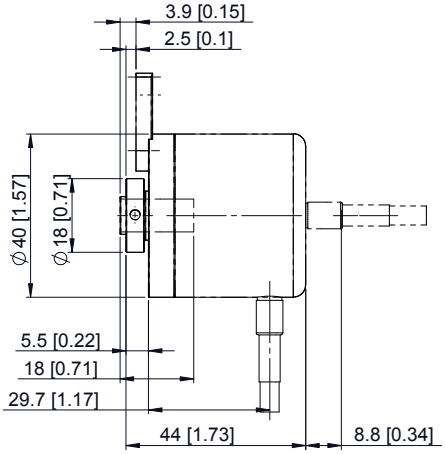


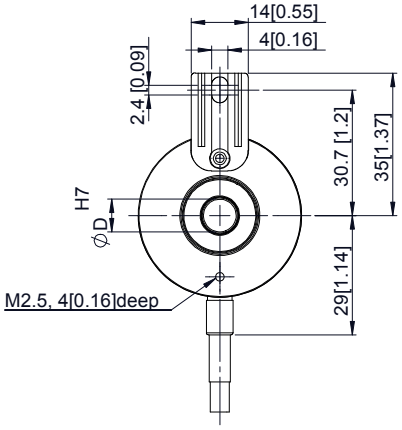
D = ø 6 [0.24]
ø 1/4"

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 2

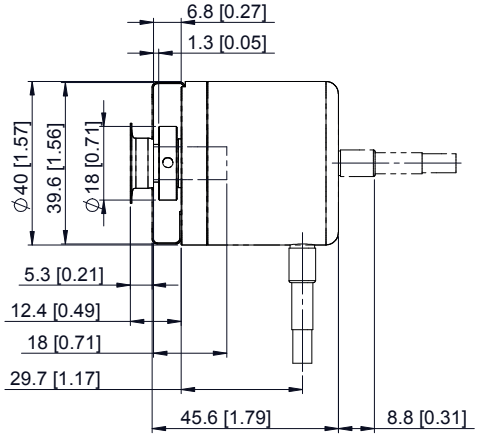


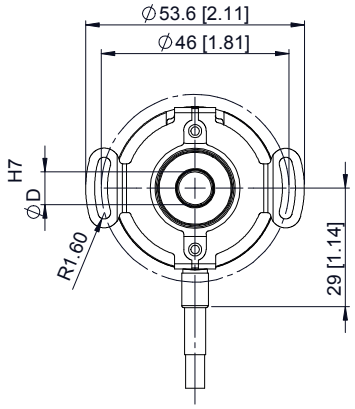


D = ø 8 [0.31]
ø 1/4"

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

Shaft: minimum insertion depth 1.5 x D





D = ø 8 [0.31]
ø 1/4"

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 | 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

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 *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.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**

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	aluminium
	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 2004/108/EC RoHS guideline 2011/65/EU		

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

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, E, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable colour:	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, E, A, B	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
		Cable colour:	WH	BN	GN	-	YE	-	GY	-

Output circuit	Type of connection	M12 connector								
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								
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

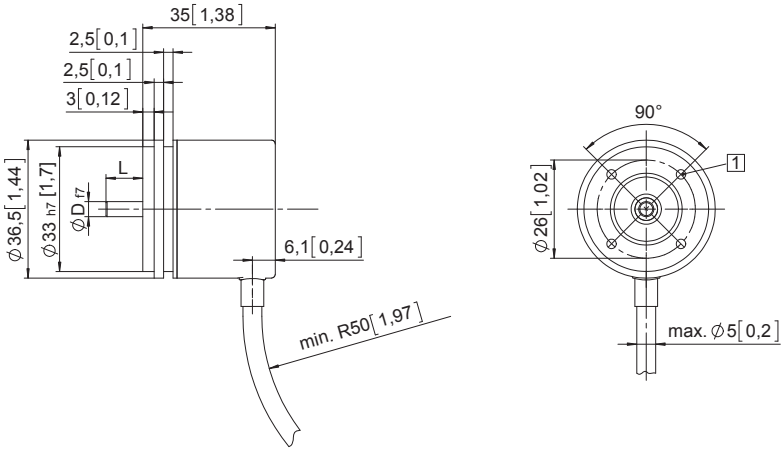
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output channel B
0, $\overline{0}$: Reference signal

Dimensions shaft version

Dimensions in mm [inch]

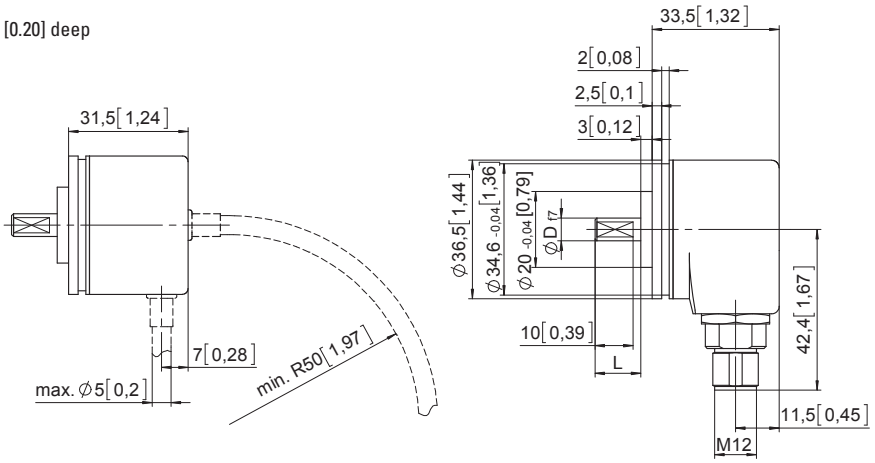
Synchro flange, ø 36.5 [1.44]
Flange type 2

1 M3, 5 [0.20] deep



Clamping flange, ø 36.5 [1.44]
Flange type 3

1 M3, 5 [0.20] deep



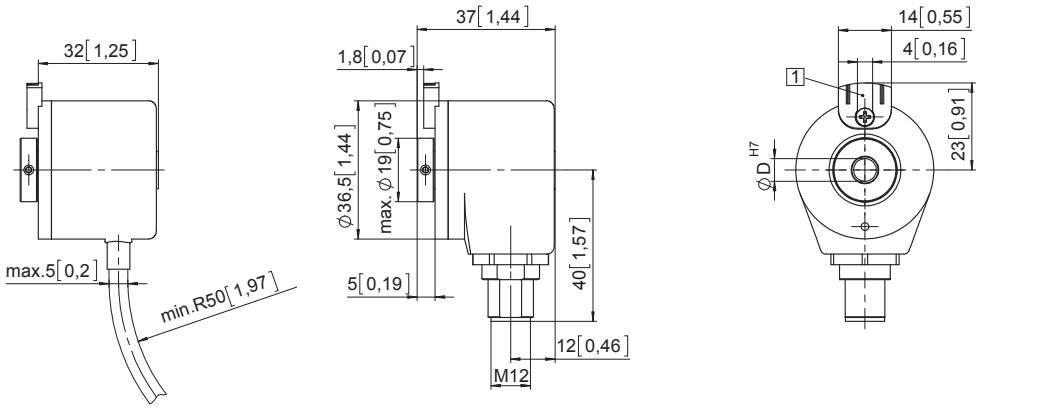
Compact optical	3610 / 3620 (shaft / hollow shaft)	Push-Pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

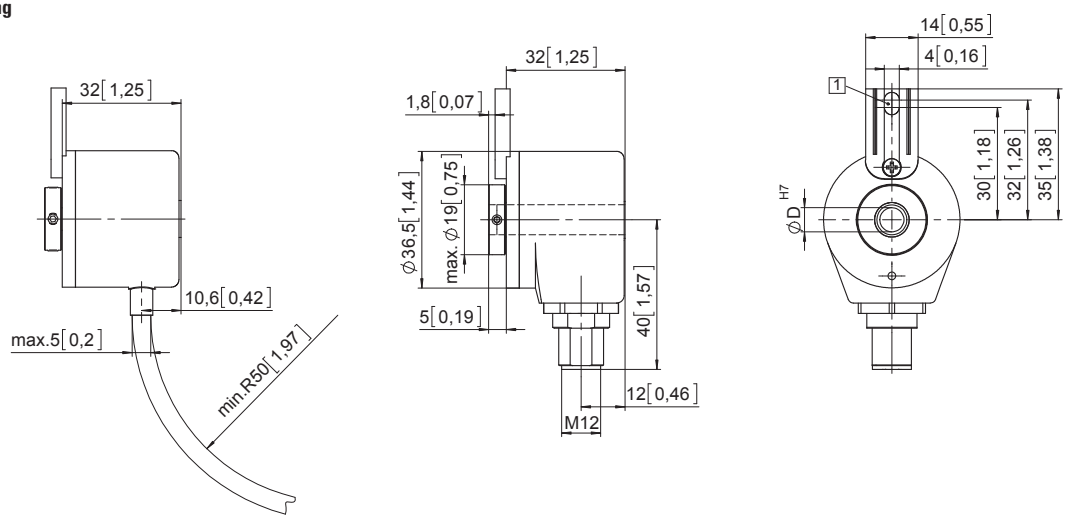
Flange with spring element, short
Flange type 1

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]



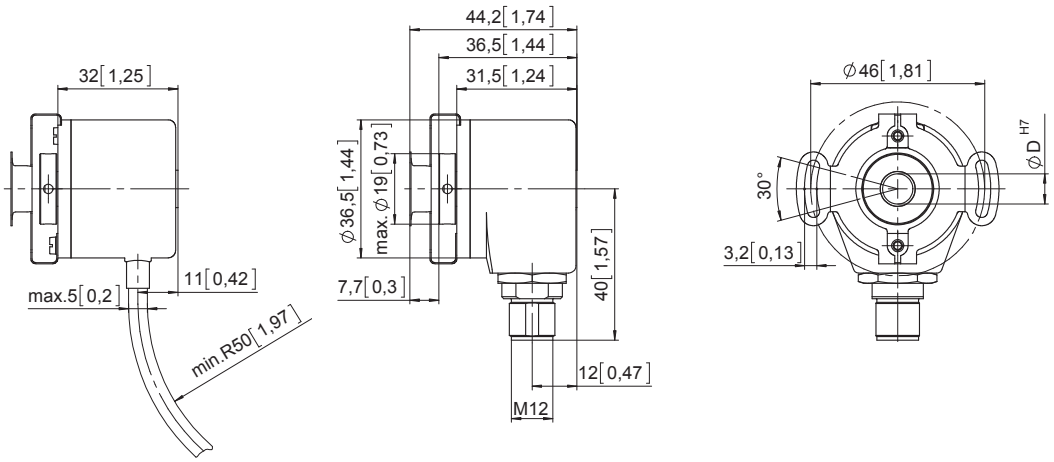
Flange with spring element, long
Flange type 2

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]



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

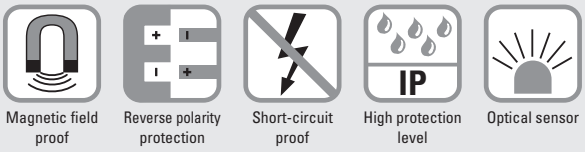
Shaft: minimum insertion depth 1.5 x D



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-fibre 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 . 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 = clamping-synchro flange, ø 36.8 mm [1.45"]
A = flange adapter, mounted, ø 36.8 mm [1.45"]

b *Shaft (ø x L), with flat*
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 . 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 *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.

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 fibre)
	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 2004/108/EC 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 colour:	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’].

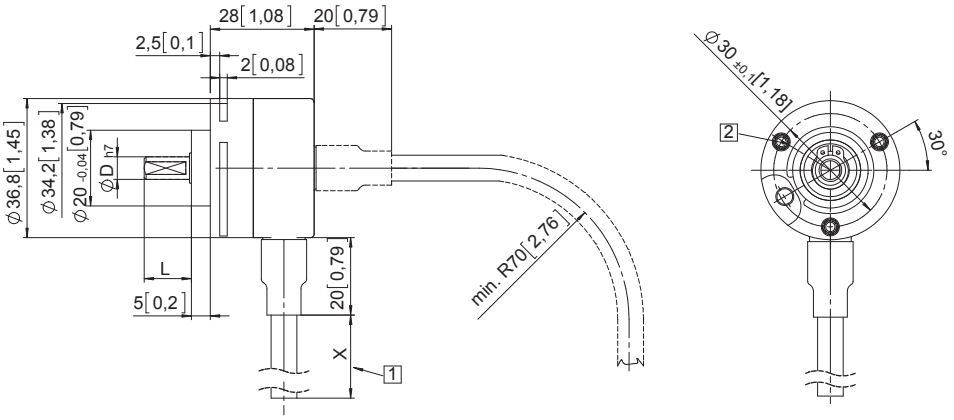
Compact plastic housing, optical	3700 / 3720 (shaft / hollow shaft)	Push-Pull / RS422

Dimensions shaft version

Dimensions in mm [inch]

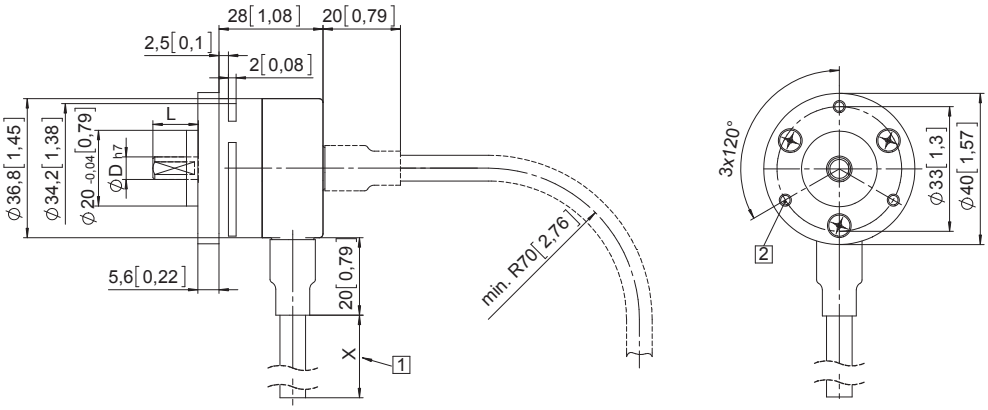
Clamping-synchro flange, ø 36.8 [1.45]
Flange type 1

1 Cable length 1, 2, 3 or 5 m [3.28', 6.56', 9.84' or 16.40']
2 M3, 6 [0.24] deep



Flange adapter, ø 36.8 [1.45]
Flange type A

1 Cable length 1, 2, 3 or 5 m [3.28', 6.56', 9.84' or 16.40']
2 M3, 6 [0.24] deep



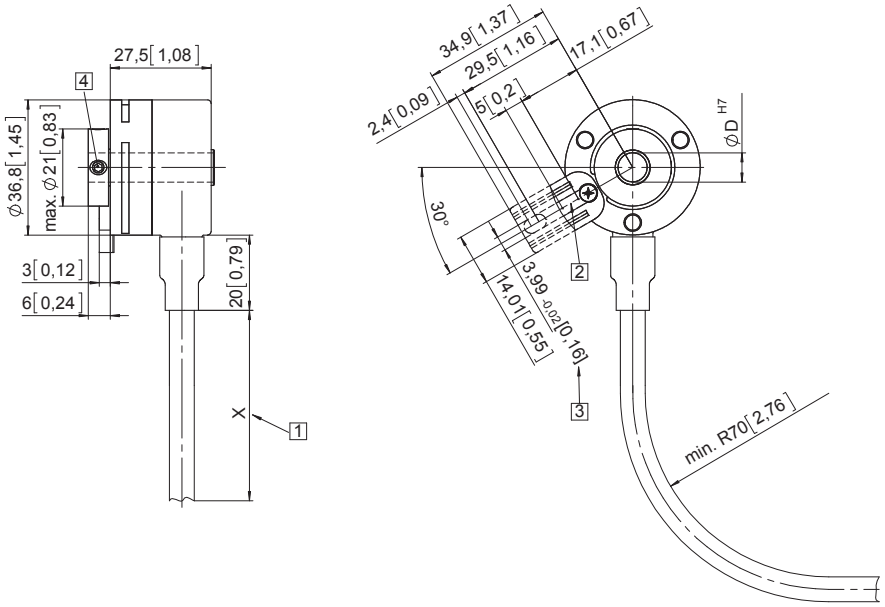
Compact plastic housing, optical	3700 / 3720 (shaft / hollow shaft)	Push-Pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

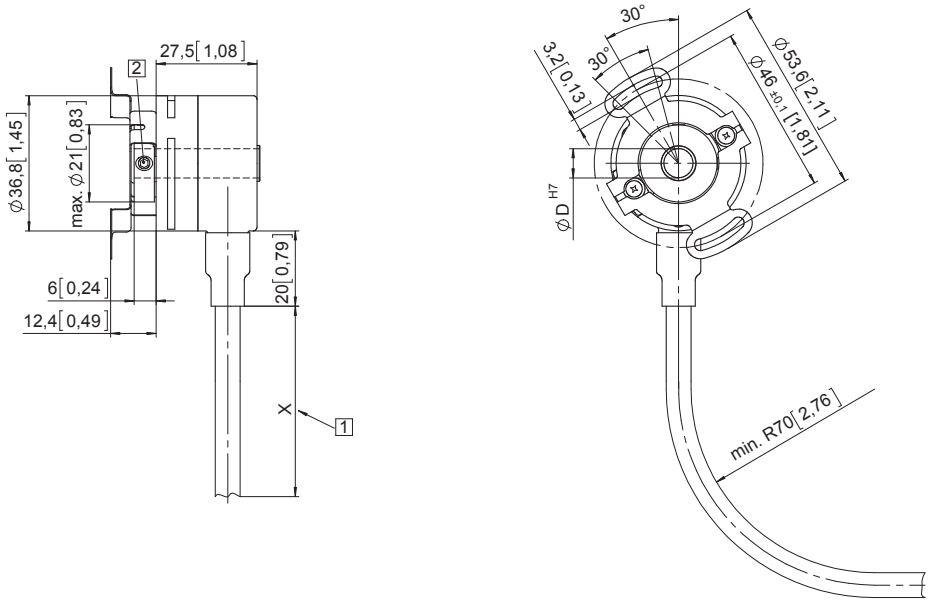
Flange with spring element, short
(long spring element version is shown dashed)
Flange type 1 (2)

1 Cable length 1, 2, 3 or 5 m [3.28', 6.56', 9.84' or 16.40']
2 Slot for torque stop, 3 [0.12] deep
3 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
4 Recommended torque for the clamping ring 1.0 Nm



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

1 Cable length 1, 2, 3 or 5 m [3.28', 6.56', 9.84' or 16.40']
2 Recommended torque for the clamping ring 1.0 Nm



Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-Pull / RS422**

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.

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

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.
- Wide temperature range, -40°C ... +85°C.

Many variants

- Suitable connection variant for every specific case: cable connection, M12, M23 and MIL 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.

Order code Shaft version

8.5000	.	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*

5 = synchro flange, IP67	ø 50.8 mm [2"]
6 = synchro flange, IP65	ø 50.8 mm [2"]
7 = clamping flange, IP67	ø 58 mm [2.28"]
8 = clamping flange, IP65	**ø 58 mm [2.28"]**
A = synchro flange, IP67	ø 58 mm [2.28"]
B = synchro flange, IP65	**ø 58 mm [2.28"]**
C = square flange, IP67	□63.5 mm [2.5"]
D = square flange, IP65	□63.5 mm [2.5"]
G = euro flange, IP67	ø 115 mm [4.53"] 2)
1 = servo flange, IP67	ø 50.8 mm [2"] 1)
2 = servo flange, IP65	ø 50.8 mm [2"] 1)
3 = square flange, IP67	□50.8 mm [2"] 1)
4 = square flange, IP65	□50.8 mm [2"] 1)
E = servo flange, IP67	ø 63.5 mm [2.5"] 1)
F = servo flange, IP65	ø 63.5 mm [2.5"] 1)

b *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 = ø 8 x 15 mm [0.32 x 0.59"]	4 = ø 3/8 x 5/8"
3 = ø 10 x 20 mm [0.39 x 0.79"]	
B = ø 11 x 33 mm [0.43 x 1.30"], with feather key shaft slot 3)	
5 = ø 12 x 20 mm [0.47 x 0.79"]	
7 = ø 1/4 x 7/8" 1)	
8 = ø 3/8 x 7/8" 1)	

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 1)
8 = Push-Pull (7272 with inverted signal), without capacitor / 5 ... 30 V DC 1)

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, 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 1)

*) 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.: 8.5000.814A.1024.0030 (for cable length 3 m)

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)

Stock types

8.5000.8354.1024
8.5000.8354.5000
8.5000.8358.0200
8.5000.8358.0360
8.5000.8358.0500
8.5000.8358.1000
8.5000.8358.5000
8.5000.B157.1024

Optional on request

- other pulse rates
- Ex 2/22
- surface protection salt spray tested

1) US version.
2) Only in conjunction with shaft type B.
3) Only in conjunction with flange type G.

Standard optical | Sendix 5000 / 5020 (shaft / hollow shaft) | Push-Pull / RS422

Order code Hollow shaft

8.5020 . 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, IP67
2 = with spring element, long, IP65
3 = with fastening arm, long, IP67
4 = with fastening arm, long, IP65
7 = with stator coupling, IP67 ø 65 mm [2.56"]
8 = with stator coupling, IP65 ø 65 mm [2.56"]
C = with stator coupling, IP67 ø 63 mm [2.48"]
D = with stator coupling, IP65 ø 63 mm [2.48"]

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

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

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)

d *Type of connection*
1 = radial cable, 1 m [3.28'] PVC
A = radial cable, special length PVC *)
2 = radial M12 connector, 8-pin
4 = radial M23 connector, 12-pin
7 = radial MIL connector, 10-pin
E = tangential cable, 1 m [3.28'] PVC
F = tangential cable, special length PVC *)
H = tangential cable, 0.3 m [0.98'] PVC, including M12 connector for central fastening

*) Available special lengths (connection types A, 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.: 8.5020.234A.1024.0030 (for cable length 3 m)

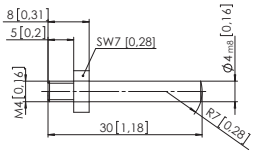
e *Pulse rate*
1, 5, 10, 12, 36, 100, 200, 250, 256, **360**, 400, 500, **512**, 600, 800, **1000**, **1024**, 1200, 2000, **2048**, **2500**, **3600**, **4096**, **5000**
(e.g. 100 pulses => 0100)

Stock types
8.5020.2351.1000
8.5020.2351.2500
8.5020.8552.1024

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

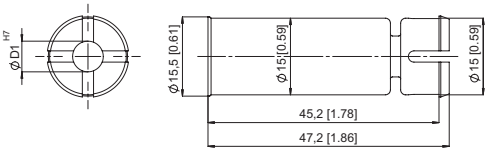
Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	**8.0000.1102.0606**
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	**8.0000.1102.1010**

Mounting accessory for hollow shaft encoders		Order no.
Cylindrical pin, long for torque stops	with fixing thread	**8.0010.4700.0000**



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 8.5020.X8XX.XXXX.

D1	Isolation insert
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**

1) US version.

Incremental encoders

Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-Pull / RS422

Connection technology

		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
	MIL female connector with coupling nut, 10-pin	**8.0000.5062.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6201.0002**

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} 6000 min^{-1} (continuous)
	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
	IP67	< 0.05 Nm
Shaft load capacity	radial	80 N
	axial	40 N

Weight	approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	
without shaft seal	IP65
with shaft seal	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	2500 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)	**RS422** (TTL compatible)	**Push-Pull**	**Push-Pull** (7272 compatible)	**Push-Pull** (7272, without capacitor)	**Open collector** (7273)
Ordercode	**1**	**4**	**5**	**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 [2]	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 [3]	yes [4]	yes [4]	yes	yes	yes [4]	yes
Reverse polarity protection of the power supply	yes	no	yes	no	no	no
UL approval	file 224618					
CE compliant acc. to	EMC guideline 2004/108/EC 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) 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.

Standard optical | Sendix 5000 / 5020 (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, 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 colour:	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, 8	5000: 3, 4	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: 2, H [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, 8	5000: 7, 8	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: 4	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	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5020: 7	Pin:	F	D		E	A	G	B	H	C	I	J

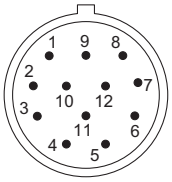
Output circuit	Type of connection	MIL connector, 7-pin											
1, 3, 4, 5, 8	5000: W	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	F	D		E	A		B		C		G

Output circuit	Type of connection	MIL connector, 6-pin											
1, 3, 4, 5, 8	5000: 9	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	A	B			E		D		C		

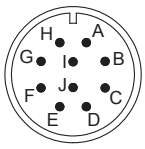
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output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

Top view of mating side, male contact base

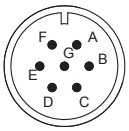
M12 connector, 8-pin



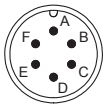
M23 connector, 12-pin



MIL connector, 10-pin



MIL connector, 7-pin



MIL connector, 6-pin

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

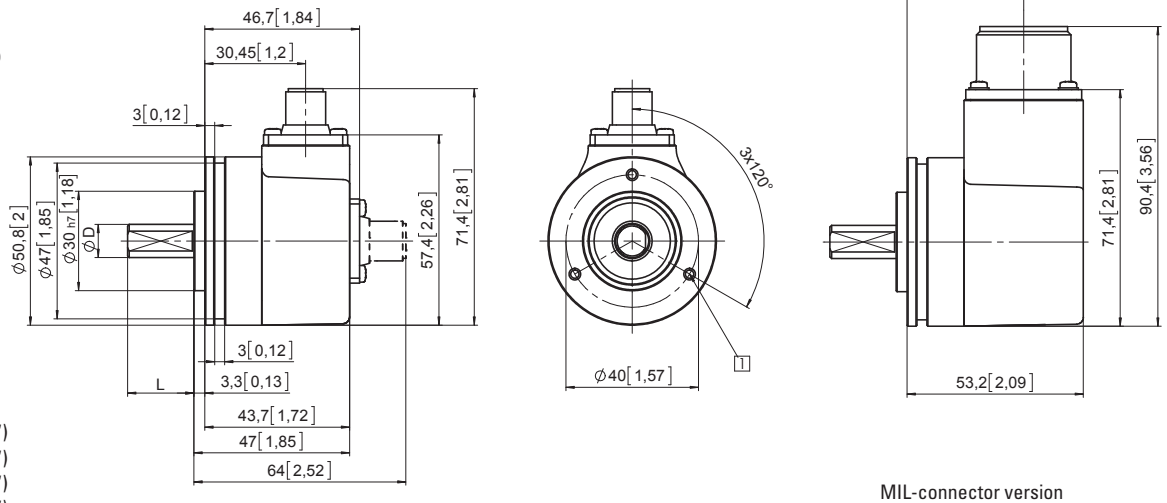
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-Pull / RS422**

Dimensions shaft version

Dimensions in mm [inch]

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

1 M3, 6 [0.24] deep

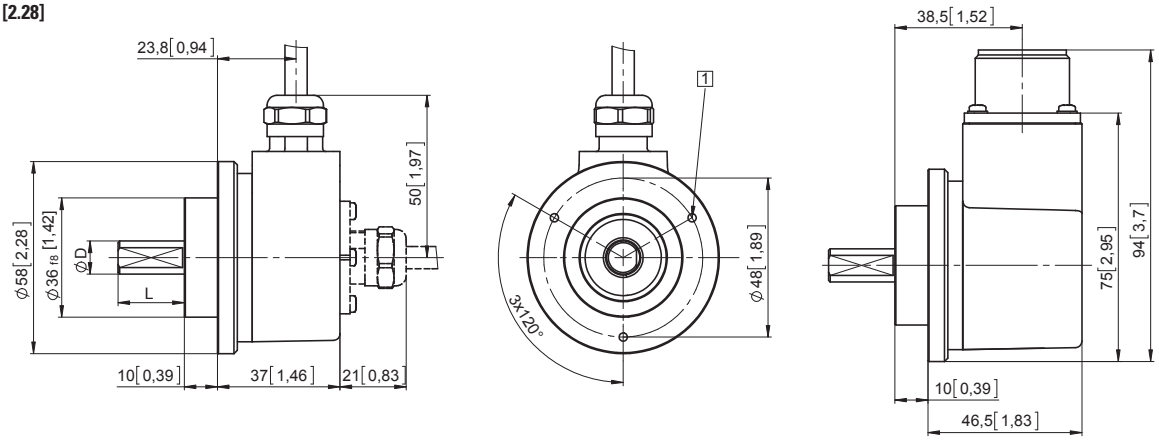


D = ø 6 h7 [0.24]
ø 8 h7 [0.32]
ø 10 f7 [0.39]
ø 12 h7 [0.47]
ø 1/4" h7 (L = 5/8")
ø 3/8" h7 (L = 5/8")
ø 1/4" h8 (L = 7/8")
ø 3/8" h8 (L = 7/8")

MIL-connector version

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

1 M3, 6 [0.24] deep

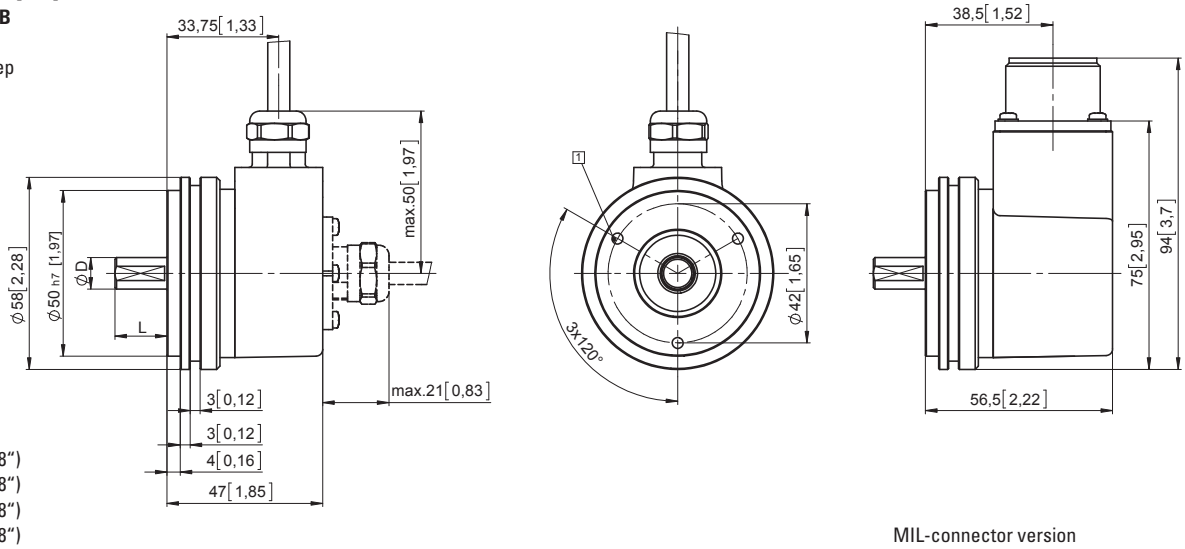


D = ø 6 h7 [0.24]
ø 8 h7 [0.32]
ø 10 f7 [0.39]
ø 12 h7 [0.47]
ø 1/4" h7 (L = 5/8")
ø 3/8" h7 (L = 5/8")
ø 1/4" h8 (L = 7/8")
ø 3/8" h8 (L = 7/8")

MIL-connector version

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

1 M4, 6 [0.24] deep



D = ø 6 h7 [0.24]
ø 8 h7 [0.32]
ø 10 f7 [0.39]
ø 12 h7 [0.47]
ø 1/4" h7 (L = 5/8")
ø 3/8" h7 (L = 5/8")
ø 1/4" h8 (L = 7/8")
ø 3/8" h8 (L = 7/8")

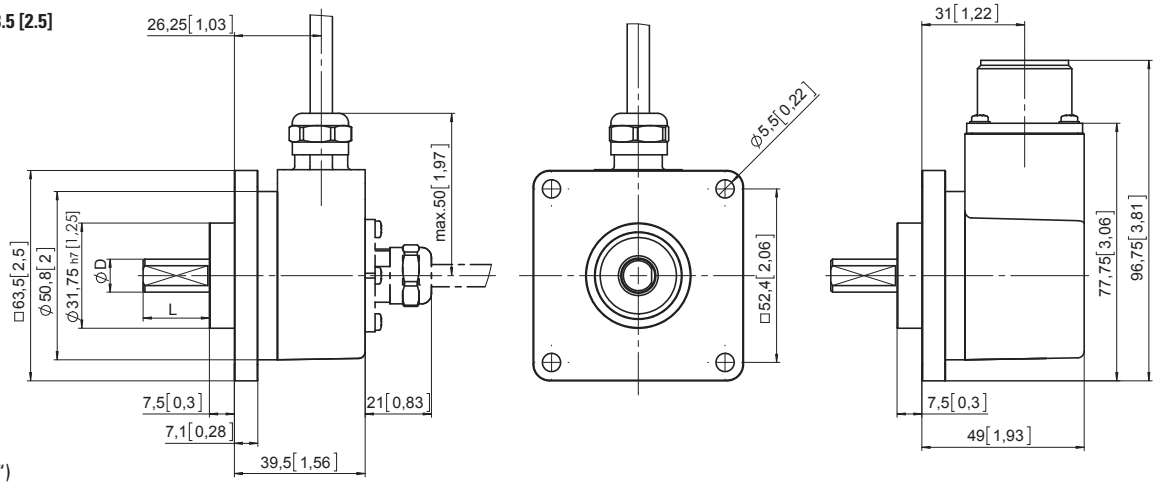
MIL-connector version

Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-Pull / RS422**

Dimensions shaft version

Dimensions in mm [inch]

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

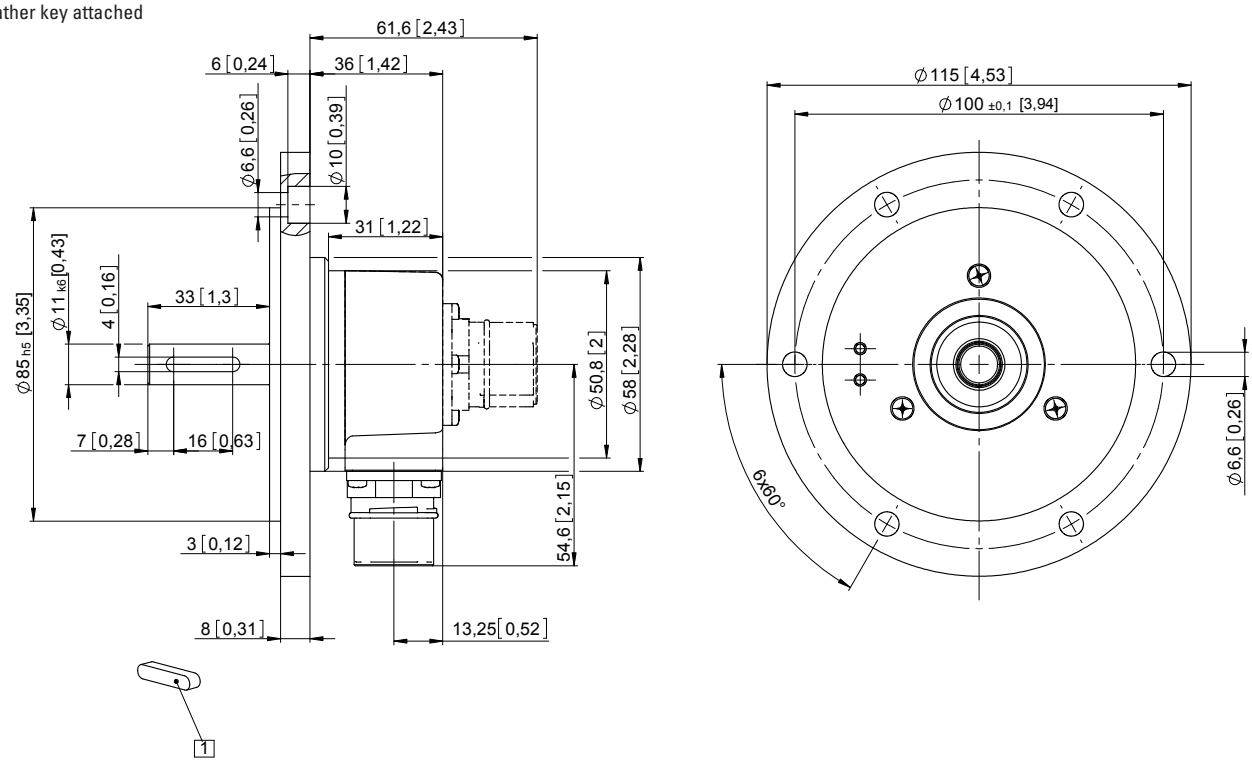


D = ø 6 h7 [0.24]
ø 8 h7 [0.32]
ø 10 f7 [0.39]
ø 12 h7 [0.47]
ø 1/4" h7 (L = 5/8")
ø 3/8" h7 (L = 5/8")
ø 1/4" h8 (L = 7/8")
ø 3/8" h8 (L = 7/8")

MIL-connector version

Euro flange, ø 115 [4.53]
Flange type G

1 Feather key attached



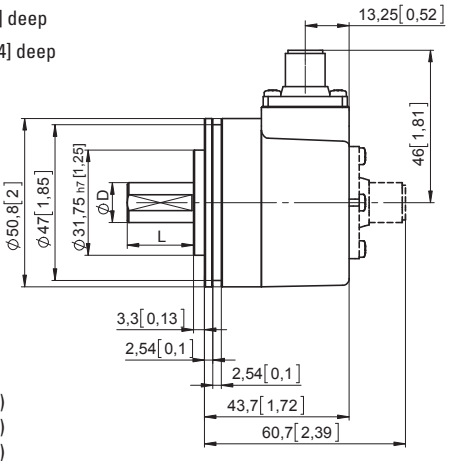
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-Pull / RS422**

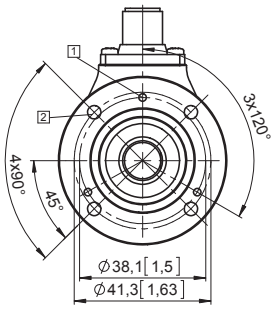
Dimensions shaft version

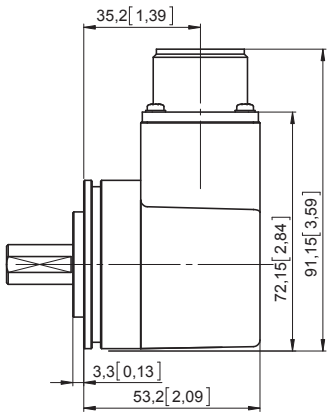
Dimensions in mm [inch]

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

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





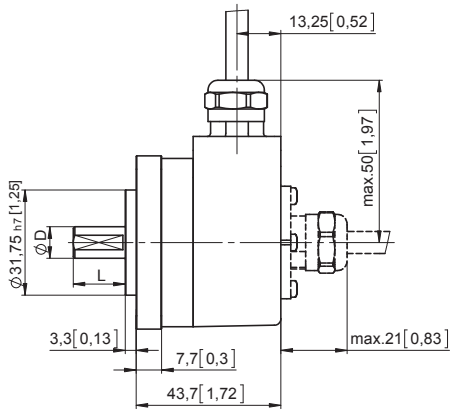


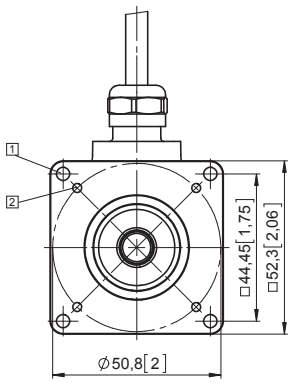
MIL-connector version

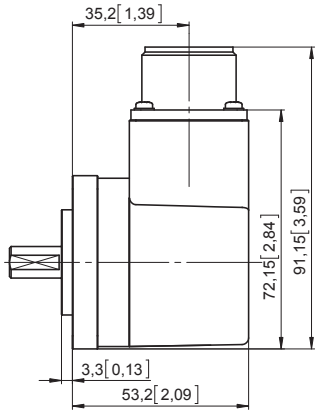
D = ø 6 h7 [0.24]
ø 8 h7 [0.32]
ø 10 f7 [0.39]
ø 12 h7 [0.47]
ø 1/4" h7 (L = 5/8")
ø 3/8" h7 (L = 5/8")
ø 1/4" h8 (L = 7/8")
ø 3/8" h8 (L = 7/8")

Square flange, □ 50.8 [2]
Flange type 3 and 4

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





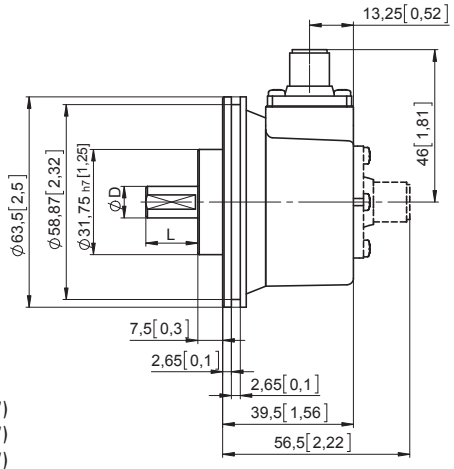


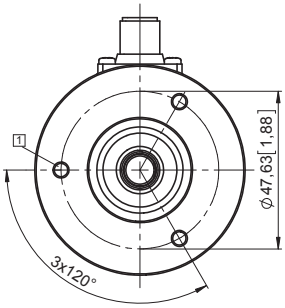
MIL-connector version

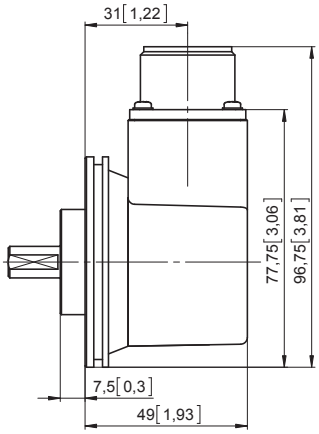
D = ø 6 h7 [0.24]
ø 8 h7 [0.32]
ø 10 f7 [0.39]
ø 12 h7 [0.47]
ø 1/4" h7 (L = 5/8")
ø 3/8" h7 (L = 5/8")
ø 1/4" h8 (L = 7/8")
ø 3/8" h8 (L = 7/8")

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

1 6-32 UNC







MIL-connector version

D = ø 6 h7 [0.24]
ø 8 h7 [0.32]
ø 10 f7 [0.39]
ø 12 h7 [0.47]
ø 1/4" h7 (L = 5/8")
ø 3/8" h7 (L = 5/8")
ø 1/4" h8 (L = 7/8")
ø 3/8" h8 (L = 7/8")

Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-Pull / RS422

Dimensions hollow shaft version

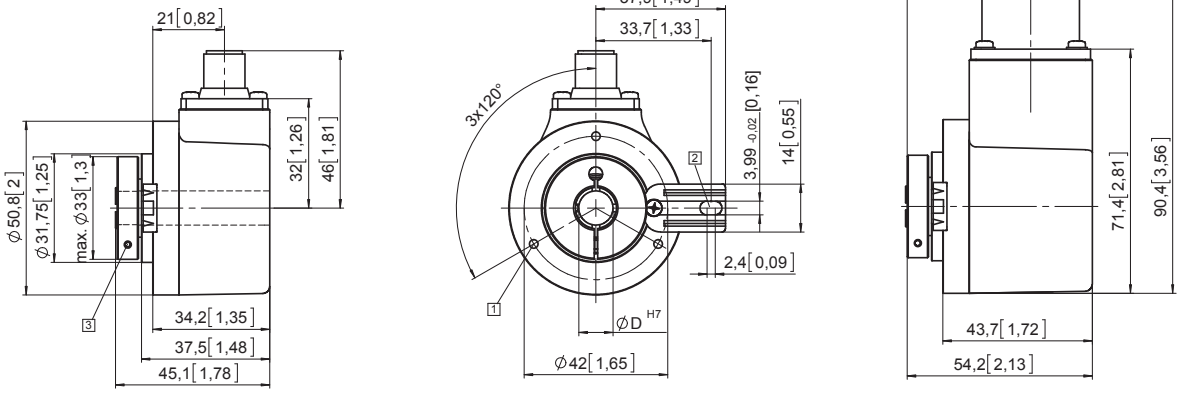
Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

1 M3, 6 [0.24] deep

2 Torque stop slot,
recommendation: cylindrical pin DIN7, 4 [0.16]

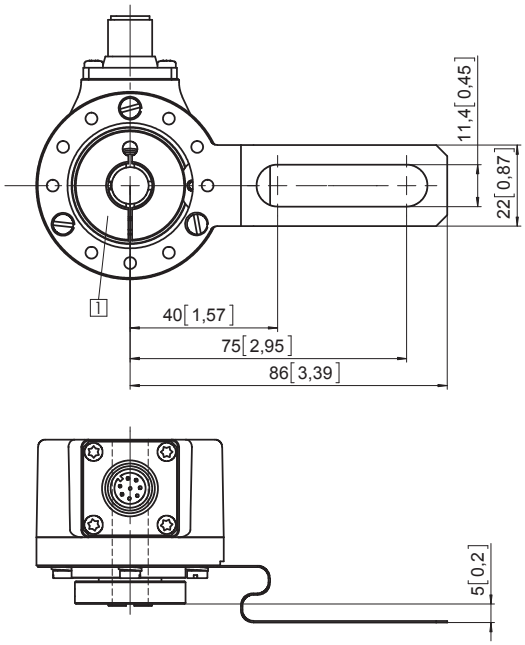
3 Recommended torque for the clamping ring 0.6 Nm



MIL-connector version

Flange with fastening arm, long
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm



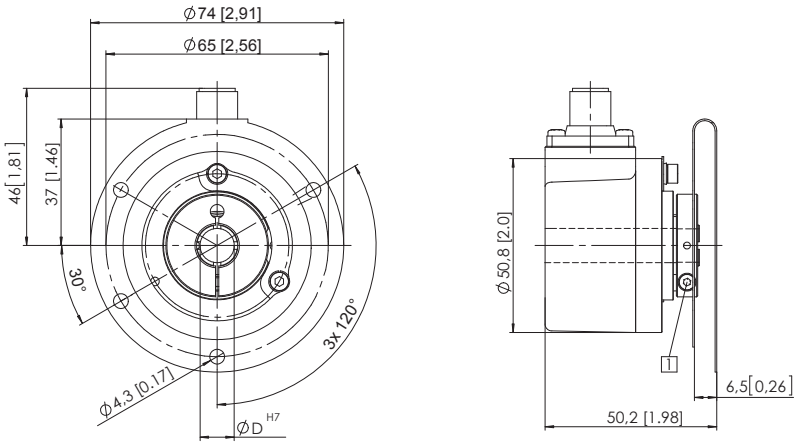
Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-Pull / RS422**

Dimensions hollow shaft version

Dimensions in mm [inch]

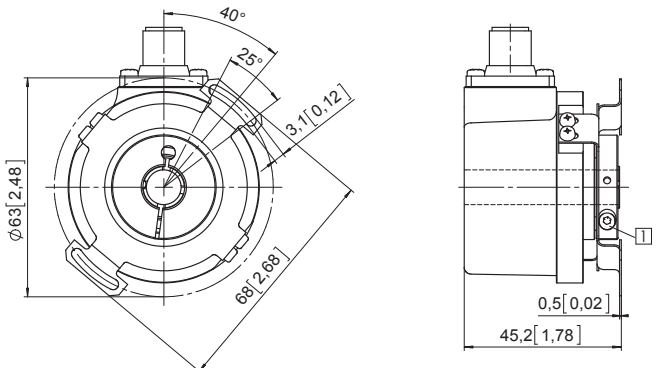
Flange with stator coupling, ø 65 [2.56]
Flange type 7 and 8

1 Recommended torque for the clamping ring 0.6 Nm



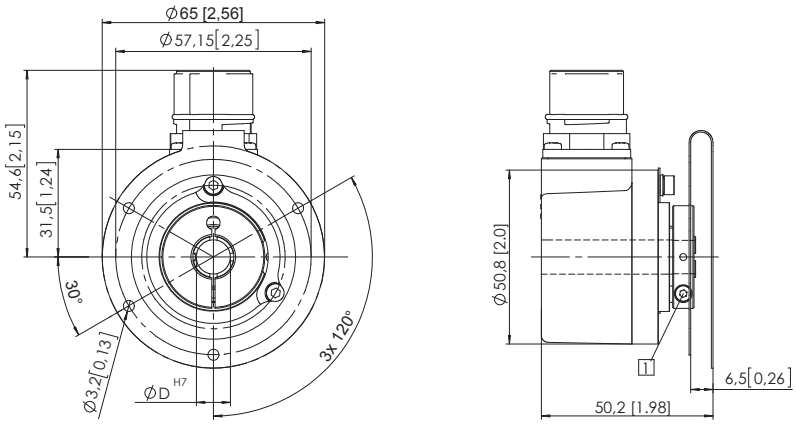
Flange with stator coupling, ø 63 [2.48]
Flange type C and D

1 Recommended torque for the clamping ring 0.6 Nm



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

1 Recommended torque for the clamping ring 0.6 Nm



Standard optical | **Sendix 5000 / 5020 (shaft / hollow shaft)** | **Push-Pull / RS422**

Dimensions hollow shaft version

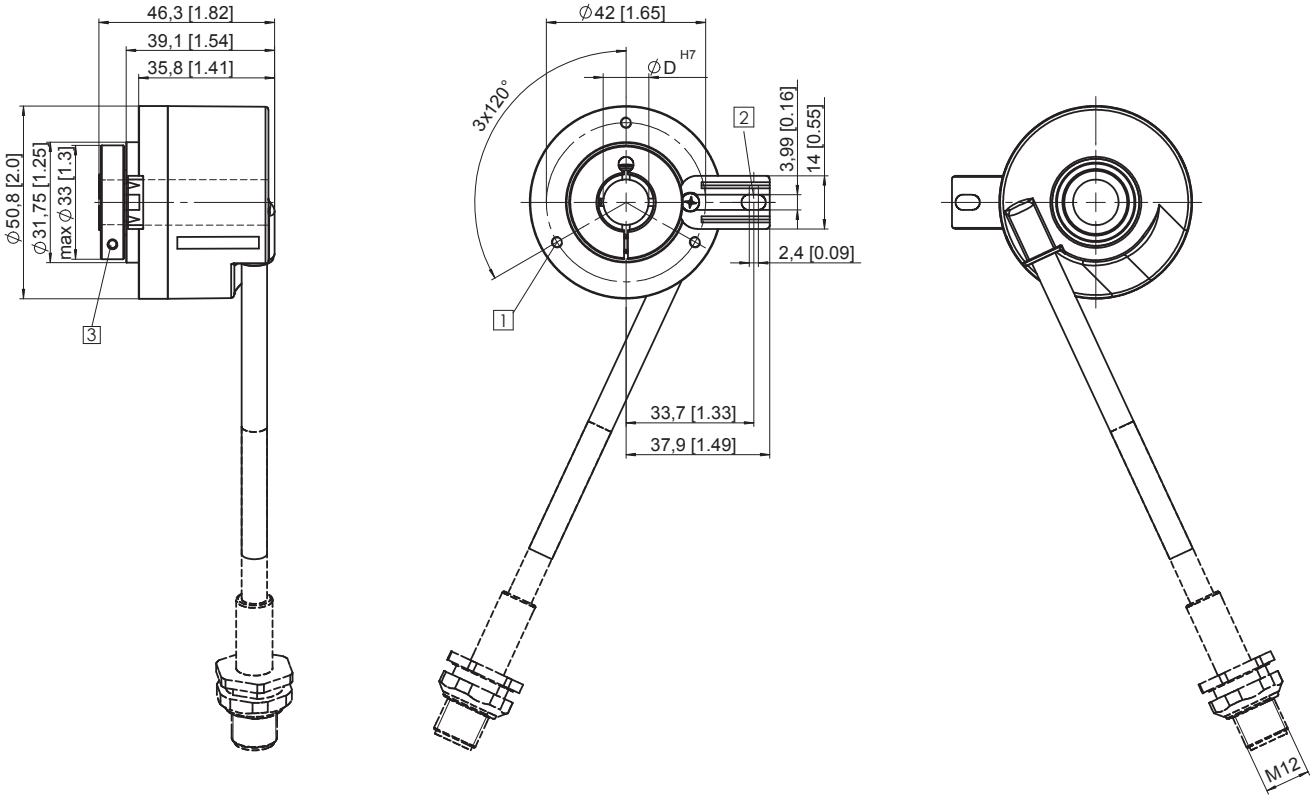
Dimensions in mm [inch]

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

1 M3, 6 [0.24] deep

2 Torque stop slot,
recommendation: cylindrical pin DIN7, 4 [0.16]

3 Recommended torque for the clamping ring 0.6 Nm



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

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 [3)] and spring element, short
3 = with hollow shaft and stator coupling, ø 65 mm [2.56"]
4 = with blind hollow shaft [3)] and stator coupling, ø 65 mm [2.56"]

b *Hollow shaft*
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

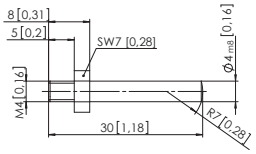
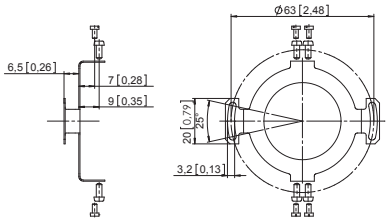
e *Pulse rate*
25, 50, 60, 100, 125, 200, 250, 256, 300, 360, 500, 512, 600, 720, 800, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000
(e.g. 100 pulses => 0100)

Optional on request
- other pulse rates

1) Only in conjunction with flange M or P.
2) Only with output circuit 7.
3) Insertion depth ≤ 30 mm [1.18"].

Standard high temperature, optical	5803 / 5823 (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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**
Stator coupling **ø 63 mm [2.48"]**		**8.0010.4D00.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6901.0002**

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 ... +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 2004/108/EC 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:
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.

Standard
high temperature, optical | **5803 / 5823 (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	5803: 1, 2	Signal:	0 V	+V	0 Vsens [2]	+Vsens [2]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5823: 1	Cable colour:	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 [2]	+Vsens [2]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5823: 2	Pin:	10	12	11	2	5	6	8	1	3	4	PH [1]

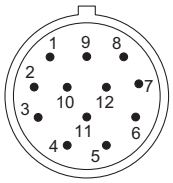
Output circuit	Type of connection	MIL connector, 7-pin											
1, 2, 3, 4, 5, 6, 7	5803: W	Signal:	0 V	+V	0 Vsens [2]	+Vsens [2]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5823: –	Pin:	F	D	–	E	A	–	B	–	C	–	G

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

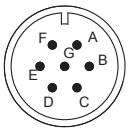
Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 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)

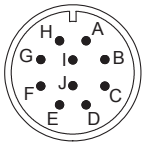
Top view of mating side, male contact base



M23 connector, 12-pin



MIL connector, 7-pin



MIL connector, 10-pin

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.

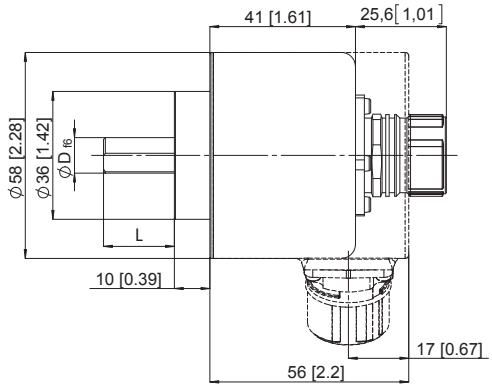
Standard high temperature, optical	5803 / 5823 (shaft / hollow shaft)	Push-Pull / RS422

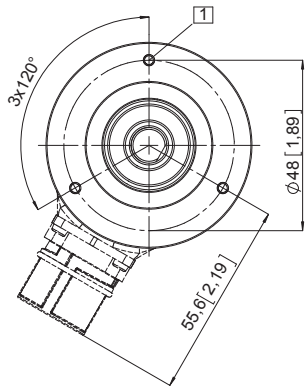
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

1 3 x M3, 5 [0.2] deep

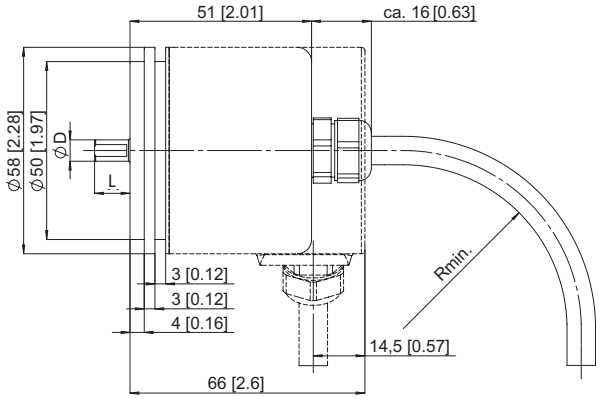


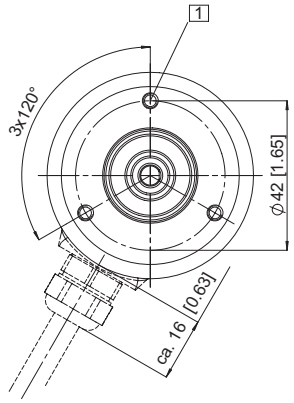


Synchro flange, ø 58 [2.28]
Flange type 2

1 3 x M4, 5 [0.2] deep

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





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

Dimensions hollow shaft version

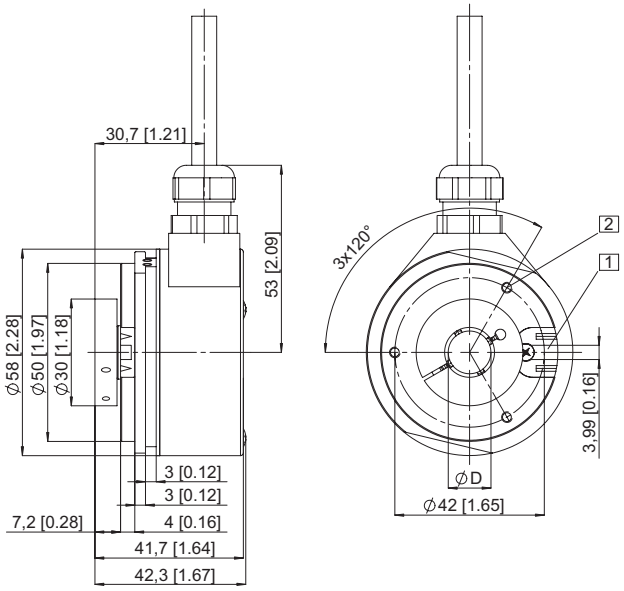
Dimensions in mm [inch]

Flange with spring element, short
Flange type 1 and 2

1 Torque stop slot,
recommendation:
cylindrical pin DIN 7, ø 4 [0.16]

2 M3, 5 [0.2] deep

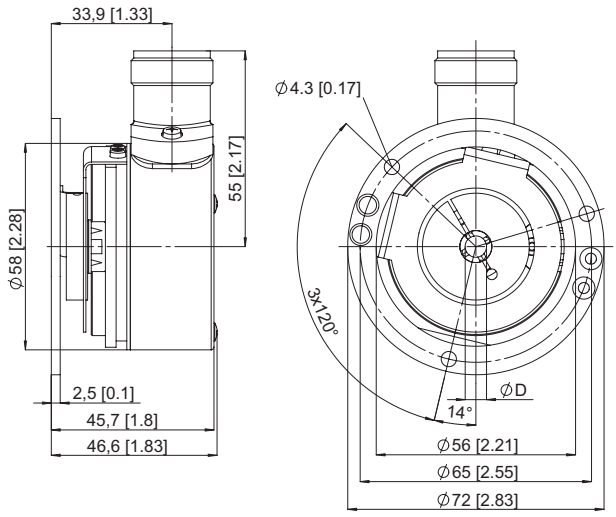
Recommended torque for the clamping ring 0.6 Nm



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

Recommended torque for the clamping ring 0.6 Nm

Note:
Minimum insertion depth 1.5 x $D_{hollow\ shaft}$

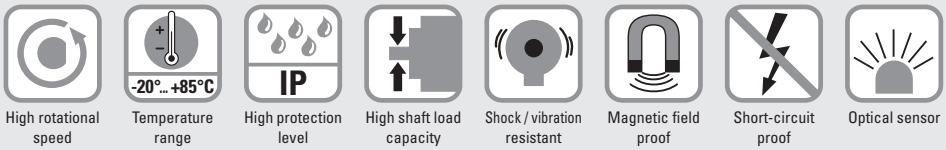


Standard
sine wave output, with zero pulse, optical | 5804 / 5824 (shaft / hollow shaft) | SinCos

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 | High protection level | 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 [1] and spring element, short
3 = with hollow shaft and stator coupling, ø 65 mm [2.56“]
4 = with blind hollow shaft [1] and stator coupling, ø 65 mm [2.56“]

b *Hollow shaft*
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)

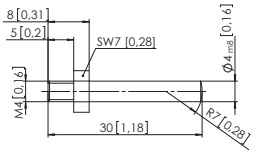
Optional on request
- other pulse rates

1) Insertion depth ≤ 30 mm [1.18“].

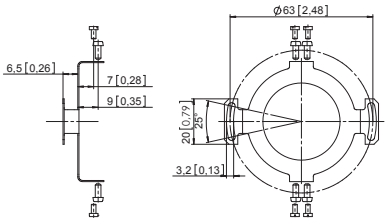
Standard sine wave output, with zero pulse, optical	5804 / 5824 (shaft / hollow shaft)	SinCos

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		Order no.
Cylindrical pin, long for torque stops	with fixing thread	**8.0010.4700.0000**



Stator coupling **ø 63 mm [2.48“]**		**8.0010.4D00.0000**



Connection technology		Order no.
Connector, self-assembly (straight)	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56‘] PVC cable	**8.0000.6901.0002**

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 2004/108/EC 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.

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

Terminal assignment

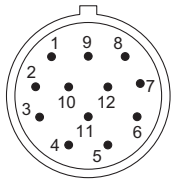
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2	5804: 1, 2	Signal:	0 V	+V	0 Vsens 2)	+Vsens 2)	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5824: 1	Cable colour:	WH 0.5 mm²	BN 0.5 mm²	WH	BN	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection	M23 connector, 12-pin											
1, 2	5804: 3, 5	Signal:	0 V	+V	0 Vsens 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



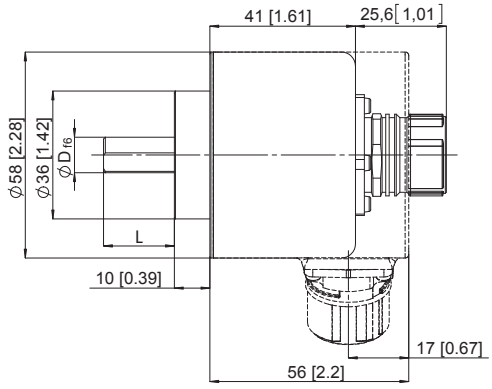
M23 connector, 12-pin

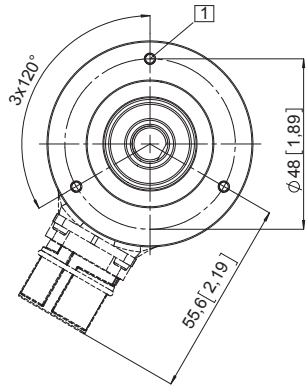
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

1 3 x M3, 5 [0.2] deep

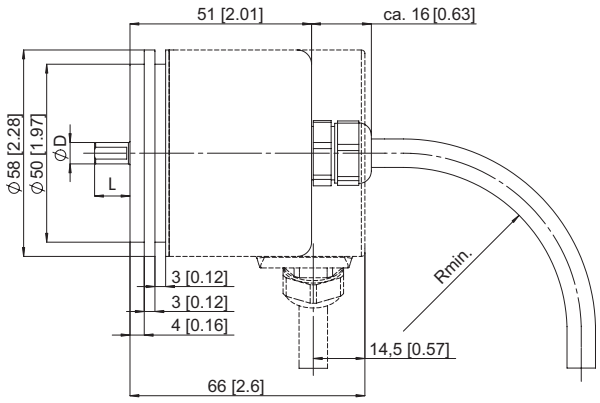


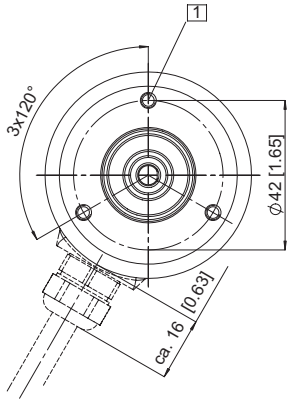


Synchro flange, ø 58 [2.28]
Flange type 2

1 3 x M4, 5 [0.2] deep

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





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.

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

Dimensions hollow shaft version

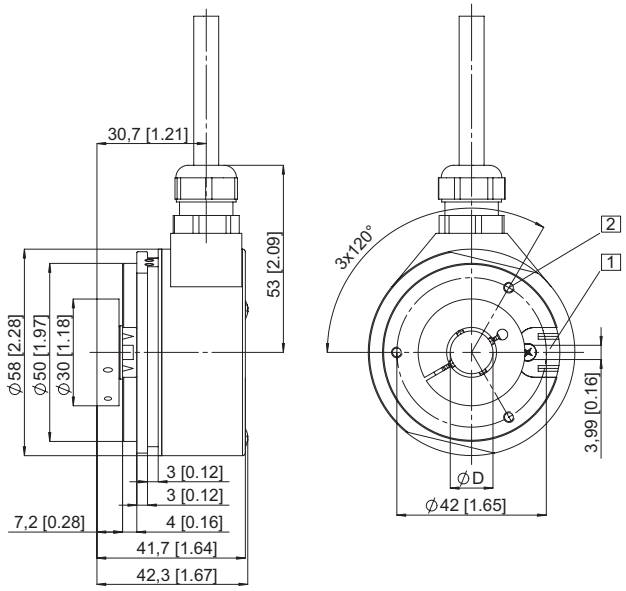
Dimensions in mm [inch]

Flange with spring element, short
Flange type 1 and 2

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 M3, 5 [0.2] deep

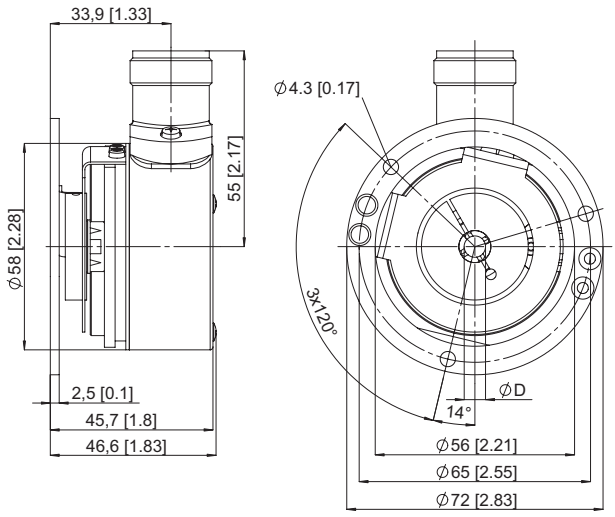
Recommended torque for the clamping ring 0.6 Nm



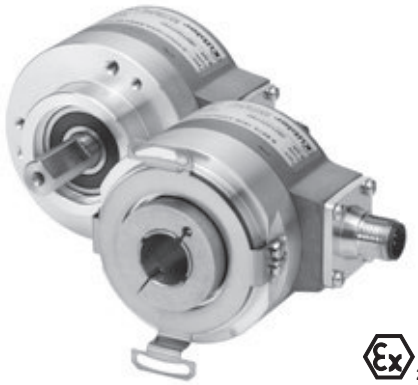
Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

Recommended torque for the clamping ring 0.6 Nm

Note:
Minimum insertion depth 1.5 x $D_{hollow\ shaft}$



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.

Ex 2/22 | c UL us | RoHS

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 | 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
- 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 *Hollow shaft*
3 = ø 10 mm [0.39"]
K = ø 10 mm [0.39"], tapered shaft
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 *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
- surface protection salt spray tested

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

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

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	aluminium
	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		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 2004/108/EC 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 colour:	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.

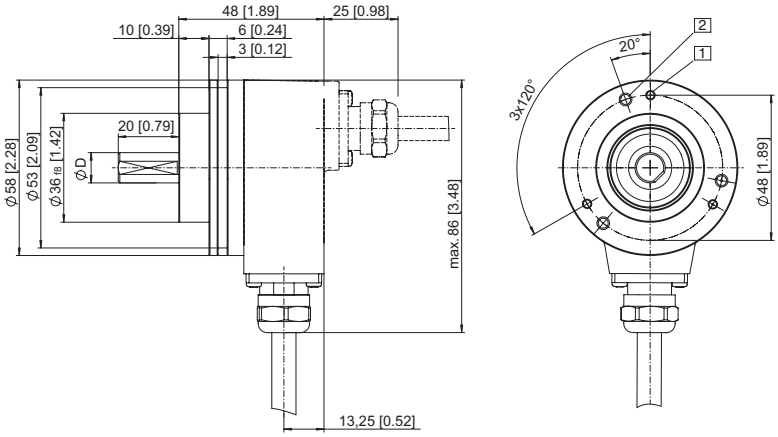
Standard
sine wave output, highly interpolable, optical | **Sendix 5814 / 5834 (shaft / hollow shaft)** | **SinCos**

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 =10 ^{f7} [0.39]

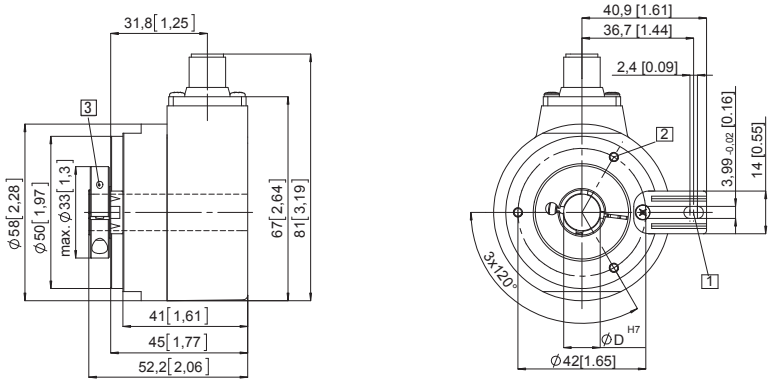


Dimensions hollow shaft version

Dimensions in mm [inch]

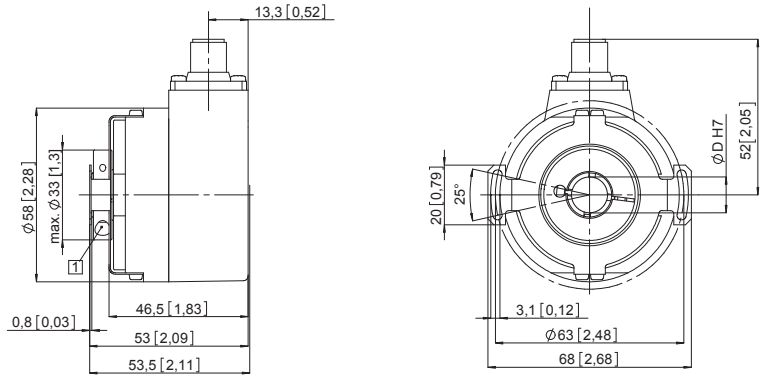
Flange with spring element, long
Flange type 1
(drawing with M12 connector)

1 Torque stop slot, 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



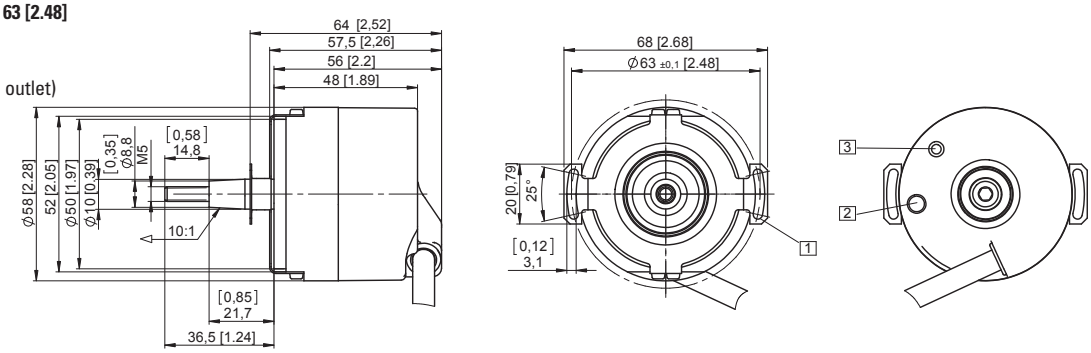
Flange with stator coupling, ø 63 [2.48] and hollow shaft
Flange type 5
(drawing with M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm



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

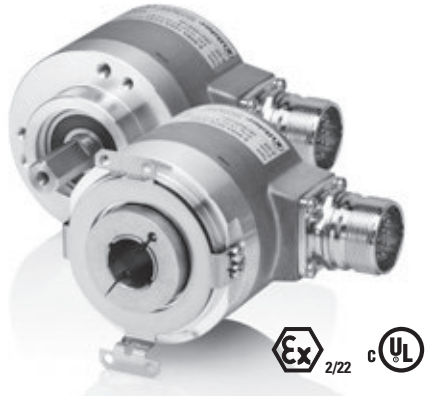
1 For (4x) M3 screw
2 Status LED
3 SET button



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 -40°... +90°C | High protection level IP | 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

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 *Hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft

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)

Incremental encoders

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

Accessory		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.	

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable [1]	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable [1]	**8.0000.6901.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
	M23 female connector with coupling nut, Ex zone 2/22	**8.0000.5012.0000.Ex**

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

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 / HFT = 1)
PFH_d value [2]	2.16 x 10^{-8} h^{-1}
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
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 [4]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2004/108/EC 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

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 intertia		
	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]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PVC
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) Other lengths available.
2) 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.
3) Cable version: -30°C ... + 90°C [-22°F ... +194°F] fixed installation.
4) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [1]
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 colour:	WH	BN	GN	YE	GY	PK	shield

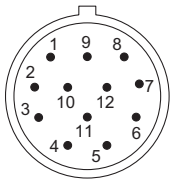
Output circuit	Type of connection	M23 connector, 12-pin							
1, 2	3, 4	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	10	12	5	6	8	1	PH [2]

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 [2]

+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) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
2) PH = shield is attached to connector housing.

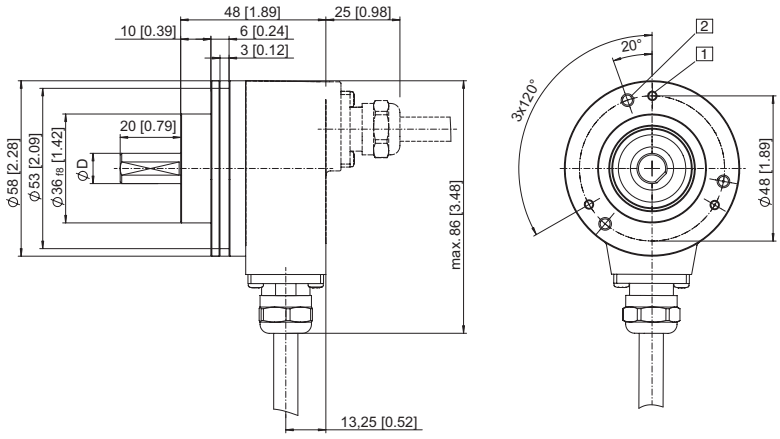
Standard
sine wave output, SIL2/PLd, optical | **Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)** | **SinCos**

Dimensions shaft version

Dimensions in mm [inch]

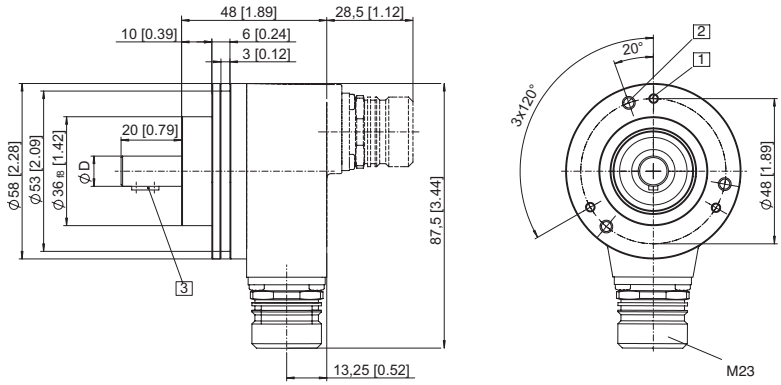
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
D =10 ^{f7} [0.39]



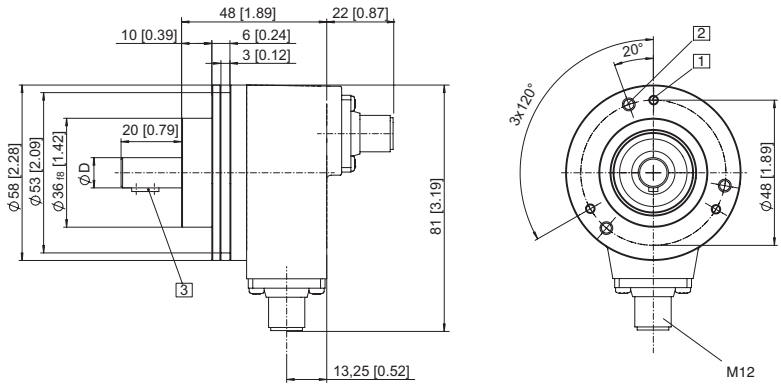
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6
D =10 ^{h7} [0.39]



(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 =10 mm ^{h7} [0.39]



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

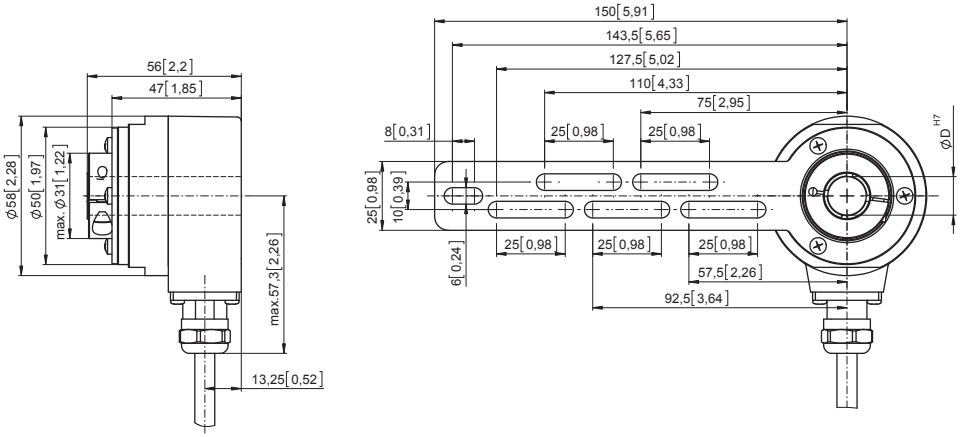
Dimensions hollow shaft version

Dimensions in mm [inch]

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

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

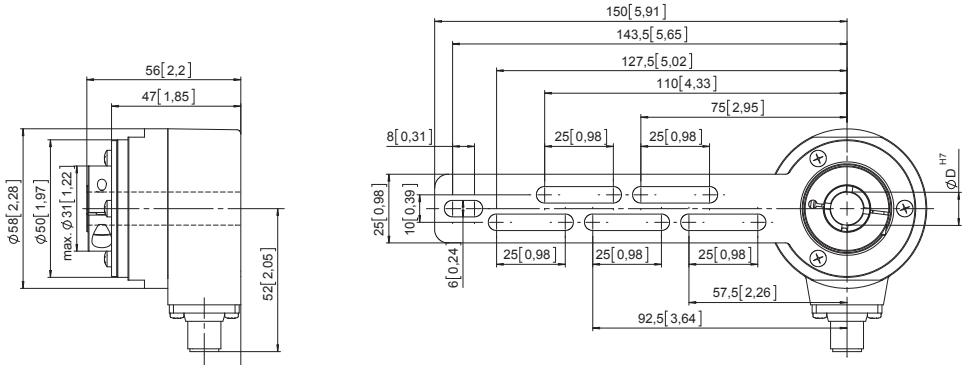
D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



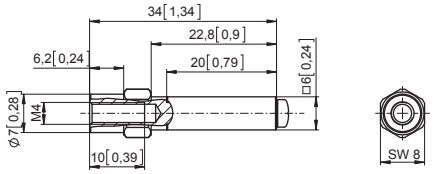
(drawing with M12 connector)

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

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



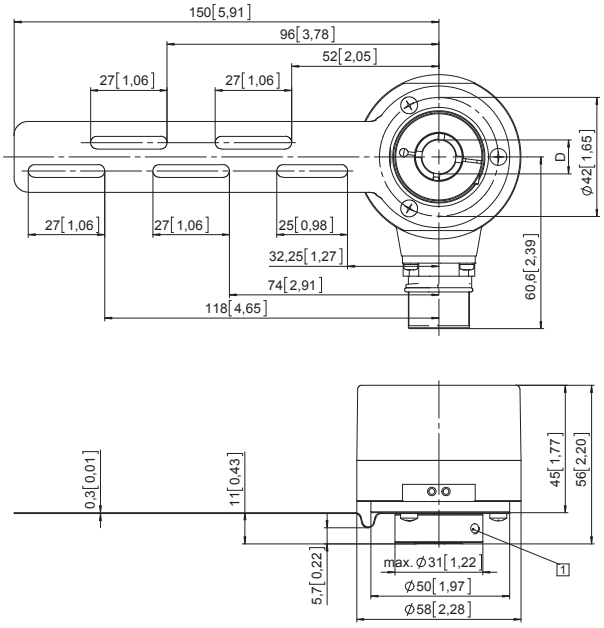
Torque pin with rectangular sleeve with M4 thread



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

1 Recommended torque for the clamping ring 2.5 Nm

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



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

Dimensions hollow shaft version

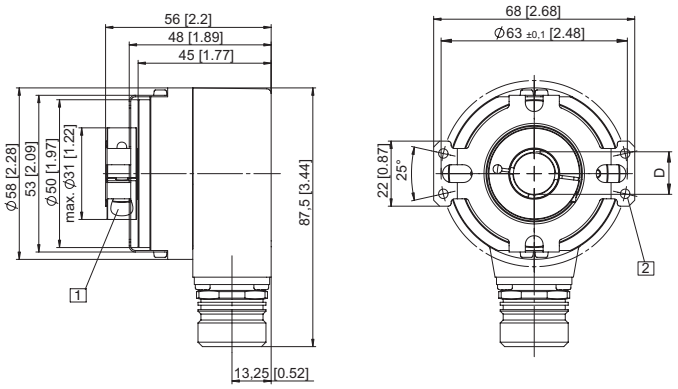
Dimensions in mm [inch]

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

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

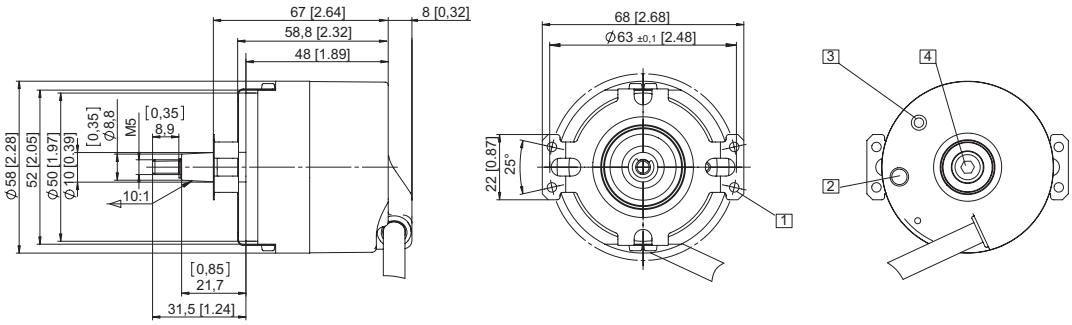
2 For (4x) M3 screw

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



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

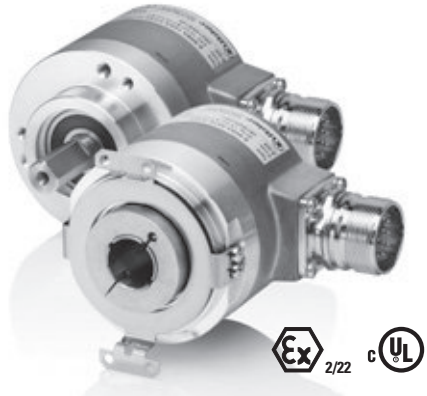
1 For (4x) M3 screw
2 Status LED
3 SET button
4 SW 4



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 -40° ... +90°C | High protection level IP | 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

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 *Hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft

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)

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

Accessory		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.	

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable [1]	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable [1]	**8.0000.6901.0002**
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
	M23 female connector with coupling nut, Ex zone 2/22	**8.0000.5012.0000.Ex**

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

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 / HFT = 1)
PFH_d value [2]	1.09 x 10^{-8} h^{-1}
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
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 [4]
UL approval		file 224618
CE compliant acc. to		EMC guideline 2004/108/EC 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

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 intertia		
	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]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PVC
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) Other lengths available.
2) 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.
3) Cable version: -30°C ... + 90°C [-22°F ... +194°F] fixed installation.
4) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 Vpp (±10 %)
Short circuit proof	yes [1]
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 colour:	WH	BN	GN	YE	GY	PK	shield

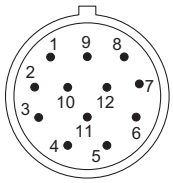
Output circuit	Type of connection	M23 connector, 12-pin							
1, 2	3, 4	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	⏚
		Pin:	10	12	5	6	8	1	PH [2]

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 [2]

+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) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
2) PH = shield is attached to connector housing.

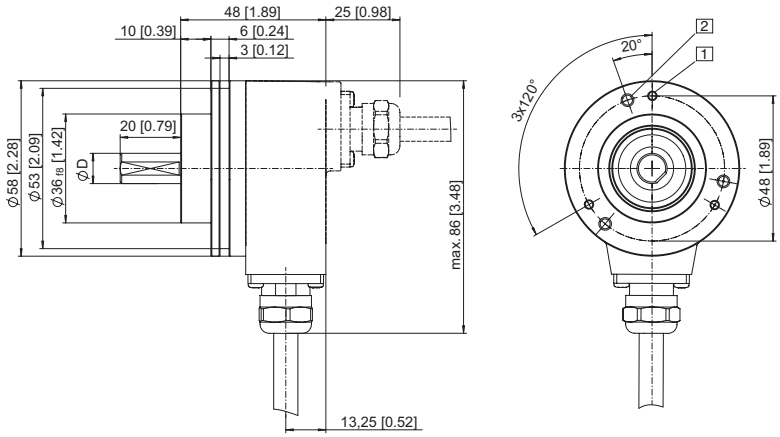
Standard
sine wave output, SIL3/PLe, optical | **Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)** | **SinCos**

Dimensions shaft version

Dimensions in mm [inch]

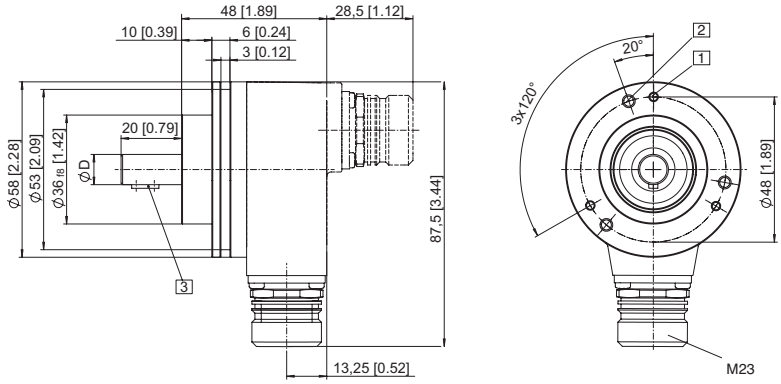
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
D =10 ^{f7} [0.39]



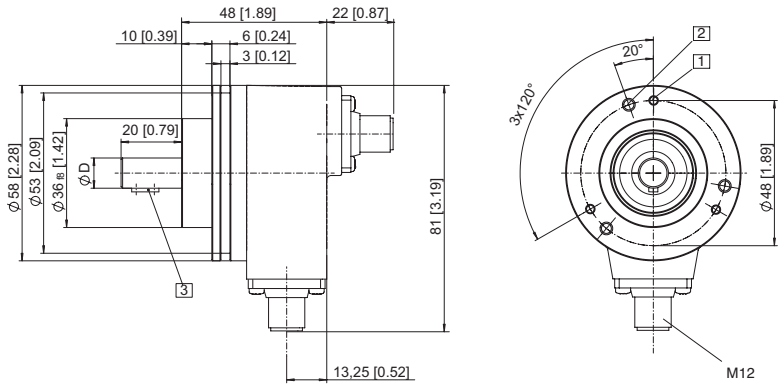
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type A
(drawing with M23 connector)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6
D =10 ^{h7} [0.39]



(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 =10 mm ^{h7} [0.39]



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

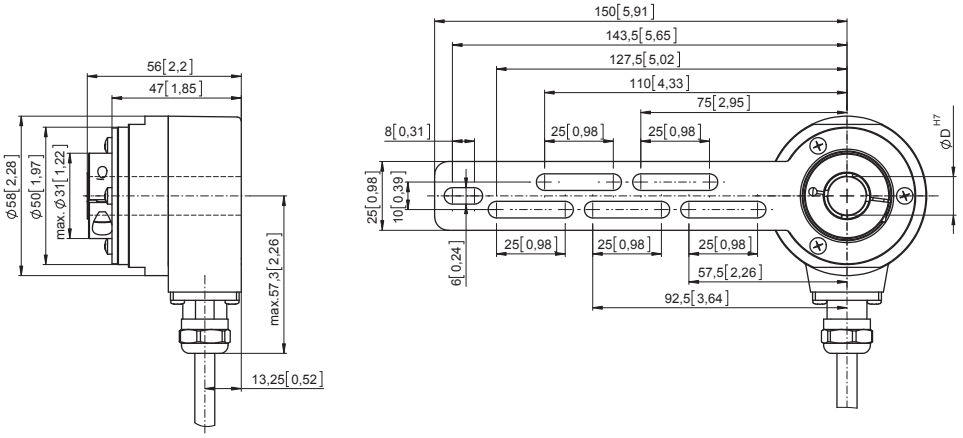
Dimensions hollow shaft version

Dimensions in mm [inch]

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

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

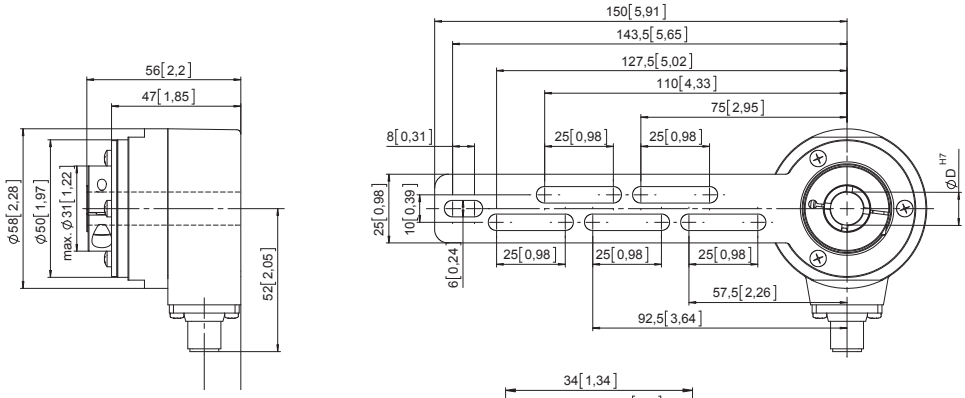
D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



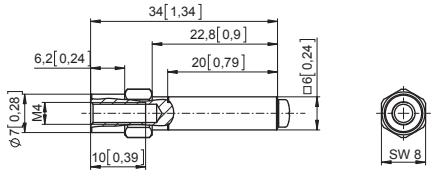
(drawing with M12 connector)

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

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



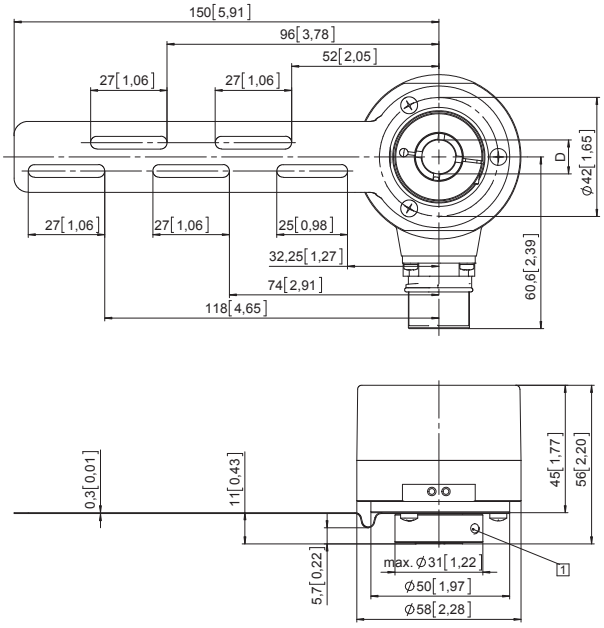
Torque pin with rectangular sleeve with M4 thread



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

1 Recommended torque for the clamping ring 2.5 Nm

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



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

Dimensions hollow shaft version

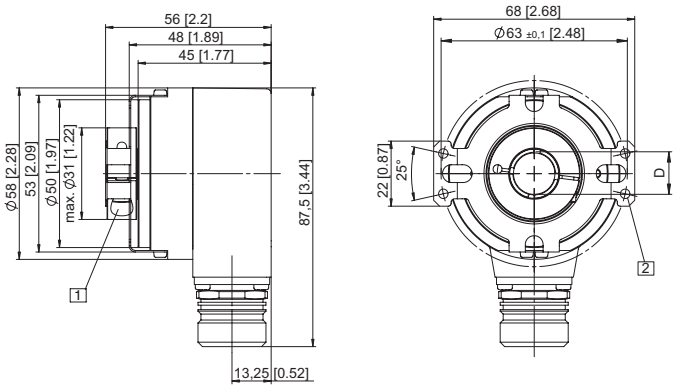
Dimensions in mm [inch]

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

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

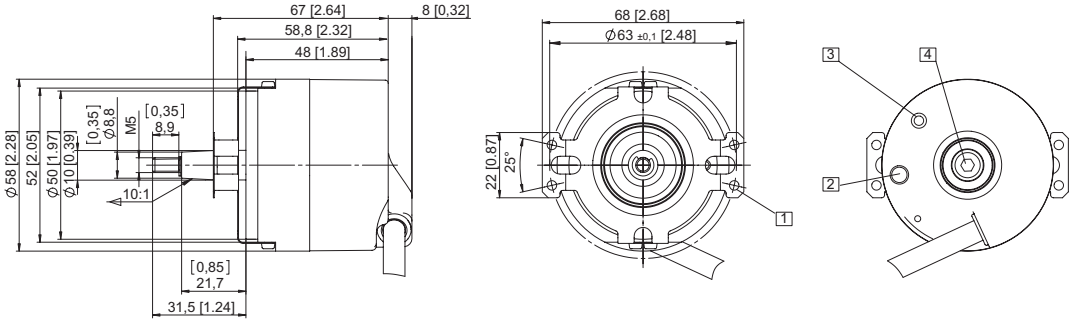
2 For (4x) M3 screw

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



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

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



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

High protection level


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

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

b *Hollow shaft*
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

e *Pulse rate*
6000, 7200, 8000, 8192,
9000, 10000, 18000, 36000
(e.g. 18000 pulses => 18000)

Optional on request
- other pulse rates

1) Insertion depth ≤ 30 mm [1.18“].

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		Order no.
Cylindrical pin, long for torque stops	with fixing thread	**8.0010.4700.0000**
Stator coupling **ø 63 mm [2.48"]**		**8.0010.4D00.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M23 female connector with coupling nut	**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 intertia	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 2004/108/EC 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.

Standard
high resolution, optical

5805 / 5825 (shaft / hollow shaft)

Push-Pull / RS422

Terminal assignment

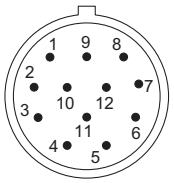
Output circuit	Type of connection		Cable (isolate unused wires individually before initial start-up)											
1, 2, 3, 4, 5, 6, 7	5805:	1, 2	Signal:	0 V	+V	0 Vsens [2]	+Vsens [2]	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
	5825:	1	Cable colour:	WH 0.5 mm²	BN 0.5 mm²	WH	BN	GN	YE	GY	PK	BU	RD	shield

Output circuit	Type of connection		M23 connector, 12-pin											
1, 2, 3, 4, 5, 6, 7	5805:	3, 5	Signal:	0 V	+V	0 Vsens [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]

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



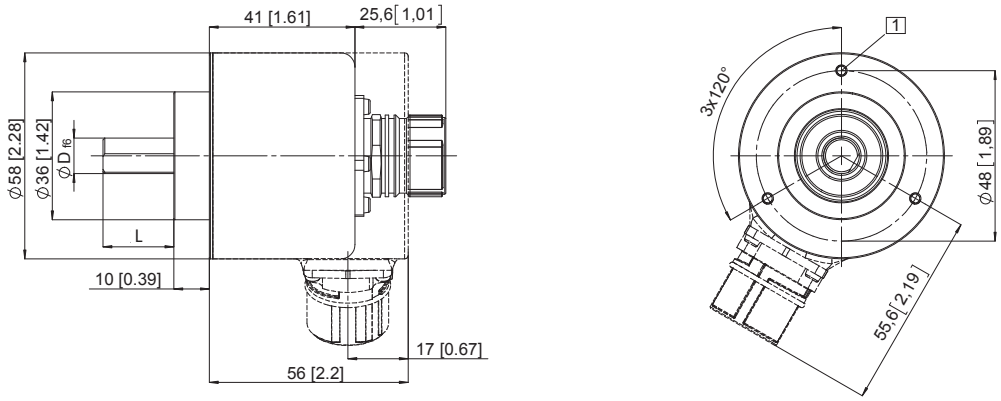
M23 connector, 12-pin

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1

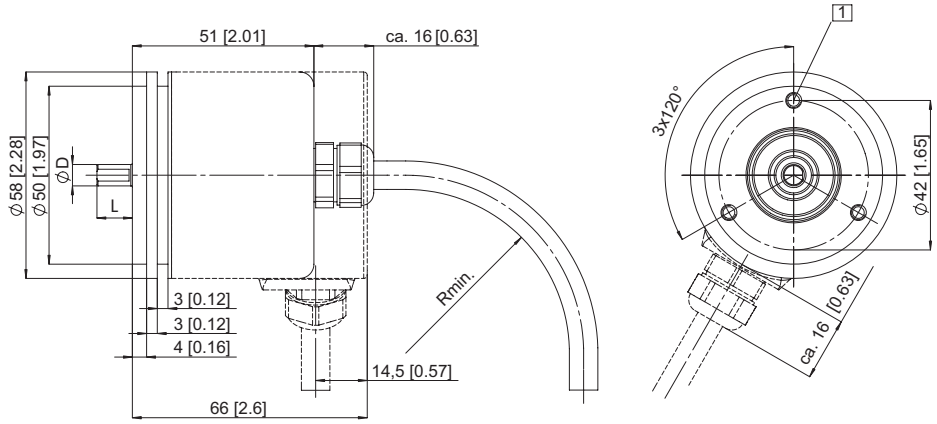
1 3 x M3, 5 [0.2] deep



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]



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.

Standard high resolution, optical	5805 / 5825 (shaft / hollow shaft)	Push-Pull / RS422

Dimensions hollow shaft version

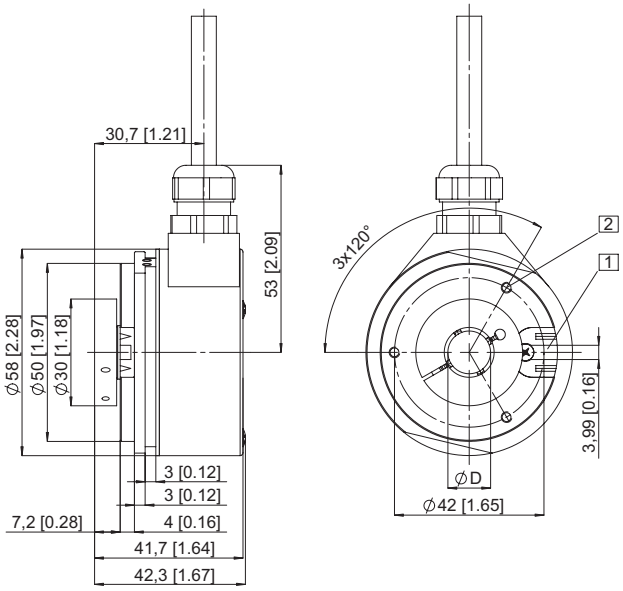
Dimensions in mm [inch]

Flange with spring element, short
Flange type 1 and 2

1 Torque stop slot,
recommendation:
cylindrical pin DIN 7, ø 4 [0.16]

2 M3, 5 [0.2] deep

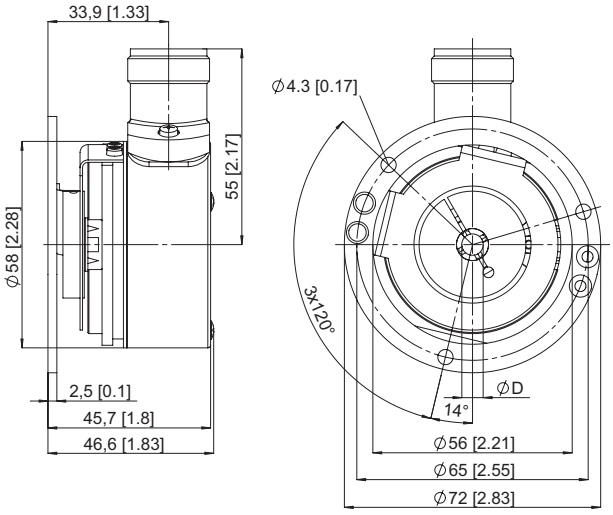
Recommended torque for the clamping ring 0.6 Nm



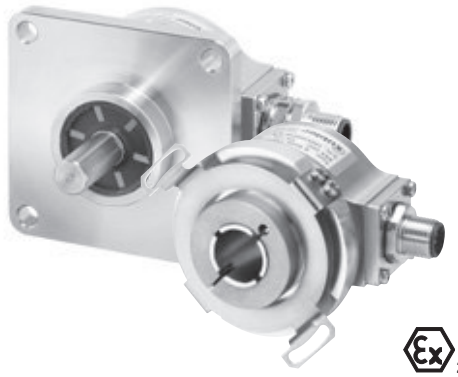
Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

Recommended torque for the clamping ring 0.6 Nm

Note:
Minimum insertion depth 1.5 x $D_{hollow\ shaft}$



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.

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

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 *Hollow shaft*
3 = ø 10 mm
5 = ø 12 mm
8 = ø 15 mm

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)

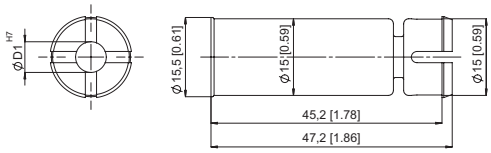
Optional on request
- other pulse rates
- Ex 2/22

Standard
stainless steel, optical | **Sendix 5006 / 5026 (shaft / hollow shaft)** | **Push-Pull / RS422**

Mounting accessory for hollow shaft encoders

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	Order no. Isolation insert
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 2004/108/EC 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}.

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

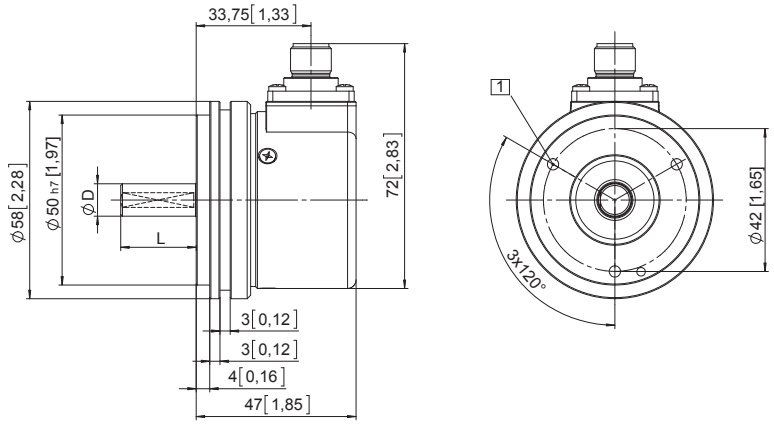
M12 connector, 8-pin

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type A

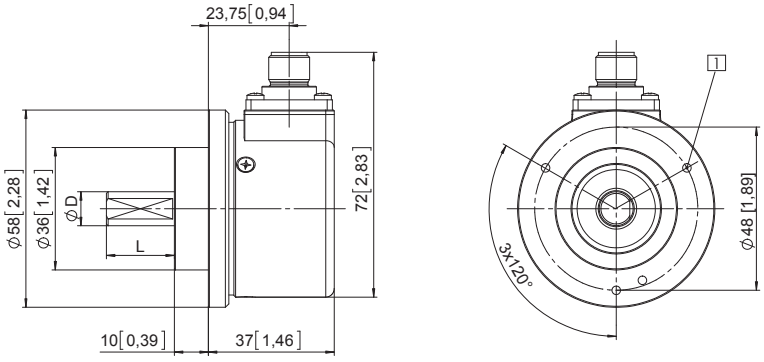
1 3 x M4, 6 [0.24] deep



D = ø 6 h7 [0.24]
ø 10 f7 [0.39]
ø 3/8" h8

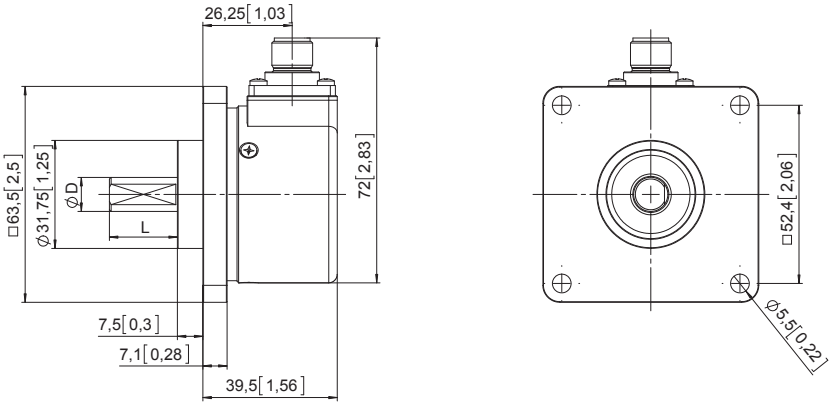
Clamping flange, ø 58 [2.28]
Flange type 7

1 3 x M3, 5.5 [0.22] deep



D = ø 6 h7 [0.24]
ø 10 f7 [0.39]
ø 3/8" h8

Square flange, □ 63.5 [2.5]
Flange type C



D = ø 6 h7 [0.24]
ø 10 f7 [0.39]
ø 3/8" h8

1) PH = shield is attached to connector housing.

Standard
stainless steel, optical | **Sendix 5006 / 5026 (shaft / hollow shaft)** | **Push-Pull / RS422**

Dimensions hollow shaft version

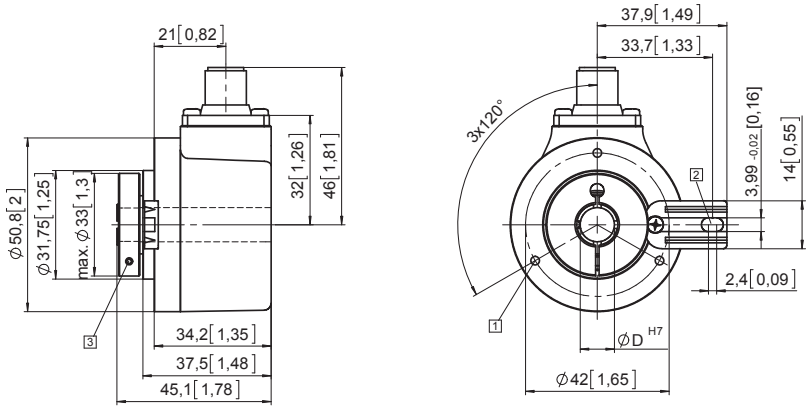
Dimensions in mm [inch]

Flange with spring element, long
Flange type 1

1 M3, 6 [0.24] deep

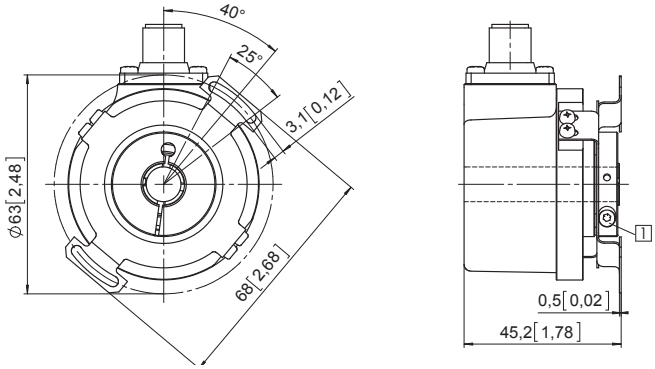
2 Torque stop slot,
recommendation: cylindrical pin DIN7, 4 [0.16]

3 Recommended torque for the clamping ring 0.6 Nm



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

1 Recommended torque for the clamping ring 0.6 Nm



Standard
large hollow shaft, optical | **5821 (hollow shaft)** | **Push-Pull / RS422**

Optimised proportions, optimised costs:

With an overall diameter of just 58 millimetres the series 5821 boasts a hollow shaft of up to 28 millimetres 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 *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, 2 m [6.56'] 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.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**

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.

Standard large hollow shaft, optical	5821 (hollow shaft)	Push-Pull / RS422

Technical data

Mechanical characteristics

Maximum speed	2500 min^{-1}
Mass moment of intertia	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} at max. speed 2500 min^{-1}	 -20°C ... +70°C [-4°F ... +158°F] -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 2004/108/EC 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 colour:	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.

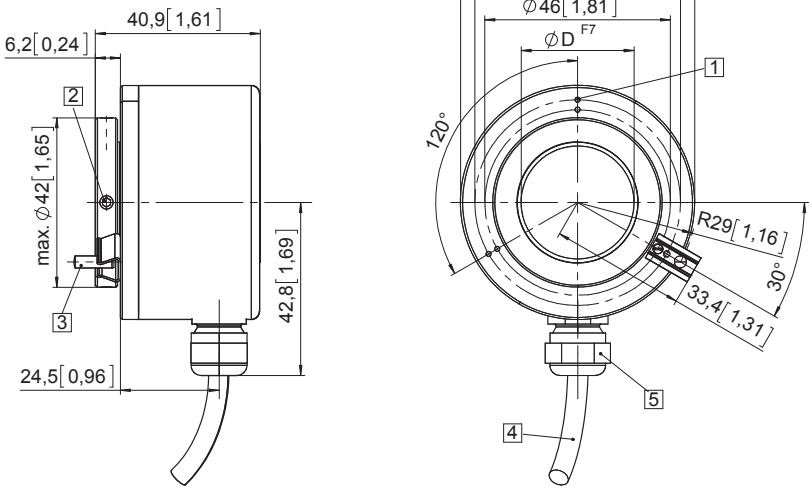
Standard large hollow shaft, optical | 5821 (hollow shaft) | Push-Pull / RS422

Dimensions

Dimensions in mm [inch]

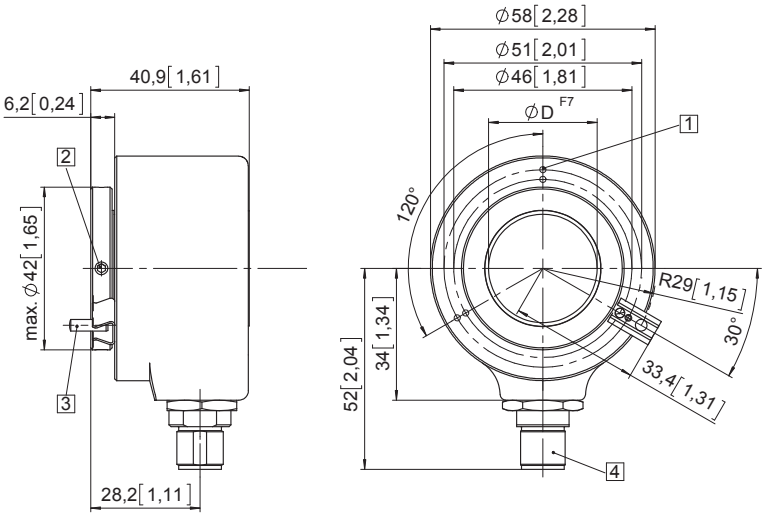
Flange with spring element, ø 58 [2.28]
Cable version, connection type 1

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 2 m [6.56']
5 Cable gland PG7



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



Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7000 (shaft)** | **Push-Pull / RS422**

The Sendix 7000 incremental encoders offer Ex protection in a compact 70 mm seawater durable 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 aluminium.
- 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
- stainless steel version

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.

1) Not applicable with connection types 1 and 2.

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7000 (shaft)** | **Push-Pull / RS422**

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 IP6x
Directive 94/9/EC	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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

Electrical characteristics

Output circuit	**RS422** (TTL compatible)	**RS422** (TTL compatible)	**Push-Pull**	**Push-Pull** (7272 compatible)
Ordercode	**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 2004/108/EC ATEX guideline 94/9/EC 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 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 / 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.

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7000 (shaft)** | **Push-Pull / RS422**

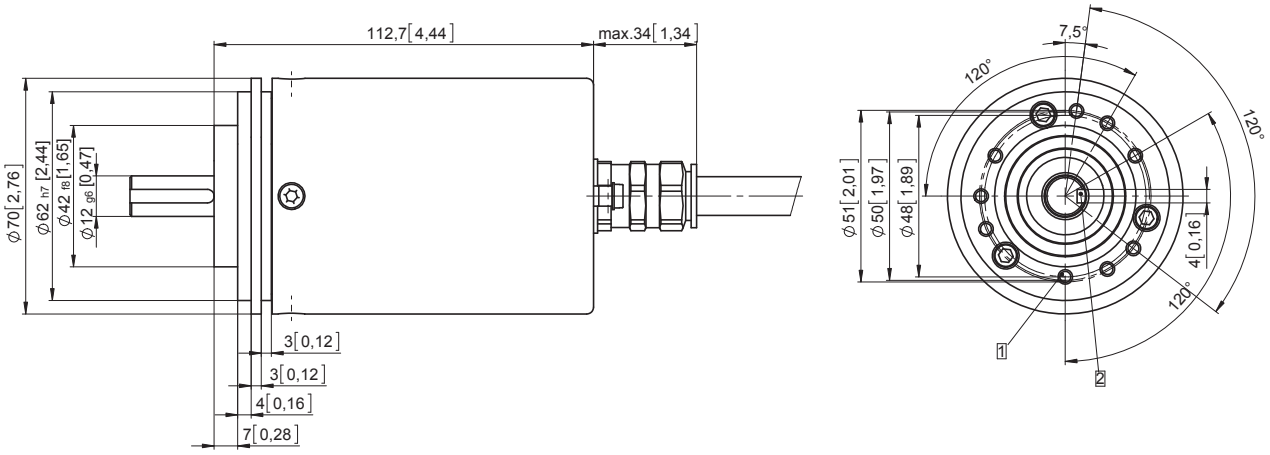
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

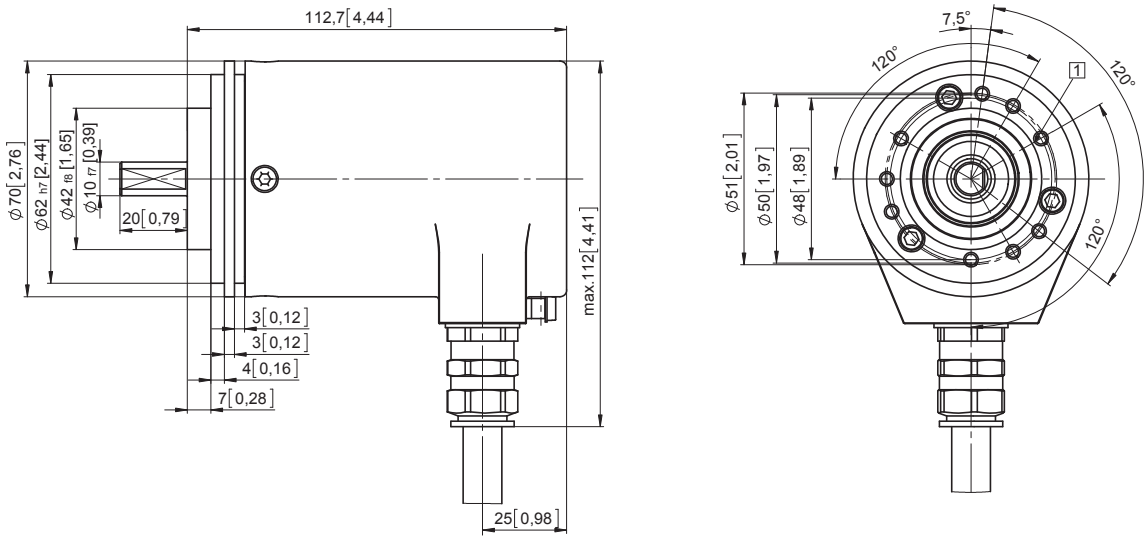
1 9 x M4, 10 [0.39] deep

2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



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 aluminium.

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
- stainless steel version

Accessory		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.

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 IP6x
Relevant standards	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
Relevant standards	IEC 60079-0:2007; IEC 60079-1:2007; 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
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC 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

Safety characteristics

Classification	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value [1]	2.16×10^{-8} h^{-1}
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		4.0×10^{-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
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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.

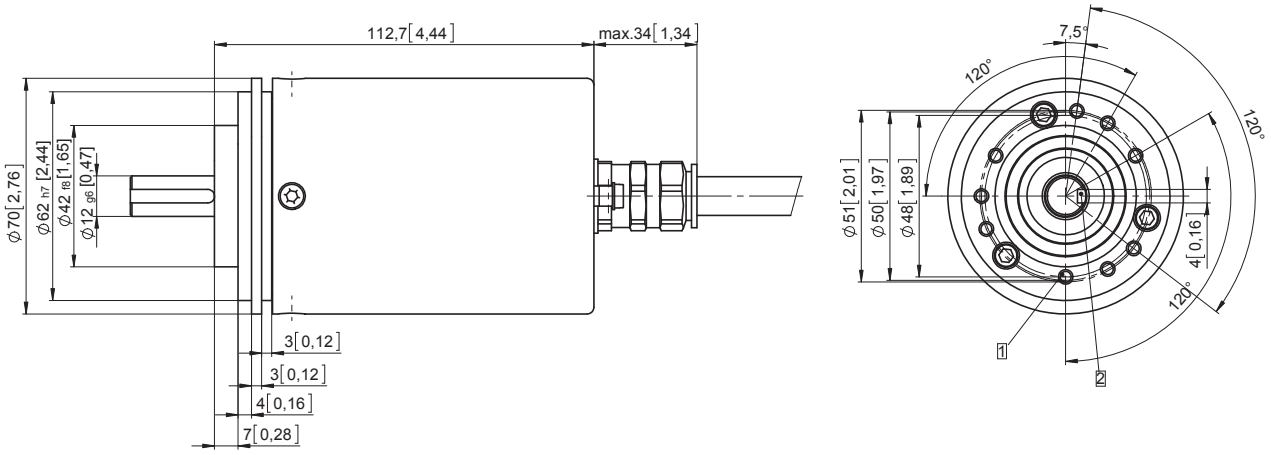
Standard
ATEX/IECEx – zone 1/21, SIL2/PLd, optical | **Sendix SIL 7014FS2 (shaft)** | **SinCos**

Dimensions

Dimensions in mm [inch]

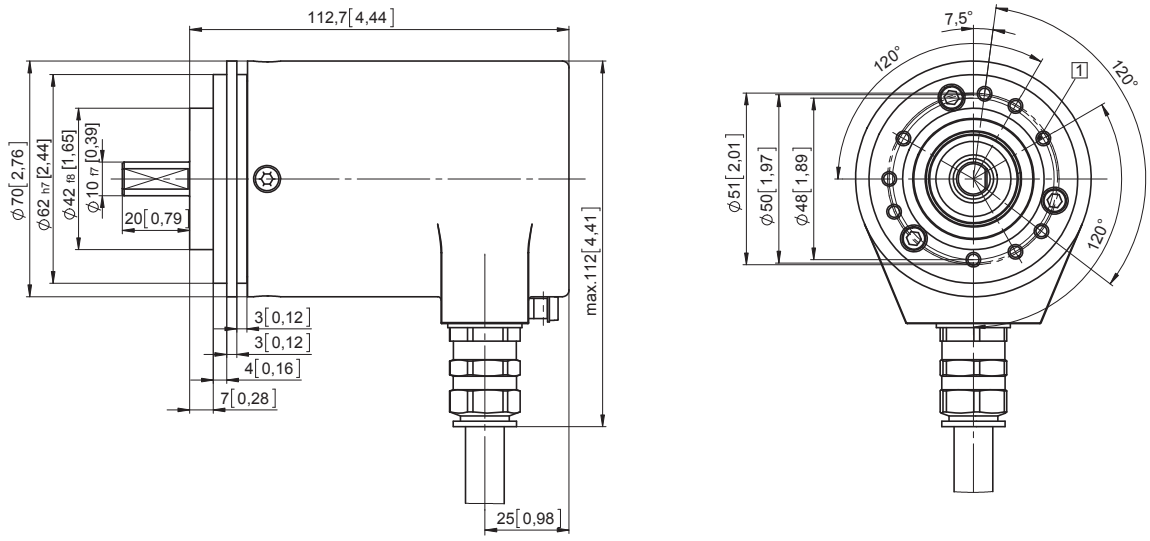
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 9 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



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 aluminium.

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
- stainless steel version

Accessory		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.

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 IP6x
Relevant standards	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
Relevant standards	IEC 60079-0:2007; IEC 60079-1:2007; 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
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC 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

Safety characteristics

Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value [1]	1.09×10^{-8} h^{-1}
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		4.0×10^{-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
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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.

Standard
ATEX/IECEx – zone 1/21, SIL3/PLe, optical | **Sendix SIL 7014FS3 (shaft)** | **SinCos**

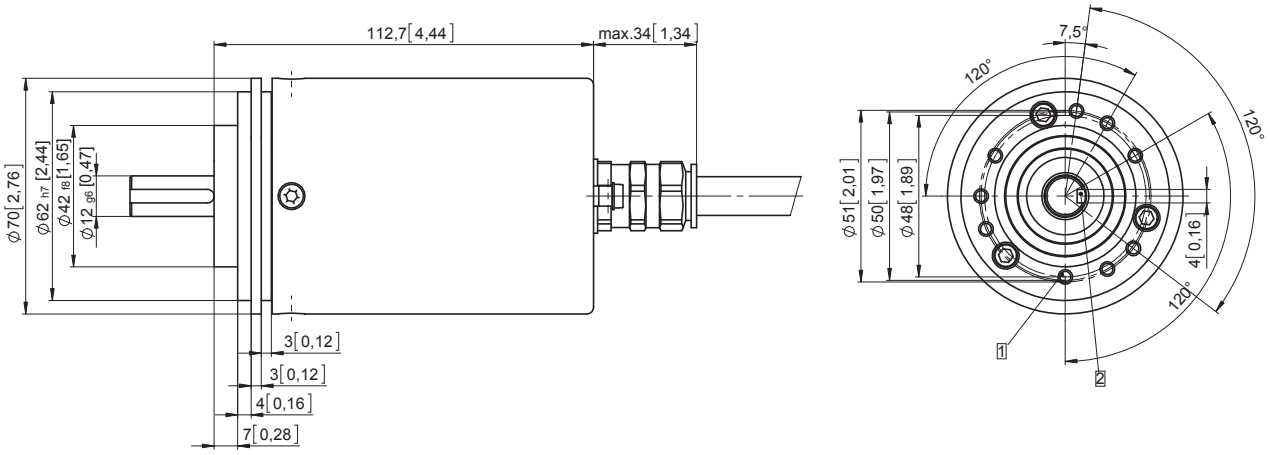
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

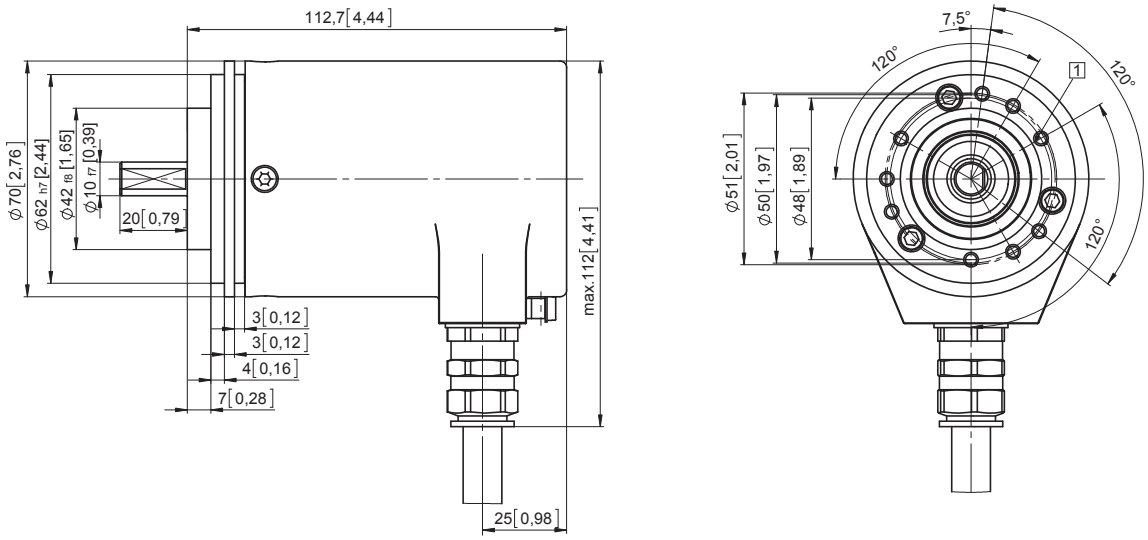
1 9 x M4, 10 [0.39] deep

2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – mining, optical | **Sendix 7100 (shaft)** | **Push-Pull / RS422**

The incremental encoders Sendix 7100 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)
other pulse rates on request

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.

Standard
ATEX/IECEx – mining, optical | **Sendix 7100 (shaft)** | **Push-Pull / RS422**

Technical data

Explosion protection ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Directive 94/9/EC	EN 60079-0:2012; EN 60079-1:2007

Explosion protection IECEx

Certificate of conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
IECEx	IEC 60079-0:2011; IEC 60079-1:2007

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Materials	shaft	stainless steel
	flange / housing	stainless steel
	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

Output circuit	**RS422** (TTL compatible)	**RS422** (TTL compatible)	**Push-Pull**	**Push-Pull** (7272 compatible)
Ordercode	**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 2004/108/EC ATEX guideline 94/9/EC 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 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 / 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.

Standard
ATEX/IECEx – mining, optical | **Sendix 7100 (shaft)** | **Push-Pull / RS422**

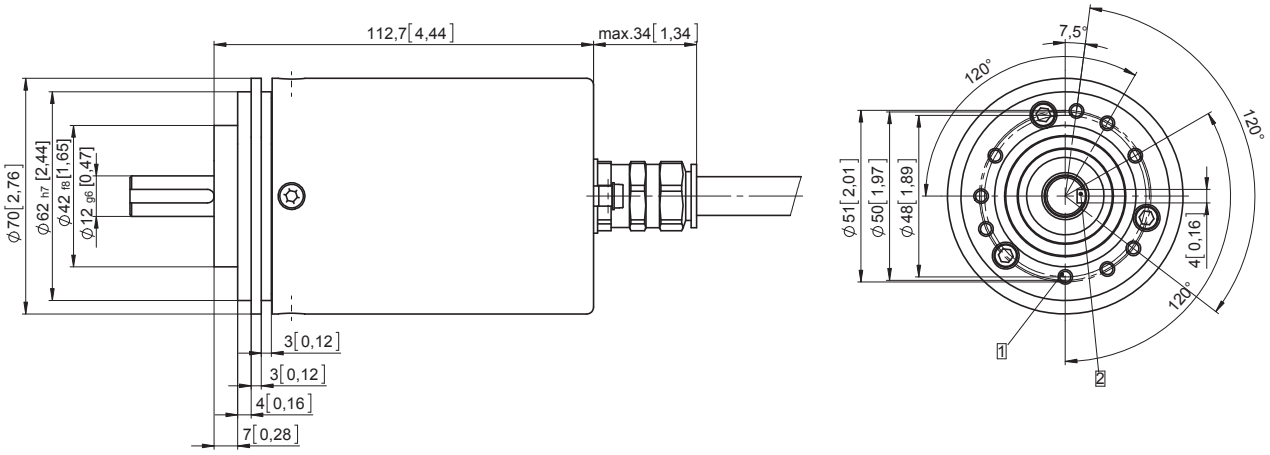
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

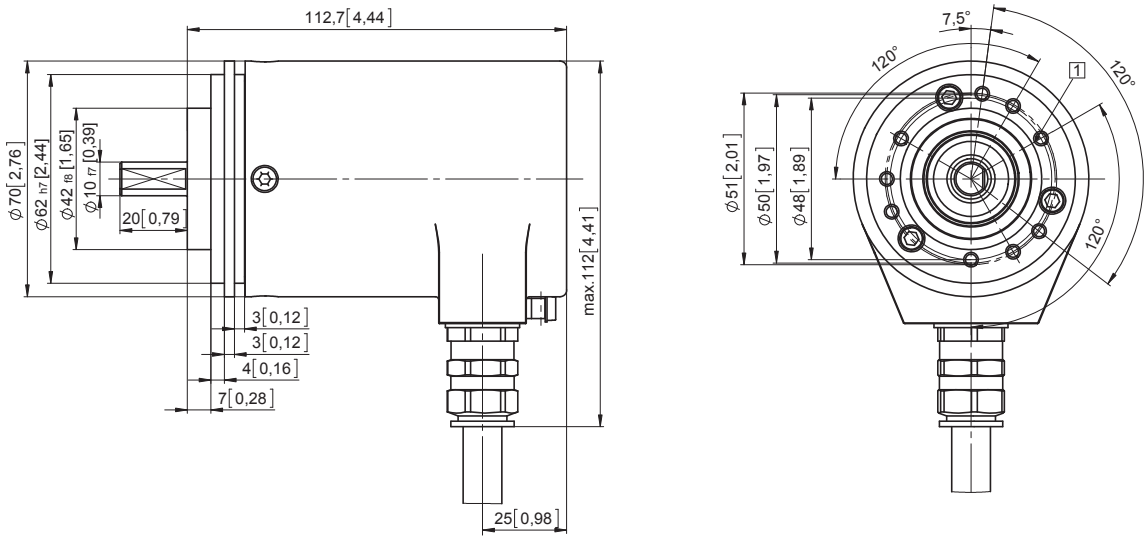
1 9 x M4, 10 [0.39] deep

2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



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 fastening arm, long

b *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)

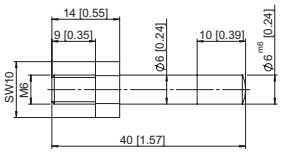
e *Pulse rate*
50, 360, 512, 600, 1000, **1024**, 1500, 2000, **2048**, 2500, 4096, **5000**
(e.g. 360 pulses => 0360)

SinCos version only available with pulses ≥ 1024

Optional on request
- other pulse rates

Large hollow shaft optical | A020 (hollow shaft) | Push-Pull / RS422 / SinCos

Mounting accessory for hollow shaft encoders

		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0003**

Connection technology

		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6201.0002**

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 2004/108/EC RoHS guideline 2011/65/EU	

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 with inverted signal	 – typ. 40 mA/max. 90 mA	 typ. 55 mA/max. 125 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 LOW	min. 2.5 V max. 0.5 V	min. +V - 3.0 V max. 2.5 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 4)	yes 5)	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 2004/108/EC 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.
5) 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.

Large hollow shaft optical | A020 (hollow shaft) | Push-Pull / RS422 / SinCos

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 colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield

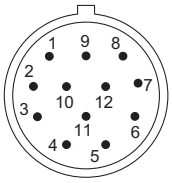
Output circuit	Type of connection	M23 connector, 12 pin											
1 ... A	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	10	12	11	2	5	6	8	1	3	4	PH [1]

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 [1]

+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

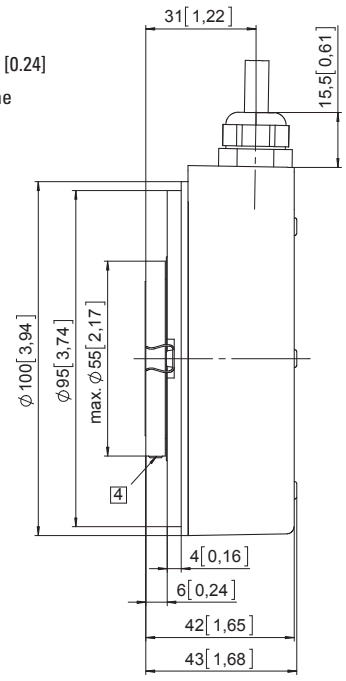
Dimensions hollow shaft version

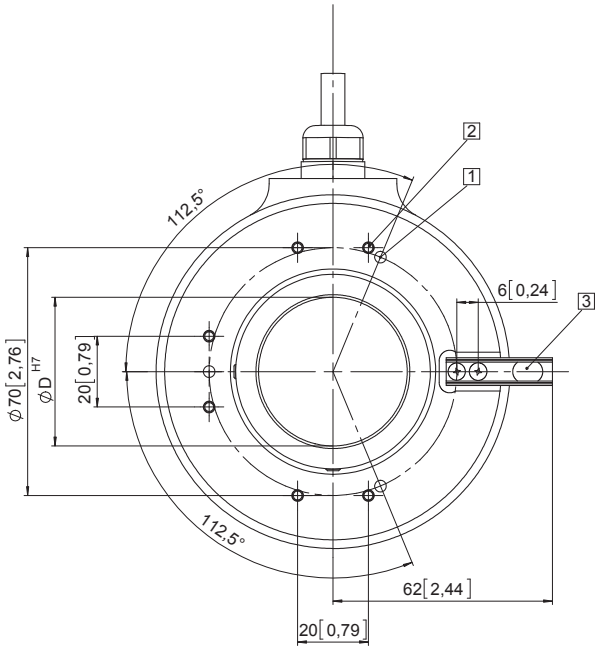
Dimensions in mm [inch]

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

Note:
Minimum insertion depth
1.5 x $D_{hollow\ shaft}$





1) PH = shield is attached to connector housing.

Large hollow shaft optical	A020 (hollow shaft)	Push-Pull / RS422 / SinCos

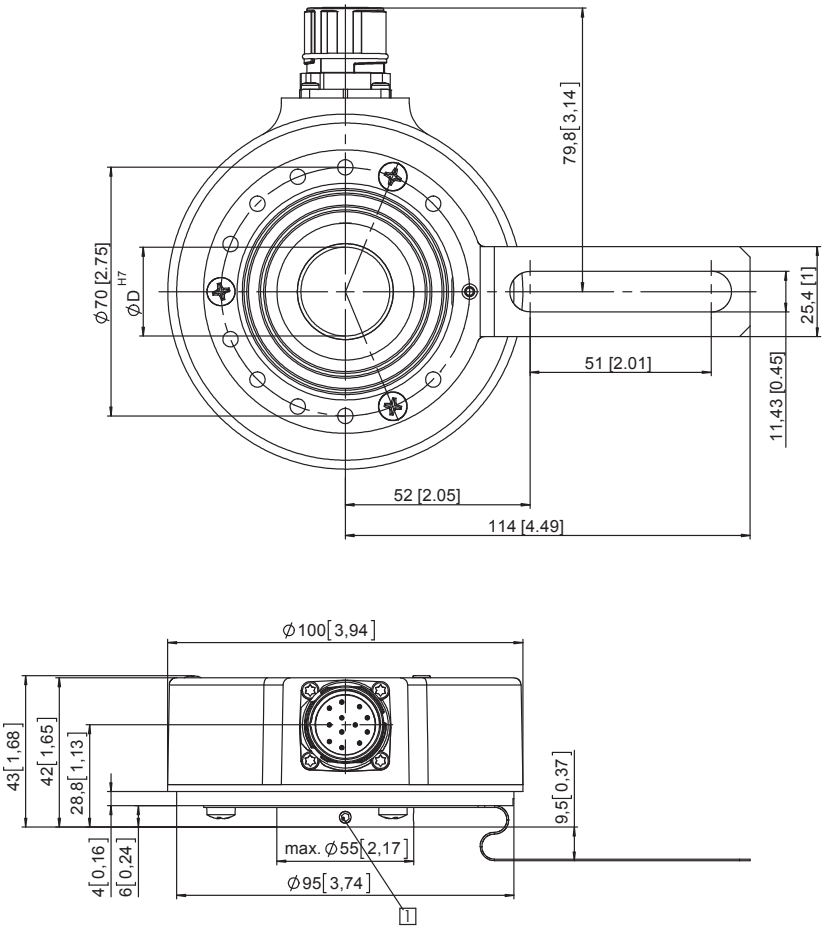
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with fastening arm, long
Flange type 5

1 Recommended torque for the clamping ring 1.0 Nm

Note:
Minimum insertion depth
1.5 x $D_{hollow\ shaft}$



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.

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 fastening arm, long

6 = with fastening arm, short, 4.5" [1]

b *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)

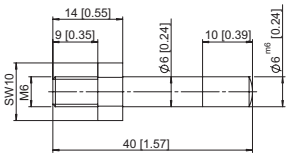
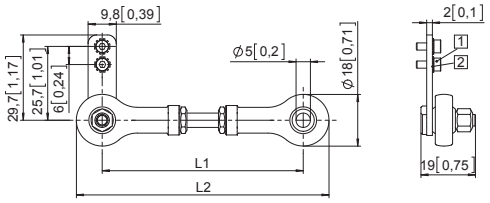
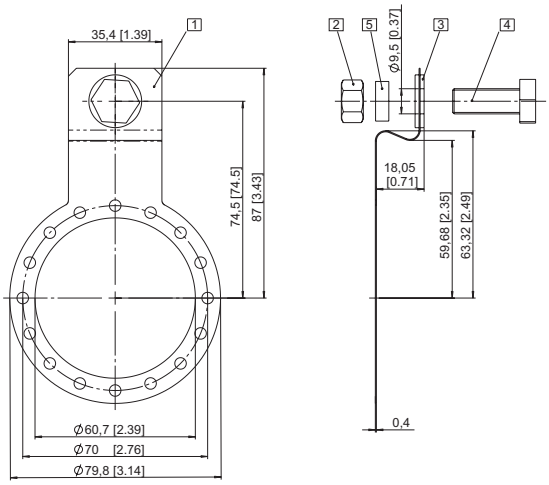
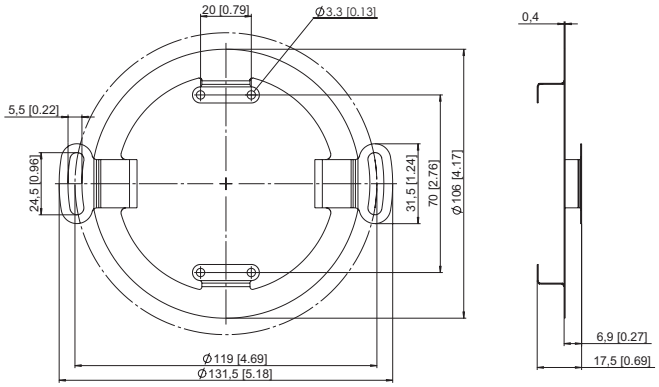
e *Pulse rate*
50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000
(e.g. 360 pulses => 0360)

SinCos version only available with pulses ≥ 1024

Optional on request
- other pulse rates on request
- Ex 2/22

1) US version

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 torque stops		with fixing thread	**8.0010.4700.0003**
Tether arm, flexible		70 mm [2.76"] 100 mm [3.94"] 150 mm [5.91"]	**8.0010.40S0.0000** **8.0010.40T0.0000** **8.0010.40U0.0000**
1 Socket screw M2.5 x 6 [0.24] 2 Lock washer			
Fastening arm, 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**
			

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
- Fastening arm (8.0010.4T00.0000)
- 3 screws for fixing to the encoder

8.0010.40Y0.0001

Tapered shaft mounting kit

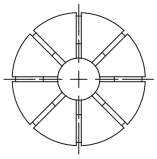
for A02H with hollow shaft, ø 38 mm [1.50"]

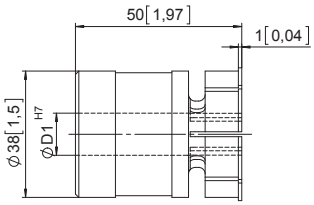
For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling.
An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.
Included in the set:
- Insert for cone blind hole, cone 1:10, 17 mm [0.67"] length
- 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**

Connection technology

Order no.

Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6201.0002**

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.

Large hollow shaft robust, optical | **A02H (hollow shaft)** | **Push-Pull / RS422 / SinCos**

Technical data

Mechanical characteristics

Maximum speed		6000 min^{-1} 1) 2500 min^{-1} 1)
	at 60°C [140°F]	
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 2004/108/EC 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 2004/108/EC 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'].

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 colour:	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]

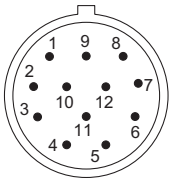
Output circuit	Type of connection	M12 connector, 8-pin											
1 ... D	E	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Pin:	1	2			3	4	5	6	7	8	PH [1]

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

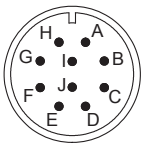
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output 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.

Large hollow shaft robust, optical | **A02H (hollow shaft)** | **Push-Pull / RS422 / SinCos**

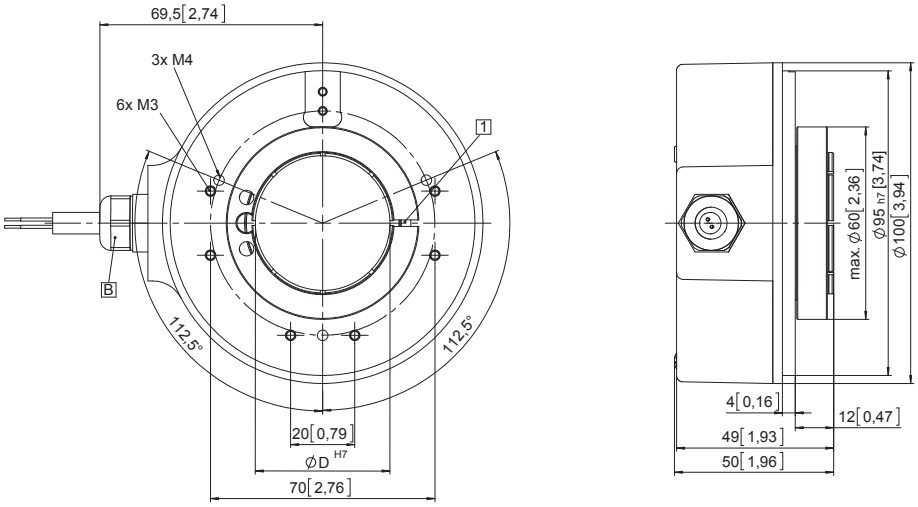
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange without mounting aid
Flange type 1

1 Recommended torque for the clamping ring 1.0 Nm

B Cable version



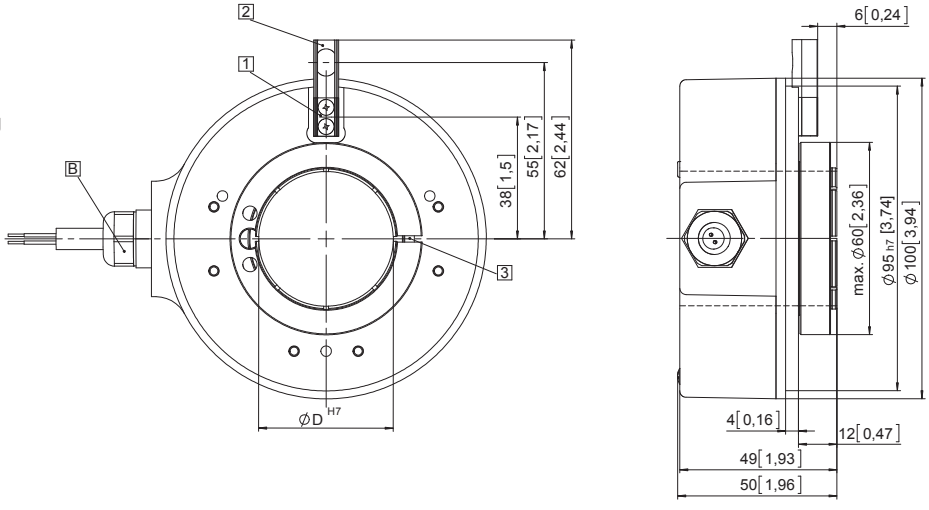
Flange with spring element
Flange type 2 and 3

1 Spring element, short (flange type 2)

2 Spring element, long (flange type 3)

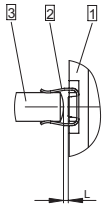
3 Recommended torque for the clamping ring
flange type 2: 1.0 Nm
flange type 3: 2.0 Nm

B Cable version



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!



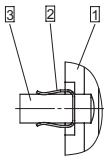
1 Flange

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

Large hollow shaft robust, optical | **A02H (hollow shaft)** | **Push-Pull / RS422 / SinCos**

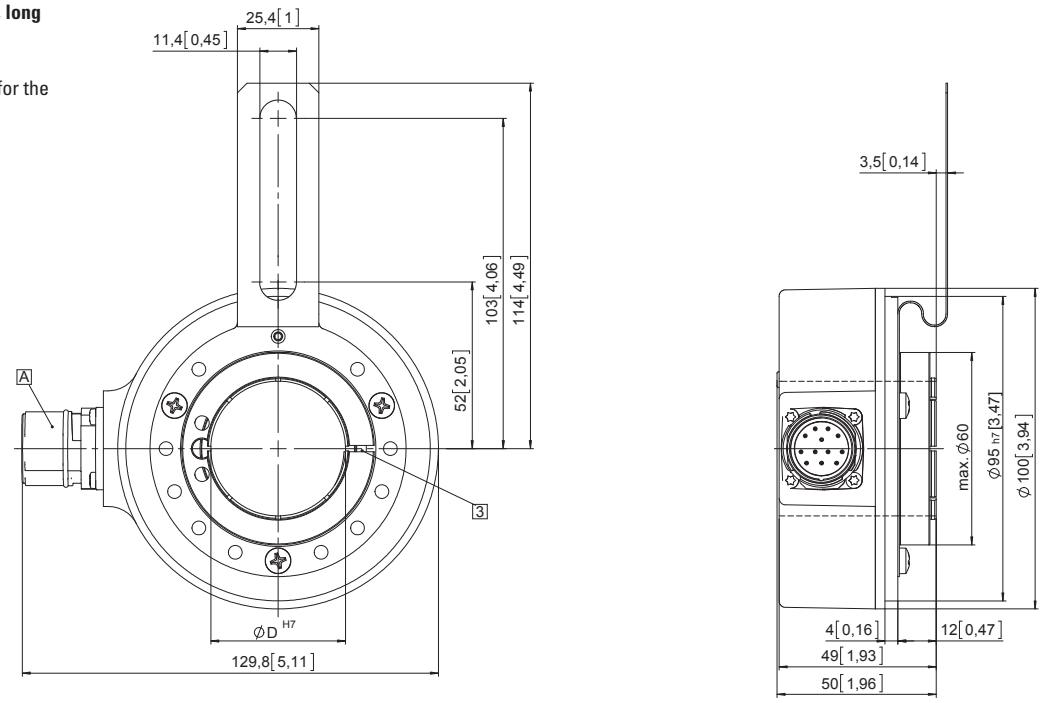
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with fastening arm, long
Flange type 5

3 Recommended torque for the clamping ring 2.0 Nm

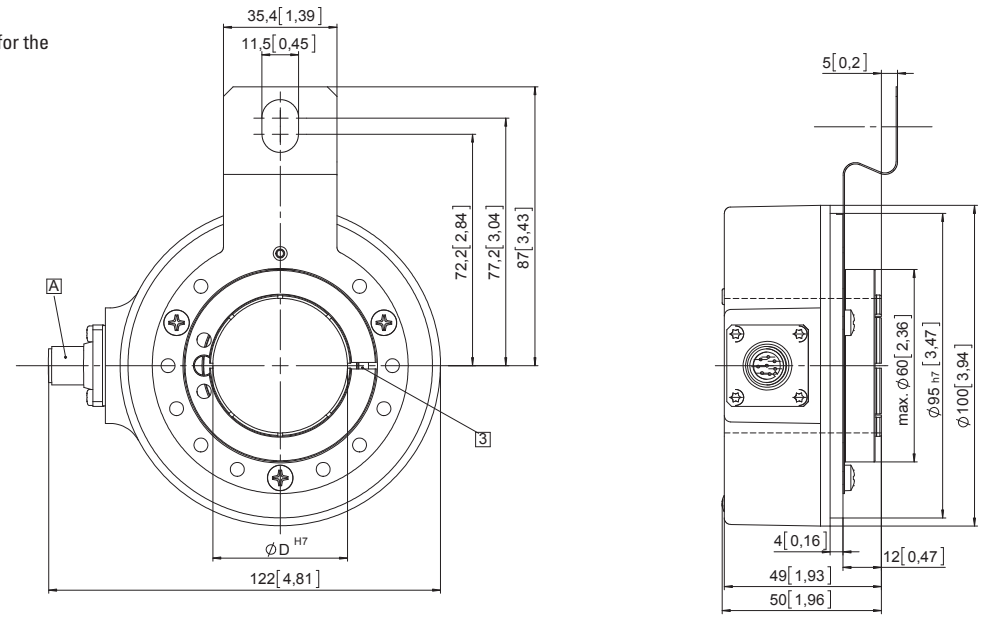
A Plug version



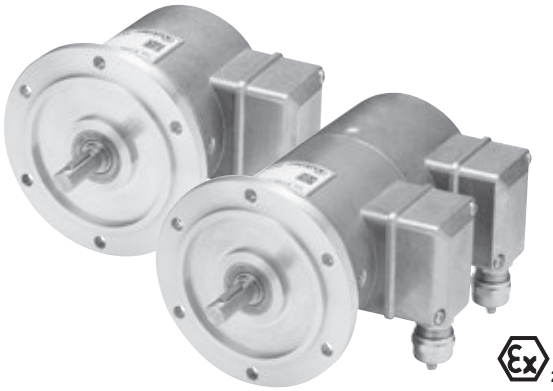
Flange with fastening arm, short 4.5"
Flange type 6

3 Recommended torque for the clamping ring 2.0 Nm

A Plug version



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 (-40°...+100°C) | High protection level (IP66) | 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

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	400 N
	axial	300 N
Weight	H100	~ 1.8 kg [63.49 oz]
	H100 + speed switch	~ 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	stainless steel
	housing	aluminium die-cast (EN AC-44300), seawater durable coating
	flange	seawater durable aluminium type Al Si Mg Mn (EN AW-6082)
Shock resistance acc. to EN 60068-2-27		< 300 g ~ 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)		typ. 40 mA	typ. 50 mA
with inverted signal		max. 90 mA	max. 100 mA
Permissible load per channel	DC	max. +/- 20 mA	max. +/- 30 mA
	peak	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	min. 2.5 V	min. +V - 2.5 V
	LOW	max. 0.5 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 2004/108/EC 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.

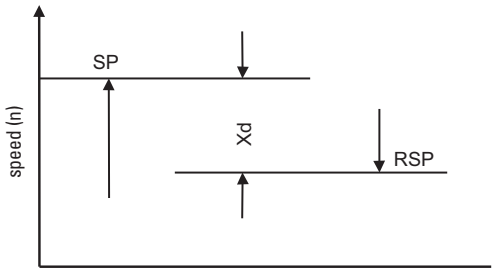
Incremental encoders

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 / 230 V AC 1 A / 125 V DC

(more details see manual)

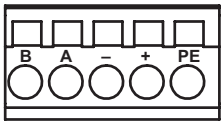
Definition switching hysteresis (Xd)



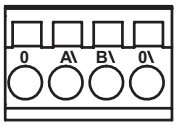
SP = switching point (for switching speed ns)
RSP = reset point
Xd = switching difference (hysteresis)

Terminal assignment terminal connections

Incremental encoders

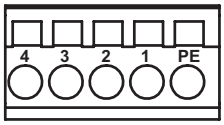


B	incremental track B
A	incremental track A
-	0 V
+	+V
PE	shield



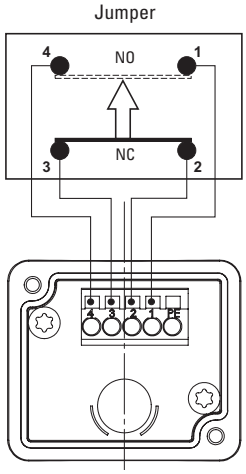
0	incremental track 0
$\overline{A}$	incremental track $\overline{A}$
$\overline{B}$	incremental track $\overline{B}$
$\overline{0}$	incremental track $\overline{0}$

Speed switch



4, 1	normally open (NO)
3, 2	normally closed (NC)
PE	shield

Jumper



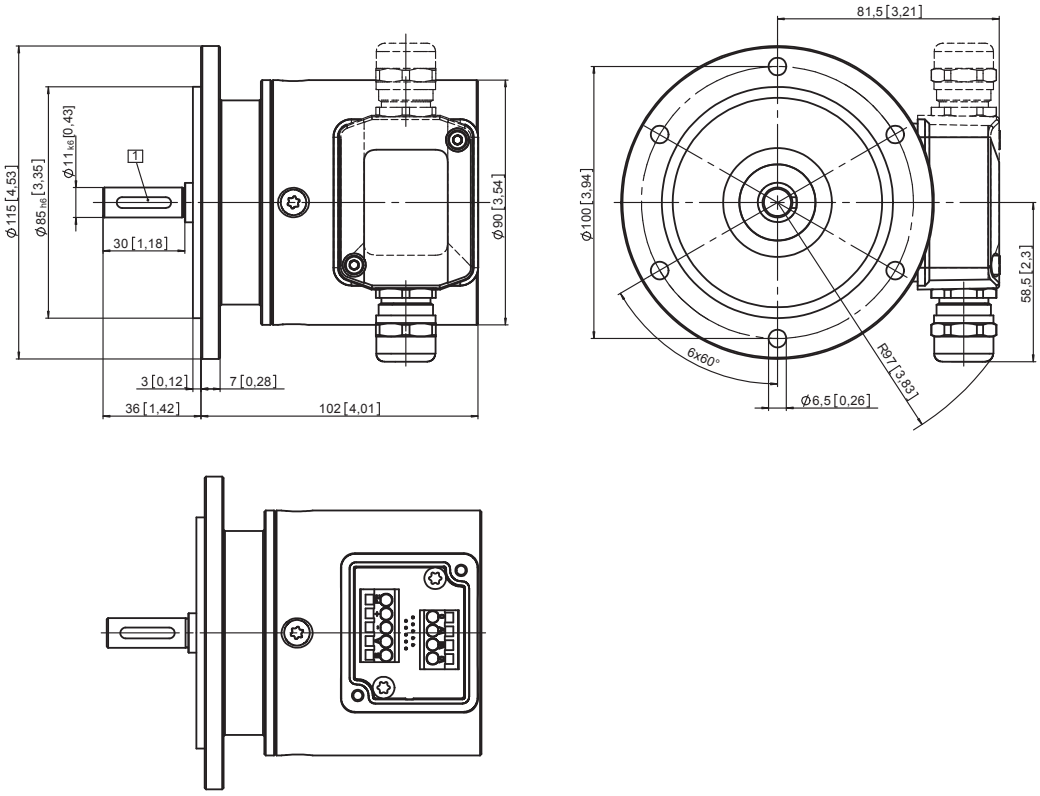
Heavy Duty shaft, optical | **Sendix Heavy Duty H100 (shaft)** | **Push-Pull / RS422 / speed switch**

Dimensions

Dimensions in mm [inch]

Incremental encoder
Version 1

1 Feather key acc. to DIN 6885 / ISO 2491
4 x 4 x 20 [0.16 x 0.16 x 0.79]



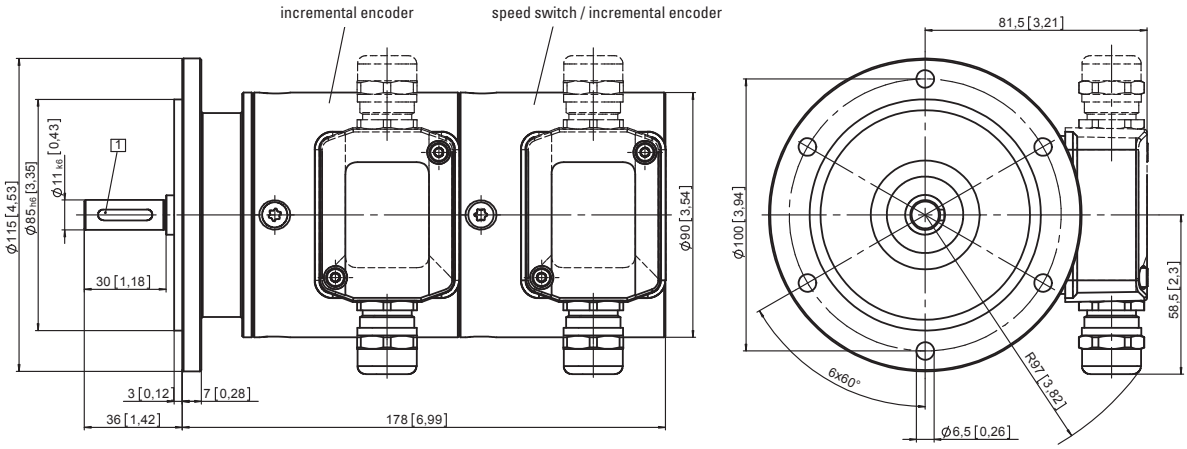
Heavy Duty shaft, optical | **Sendix Heavy Duty H100 (shaft)** | **Push-Pull / RS422 / speed switch**

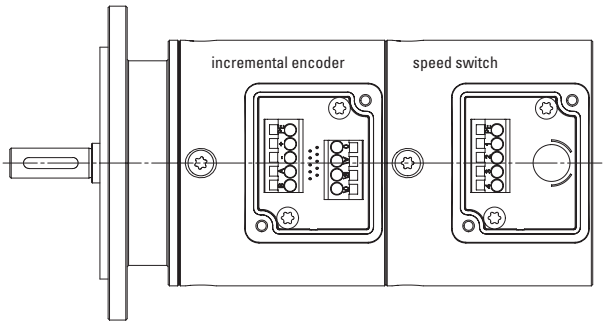
Dimensions

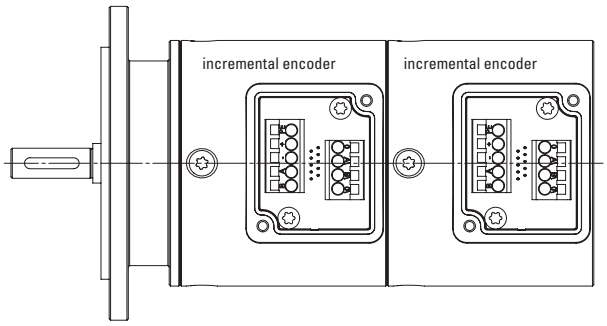
Dimensions in mm [inch]

Incremental encoder with mechanical speed switch or 2 x incremental encoder (double encoder)
Version 2 or 3

1 Feather key acc. to DIN 6885 / ISO 2491
4 x 4 x 20 [0.16 x 0.16 x 0.79]







Heavy Duty hollow shaft, optical | **Sendix Heavy Duty H120 (hollow shaft)** | **Push-Pull / RS422 / optical fibre**

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.
- 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 fibre technology.

Seawater durable

- 3 fixing solutions: conical central fastening, cylindrical central fastening or through hollow shaft.
- Connection via cable, M12 or M23 connector, terminal box or optical fibre.
- Fastening arm 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"] 1)
3 = with fastening arm 100 mm [3.93"] 1)
4 = with fastening arm 150 mm [5.91"] 1)
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
A = ø 12 mm [0.47"]
B = ø 16 mm [0.63"]
K = cone, 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 = LWL + RS422 (with inverted signal) / 5 V DC 2)
A = LWL + RS422 (with inverted signal) / 10 ... 30 V DC 2)
C = LWL + Push-Pull (with inverted signal) / 10 ... 30 V DC 2)

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 fibre connector + radial M23 connector, 12-pin, cw 3)

*) 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

1) Enclosed, not mounted.
2) Can only be ordered with connection type L.
3) Can only be ordered with output circuits A, B or C.

Heavy Duty hollow shaft, optical	Sendix Heavy Duty H120 (hollow shaft)	Push-Pull / RS422 / optical fibre

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut [1]	**8.0000.5012.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable [1]	**8.0000.6201.0002**
Simplex patch cable, ST-ST-multimode	optical fibre, length 5 m [16.40']	**05.B09-B09-821-0005**
Cable gland for optical fibre version	for achieving protection IP66 and IP67 at the optical fibre connector	**8.0000.5000.0007**
Optical fibre 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}
	at 60°C [140°F]	3500 min^{-1}
Starting torque – at 20°C [68°F]		0.05 Nm
Load capacity of shaft	radial	400 N
	axial	300 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 fibre connection

Power consumption per module	< 2 W
Input level optical fibre transmitter	10 ... 30 V DC or RS422
Optical wavelength	850 nm
Optical transmission rate	120 Mbit/s
Optical fibre synchronisation display	LED on the receiver
Optical fibre connection	ST connector, ø 9 mm [0.35"]
Glass fibre	multimode fibre, 50/125 µm, 62.5/125 µm
Optical fibre transmission distance	max. 1000 m [3280.84']

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 per channel	DC	max. +/- 20 mA	max. +/- 30 mA	max. +/- 150 mA
	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 2004/108/EC 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.

Heavy Duty hollow shaft, optical | **Sendix Heavy Duty H120 (hollow shaft)** | **Push-Pull / RS422 / optical fibre**

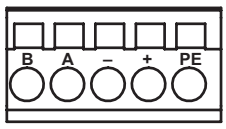
Terminal assignment

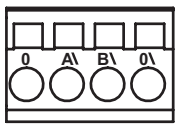
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)										
1, 4, 5, 6	1	Signal:	0 V	+V	0 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	Shield

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 [2]

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 [2]

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	$\overline{A}$	$\overline{B}$	$\overline{0}$

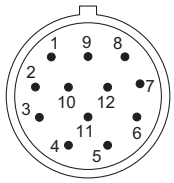




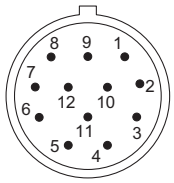
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
A, $\overline{A}$: Incremental output channel A
B, $\overline{B}$: Incremental output 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

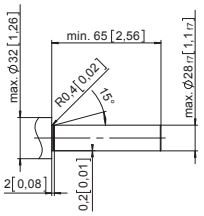
Dimensions

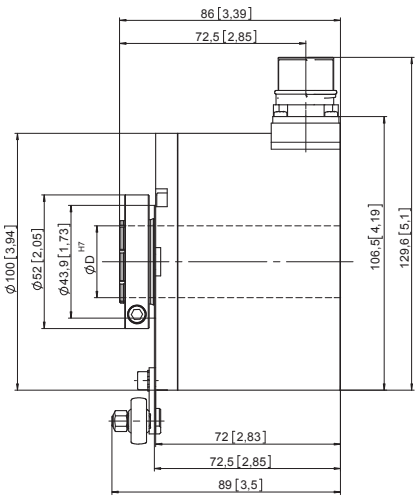
Dimensions in mm [inch]

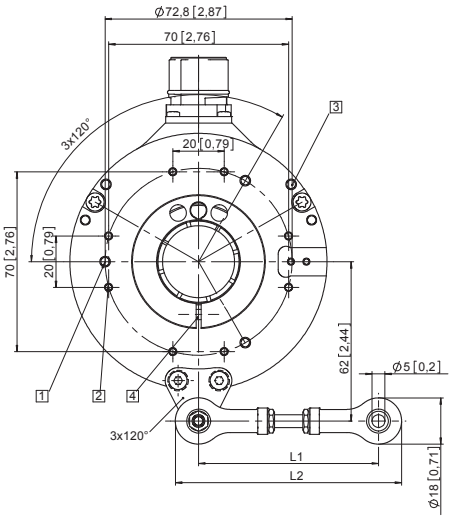
Flange with fastening arm
Through hollow shaft

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

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]

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.
2) PH = shield is attached to connector housing.

Heavy Duty hollow shaft, optical | **Sendix Heavy Duty H120 (hollow shaft)** | **Push-Pull / RS422 / optical fibre**

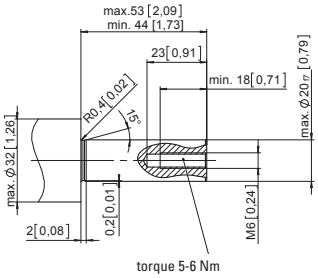
Dimensions

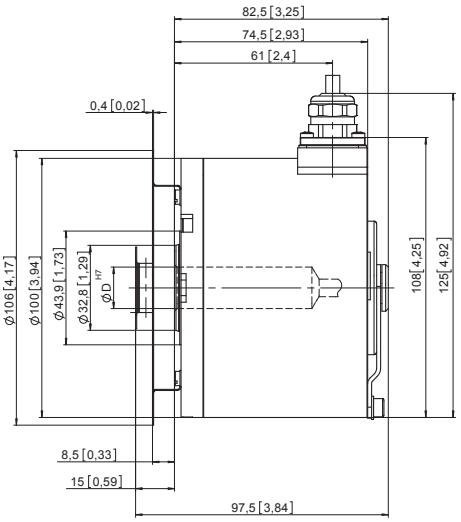
Dimensions in mm [inch]

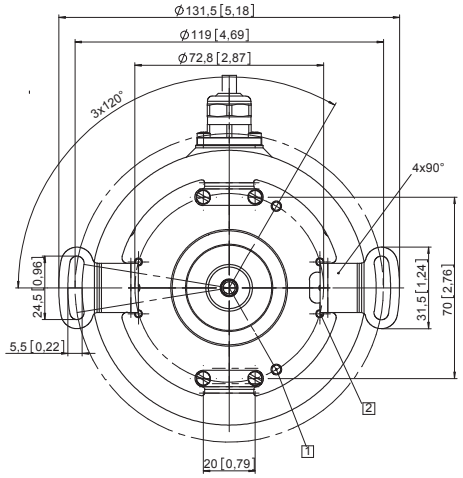
Flange with stator coupling, ø 119 [4.69]
Blind hollow shaft with central fastening

1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep

Shaft connection to the application



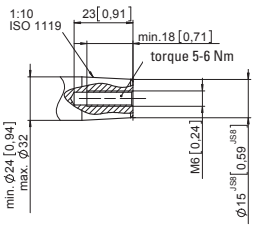


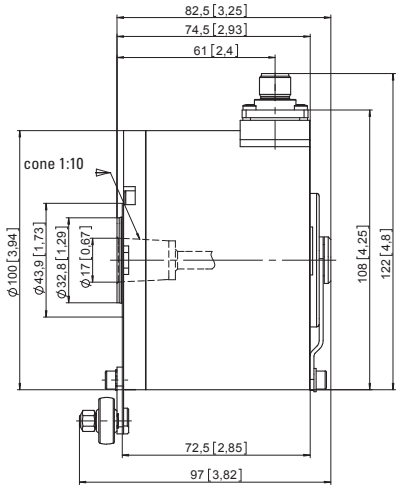


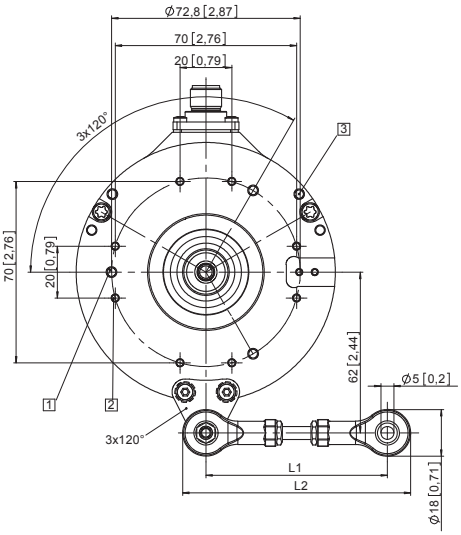
Flange with fastening arm
Blind hollow shaft with central fastening, cone, ø 17 [0.67], 1 : 10

1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep
3 6 x M4

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]

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.

Heavy Duty hollow shaft, optical | **Sendix Heavy Duty H120 (hollow shaft)** | **Push-Pull / RS422 / optical fibre**

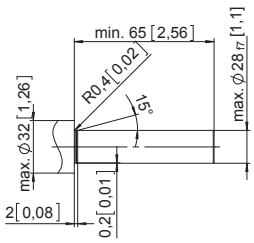
Dimensions

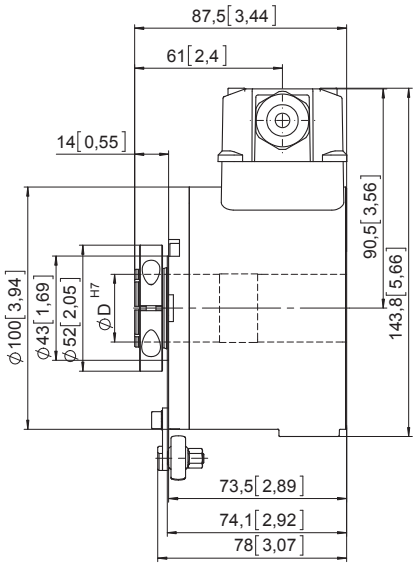
Dimensions in mm [inch]

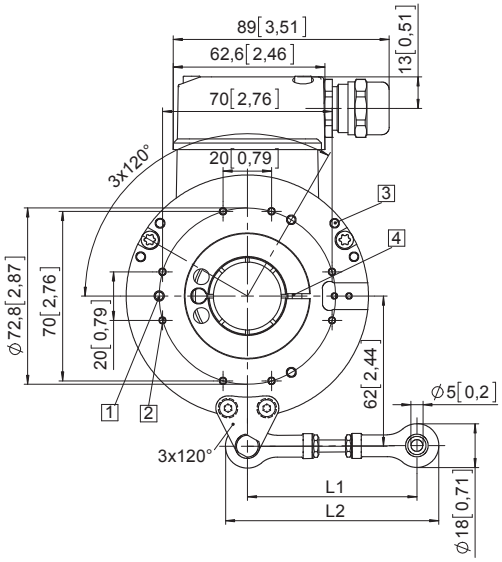
Flange with fastening arm
Through hollow shaft and
terminal box (type of connection K)

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

Shaft connection to the application





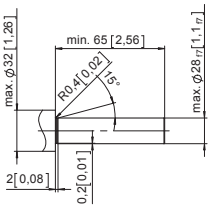


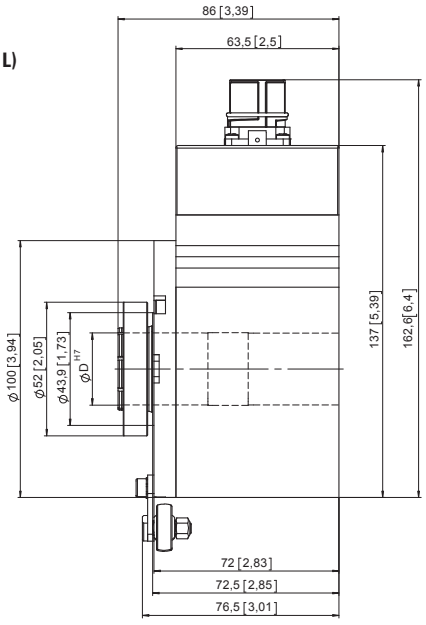
Fastening arm	L1	L2
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

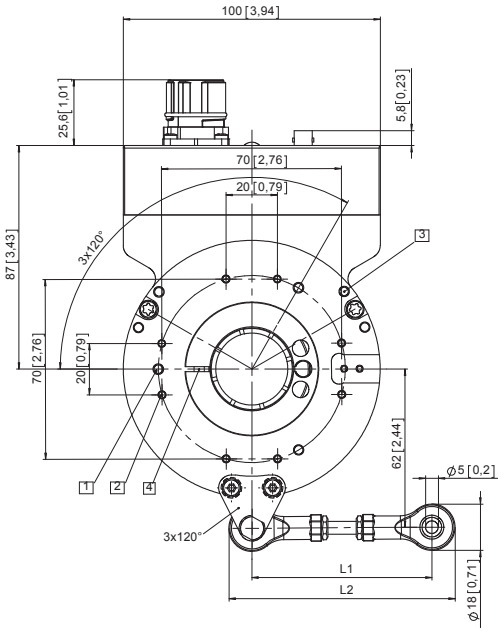
Flange with fastening arm
Through hollow shaft and
optical fibre connection (type of connection L)

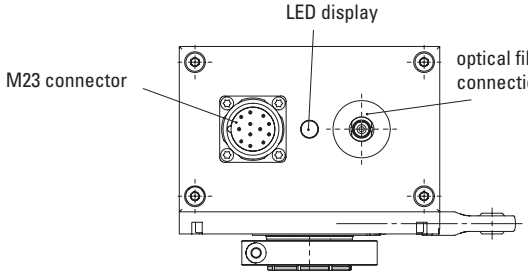
1 3 x M4, 7 [0.28] deep
2 8 x M3, 8 [0.31] deep
3 6 x M4
4 Recommended torque for the clamping ring 2 Nm

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]

1) With a shaft diameter > 32 mm [1.26“] the insulation resistance of 2.5 kV cannot be guaranteed.

Bearingless 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 aluminium 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.

Bearingless 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 analogue 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 analogue 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)		aluminium
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 2004/108/EC 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 colour:	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)

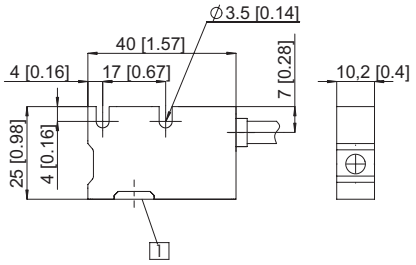
1) Shield is attached to connector housing.

Bearingless magnetic | **RI20 / Limes LI20 (hollow shaft)** | **Push-Pull / RS422**

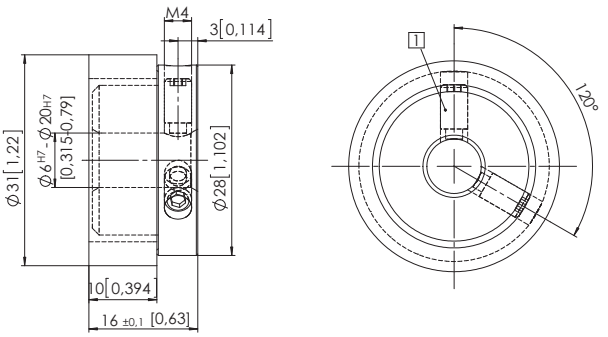
Dimensions

Dimensions in mm [inch]

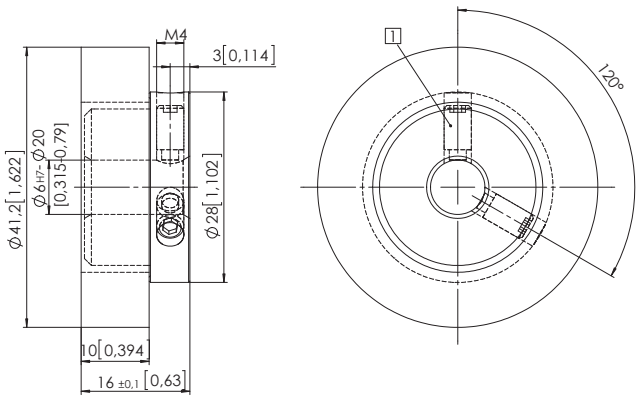
Sensor head Limes LI20



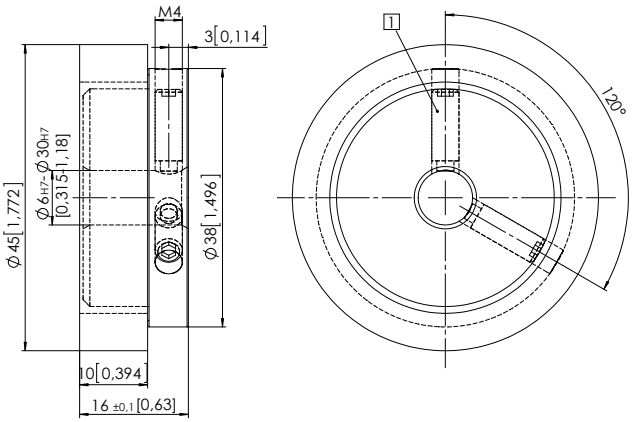
Magnetic ring, ø 31 [1.22], 8.RI20.031.XXXX.111



Magnetic ring, ø 41.2 [1.62], 8.RI20.041.XXXX.111



Magnetic ring, ø 45 [1.77], 8.RI20.045.XXXX.111

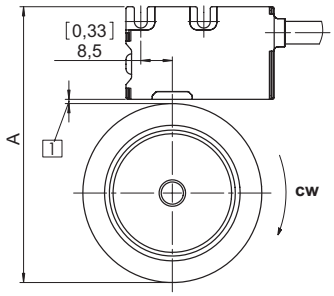


1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

Mounting orientation and permissible mounting tolerances

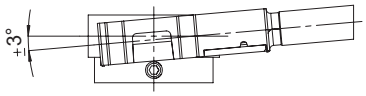
Distances



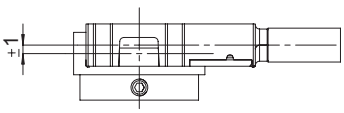
1 Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

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]

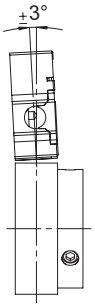
Torsion



Offset



Tilting

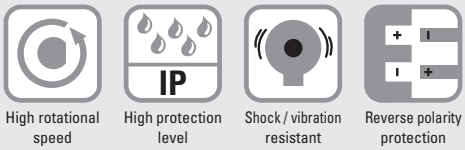


Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

Bearingless 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 aluminium 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.

Incremental encoders

Bearingless 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 analogue 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 analogue 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)		aluminium
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.LI50.XXXX.X050 and 8.LI50.XXXX.X250)
CE compliant acc. to		EMC guideline 2004/108/EC 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		max. 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		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 colour:	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)

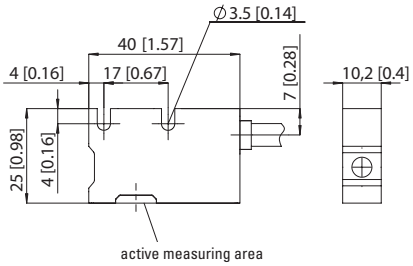
1) Shield is attached to connector housing.

Bearingless zero pulse, magnetic | **RI50 / Limes LI50 (hollow shaft)** | **Push-Pull / RS422**

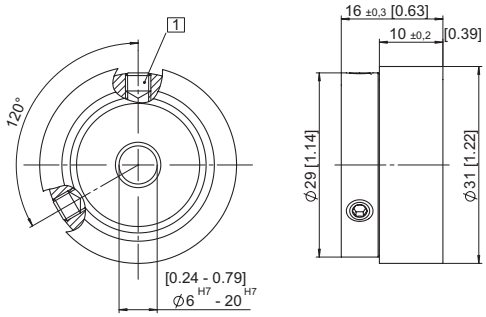
Dimensions

Dimensions in mm [inch]

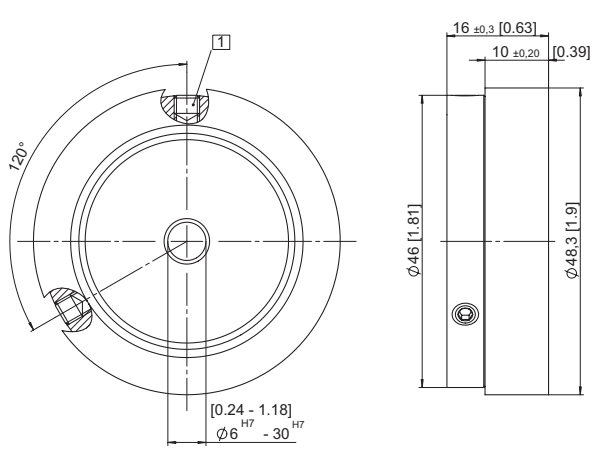
Sensor head Limes LI50



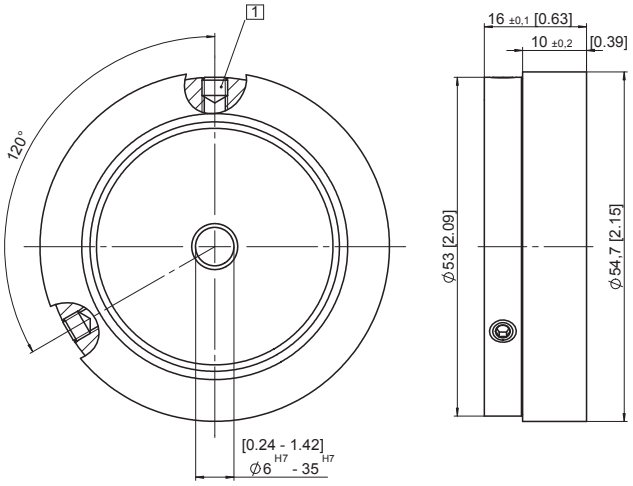
Magnetic ring, ø 31 [1.22], 8.RI50.031.XXXX.112



Magnetic ring, ø 48.3 [1.90], 8.RI50.048.XXXX.112



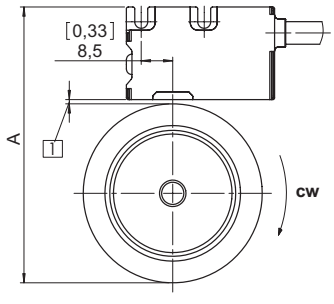
Magnetic ring, ø 54.7 [2.15], 8.RI50.055.XXXX.112



1 M4 Set screw

Mounting orientation and permissible mounting tolerances

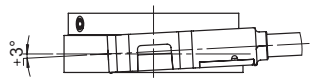
Distances



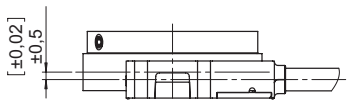
1 Distance sensor head / magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

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]

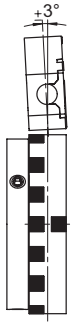
Torsion



Offset



Tilting



Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

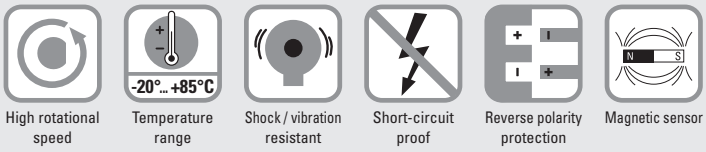
Absolute encoders - singleturn

Series		Type	Interface	Page
Miniature, magnetic		2450 / 2470 (shaft / hollow shaft)	SSI	**152**
Compact, magnetic		Sendix 3651 / 3671 (shaft / hollow shaft)	Analogue	**155**
		Sendix M3658 / M3678 (shaft / hollow shaft)	CANopen	**160**
		Sendix M3658 / M3678 (shaft / hollow shaft)	SAE J1939	**164**
Compact, optical		Sendix F3653 / F3673 (shaft / hollow shaft)	SSI / BiSS	**168**
(patented technology)		Sendix F3658 / F3678 (shaft / hollow shaft)	CANopen	**174**
Standard, optical		5850 / 5870 (shaft / hollow shaft)	Parallel, analogue	**178**
		5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed	**183**
		Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS	**186**
	SIL2/PLd	Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)	SSI / BiSS + SinCos	**193**
	SIL3/PLe	Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)	SSI / BiSS + SinCos	**199**
		Sendix 5858 / 5878 (shaft / hollow shaft)	PROFIBUS DP	**205**
		Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen	**210**
		Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT	**218**
		Sendix 5858 / 5878 (shaft / hollow shaft)	PROFINET IO	**223**
	Stainless steel	5876 (hollow shaft)	SSI, parallel	**228**
	ATEX / IECEx	Sendix 7053 (shaft)	SSI / BiSS	**232**
new	ATEX / IECEx, SIL2/PLd	Sendix SIL 7053FS2 (shaft)	SSI / BiSS + SinCos	**235**
new	ATEX / IECEx, SIL3/PLe	Sendix SIL 7053FS3 (shaft)	SSI / BiSS + SinCos	**239**
	ATEX / IECEx	Sendix 7058 (shaft)	PROFIBUS DP	**243**
	ATEX / IECEx	Sendix 7058 (shaft)	CANopen	**246**
new	ATEX / IECEx, minig	Sendix 7153 (shaft)	SSI / BiSS	**249**
new	ATEX / IECEx, minig	Sendix 7158 (shaft)	PROFIBUS DP	**252**
new	ATEX / IECEx, minig	Sendix 7158 (shaft)	CANopen	**255**

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.



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

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.

Miniature magnetic	2450 / 2470 (shaft / hollow shaft)	SSI

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 axial	10 N 20 N
Weight		approx. 0.06 kg [2.11 oz]
Protection acc. to EN 60529	housing side flange side	IP65 (IP67 on request) IP50 (IP67 on request)
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]
Material	shaft / hollow shaft clamping ring	stainless steel 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 SSI interface

Sensor

Power supply		5 (+0,4) V DC [1]
Power consumption (no load)		< 40 mA
Reverse polarity protection of the power supply		yes
Measuring range		360°
Resolution		12 bit
Code		gray
Linearity, 25°C [77°F]		< 1.5°
Repeat accuracy		≤ 0.4°
Data refresh rate		typ. 100 µs
CE compliant acc. to		EMC guideline 2004/108/EC RoHS guideline 2011/65/EU

SSI interface

SSI clock speed		100 kHz ... 750 kHz
Output driver		RS485
Monoflop time	typ. / max.	16 µs / 20 µs
Short circuit proof output		yes [2]
Permissible load / channel		typ. 60 Ohm (acc. to RS485)

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 colour:	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.

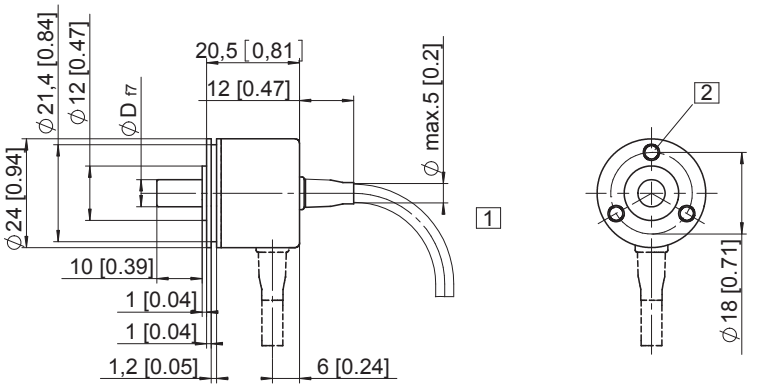
Miniature magnetic	2450 / 2470 (shaft / hollow shaft)	SSI

Dimensions shaft version

Dimensions in mm [inch]

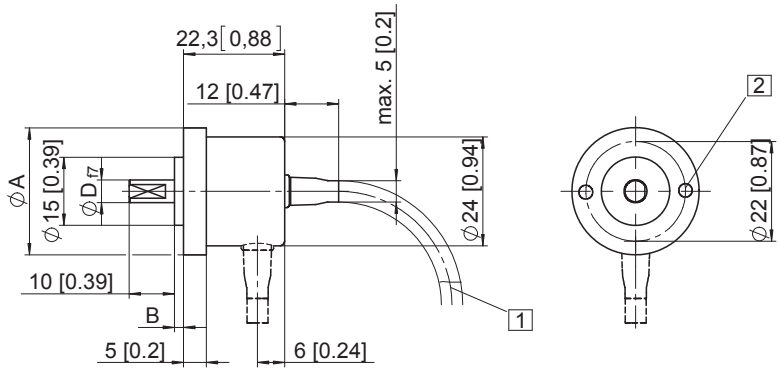
Flange type 1, ø 24 [0.94]

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



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



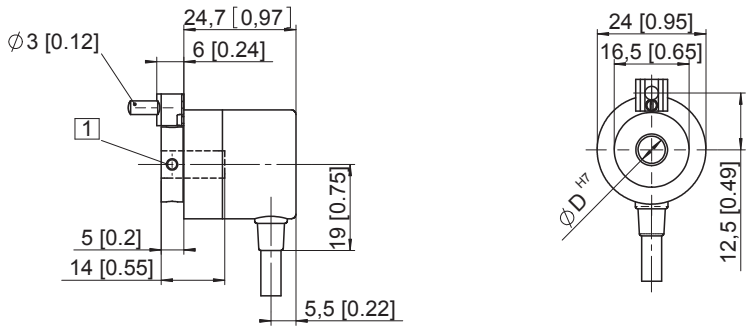
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

1 4 x M3 DIN 915 - SW1.5



Absolute encoders - singleturn

Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analogue**

Thanks to their different interfaces and measurement ranges, the Sendix 3651 and Sendix 3671 singleturn encoders with analogue 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-Lock™ | 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

Safe operation

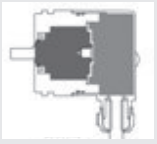
- Non-contact measuring system for long-life non-wear applications.
- Rugged die-cast-housing and protection up to IP69k for an exceptional tightness.
- High shock and vibration resistance for an exceptional robustness.

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.

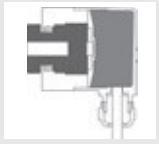
Safety-Lockplus™

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.

Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analogue**

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 *Hollow shaft*
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°

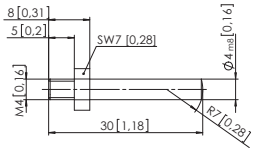
f *Interface / power supply*
3 = 4 ... 20 mA / 10 ... 30 V DC
4 = 0 ... 10 V / 15 ... 30 V DC
5 = 0 ... 5 V / 10 ... 30 V DC

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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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	aluminium
	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 2004/108/EC 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.

Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analogue**

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
Absoulte 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.

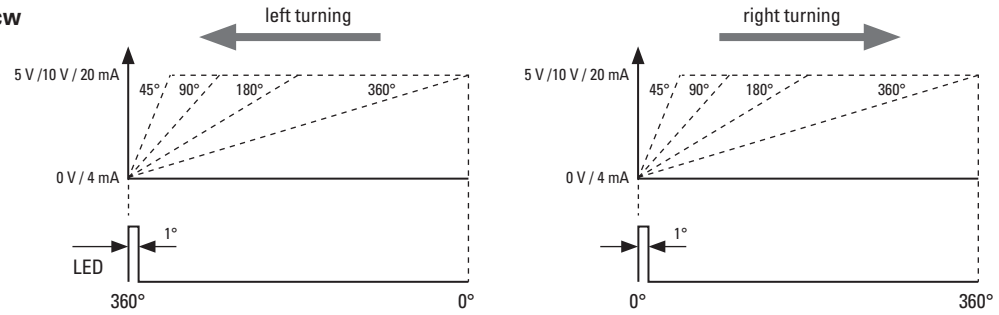
Status LED (green)

Status LED	green	reference point display turns ON at cw: betw. 0° and 1° at ccw: betw. 0° and -1°

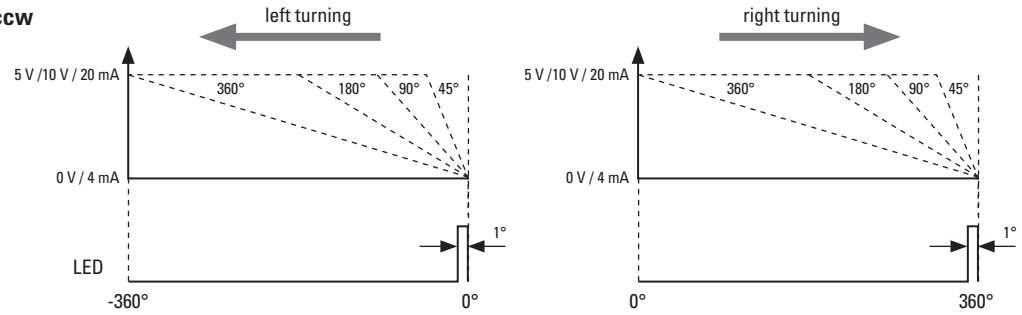
Example (output signal profile)

Measurement range 45° / 90° / 180° / 360°

Version cw



Version ccw



Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analogue**

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 colour:	WH	BN	GN	YE

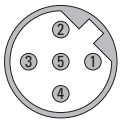
Interface	Type of connection	M12 connector, 5 pin				
3 (current)	3, 4	Signal:	0 V	+V	+I	-I
		Pin:	3	2	4	5

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 colour:	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



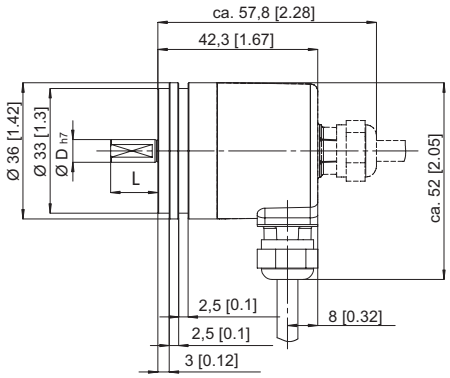
M12 connector, 5-pin

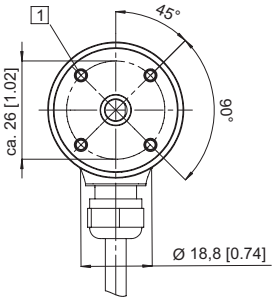
Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with cable)

1 M3, 6 [0.24] deep

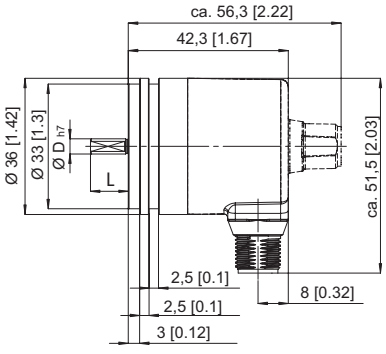


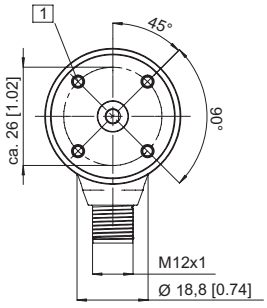


D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	12.5 [0.49]	h7
1/4“	12.5 [0.49]	h7

Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with M12 connector)

1 M3, 6 [0.24] deep





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

Compact magnetic | **Sendix 3651 / 3671 (shaft / hollow shaft)** | **Analogue**

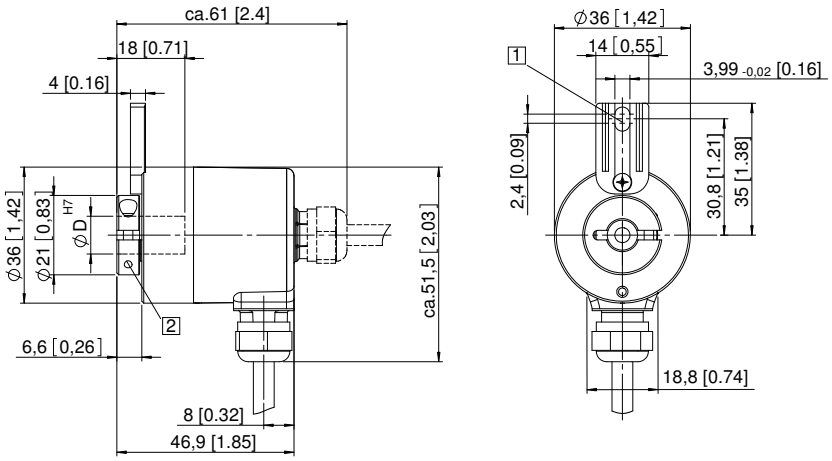
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 2

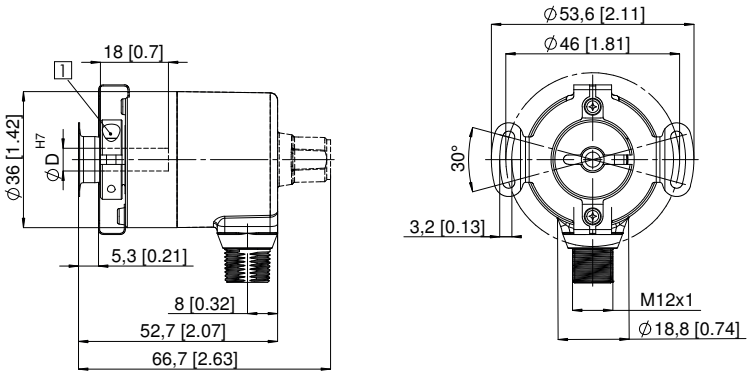
1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

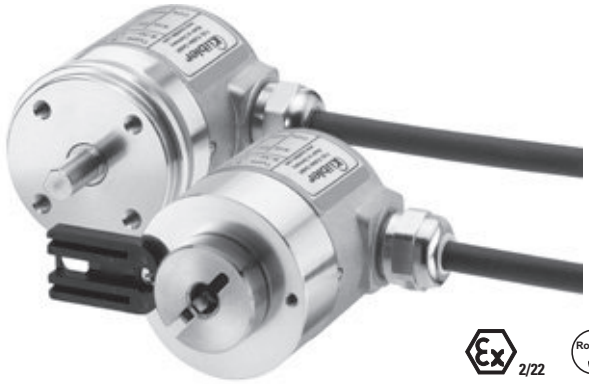


Flange with stator coupling, ø 46 [1.81]
Flange type 5

1 Recommended torque for the clamping ring 0.7 Nm



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-Lock™ | 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

Safe technology

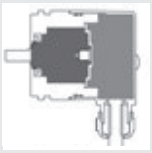
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety-Lock™ design.
- Resistant die-cast-housing and protection up to IP69k.

Versatile applications

- CANopen encoder profile DS406 V3.2.
- Fast determination of the operating status via two-colour 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 encoder profil DS406 V3.2

f *Protection*
1 = IP67
2 = IP69k

Optional on request
- Ex 2/22 (only for type of connection 4)
- surface protection salt spray tested

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 *Hollow shaft*
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 encoder profil DS406 V3.2

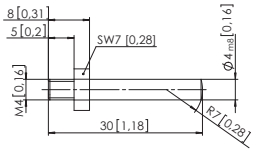
f *Protection*
1 = IP67
2 = IP69k

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

			Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology

		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 6 m [19.69'] PVC cable	**05.00.6091.A211.006M**

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	aluminium
	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°
Absoulte 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 2004/108/EC RoHS guideline 2011/65/EU

Diagnostic LED (two-colour, red/green)

LED ON or blinking	red	error display
	green	status display

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 colour 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 behaviour 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 colours.
- 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.

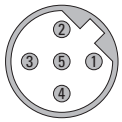
For a network with 3 encoders and 250 Kbit the maximum length of the drop line/ encoder must not exceed 70 cm.

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 colour:	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

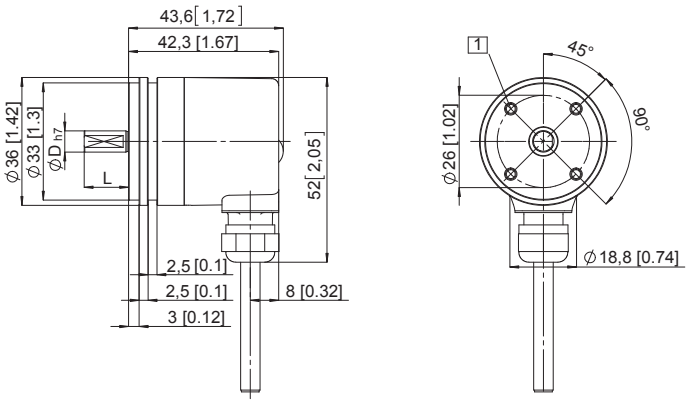
Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

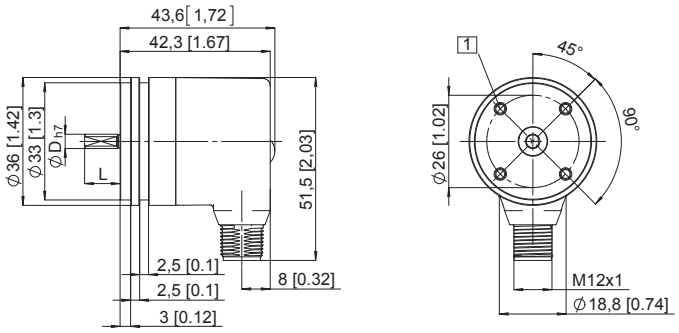
Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with cable)

1 4 x M3, 6 [0.24] deep



Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



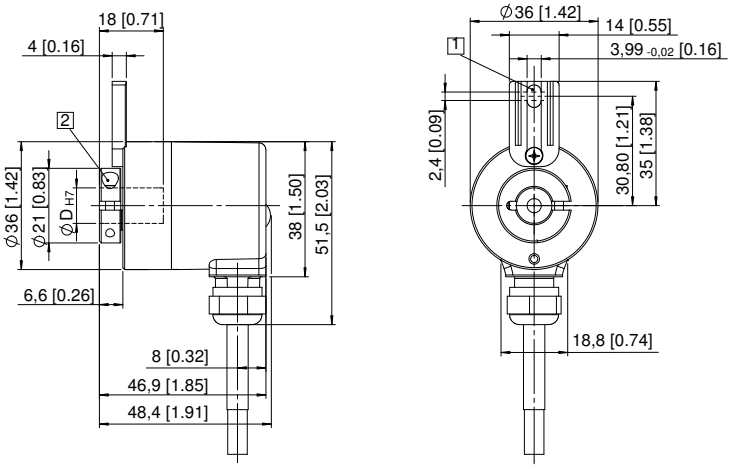
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	12.5 [0.49]	h7
1/4"	12.5 [0.49]	h7

Dimensions hollow shaft version

Dimensions in mm [inch]

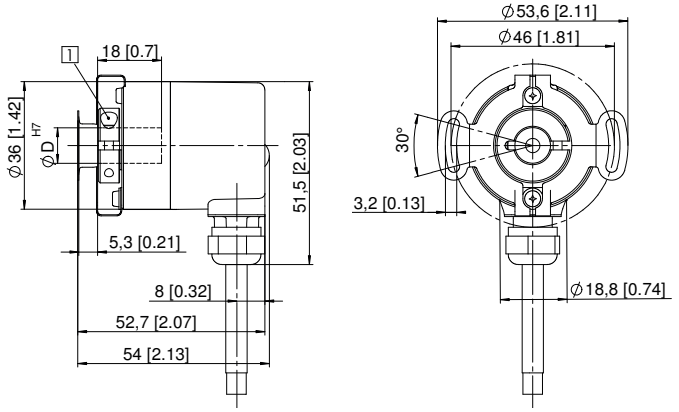
Flange with spring element, long
Flange type 2

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 Recommended torque for the clamping ring 0.7 Nm

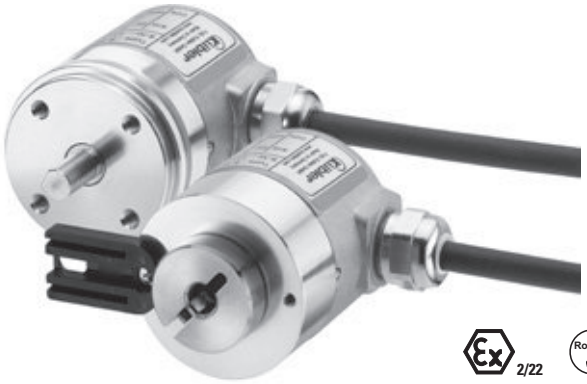


Flange with stator coupling, ø 46 [1.81]
Flange type 5

1 Recommended torque for the clamping ring 0.7 Nm



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 localisation.

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-Lock™ (shaft) | 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

Safe technology

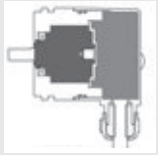
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety Lock™ Design.
- Resistant die cast housing and protection up to IP69k.

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-colour LED.
- Fast, error-free start up with no need to set switches; with automatic address claiming (ACL).

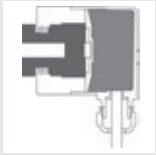
Safety-Lockplus™

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

Compact magnetic | Sendix M3658 / M3678 (shaft / hollow shaft) | SAE J1939

Order code Hollow shaft

8.M3678 . X 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 = with spring element, long
5 = with stator coupling, ø 46 mm [1.81"]

b *Hollow shaft*
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

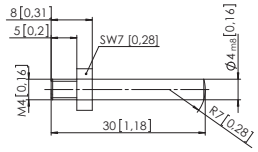
*) Available special lengths (connection type B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3678.52CB.3211.0030 (for cable length 3 m)

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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 6 m [19.69'] PVC cable	**05.00.6091.A211.006M**

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	aluminium
	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°
Absoulte 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 2004/108/EC RoHS guideline 2011/65/EU

Diagnostic LED (two-colour, red/green)

LED ON or blinking	red	error display
	green	status display

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 decentralised 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 optimised 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.

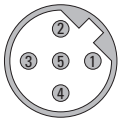
A two-colour LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.

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 colour:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector					
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

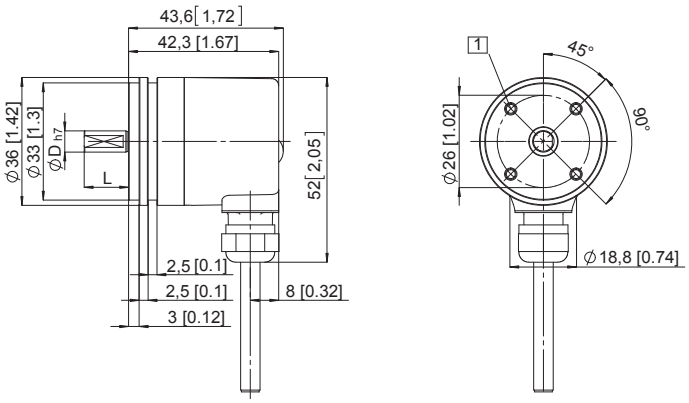
Compact magnetic | **Sendix M3658 / M3678 (shaft / hollow shaft)** | **SAE J1939**

Dimensions shaft version

Dimensions in mm [inch]

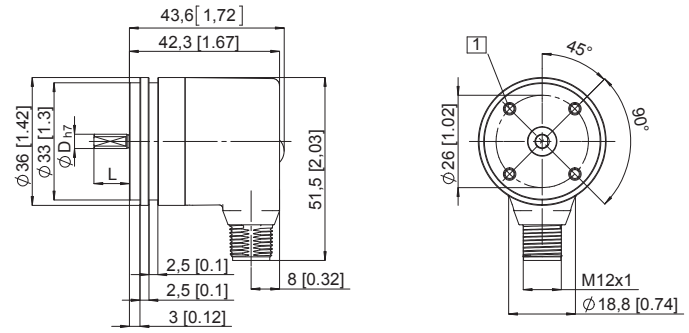
Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with cable)

1 4 x M3, 6 [0.24] deep



Synchro flange, ø 36 [1.42]
Flange type 2
(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



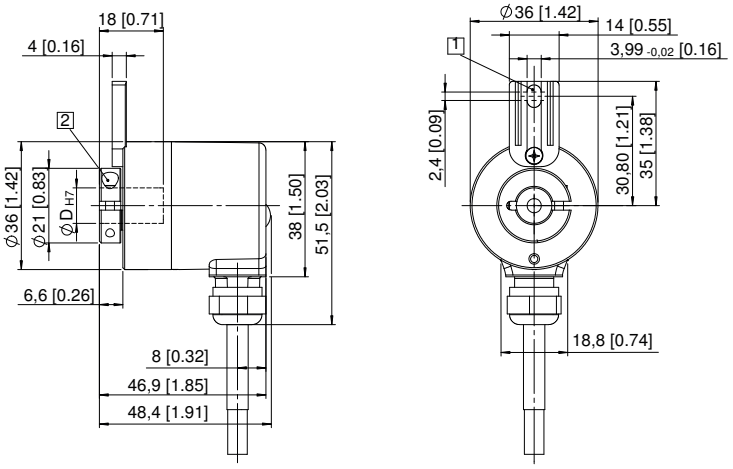
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	12.5 [0.49]	h7
1/4"	12.5 [0.49]	h7

Dimensions hollow shaft version

Dimensions in mm [inch]

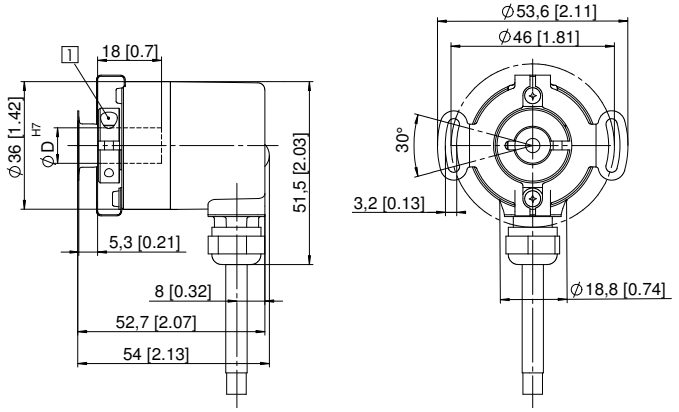
Flange with spring element, long
Flange type 2

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 Recommended torque for the clamping ring 0.7 Nm



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

1 Recommended torque for the clamping ring 0.7 Nm



Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS**

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 (-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 | 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.

Optimised 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 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"]
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.

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS**

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 *Hollow shaft*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"], blind hollow shaft
2 = ø 1/4"

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)]

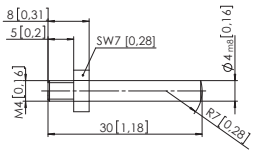
*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3673.242F.G312.0030 (for cable length 3 m)

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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**

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

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	aluminium
	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"].

Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS**

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 2004/108/EC 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
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs

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

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.

Power-ON time

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.

DIR input

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

Response time (DIR input)	1 ms

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.

1) Short circuit proof to 0 V or to output when power supply correctly applied.

Compact optical | **Sendix F3653 / F3673 (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, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⏚
			Cable colour:	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 colour:	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 colour:	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 colour:	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 colour:	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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

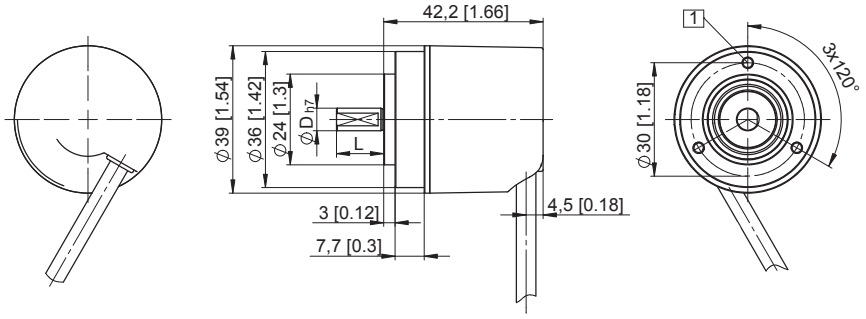
Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

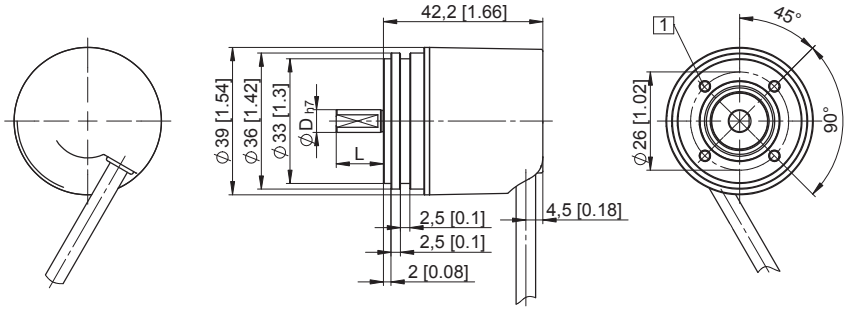
1 3 x M3, 6 [0.24] deep



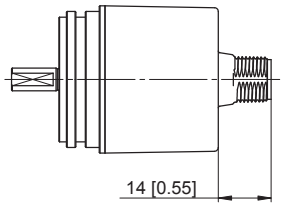
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

Synchro flange, ø 36 [1.42]
Flange type 2 and 4
(drawing with cable)

1 3 x M3, 6 [0.24] deep



Drawing with M12 connector
Type of connection 8



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

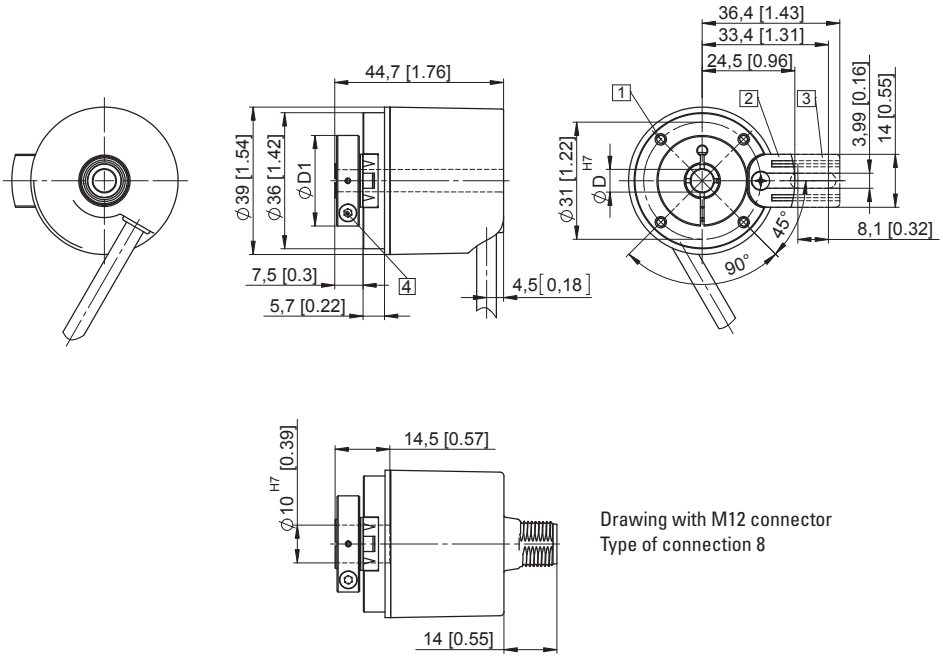
Compact optical | **Sendix F3653 / F3673 (shaft / hollow shaft)** | **SSI / BiSS**

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 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



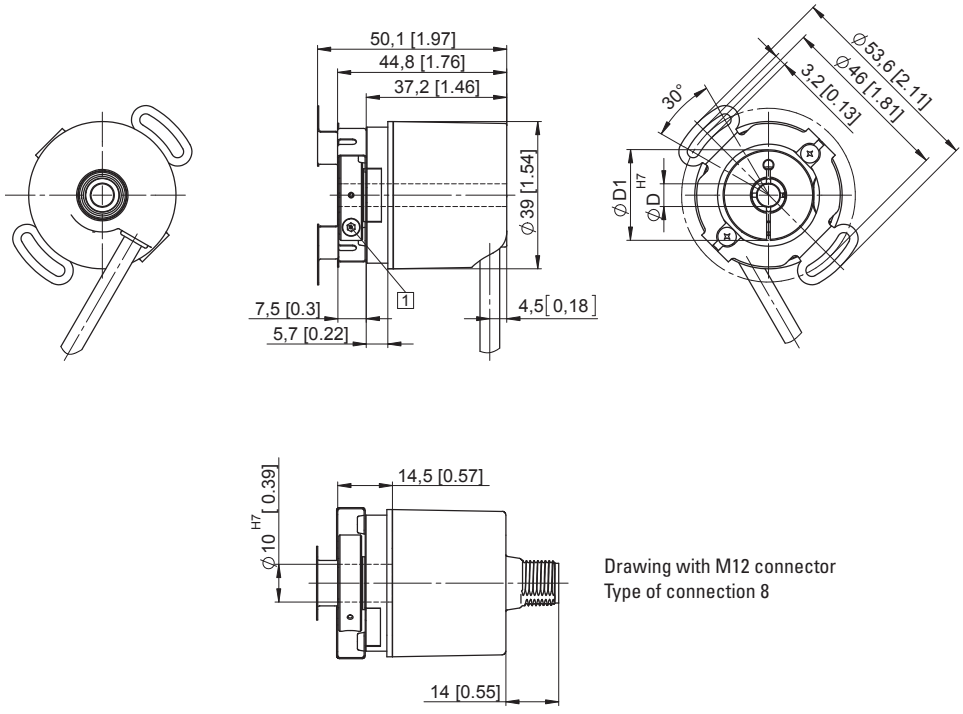
Drawing with M12 connector
Type of connection 8

D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, ø 46 [1.81]
Flange type 2

1 Recommended torque for the clamping ring 0.7 Nm



Drawing with M12 connector
Type of connection 8

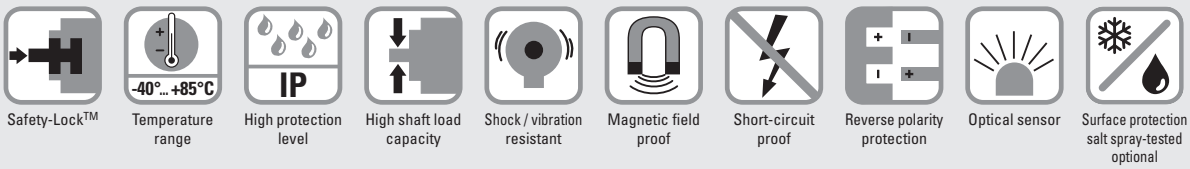
D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

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.



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 encoder profile DS406 V3.2

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*
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.F3658.432F.2112.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen encoder profile DS406 V3.2

Optional on request
- surface protection salt spray tested

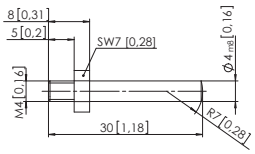
Absolute encoders - singleturn

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

			Order no.
Cylindrical pin, long for torque stops		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 aluminium 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 2004/108/EC 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-colour, red/green)

LED ON or blinking	red green	error display status display

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-colour 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 behaviour 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 colours.
- 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 colour:	BN	WH	GY	GN	YE

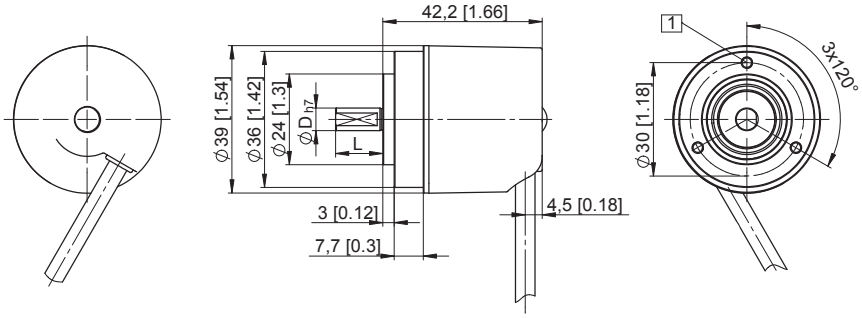
Compact optical | **Sendix F3658 / F3678 (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

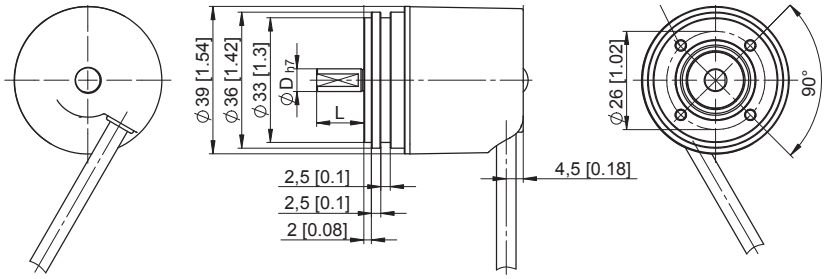
Clamping flange, ø 36 [1.42]
Flange type 1 and 3

1 M3, 6 [0.24] deep



Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 M3, 6 [0.24] deep



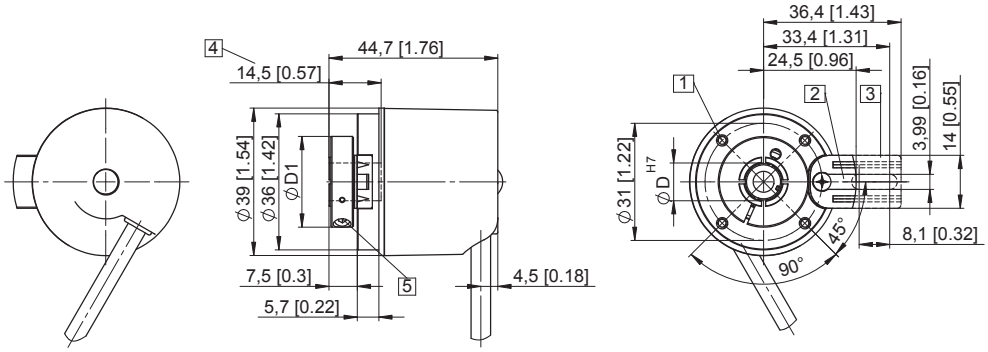
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

Dimensions hollow shaft version

Dimensions in mm [inch]

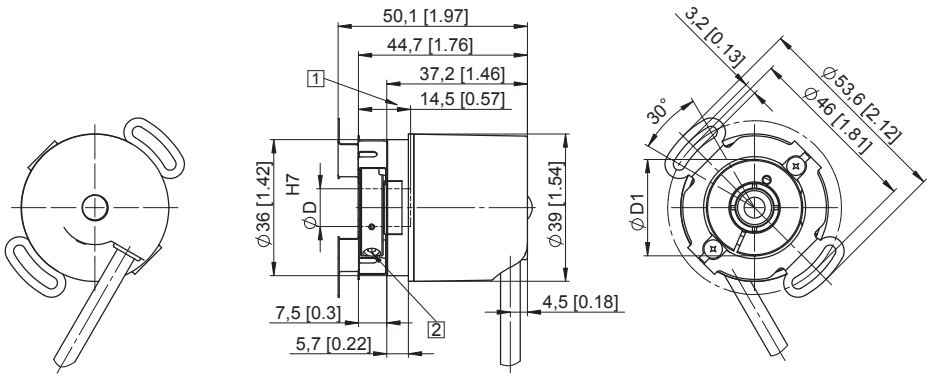
Flange with spring element
Flange type 1 and 3
(drawing with spring element short, spring element long is shown dashed)

1 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 Insertion depth for blind hollow shaft
5 Recommended torque for the clamping ring 0.7 Nm



Flange with stator coupling, ø 46 [1.81"]
Flange type 2

1 Insertion depth for blind hollow shaft
2 Recommended torque for the clamping ring 0.7 Nm



D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analogue**

The singleturn encoders 5850 and 5870 with parallel or analogue 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 analogue output the 4 ... 20 mA signals can achieve a resolution of 13 bits.

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*
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.

Absolute encoders - singleturn

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analogue**

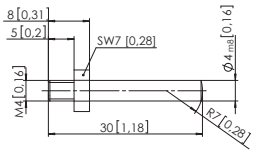
Table 1: Code type and divisions for encoders with parallel output — Interface and power supply, version 3 or 4 (parallel)

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

			Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology

		Order no.
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin for analogue interface	**8.0000.5012.0000**
	M23 female connector with coupling nut, 17-pin for parallel interface	**8.0000.5042.0000**
Cordset, pre-assembled	M23 female connector w. coupling nut, for analogue interf., 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
	M23 female connector w. coupling nut, for parallel interf., 2 m [6.56'] PVC cable	**8.0000.6741.0002**

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.

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analogue**

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 2004/108/EC 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
Analogue 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 2004/108/EC 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 analogue 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

Absolute encoders - singleturn

Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analogue**

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 colour:	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 colour:	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

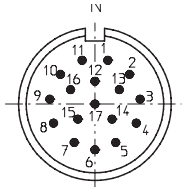
Interface	Type of connection		Cable (isolate unused wires individually before initial start-up)														
7, 8	5850:	1, 2	Signal	0 V	+V	-	-	+I	-I	ST	VR						
(4 ... 20 mA)			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY PK	RD BU		

13 bit

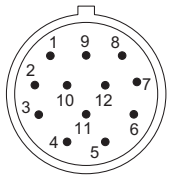
Interface	Type of connection		M23 connector, 12-pin													
7, 8	5850:	3, 5	Signal	0 V	+V	-	-	+I	-I	ST	VR					⏚	
(4 ... 20 mA)			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH	

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
Sig.: 1 =MSB; 2 = MSB-1; 3 = MSB-2 usw.
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)

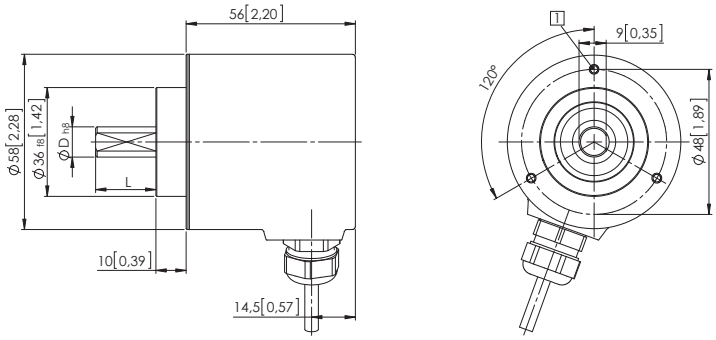
Standard optical | **5850 / 5870 (shaft / hollow shaft)** | **Parallel / analogue**

Dimensions shaft version

Dimensions in mm [inch]

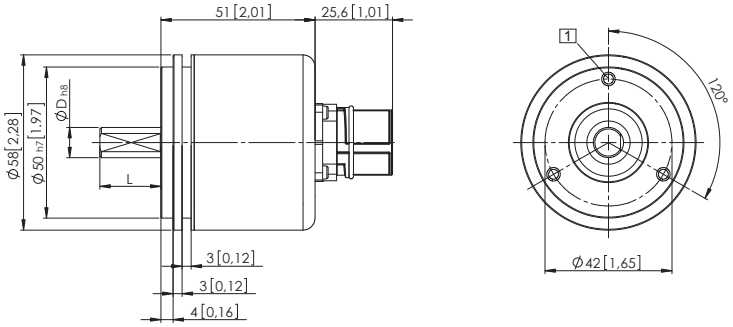
Clamping flange, ø 58 [2.28]
with shaft, ø 10 [0.39]
Flange type 1

1 3 x M3, 5 [0.20] deep



Synchro flange, ø 58 [2.28]
with shaft, ø 6 [0.24]
Flange type 2

1 3 x M3, 5 [0.20] deep



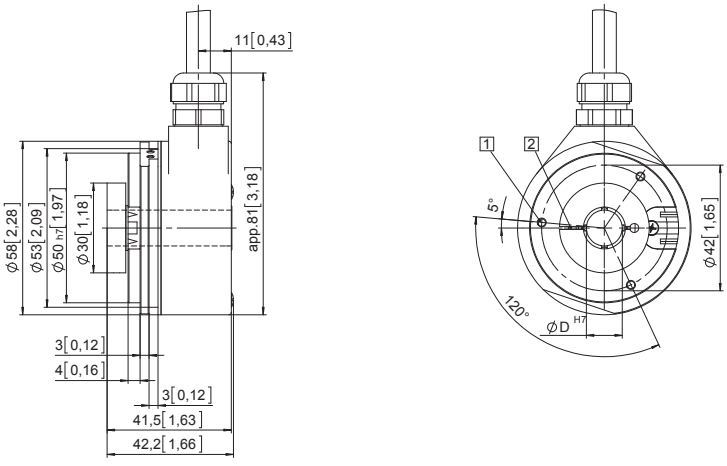
D	L	Fit
6 [0.24]	10 [0.39]	h8
10 [0.39]	20 [0.79]	h8

Dimensions hollow shaft version

Dimensions in mm [inch]

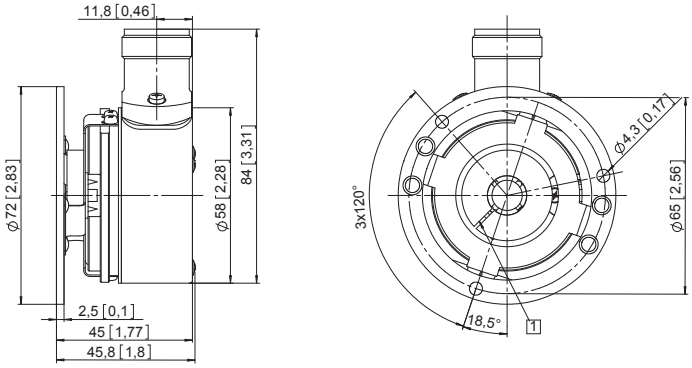
Flange with spring element, short
Flange type 1 and 2

1 3 x M3, 5 [0.20] deep
2 Recommended torque for the clamping ring 0.6 Nm



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

1 Recommended torque for the clamping ring 0.6 Nm



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 *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:

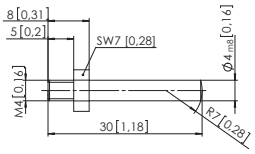
Rising code values when shaft turning clockwise (cw). Falling code values when shaft turning counterclockwise (ccw), top view of shaft.

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.

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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M23 female connector with coupling nut, 17-pin	**8.0000.5042.0000**
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6741.0002**

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 2004/108/EC RoHS guideline 2011/65/EU	

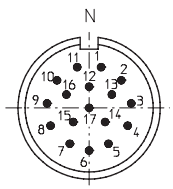
Terminal assignment

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 colour:	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)

1) For continous operation max. 1500 min^{-1}.
2) 70°C [158°F] for 14 bit version.
3) If power supply +V correctly applied.
4) V/R only with output circuit 3 up to max. 13 bit. MSB to change the count direction.

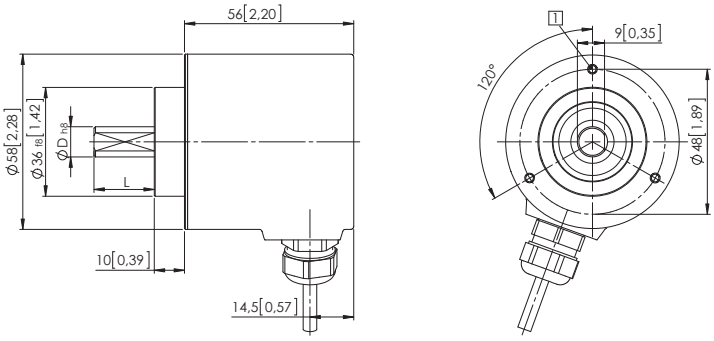
Standard optical	5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed

Dimensions shaft version

Dimensions in mm [inch]

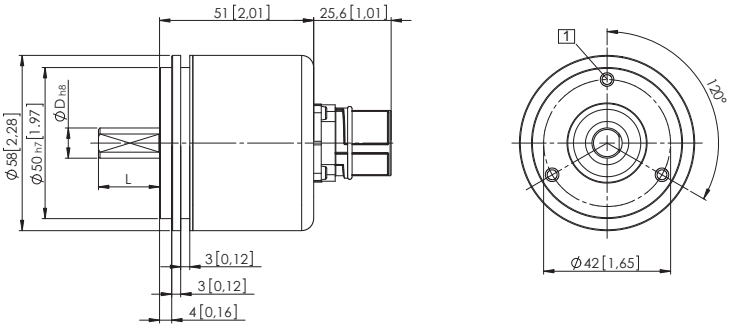
Clamping flange, ø 58 [2.28]
with shaft, ø 10 [0.39]
Flange type 12

1 3 x M3, 5 [0.20] deep



Synchro flange, ø 58 [2.28]
with shaft, ø 6 [0.24]
Flange type 21

1 3 x M3, 5 [0.20] deep



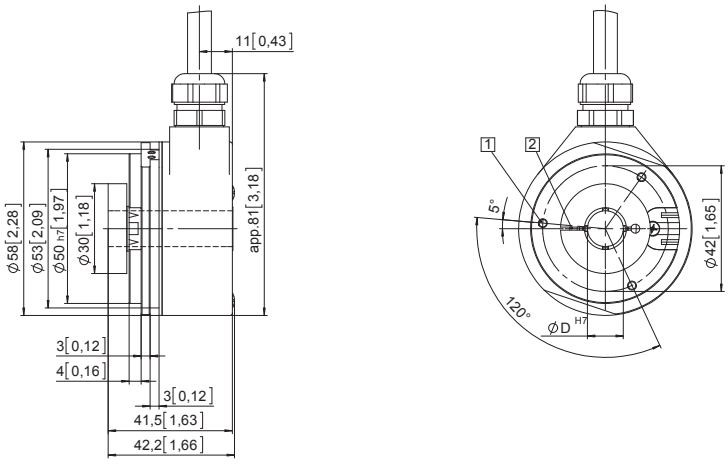
D	L	Fit
6 [0.24]	10 [0.39]	h8
10 [0.39]	20 [0.79]	h8

Dimensions hollow shaft version

Dimensions in mm [inch]

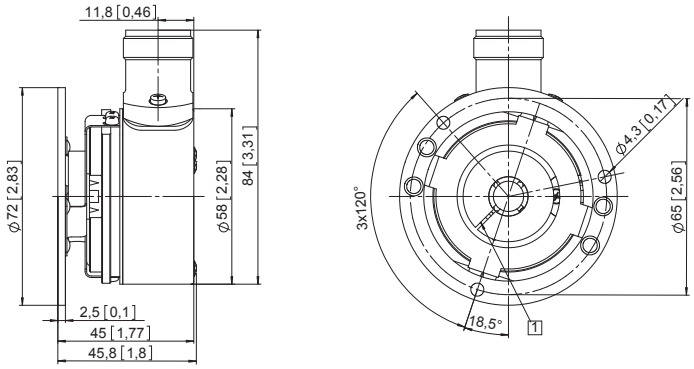
Flange with spring element, short
Flange type 1

1 3 x M3, 5 [0.20] deep
2 Recommended torque for the clamping ring 0.6 Nm

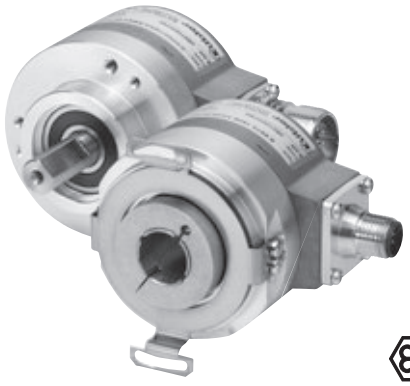


Flange with stator coupling, ø 65 [2.56]
Flange type 3

1 Recommended torque for the clamping ring 0.6 Nm



Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS**



The Sendix 5853 and Sendix 5873 singleturn encoders with SSI or BiSS interface and optical sensor technology can achieve a resolution of max. 21 bits.

These encoders are also available with an incremental track.

Special version for attachment to direct drives in the lift technology.

Ex 2/22 | cULus | RoHS | SSI | BiSS INTERFACE


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


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 +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.
- 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
- 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.

Absolute encoders - singleturn

Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS**

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]

b *Hollow shaft*
3 = ø 10 mm [0.39"]
K = ø 10 mm [0.39"], with tapered shaft
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
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)
- 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		Order no.
Cylindrical pin, long	with fixing thread	**8.0010.4700.0000**
for torque stops		

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**

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.

Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS**

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	aluminium
	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 %) 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 2004/108/EC 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
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs

BiSS interface

Resolution	10 ... 14 bit, 17 bit and 21bit
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

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
Response time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET 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.

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

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.

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.

Absolute encoders - singleturn

Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS**

DIR 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.

Power-ON time

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

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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	M23 connector													
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	0Vsens	+Vsens	⏚
		sensor output	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector													
5	3, 4	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0Vsens	+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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector													
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	$\overline{B}$	0Vsens	+Vsens	⏚
		sensor output	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

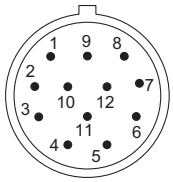
Interface	Type of connection	Features	M23 connector													
6, 9	3, 4	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	M12 connector									
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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

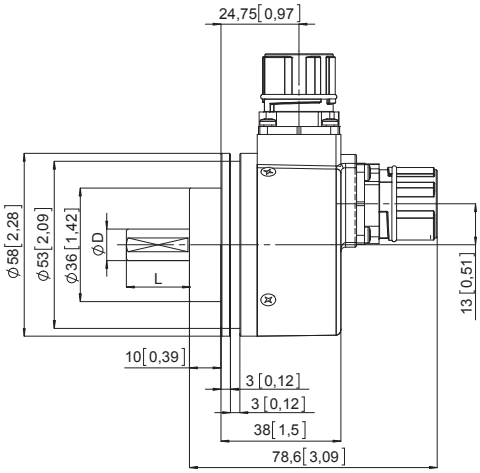
Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS**

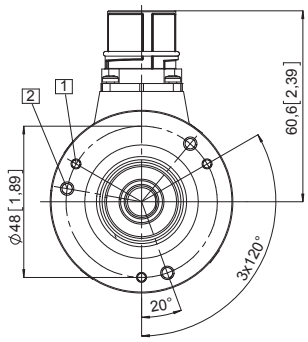
Dimensions shaft version

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

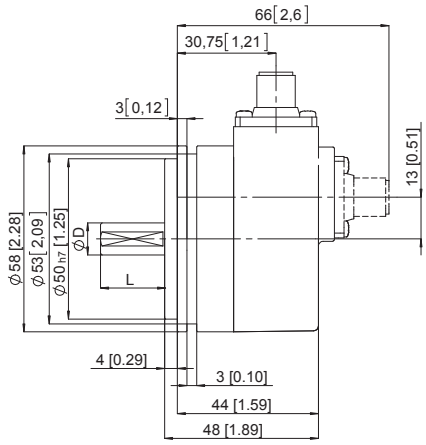


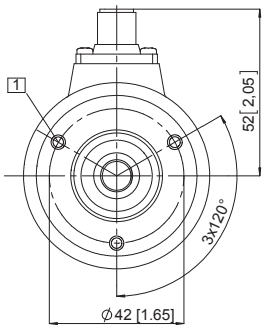


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

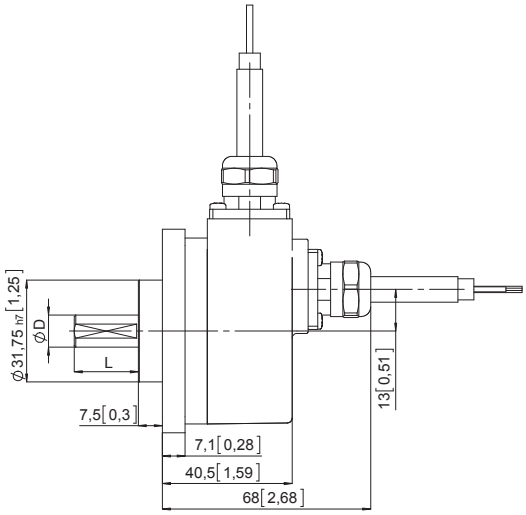
1 3 x M4, 6 [0.24] deep

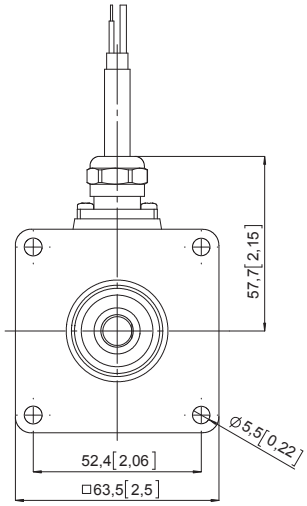




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

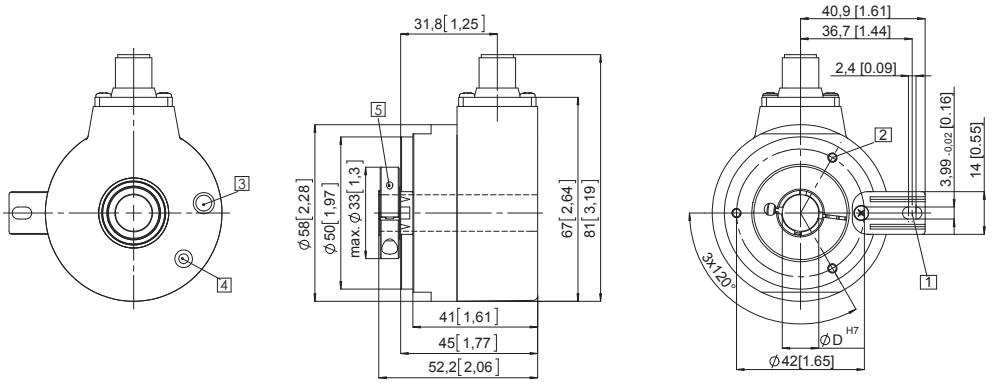
Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions hollow shaft version

Dimensions in mm [inch]

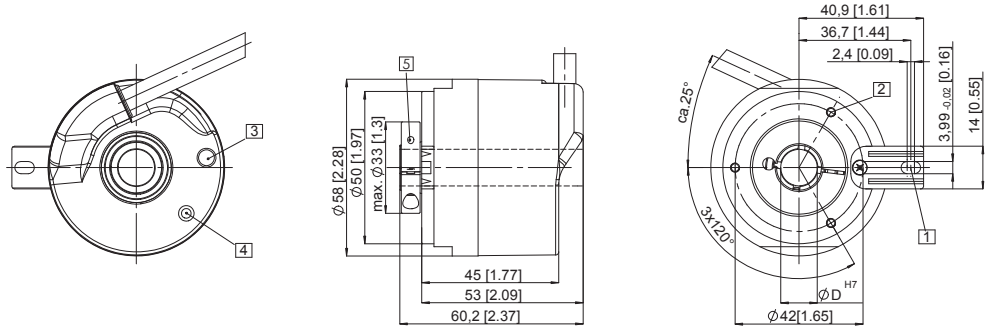
Flange with spring element, long
Flange type 1 and 2
(drawing with M12 connector)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.21] deep
3 Status-LED
4 SET button
5 Recommended torque for the clamping ring 0.6 Nm



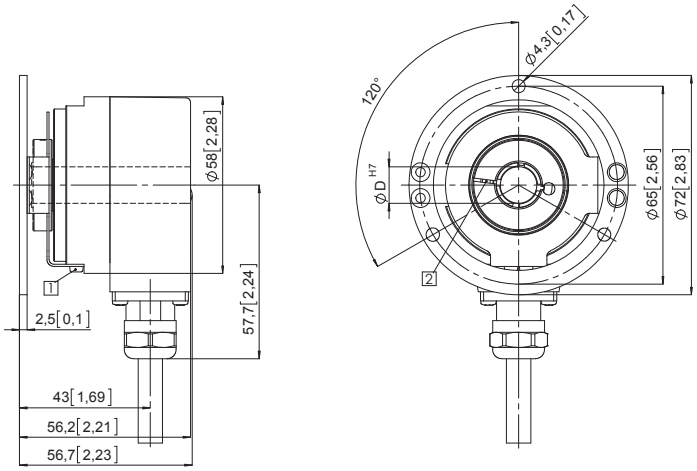
Flange with spring element, long
Flange type 1 and 2
(drawing with tangential cable)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.21] deep
3 Status-LED
4 SET button
5 Recommended torque for the clamping ring 0.6 Nm



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



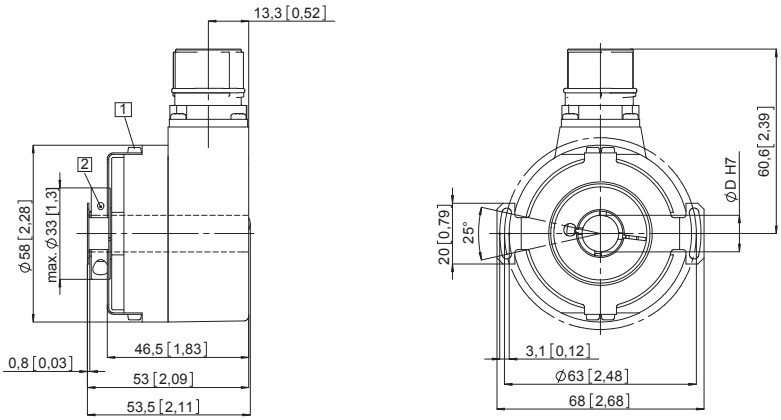
Standard optical | **Sendix 5853 / 5873 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions hollow shaft version

Dimensions in mm [inch]

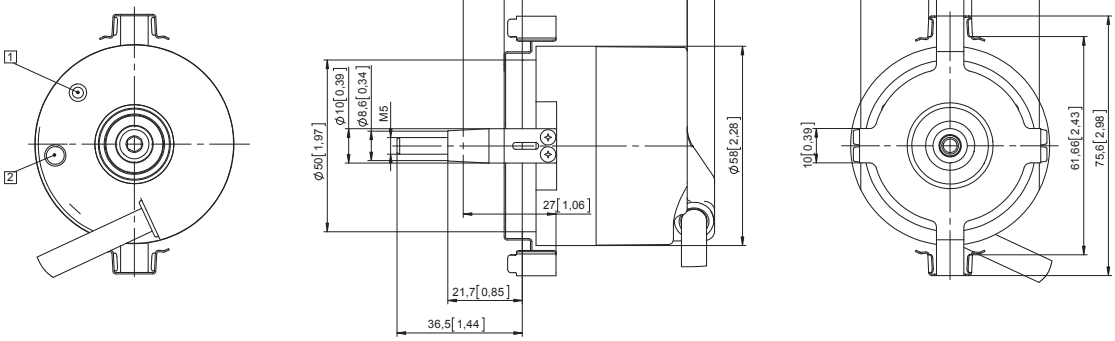
Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with M23 connector)

1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm



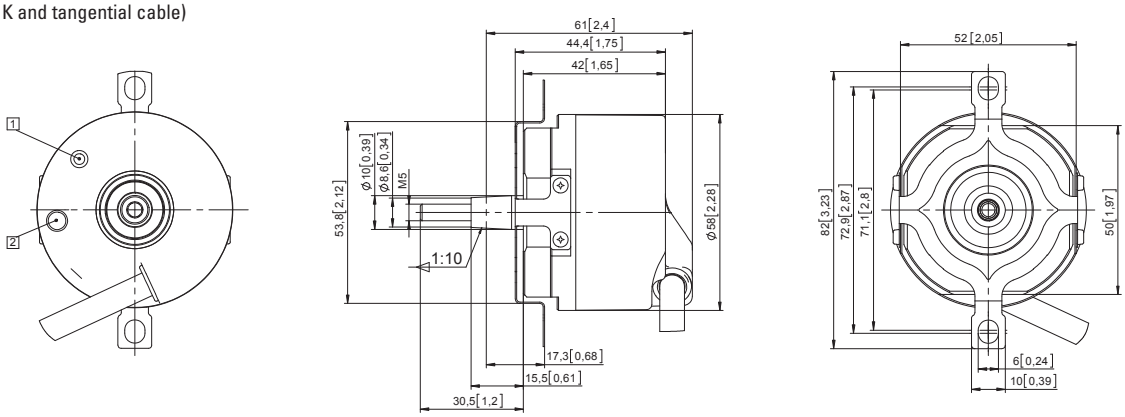
Flange with stator coupling, mounting without screws
Flange type E and F
(with tapered shaft K and tangential cable)

1 Status LED
2 SET button



Flange with stator coupling, ø 72 [2.83]
Flange type G
(with tapered shaft K and tangential cable)

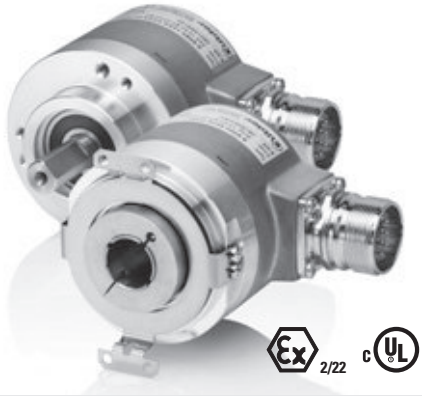
1 Status LED
2 SET Button



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
- other resolutions

1) Resolution, preset value and count direction are factory-programmable.

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 *Hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft

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)
- other resolutions

Accessory		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.	

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable [2]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 10 m [32.81'] PVC cable [2]	**8.0000.6901.0010.0031**
Connector, self-assembly (straight)	M23 female connector with coupling nut	**8.0000.5012.0000**
	M23 female connector with coupling nut, Ex zone 2/22	**8.0000.5012.0000.Ex**

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

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 / HFT = 1)
PFH_d value [3]	$2.16 \times 10^{-8}\ h^{-1}$
Proof-test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

1) Resolution, preset value and count direction are factory-programmable.
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.

Absolute encoders - singleturn

Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

SSI / BiSS + 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)
Material	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PVC
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
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 2004/108/EC 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

Power-ON time

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

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.

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
Singleturn resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs

BiSS interface

Singleturn 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
Pulse rate	2048 ppr

SET input or SET button

Input		active HIGH
Input type		comparator
Signal level	HIGH	min: 60 % of +V, 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
Reaction time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET 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.

DIR 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.

1) Cable version: -30°C ... +90°C [-22°F ... +194°F].
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Standard
SIL2/PLd, optical | **Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

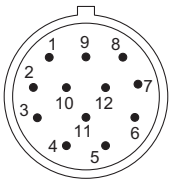
Terminal assignment

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 colour:	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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



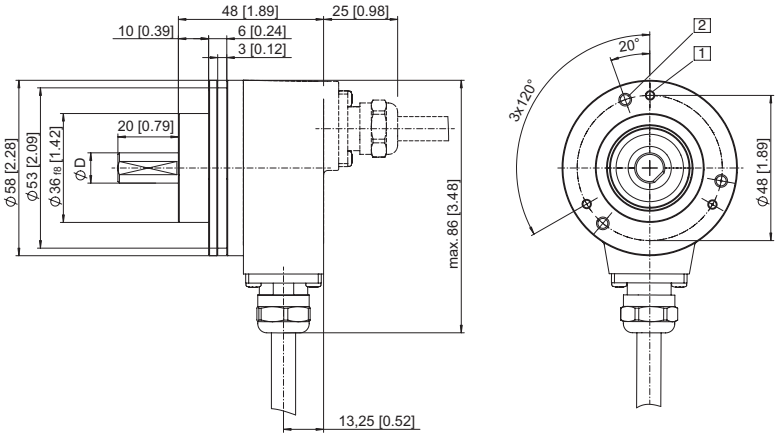
M23 connector, 12-pin

Dimensions shaft version

Dimensions in mm [inch]

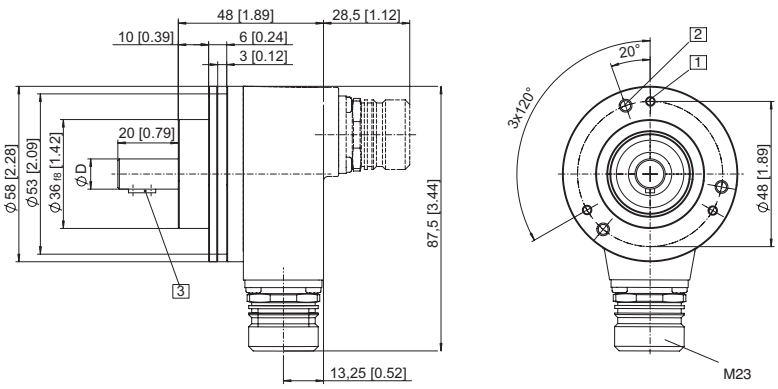
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
D = 10 f7 [0.39]



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 = 10 h7 [0.39]



Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)

SSI / BiSS + SinCos

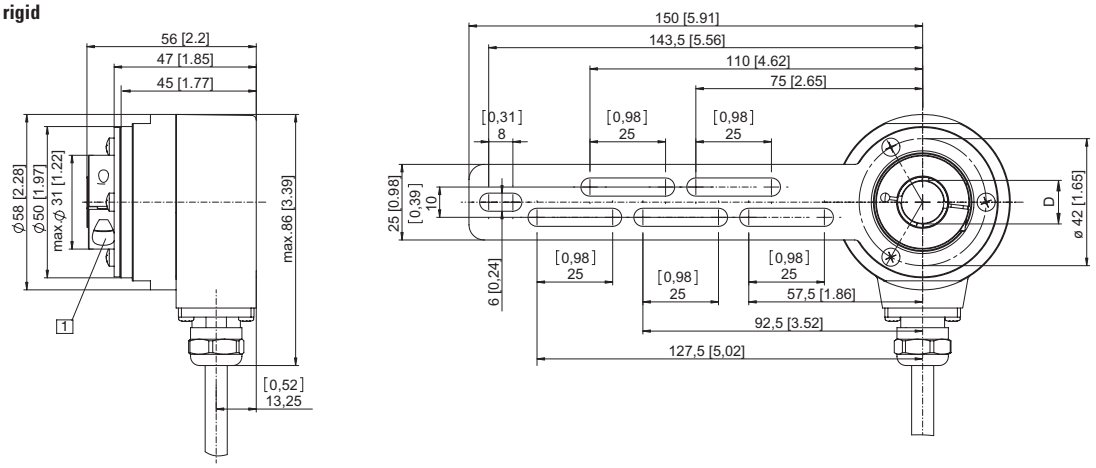
Dimensions hollow shaft version

Dimensions in mm [inch]

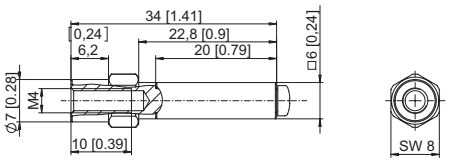
Flange with torque stop set, rigid
Flange type A
(drawing with cable)

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

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



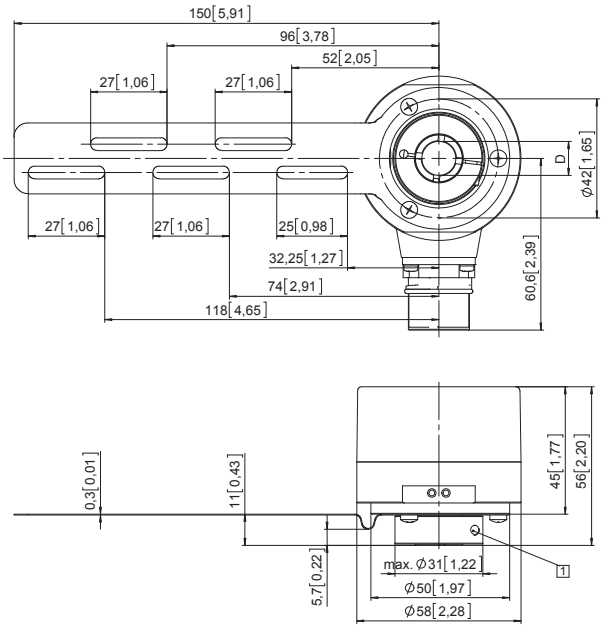
Torque pin with rectangular sleeve with M4 thread



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

1 Recommended torque for the clamping ring 2.5 Nm

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



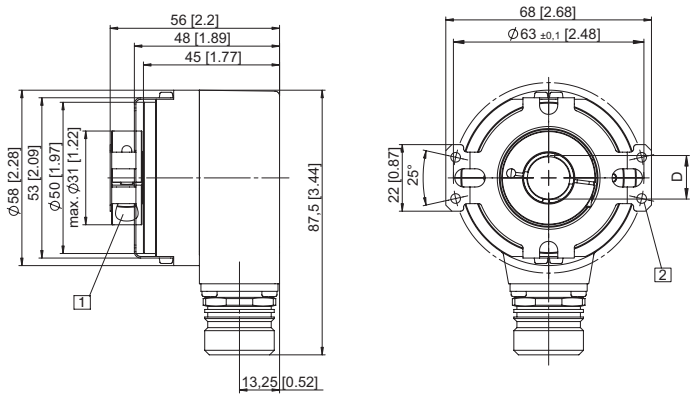
Standard
SIL2/PLd, optical | **Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

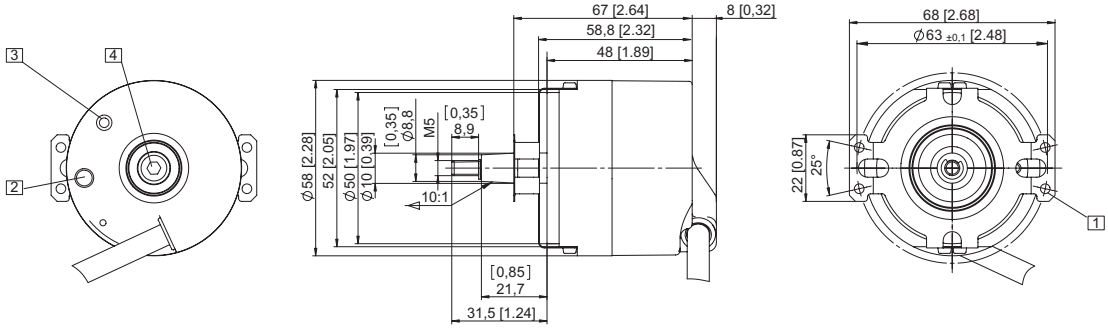
Flange with stator coupling, ø 63 [2.48]
and hollow shaft
Flange type B
(drawing with M23 connector)

1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw
D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



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

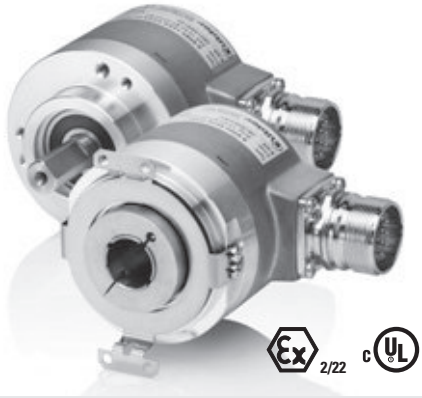
1 For (4x) M3 screw
2 Status LED
3 SET button
4 SW 4



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
- other resolutions

1) Resolution, preset value and count direction are factory-programmable.

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 *Hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft

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)
- other resolutions

Accessory		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.	

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable [2]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 10 m [32.81'] PVC cable [2]	**8.0000.6901.0010.0031**
Connector, self-assembly (straight)	M23 female connector with coupling nut	**8.0000.5012.0000**
	M23 female connector with coupling nut, Ex zone 2/22	**8.0000.5012.0000.Ex**

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

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 / HFT = 1)
PFH_d value [3]	$1.09 \times 10^{-8}\ h^{-1}$
Proof-test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

1) Resolution, preset value and count direction are factory-programmable.
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.

Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

SSI / BiSS + 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)
Material	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PVC
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
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 2004/108/EC 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

Power-ON time

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

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.

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
Singleturn resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs

BiSS interface

Singleturn 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
Pulse rate	2048 ppr

SET input or SET button

Input		active HIGH
Input type		comparator
Signal level	HIGH	min: 60 % of +V, 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
Reaction time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET 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.

DIR 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.

1) Cable version: -30°C ... +90°C [-22°F ... +194°F].
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

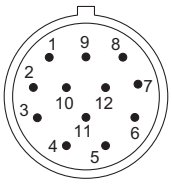
Terminal assignment

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 colour:	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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



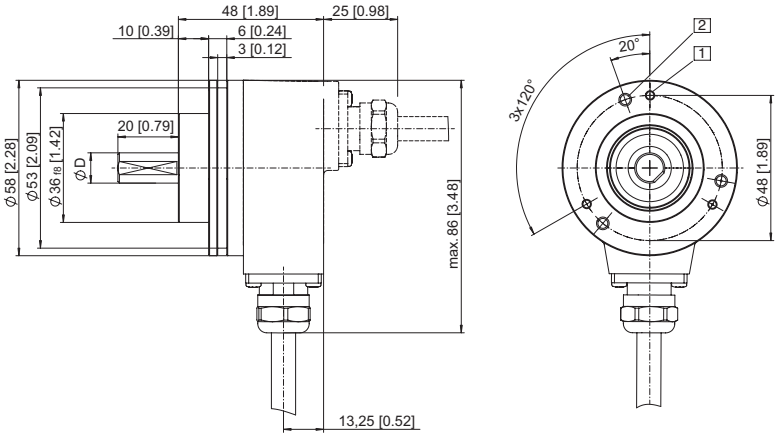
M23 connector, 12-pin

Dimensions shaft version

Dimensions in mm [inch]

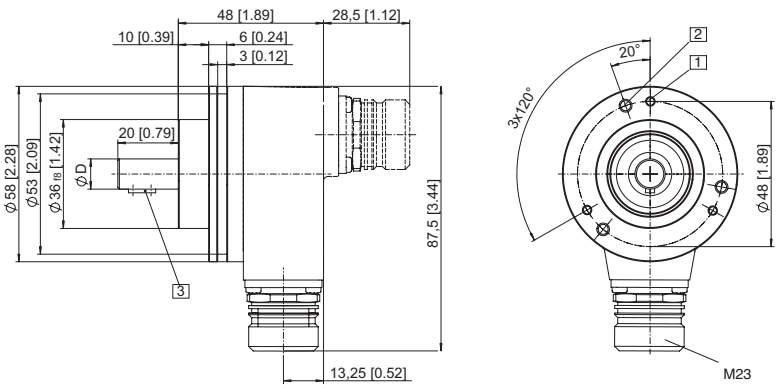
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
D = 10 f7 [0.39]



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 = 10 h7 [0.39]



Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)

SSI / BiSS + SinCos

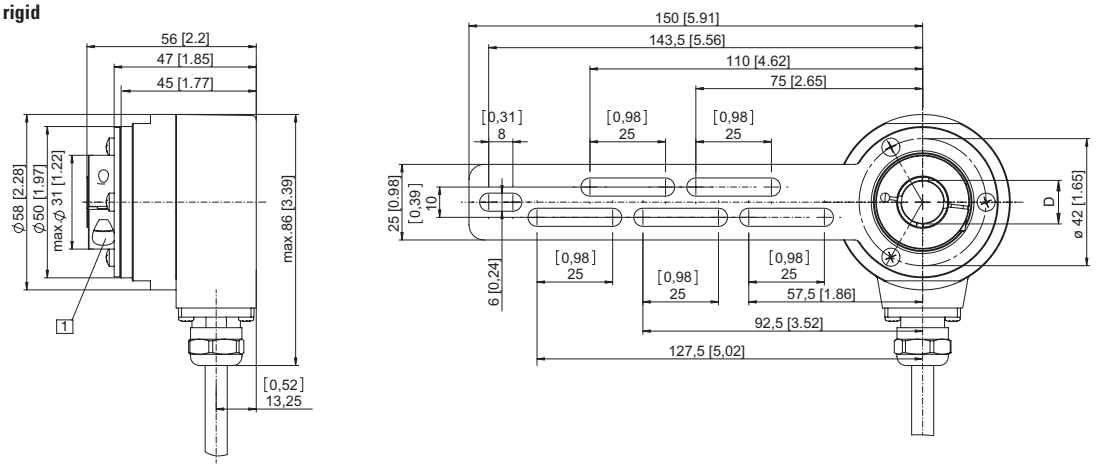
Dimensions hollow shaft version

Dimensions in mm [inch]

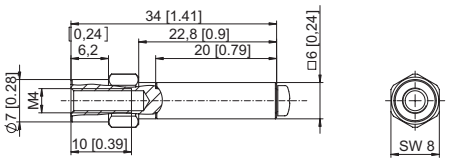
Flange with torque stop set, rigid
Flange type A
(drawing with cable)

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

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



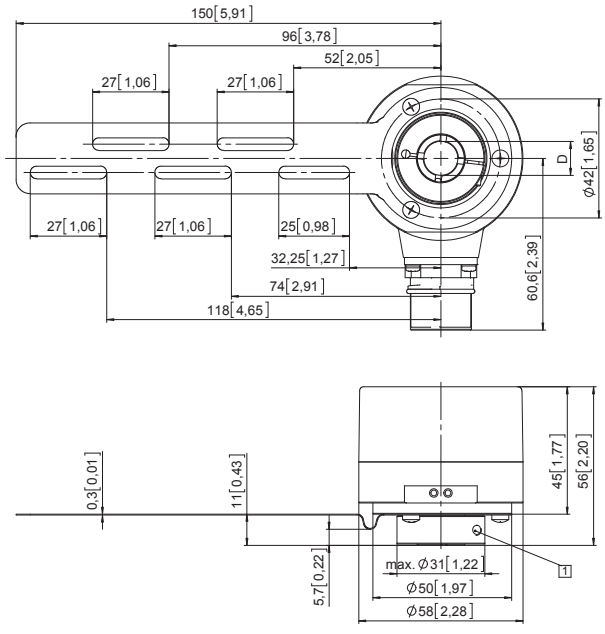
Torque pin with rectangular sleeve with M4 thread



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

1 Recommended torque for the clamping ring 2.5 Nm

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



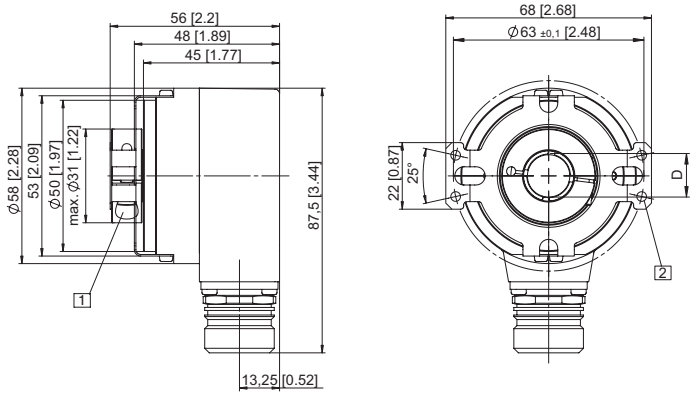
Standard
SIL3/PLe, optical | **Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

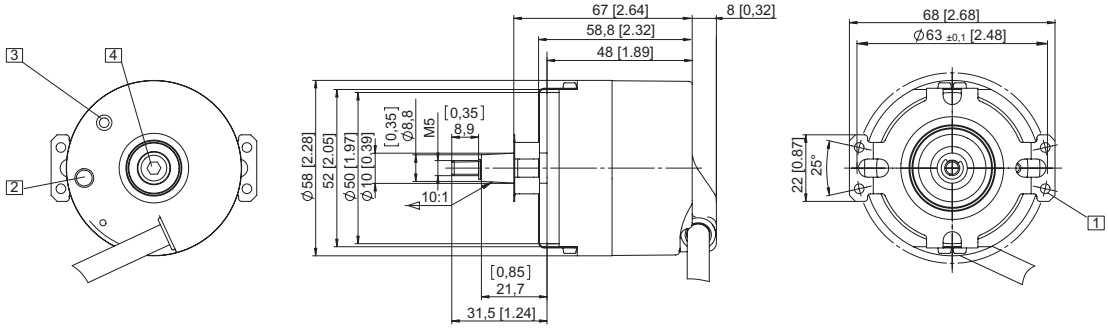
Flange with stator coupling, ø 63 [2.48]
and hollow shaft
Flange type B
(drawing with M23 connector)

1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw
D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]

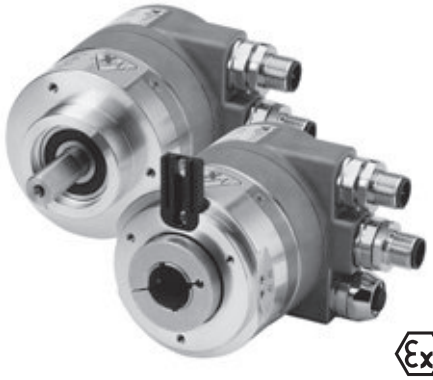


Flange with stator coupling, ø 63 [2.48]
and tapered shaft
Flange type B
(drawing with tangential cable outlet)

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



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 botton**

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*
- 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**

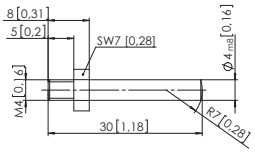
f *Options (Service)*
- 2 = no option
- **3 = SET button**

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

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		Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for bus in	**05.BMWS 8151-8.5**
	connector M12 for bus out	**05.BMSWS 8151-8.5**
	connector M12 for power supply	**05.B8141-0**
Cordset, pre-assembled	M12 cordset for bus in , 6 m [19.68'] PUR cable	**05.00.6011.3211.006M**
	M12 cordset for bus out, 6 m [19.68'] PUR cable	**05.00.6011.3411.006M**
	M12 cordset for power supply, 2 m [6.56'] PUR cable	**05.00.6061.6211.002M**

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	aluminium
	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		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 2004/108/EC 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)

Absolute encoders - singleturn

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**

Interface characteristics PROFIBUS DP	
Resolution	1 ... 65536 (16 bit), scaleable 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

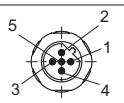
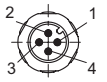
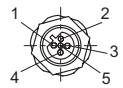
- Direction of rotation.
- Scaling (Number of steps per revolution).
- Preset value.
- Diagnostics mode.

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	Function							
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.

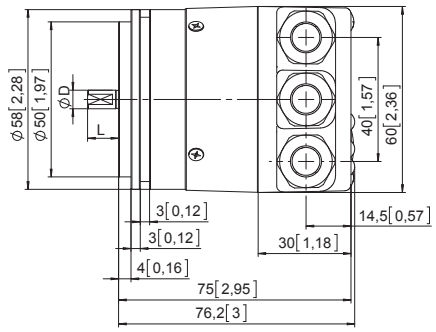
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**

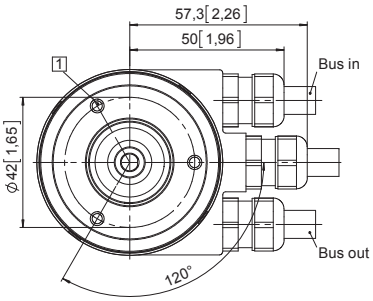
Dimensions shaft version, with removable bus terminal cover

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

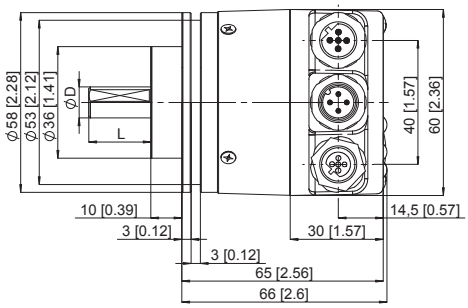


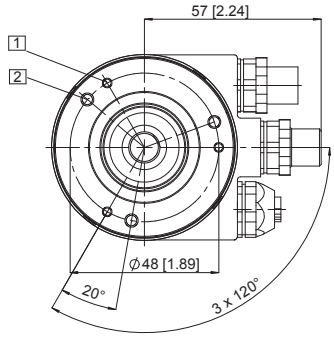


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with 3 x M12 connector)

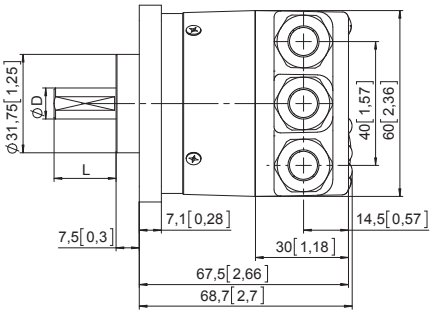
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

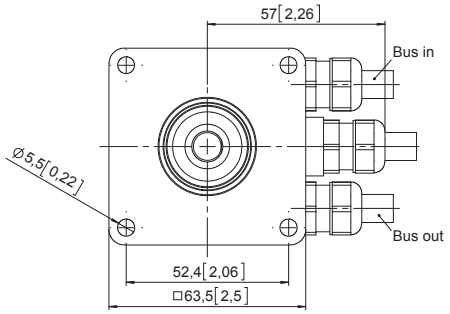




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

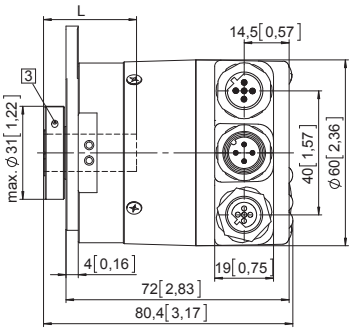
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFIBUS DP**

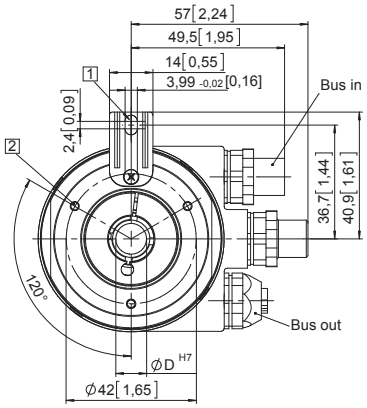
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 3 x M12 connector)

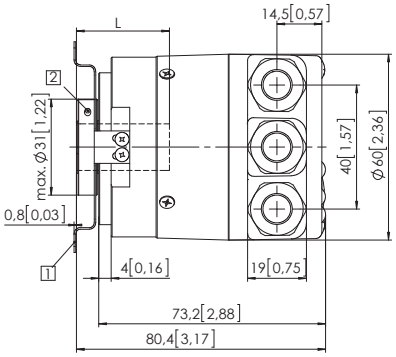
1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.21] deep
3 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

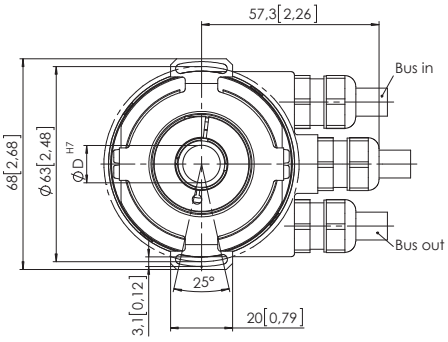




Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with cable)

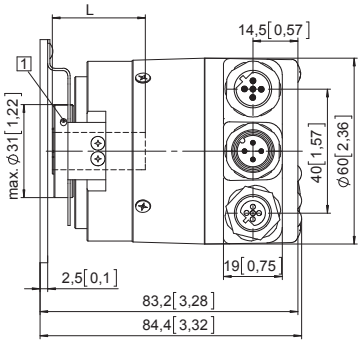
1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

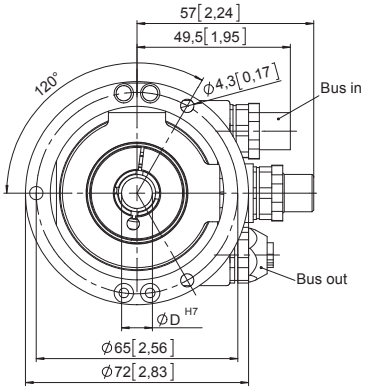




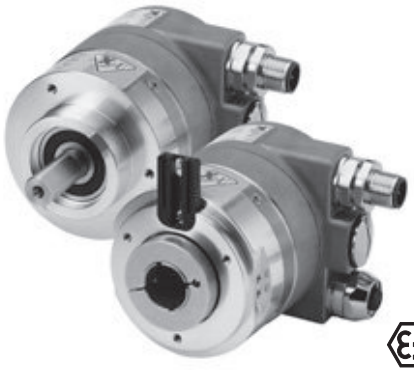
Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws, 65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]





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
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* 3)

21 = CANopen encoder profile DS406 V3.2

f *Options (service)*

2 = no options
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.
3) CAN parameters can also be factory pre-set.

Absolute encoders - singleturn

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

Order code Hollow shaft

8.5878 . 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 = 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*
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
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

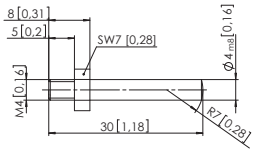
*) Available special lengths (connection type B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5878.542B.2113.0030 (for cable length 3 m)

e *Fieldbus profile* [1]
21 = CANopen encoder profile DS406 V3.2

f *Options (service)*
2 = no options
3 = SET button

Optional on request
- Ex 2/22
- 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			Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for Bus in	**8.0000.5116.0000**
	connector M12 for Bus out	**8.0000.5111.0000**
Cordset, pre-assembled	M12, for Bus in, 6 m [19.68'] PVC cable	**05.00.6091.A211.006M**
	M12, for Bus out, 6 m [19.68'] PVC cable	**05.00.6091.A411.006M**

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] [2]
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	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		100 m/s^2, 55 ... 2000 Hz

1) CAN parameters can also be factory pre-set.
2) Cable version: -30°C ... +75°C [-22°F ... +167°F].

Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

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 2004/108/EC 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 the following fault conditions	sensor error (internal code or LED error), voltage too low, over-temperature

Interface characteristics CANopen	
Resolution	1 ... 65536 (16 bit), scaleable 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 Protokoll. 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.

SET button
for fast, simple
on-site start-up

Green, red, yellow LEDs
Fault-free operation immediately
visible on the bus.

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 behaviour 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.

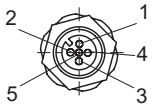
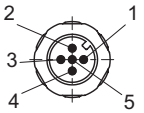
All profiles stated here: key-features
The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

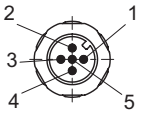
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

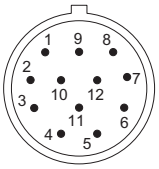
Terminal assignment

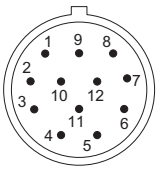
Interface	Type of connection	Cable gland (bus terminal cover with terminal box)										
			Bus OUT					Bus IN				
2	1	Signal:	CAN_GND	CAN_L	CAN_H	0 V power supply	+V power supply	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Abbreviation:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG

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 colour:	WH	BN	YE	GN	GY	

Interface	Type of connection	2 x M12 connector						
			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						
			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						
			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						
			Bus IN					
2	I	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Pin:	10	12	2	7	3	

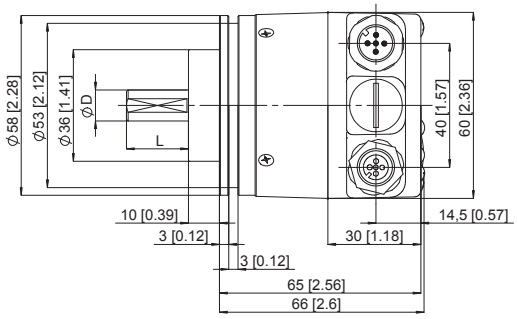
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

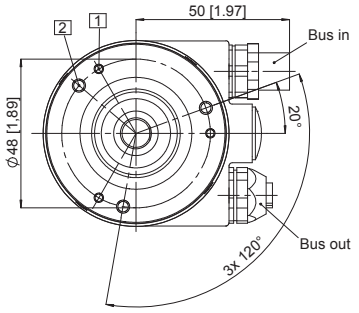
Dimensions shaft version, with removable bus terminal cover

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

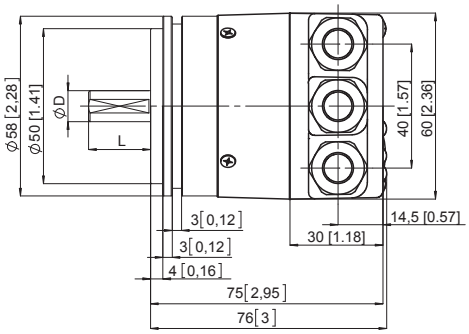


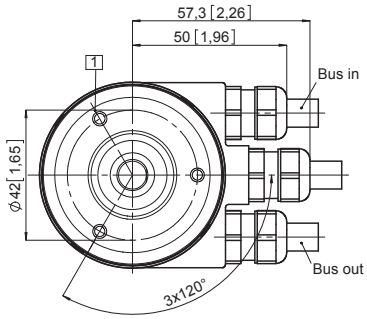


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with cable)

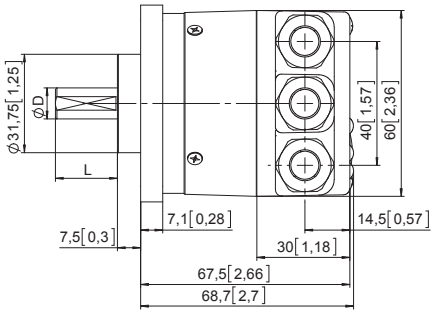
1 3 x M4, 6 [0.24] deep

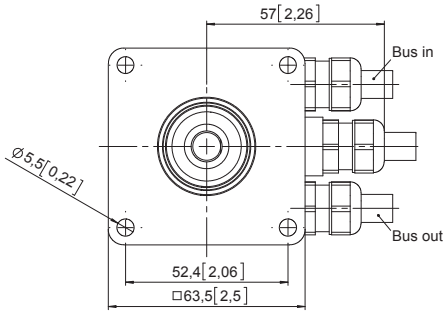




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

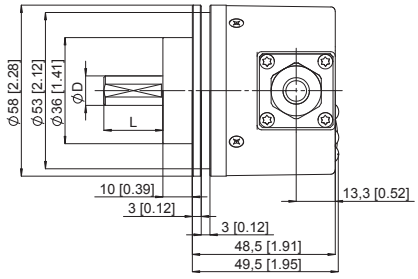
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

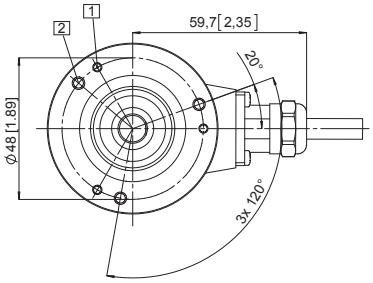
Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with cable)

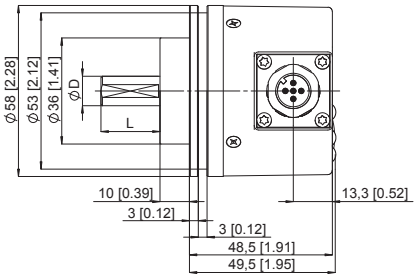
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep

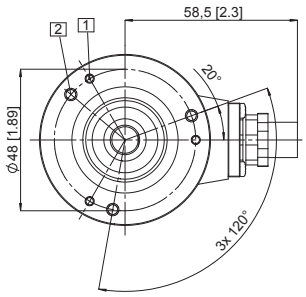




(drawing with M12 connector)

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

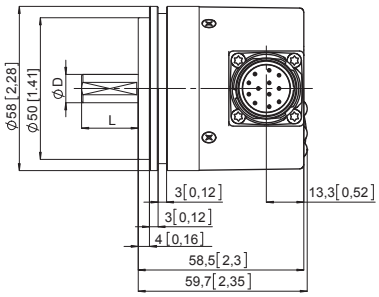


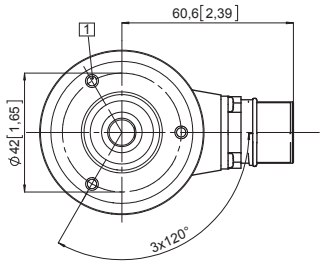


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M23 connector)

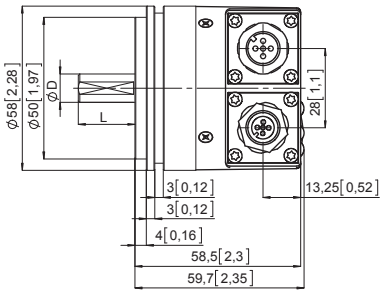
1 3 x M4, 6 [0.24] deep

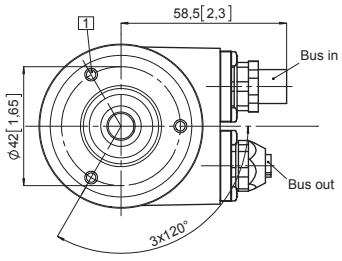




(drawing with M12 connector)

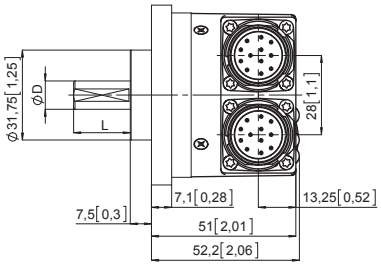
1 3 x M4, 6 [0.24] deep

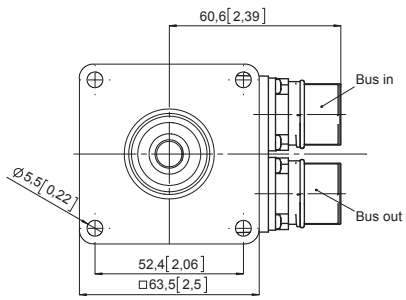




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with 2 x M23 connector)





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

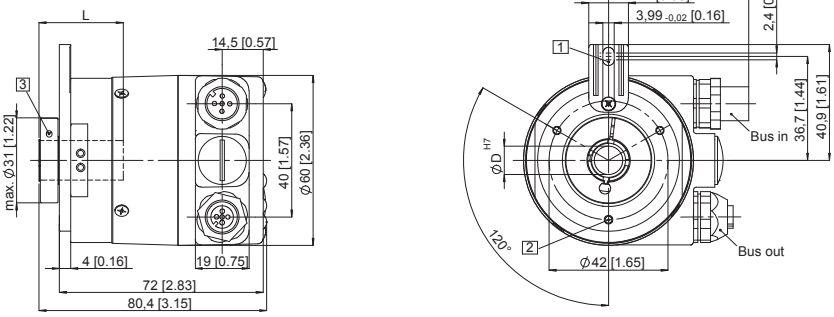
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

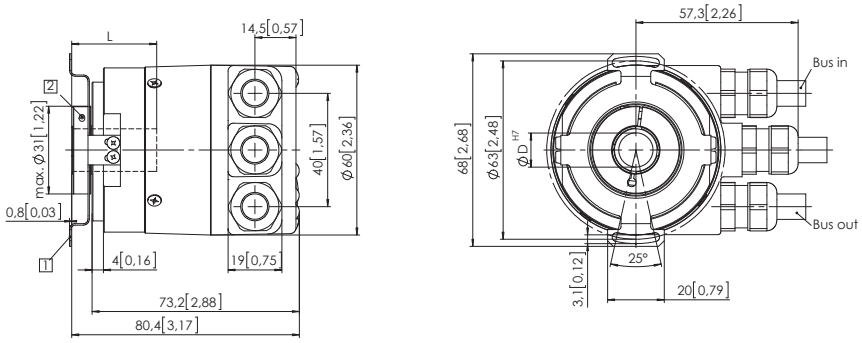
Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
- 2 3 x M3, 5.5 [0.21] deep
- 3 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [1.18]



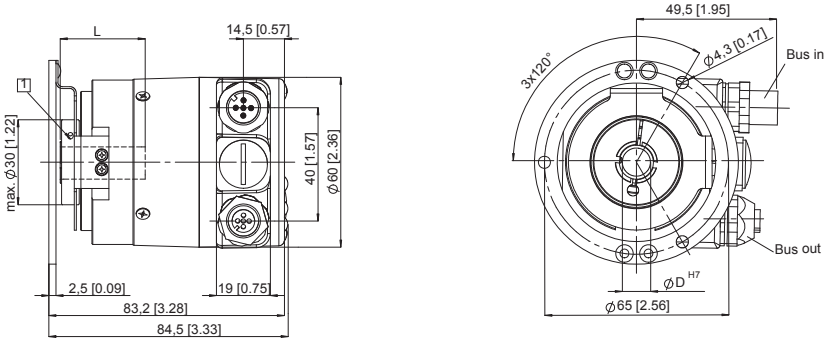
Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with cable)

- 1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [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
- L: Insertion depth for blind hollow shaft: 30 [1.18]



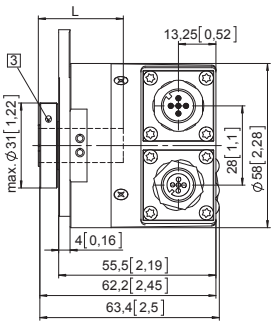
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **CANopen**

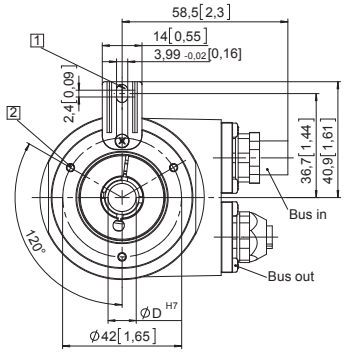
Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

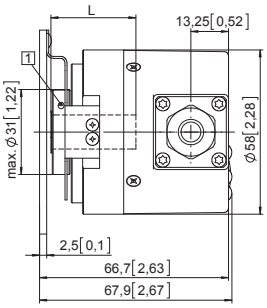
1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.21] deep
3 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

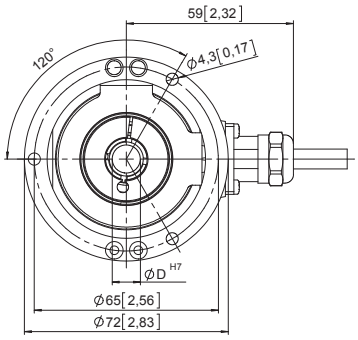




Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]





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.

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**

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*
- 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**

e *Fieldbus profile*
- **B2= EtherCAT with CoE (CAN over EtherNet)**

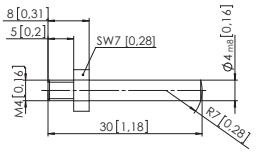
Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for port IN and port OUT	**05.WASCSY4S**
	connector M12 for power supply	**05.B8141-0**
Cordset, pre-assembled	M12 for port IN and port OUT, 2 m [6.56’] PUR cable	**05.00.6031.4411.002M**
	M12 for power supply, 2 m [6.56’] PUR cable	**05.00.6061.6211.002M**

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	aluminium
	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 2004/108/EC RoHS guideline 2011/65/EU

Interface characteristics EtherCAT

Resolution	1 ... 65535 (16 bit), scaleable 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

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.

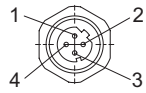
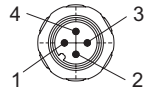
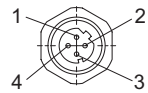
The following output values may be combined as PDO (PDO mapping): **position, speed, temperature values** and **working area state** as well as other process values.

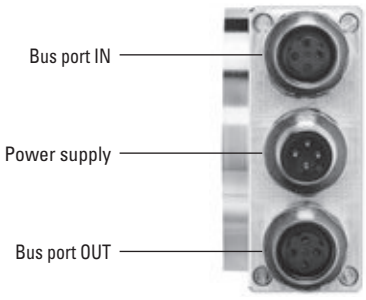
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

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.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector					
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	



Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **EtherCAT**

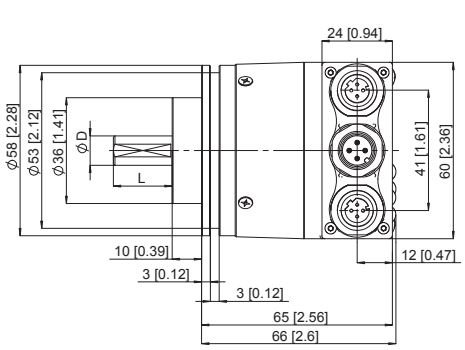
Dimensions shaft version, with removable bus terminal cover

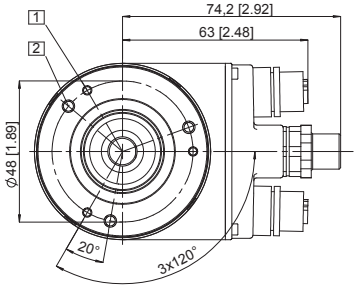
Dimensions in mm [inch]

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

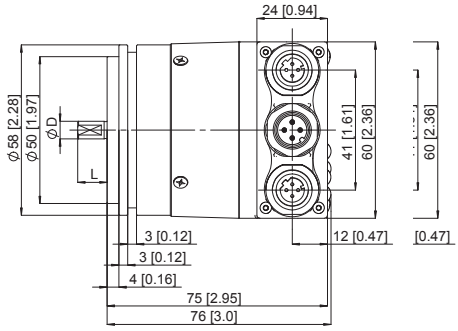


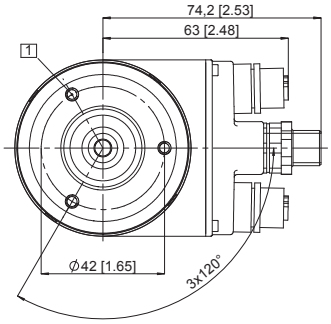


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

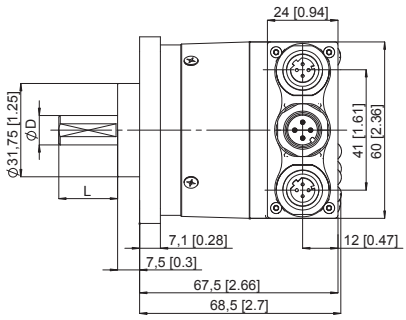
1 3 x M4, 6 [0.24] deep

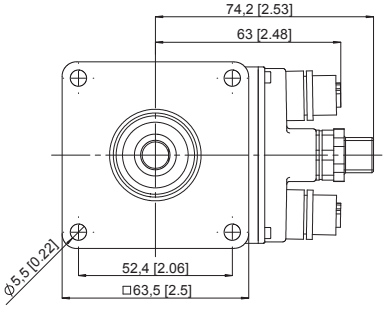




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

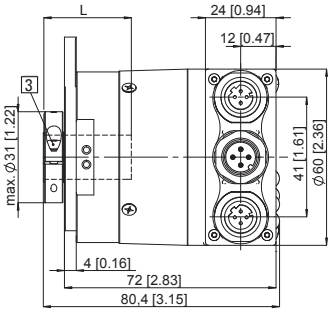
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **EtherCAT**

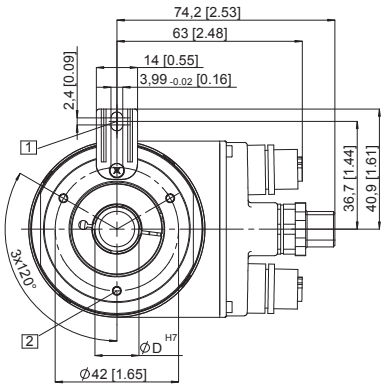
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

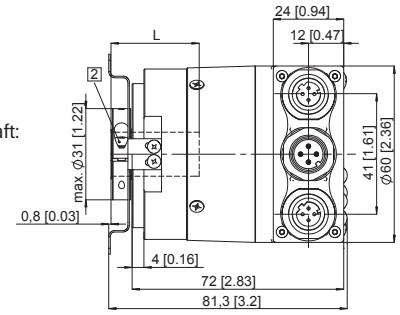
1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.21] deep
3 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

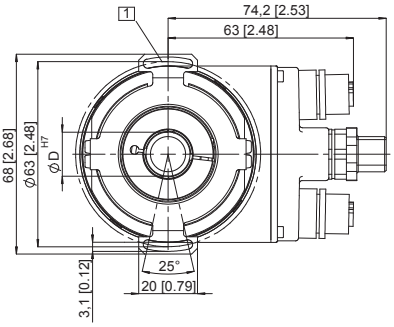




Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

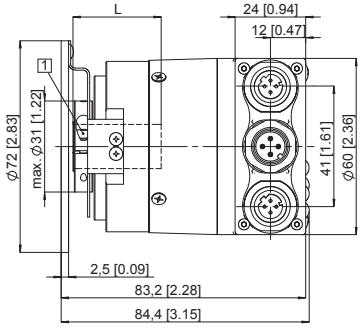
1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

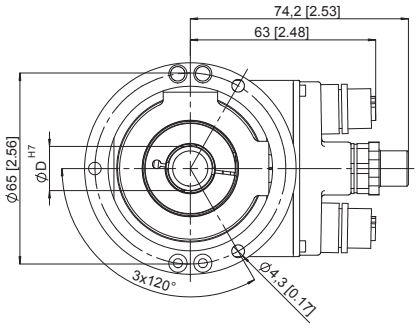




Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]





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

- IRT-Mode.
- Cycle time ≤ 1 ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.
- M12 connector ensures fast, simple, error-free connection.

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**

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*
- 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**

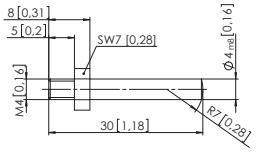
e *Field bus profile*
- **C2= PROFINET IO**

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.

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		Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for port 1 and port 2	**05.WASCSY4S**
	connector M12 for power supply	**05.B8141-0**
Cordset, pre-assembled	M12 for port 1 and port 2, 2 m [6.56'] PUR cable	**05.00.6031.4411.002M**
	M12 for power supply, 2 m [6.56'] PUR cable	**05.00.6061.6211.002M**

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	aluminium
	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 2004/108/EC RoHS guideline 2011/65/EU

Interface characteristics PROFINET IO

Resolution	1 ... 65535 (16 bit), scaleable 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

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.

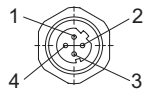
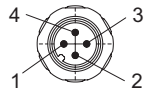
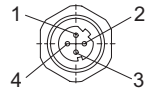
Position, speed and many other states of the encoder can be transmitted.

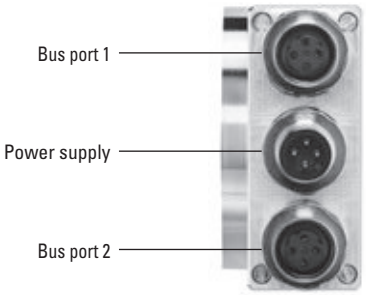
PROFINET IO

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**rotokoll 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					
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	



Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFINET IO**

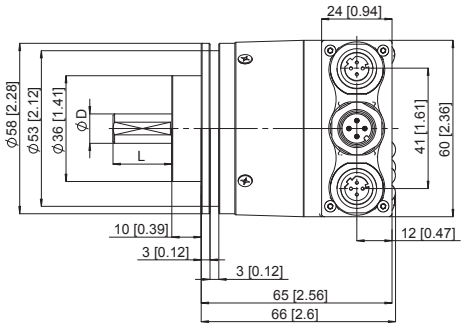
Dimensions shaft version, with removable bus terminal cover

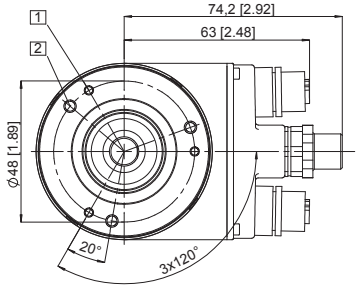
Dimensions in mm [inch]

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

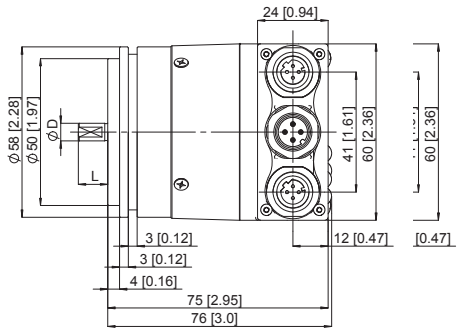


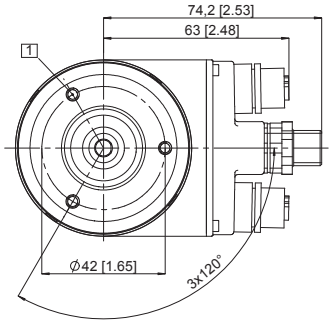


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

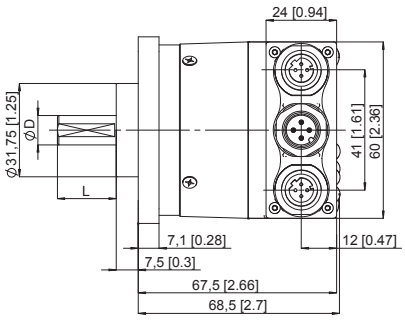
1 3 x M4, 6 [0.24] deep

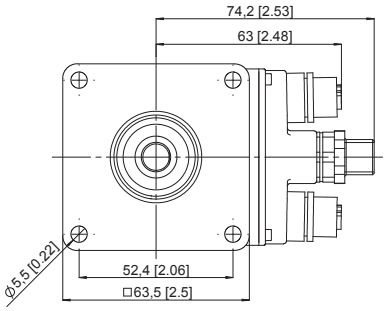




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

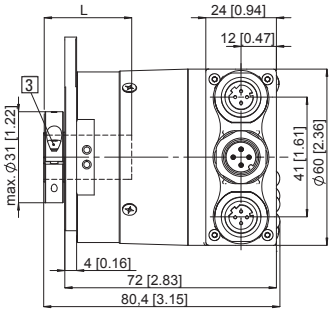
Standard optical | **Sendix 5858 / 5878 (shaft / hollow shaft)** | **PROFINET IO**

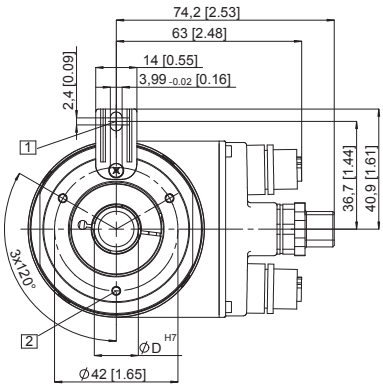
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

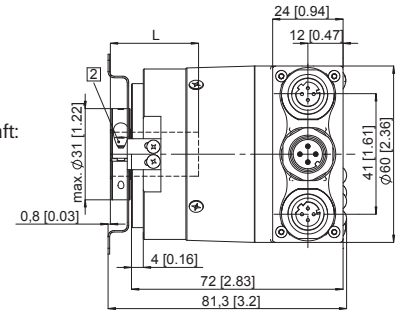
1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 3 x M3, 5.5 [0.21] deep
3 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

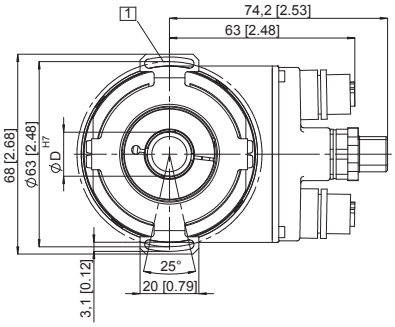




Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

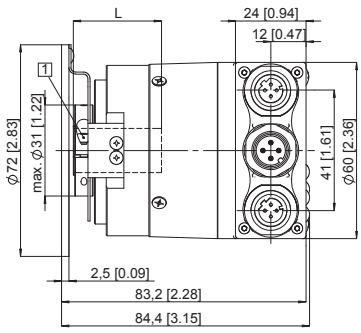
1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

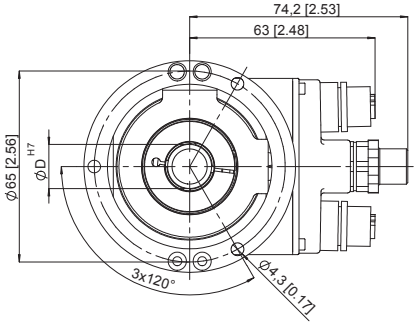




Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4

1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]





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°.

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	.	X	X	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*
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

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.

Absolute encoders - singleturn

Standard stainless steel, optical	5876 (hollow shaft)	SSI, parallel

Technical data

Mechanical characteristics

Maximum speed [1]	6000 min^{-1}	**Working temperature range**		-20°C ... +80°C [2] [-4°F ... +176°F] [2]
Mass moment of inertia	approx. 6 x 10^{-6} kgm^2	**Material**	shaft / housing	stainless steel
Starting torque - at 20°C [68°F]	< 0.05 Nm	**Shock resistance** acc. to EN 60068-2-27		2500 m/s^2, 6 ms
Weight	approx. 0.6 kg [21.16 oz]	**Vibration resistance** acc. to EN 60068-2-6		100 m/s^2, 10 ... 2000 Hz
Protection acc. to EN 60529	IP67			

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.	89 mA	89 mA	109 mA	109 mA
	max.	138 mA	138 mA	169 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 2004/108/EC 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.

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 colour:	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 colour:	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)
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)

Absolute encoders - singleturn

Standard stainless steel, optical	5876 (hollow shaft)	SSI, parallel

Dimensions

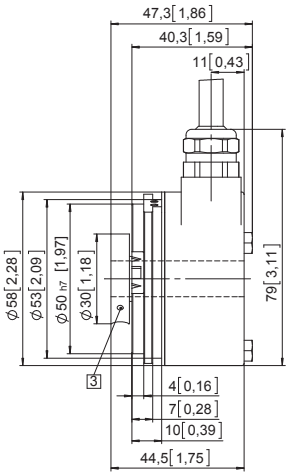
Dimensions in mm [inch]

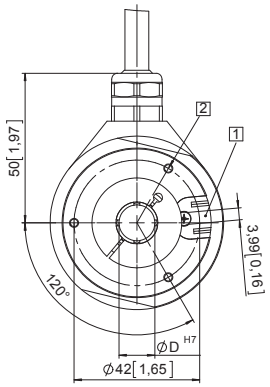
Flange with through hollow shaft, ø 58 [2.28"]
Flange type 1

1 Torque stop slot
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



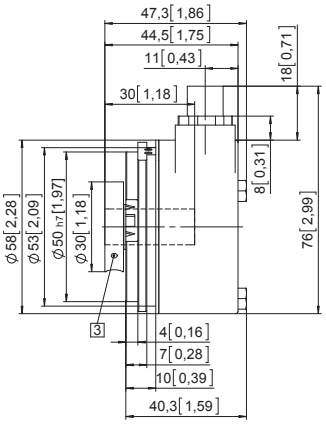


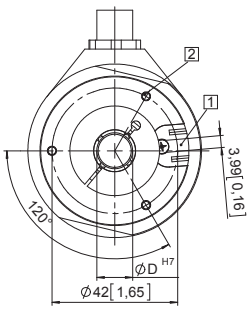
Flange with blind hollow shaft, ø 58 [2.28"]
Flange type 2

1 Torque stop slot
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





Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7053 (shaft)** | **SSI / BiSS**

The Sendix 7053 absolute encoders – singleturn offer Ex protection in a compact 70 mm seawater durable aluminium 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 speedv | 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 aluminium.
- 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']
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, 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
- stainless steel version
- other resolutions

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.

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

Absolute encoders - singleturn

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7053 (shaft)** | **SSI / BiSS**

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 IP6x
Directive 94/9/EC	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes[1)]
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

DIR input

A High signal switches the direction of rotation from the default CW to CCW. The reverse 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.

Power-ON time

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

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
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.

Data refresh rate	resolution ≤ 14 bit	< 1 µs
	resolution ≥ 15 bit	4 µs

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

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
Response time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

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.

1) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7053 (shaft)** | **SSI / BiSS**

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

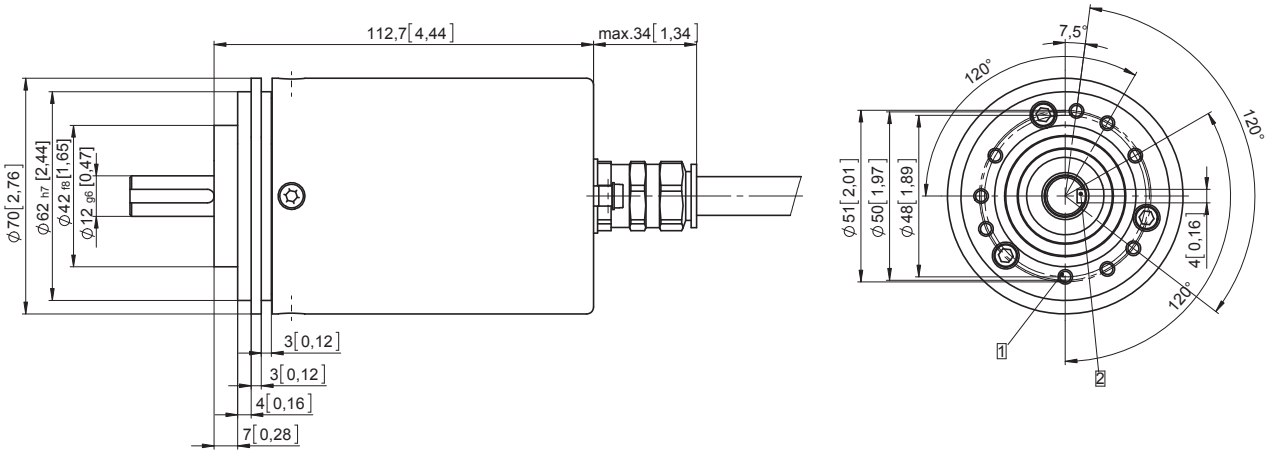
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
⏚: Protective earth

Dimensions

Dimensions in mm [inch]

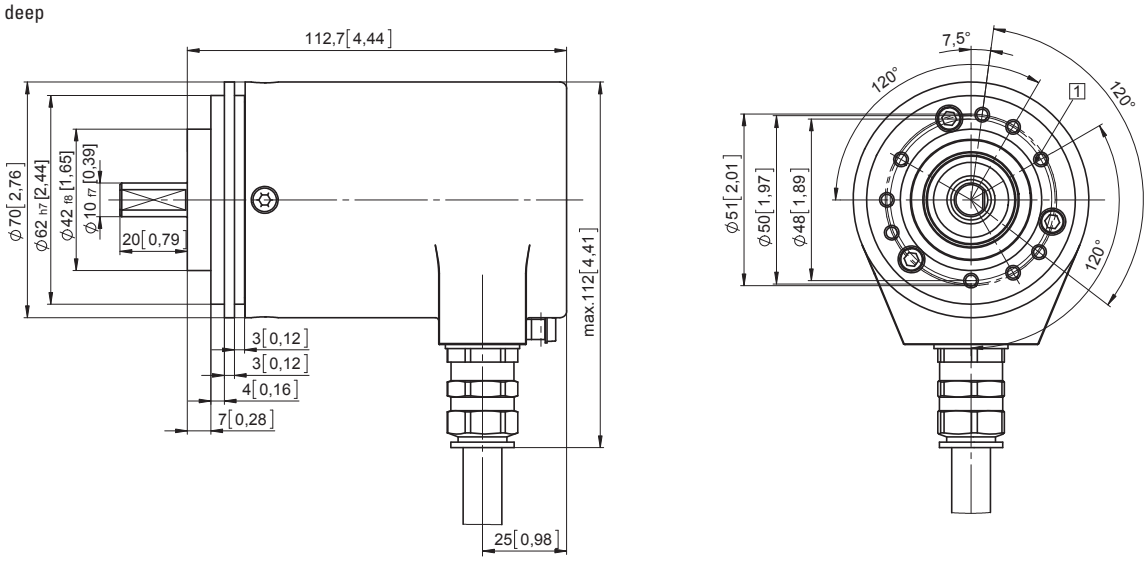
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Absolute encoders - singleturn

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 aluminium.

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
- stainless steel version
- other resolutions

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

Standard ATEX / IECEx – zone 1 / 21, SIL2/PLd, optical	Sendix SIL 7053FS2 (shaft)	SSI / BiSS + SinCos

Accessory		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)	Ⓔx II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ⓔx II 2D Ex tb IIIC T135°C - T85°C Db IP6x
Relevant standards	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
Relevant standards	IEC 60079-0:2007; IEC 60079-1:2007; 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 / HFT = 1)
PFH_d value [1]	2.16×10^{-8} h^{-1}
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 2004/108/EC ATEX guideline 94/9/EC 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

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
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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.

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
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs

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
Pulse rate	2048 ppr

SET input

Input		HIGH active
Input type		comparator
Signal level	HIGH	min. 60 % of +V
(+V = power supply)		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.

Power-ON time

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

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. The current position becomes defined as position zero.
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

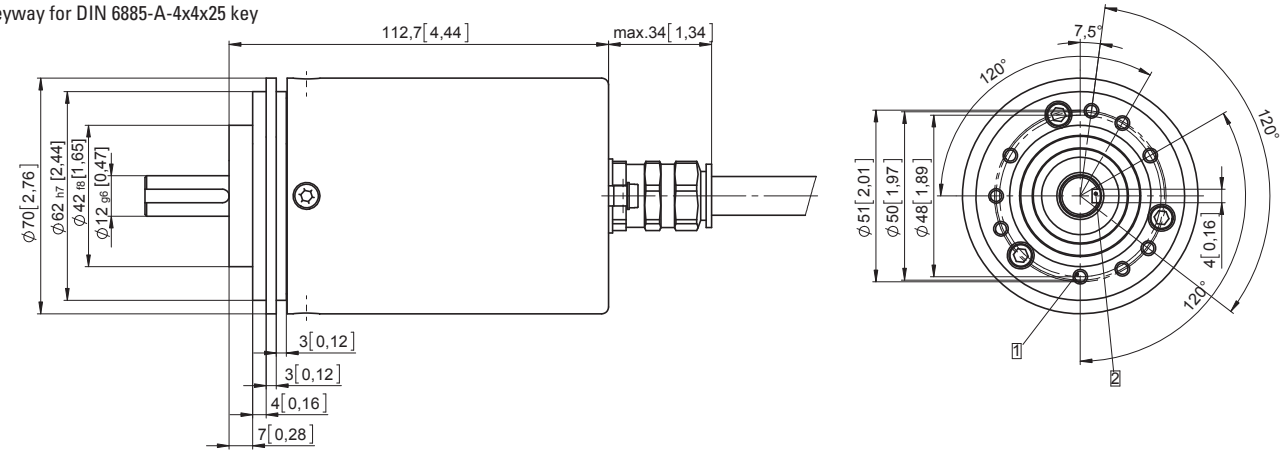
Standard
ATEX/IECEx – zone 1/21, SIL2/PLd, optical | **Sendix SIL 7053FS2 (shaft)** | **SSI/BiSS + SinCos**

Dimensions

Dimensions in mm [inch]

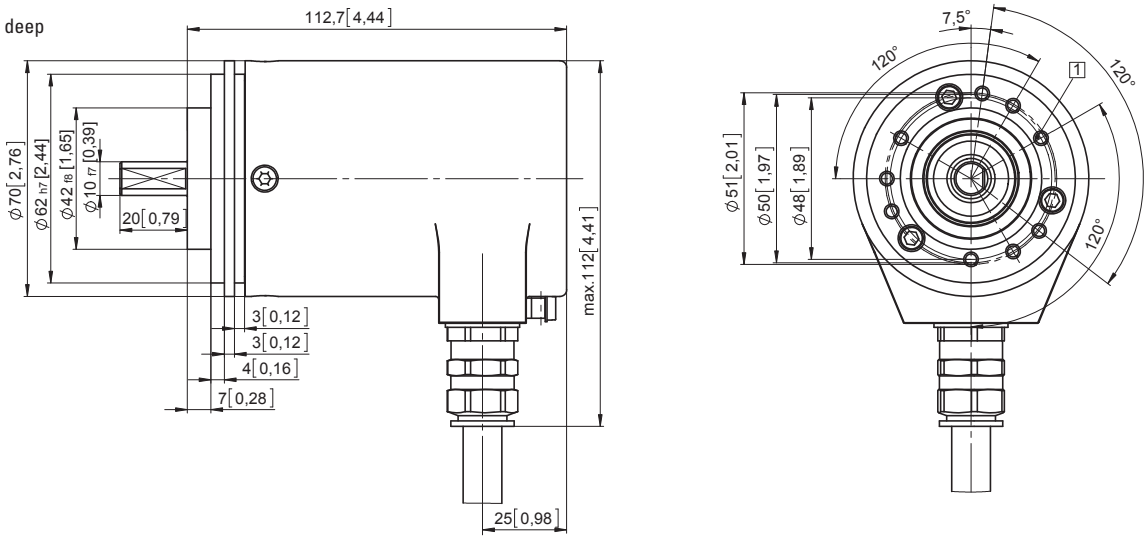
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



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 aluminium.

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
- stainless steel version
- other resolutions

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

Absolute encoders - singleturn

Standard ATEX / IECEx – zone 1 / 21, SIL3/PLe, optical	Sendix SIL 7053FS3 (shaft)	SSI / BiSS + SinCos

Accessory		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)	Ⓔx II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ⓔx II 2D Ex tb IIIC T135°C - T85°C Db IP6x
Relevant standards	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
Relevant standards	IEC 60079-0:2007; IEC 60079-1:2007; 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 / HFT = 1)
PFH_d value [1]	1.09×10^{-8} h^{-1}
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 2004/108/EC ATEX guideline 94/9/EC 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

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
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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.

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	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
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs

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
Pulse rate	2048 ppr

SET input

Input		HIGH active
Input type		comparator
Signal level	HIGH	min. 60 % of +V
(+V = power supply)		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.

Power-ON time

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

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. The current position becomes defined as position zero.
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

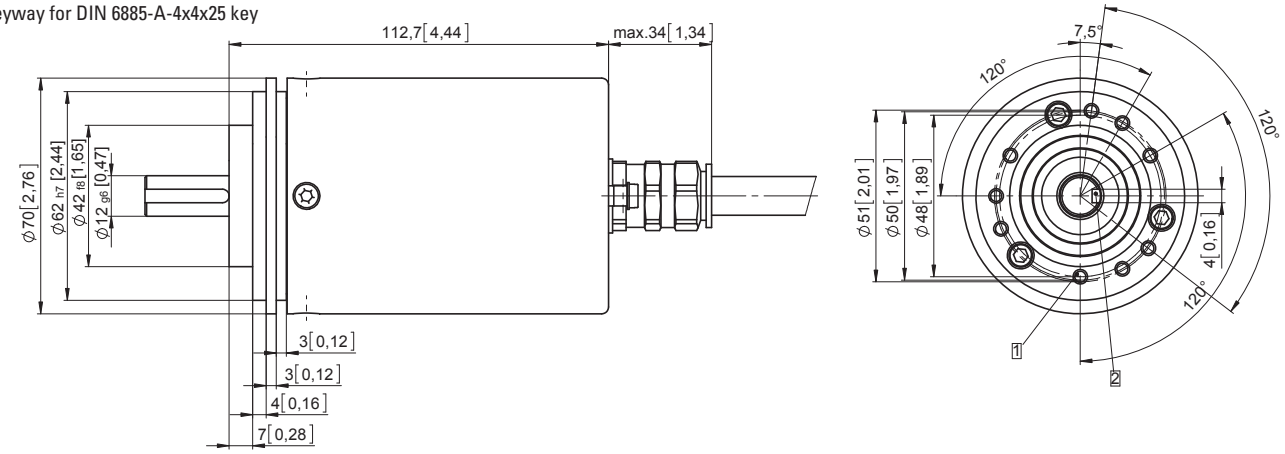
Standard
ATEX/IECEx – zone 1/21, SIL3/PLe, optical | **Sendix SIL 7053FS3 (shaft)** | **SSI/BiSS + SinCos**

Dimensions

Dimensions in mm [inch]

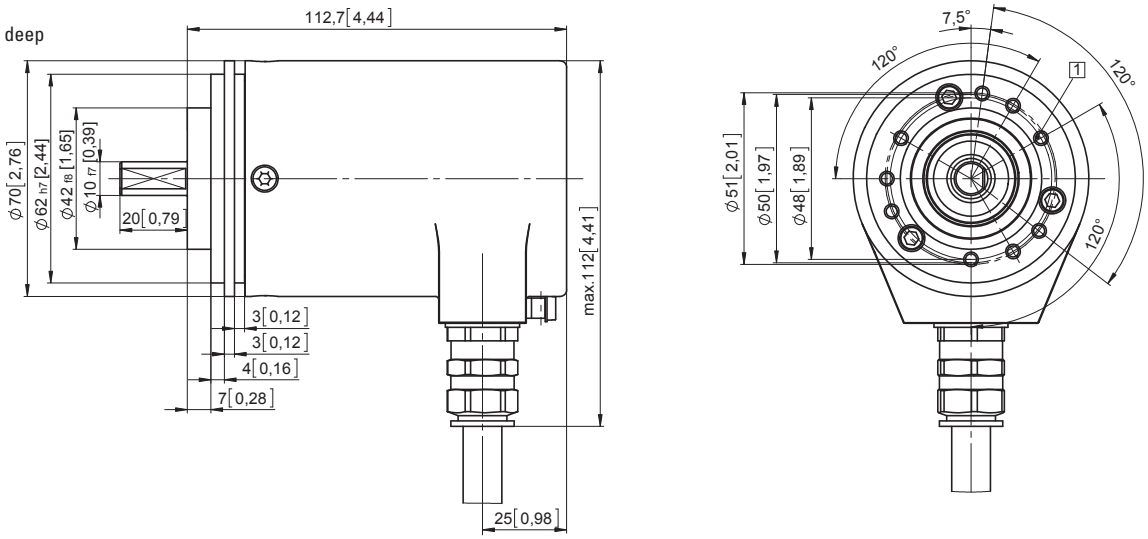
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7058 (shaft)** | **PROFIBUS DP**

The Sendix 7058 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable 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 aluminium.
- 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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

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
- stainless steel version

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.

1) Not applicable with connection types 1 and 2.

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7058 (shaft)** | **PROFIBUS DP**

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 IP6x
Directive 94/9/EC	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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. 110 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

Interface characteristics PROFIBUS DP

Resolution	1 ... 65536 (16 bit), scaleable 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 class1 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

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7058 (shaft)** | **PROFIBUS DP**

Terminal assignment

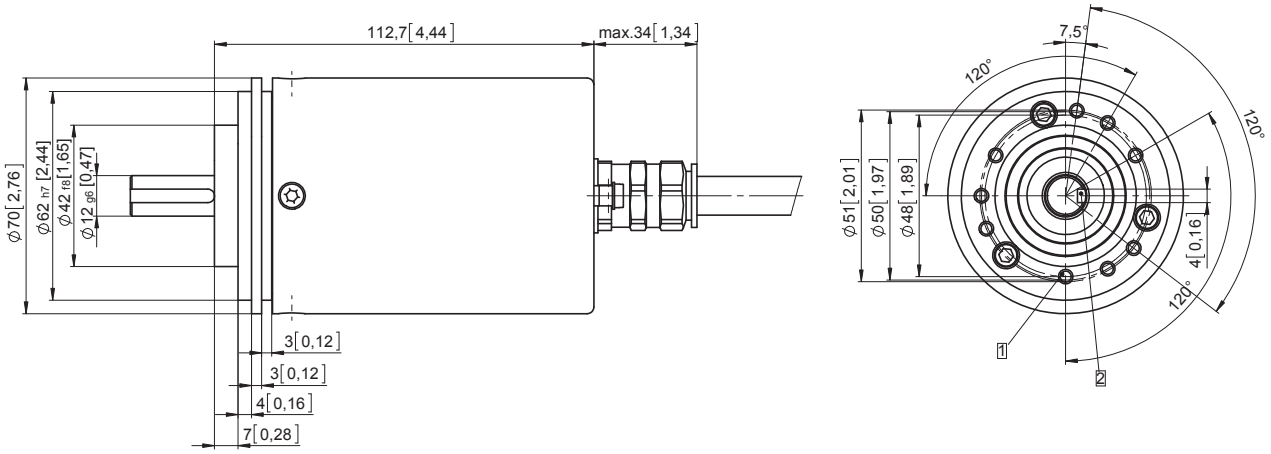
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

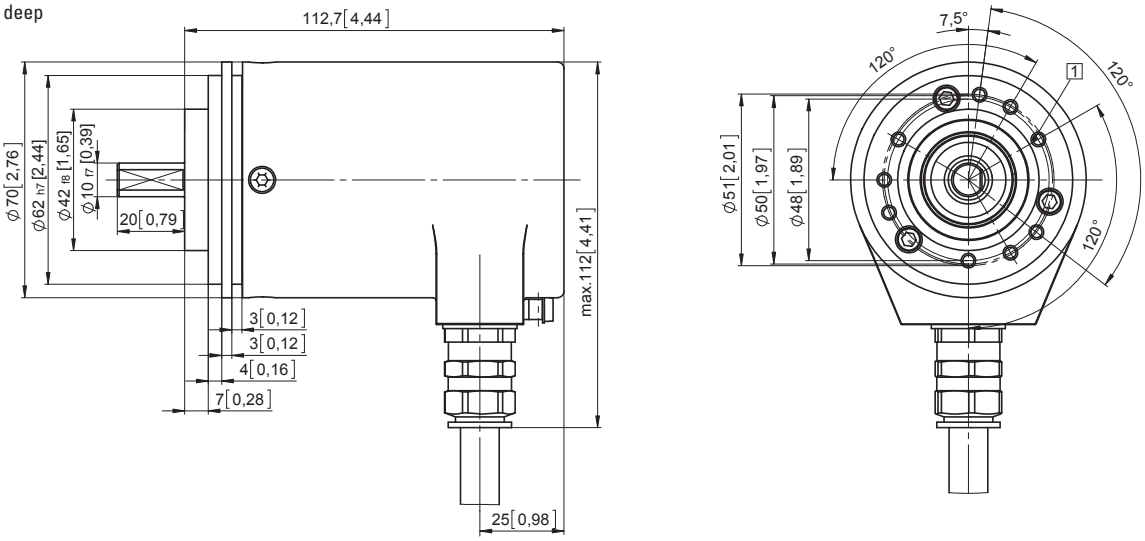
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7058 (shaft)** | **CANopen**

The Sendix 7058 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable 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 aluminium.
- 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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

e *Fieldbus profile*
21 = CANopen encoder profile DS406 V3.2

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
- stainless steel version

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.

1) Not applicable with connection types 1 and 2.

Absolute encoders - singleturn

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7058 (shaft)** | **CANopen**

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 IP6x
Directive 94/9/EC	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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 2004/108/EC ATEX guideline 94/9/EC 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 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 behaviour 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.

Standard
ATEX/IECEx – zone 1/21, optical | **Sendix 7058 (shaft)** | **CANopen**

Terminal assignment

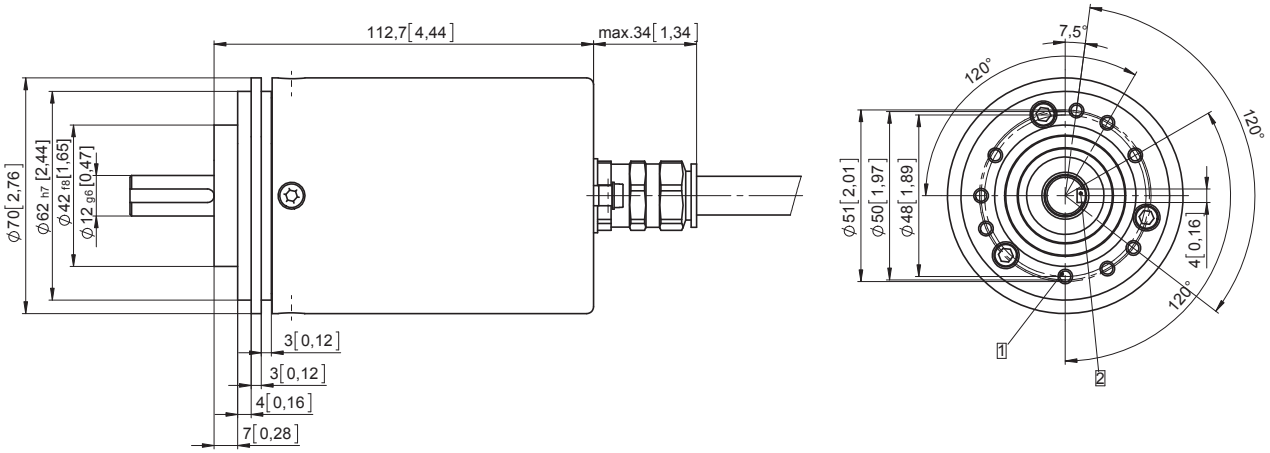
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

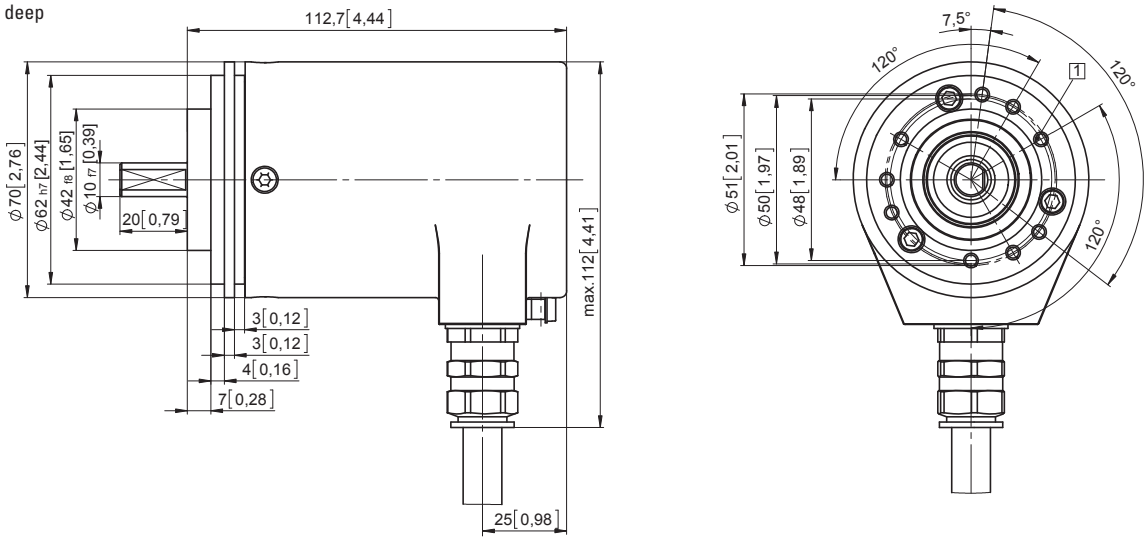
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – mining, optical | **Sendix 7153 (shaft)** | **SSI / BiSS**

The Sendix 7153 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 speedv | 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']
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, 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.

Standard
ATEX/IECEx – mining, optical | **Sendix 7153 (shaft)** | **SSI / BiSS**

Technical data

Explosion protection ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Directive 94/9/EC	EN 60079-0:2012; EN 60079-1:2007

Explosion protection IECEx

Certificate of conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
IECEx	IEC 60079-0:2011; IEC 60079-1:2007

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 axial	80 N 40 N
Weight		approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Material	shaft flange / housing cable	stainless steel stainless steel 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. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes[1)]
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

DIR input

A HIGH signal switches the direction of rotation from the default CW to CCW. The reverse 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.

Power-ON time

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

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
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.

Data refresh rate	resolution ≤ 14 bit resolution ≥ 15 bit	< 1 µs 4 µs

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

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
Response time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

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 normaloperation.

1) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

Standard
ATEX/IECEx – mining, optical | **Sendix 7153 (shaft)** | **SSI / BiSS**

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

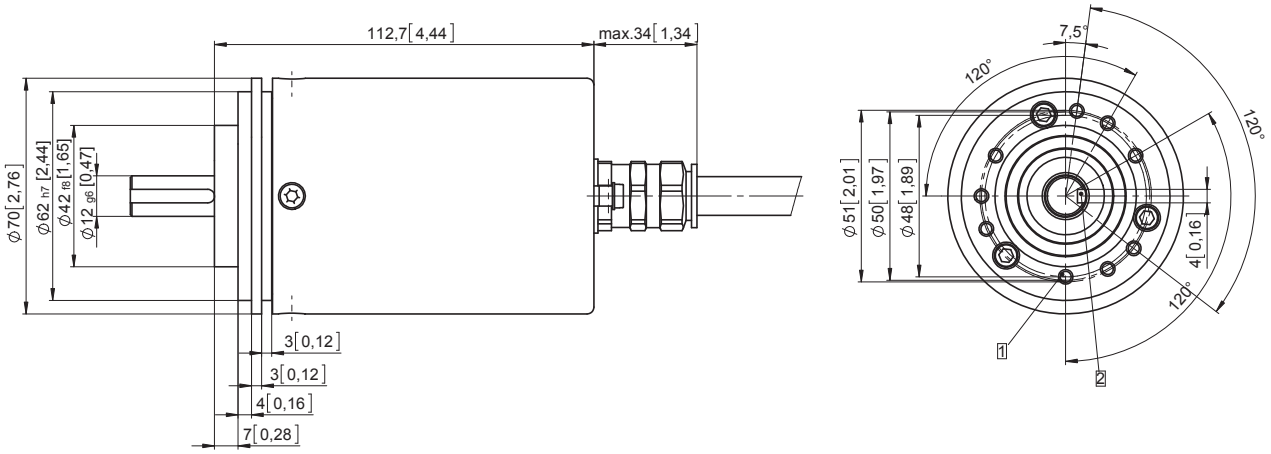
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
⏚: Protective earth

Dimensions

Dimensions in mm [inch]

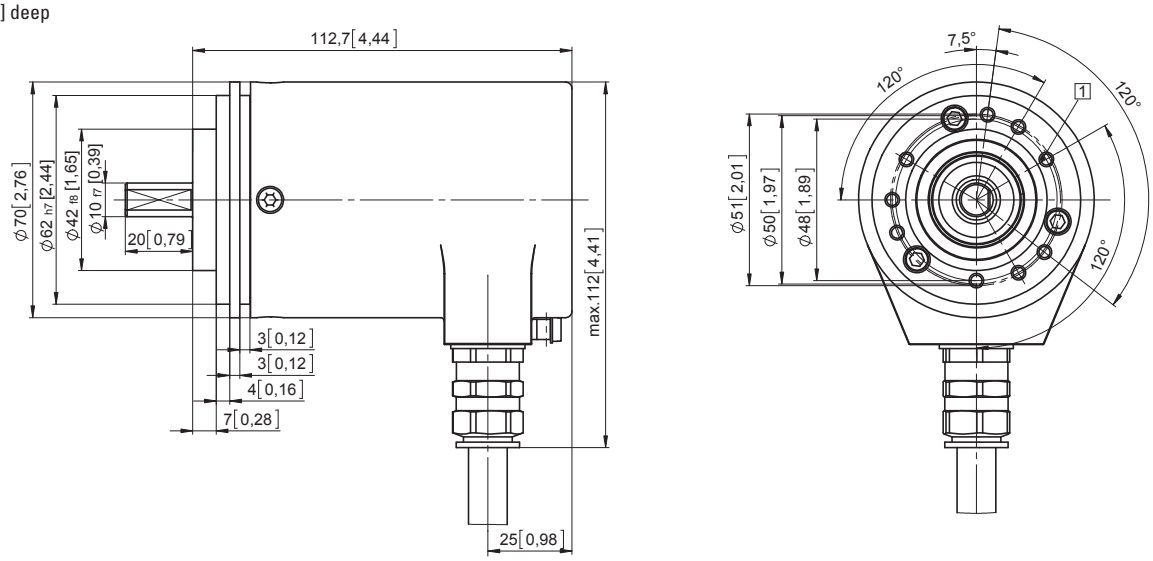
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – mining, optical | **Sendix 7158 (shaft)** | **PROFIBUS DP**

The Sendix 7158 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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

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.

Absolute encoders - singleturn

Standard
ATEX/IECEx – mining, optical | **Sendix 7158 (shaft)** | **PROFIBUS DP**

Technical data

Explosion protection ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Directive 94/9/EC	EN 60079-0:2012; EN 60079-1:2007

Explosion protection IECEx

Certificate of conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
IECEx	IEC 60079-0:2011; IEC 60079-1:2007

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Material	shaft	stainless steel
	flange / housing	stainless steel
	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. 110 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

Interface characteristics PROFIBUS DP

Resolution	1 ... 65536 (16 bit), scaleable 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 class1 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

Standard
ATEX/IECEx – mining, optical | **Sendix 7158 (shaft)** | **PROFIBUS DP**

Terminal assignment

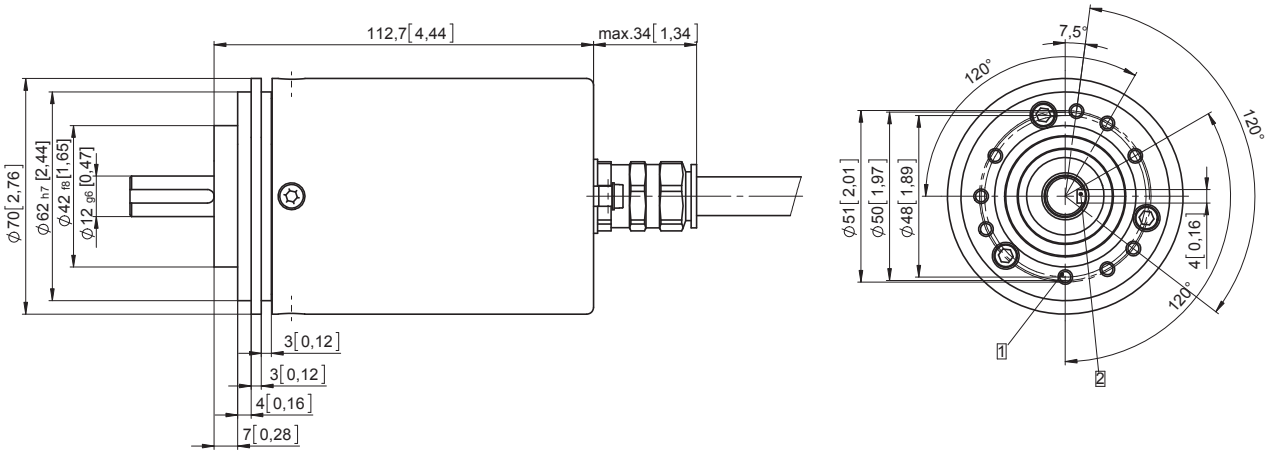
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

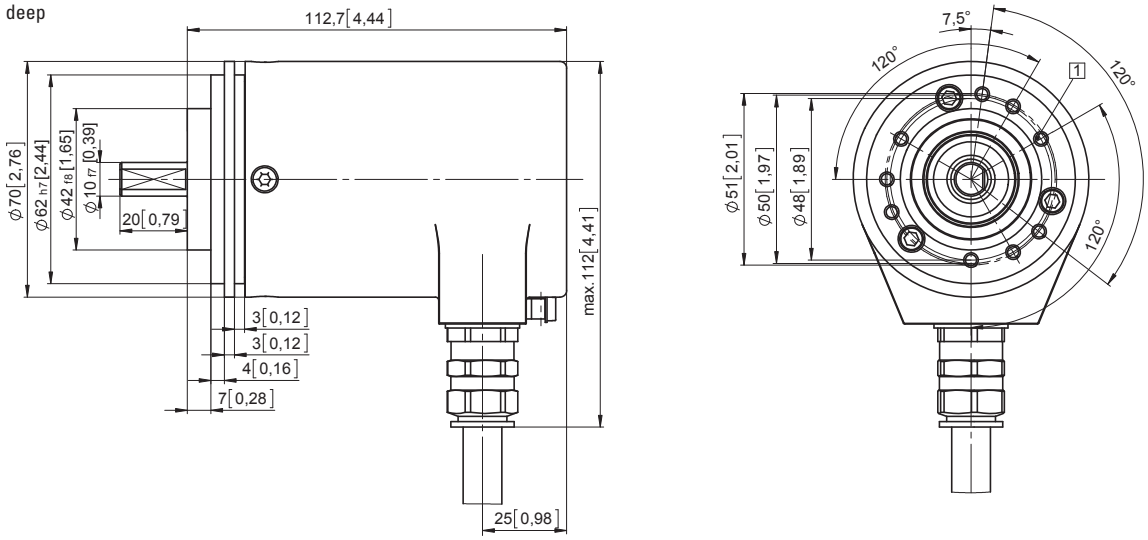
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Absolute encoders - singleturn

Standard
ATEX/IECEx – mining, optical | **Sendix 7158 (shaft)** | **CANopen**

The Sendix 7158 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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

e *Fieldbus profile*
21 = CANopen encoder profile DS406 V3.2

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.

Standard
ATEX/IECEx – mining, optical | **Sendix 7158 (shaft)** | **CANopen**

Technical data

Explosion protection ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Directive 94/9/EC	EN 60079-0:2012; EN 60079-1:2007

Explosion protection IECEx	
Certificate of conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
IECEx	IEC 60079-0:2011; IEC 60079-1:2007

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Material	shaft	stainless steel
	flange / housing	stainless steel
	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 2004/108/EC ATEX guideline 94/9/EC 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 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 behaviour 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.

Standard
ATEX/IECEx – mining, optical | **Sendix 7158 (shaft)** | **CANopen**

Terminal assignment

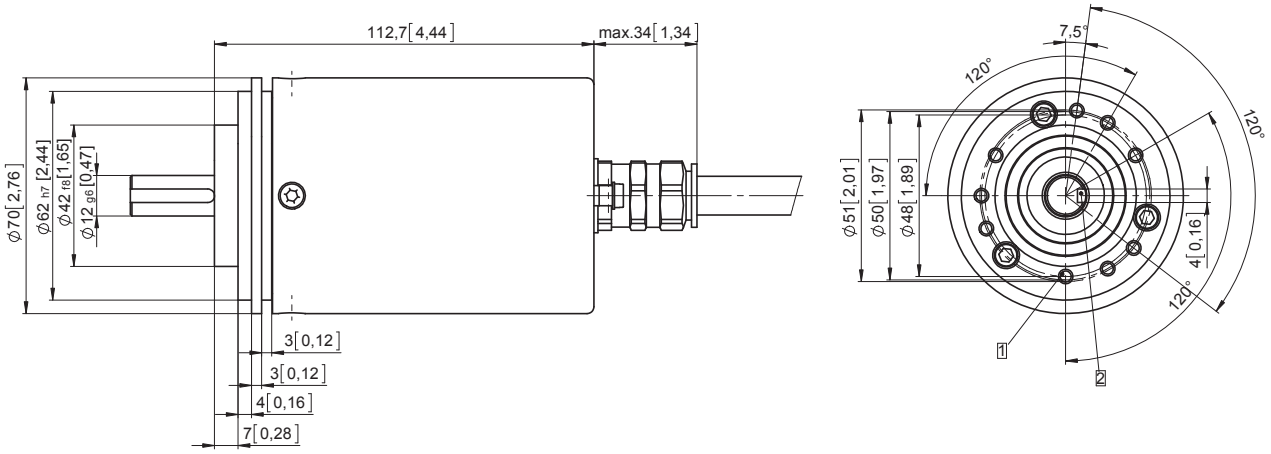
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

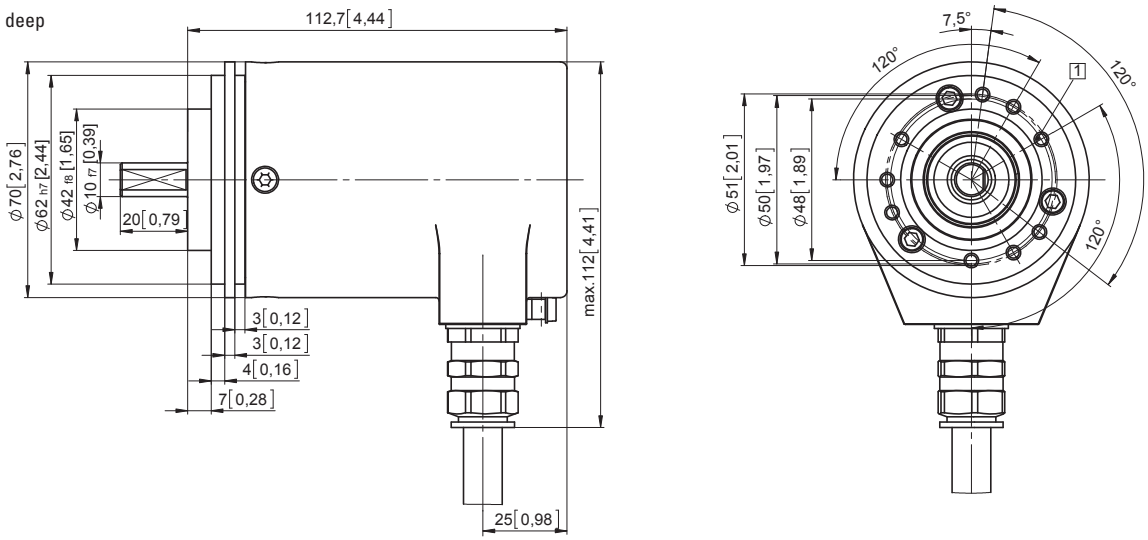
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep




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	new Electronic multiturn	Sendix M3661 / M3681 (shaft / hollow shaft)	analogue	**260**
	new Electronic multiturn	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI	**266**
	new Electronic multiturn	Sendix M3668 / M3688 (shaft / hollow shaft)	CANopen	**271**
Compact, optical	Electronic multiturn	Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS	**276**
	Electronic multiturn	Sendix F3668 / F3688 (shaft / hollow shaft)	CANopen	**282**
Standard, optical	Mechanical multiturn	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS	**287**
	SIL2/PLd, mechanical multiturn	Sendix SIL 5863FS2 / 5883FS2 (shaft / h. shaft)	SSI / BiSS + SinCos	**294**
	SIL3/PLe, mechanical multiturn	Sendix SIL 5863FS3 / 5883FS3 (shaft / h. shaft)	SSI / BiSS + SinCos	**300**
	new Electronic multiturn	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS	**306**
	new Electronic multiturn	Sendix F5868 / F5888 (shaft / hollow shaft)	CANopen	**312**
	new Electronic multiturn	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus	**317**
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP	**322**
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen / CANopenLift	**327**
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT	**338**
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFINET IO	**343**
	ATEX / IECEx, mechanical multiturn	Sendix 7063 (shaft)	SSI / BiSS + SinCos	**348**
	new ATEX / IECEx, SIL2/PLd, mech. multiturn	Sendix SIL 7063FS2 (shaft)	SSI / BiSS + SinCos	**351**
	new ATEX / IECEx, SIL3/PLe, mech. multiturn	Sendix SIL 7063FS3 (shaft)	SSI / BiSS + SinCos	**355**
	ATEX / IECEx, mechanical multiturn	Sendix 7068 (shaft)	PROFIBUS DP	**359**
	ATEX / IECEx, mechanical multiturn	Sendix 7068 (shaft)	CANopen	**362**
	new ATEX / IECEx, mech. multiturn, mining	Sendix 7163 (shaft)	SSI / BiSS + SinCos	**365**
	new ATEX / IECEx, mech. multiturn, mining	Sendix 7168 (shaft)	PROFIBUS DP	**368**
	new ATEX / IECEx, mech. multiturn, mining	Sendix 7168 (shaft)	CANopen	**371**
Large hollow shaft, optical / magnetic		9080 (hollow shaft)	PROFIBUS DP	**374**
		9080 (hollow shaft)	CANopen / DeviceNet	**377**
		9081 (hollow shaft)	SSI	**381**

Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analogue**

e1 pending · cULus pending · Ex 2/22 · RoHS

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.

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 [1]

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* [2]
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
4 = radial M12 connector

*) 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 *Resolution ST + MT / count direction*
1 = 12 bit + 4 bit / cw
2 = 12 bit + 4 bit / ccw
3 = scalable with limit switch function
4 = scalable without limit switch function

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

1) Series availability as from June 2015.
2) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

Absolute encoders – multiturn

Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analogue**

Order code Hollow shaft [1]

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*
- 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* [2]
- **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
- **4 = radial M12 connector**

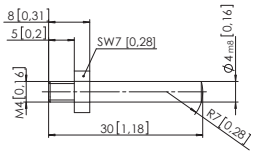
*) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm
Ex.: 8.M3681.243A.3112.0030 (for cable length 3 m)

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 *Resolution ST + MT / count direction*
- **1 = 12 bit + 4 bit / cw**
- 2 = 12 bit + 4 bit / ccw
- 3 = scalable with limit switch function
- 4 = scalable without limit switch function

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 with spring element		Order no.
Cylindrical pin, long for torque stops	 With fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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	housing side	IP67
	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	aluminium
	housing	aluminium
	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) Series availability as from June 2015.
2) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

Compact
electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analogue**

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
Resolution		12 bit
Absoulte accuracy [2]		±1°
Repeat accuracy		±0.2°
Output load	at 10 V DC at 24 V DC	max. 200 Ohm max. 900 Ohm
Setting time		< 1 ms, R_{Last} = 400 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		pending
CE compliant acc. to		EMC guideline 2004/108/EC RoHS guideline 2011/65/EU

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V

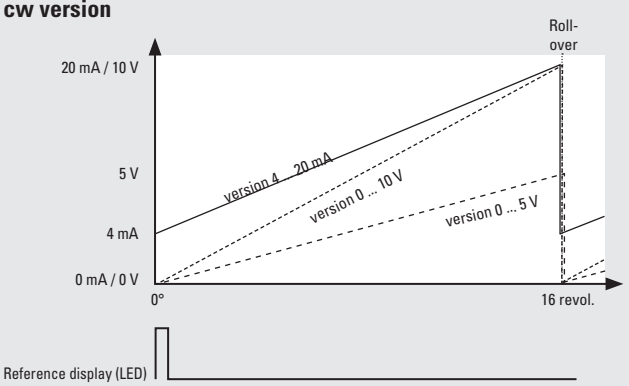
Power supply	output 0 ... 5 V output 0 ... 10 V	10 ... 30 V DC 15 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes [1]
Measuring range	factory setting optionally scalable	2^4 revolutions up to 2^{16} revolutions
Resolution	0 ... 10 V 0 ... 5 V	12 bit 11 bit
Absoulte accuracy [2]		±1°
Repeat accuracy		±0.2°
Current output		max. 10 mA
Setting time		< 1 ms, R_{Last} = 400 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		pending
CE compliant acc. to		EMC guideline 2004/108/EC 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.
2) Over the whole temperature range.

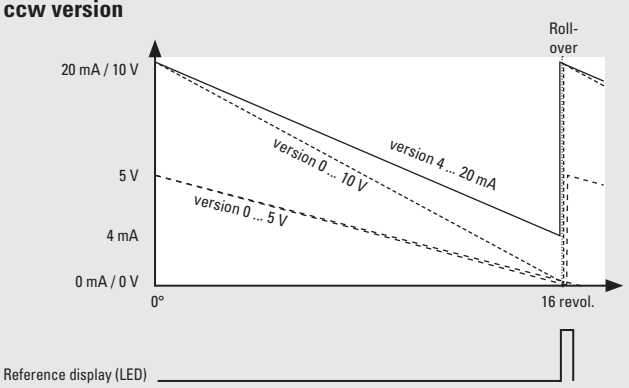
Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analogue**

Example (output signal evolution) – factory setting

cw version

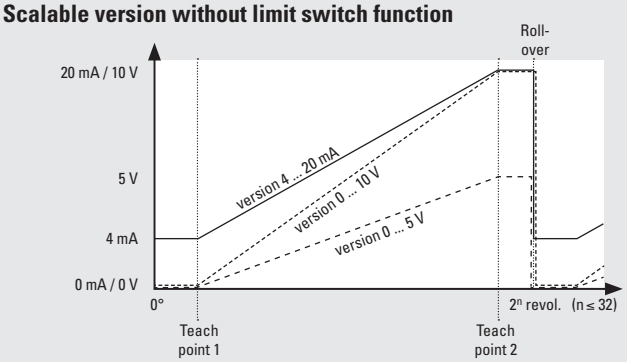


ccw version



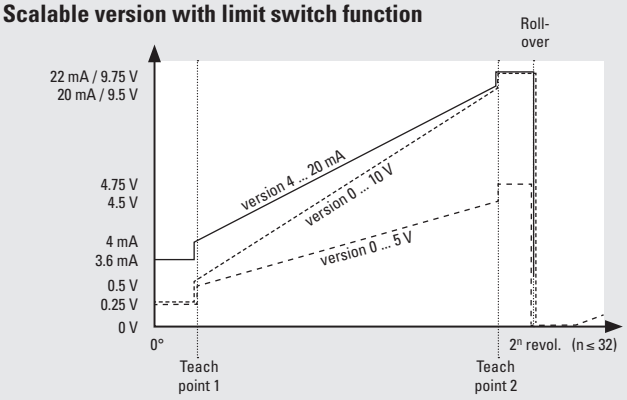
Example (output signal evolution) – option: scaleable

Scalable version without limit switch function



no reference point display!

Scalable version with limit switch function



no reference point display!

Rollover
if the signal scaled by the user is smaller than these ranges.
at 2^1, 2^2, 2^3 ... 2^{32}

Factory-set measuring range 2^4 revolutions

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 colour:	WH	BN	GN	GY	PK

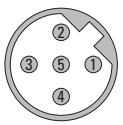
Interface	Type of connection	M12 connector, 5 pin					
3 (current)	3, 4	Signal:	0 V	+V	+I	SET 1 [1]	SET 2 [1]
		Pin:	3	2	1	5	4

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 colour:	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.

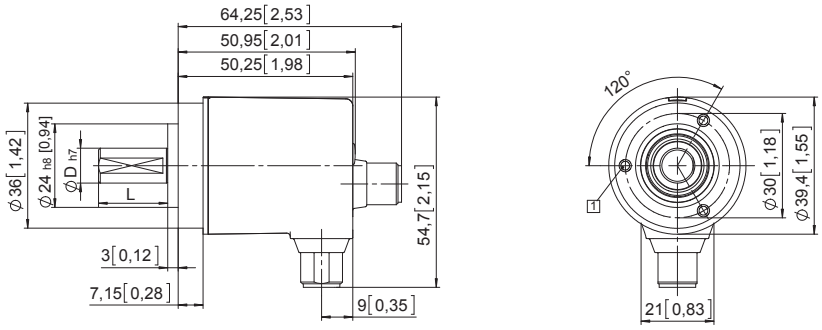
Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analogue**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

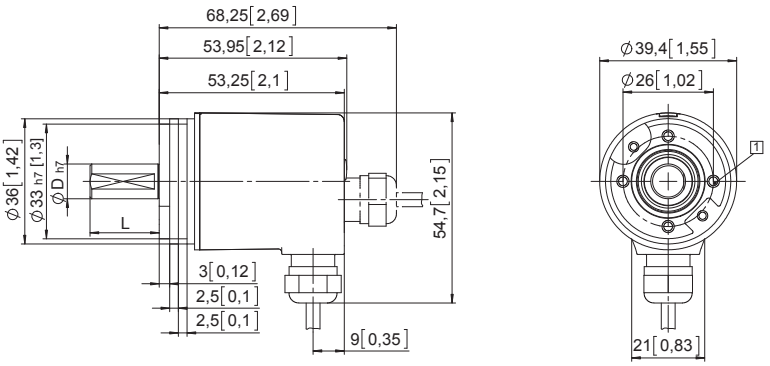
1 3 x M3, 6 [0.24] deep



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4“	12.5 [0.49]	h7

Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 4 x M3, 6 [0.24] deep



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4“	12.5 [0.49]	h7

Compact electronic multiturn, magnetic | **Sendix M3661 / M3681 (shaft / hollow shaft)** | **Analogue**

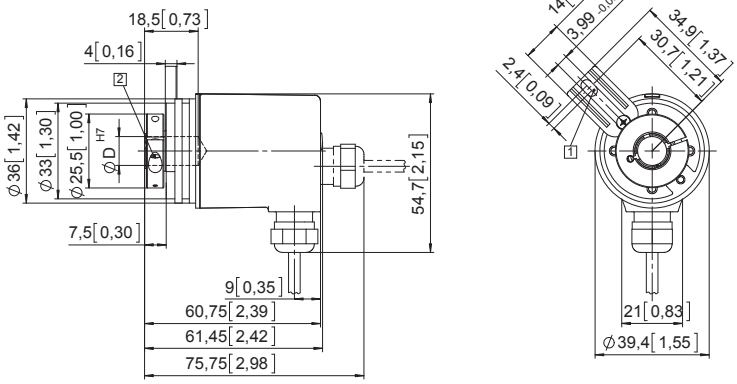
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

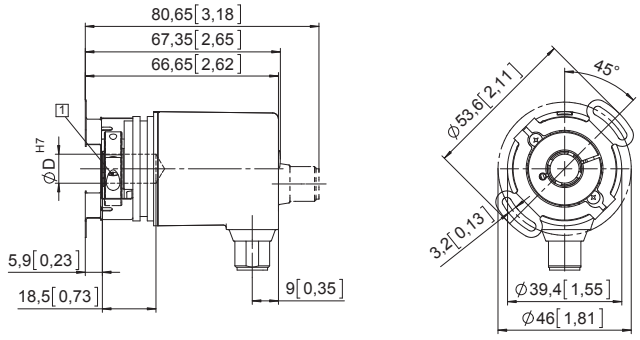


D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4“	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm



D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4“	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

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 pending · 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 [1)]

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
4 = radial M12 connector

*) 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

1) Series availability as from June 2015.

Absolute encoders – multiturn

Compact
electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

Order code Hollow shaft [1)]

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*
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
4 = radial M12 connector

*) 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

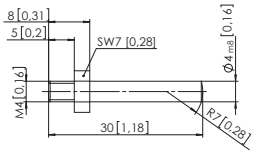
f *Resolution (singleturn)*
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST

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 with spring element		Order no.
Cylindrical pin, long for torque stops	With fixing thread	**8.0010.4700.0000**



Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PUR cable	**05.00.6051.8211.002M**

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	housing side	IP67
	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	aluminium
	housing	aluminium
	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

1) Series availability as from June 2015.

Compact
electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

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	pending
CE compliant acc. to	EMC guideline 2004/108/EC 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
Absoulte 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
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.

Data refresh rate	2 ms

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.

DIR input

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

Response time (DIR input)	1 ms

Power-ON time

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 colour:	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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
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.

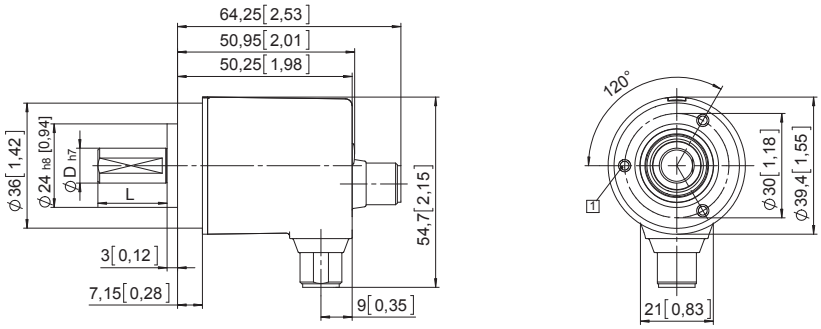
Compact electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

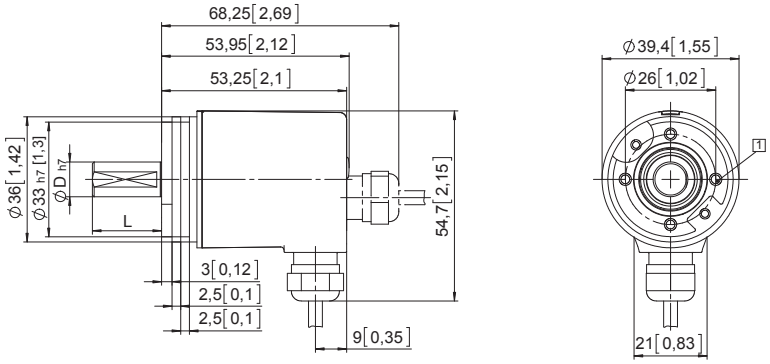
1 3 x M3, 6 [0.24] deep



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4“	12.5 [0.49]	h7

Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 4 x M3, 6 [0.24] deep



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4“	12.5 [0.49]	h7

Compact electronic multiturn, magnetic | **Sendix M3663 / M3683 (shaft / hollow shaft)** | **SSI**

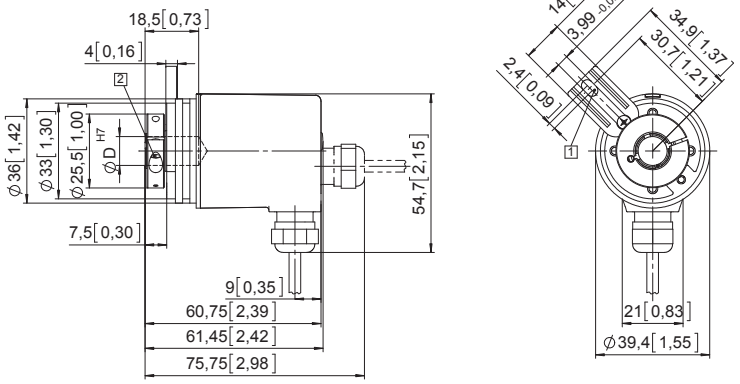
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

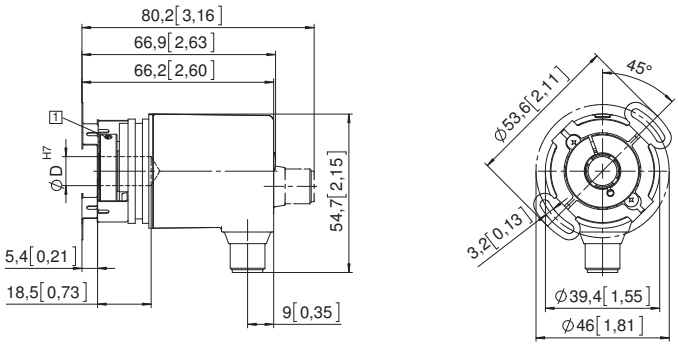


D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm



D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

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 · cULus pending · Ex 2/22 · RoHS · CANopen

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.

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 [1)]

8.M3668	.	X	X	2	X	.	21	2	2
Typ		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
4 = radial M12 connector

*) 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 encoder profil DS406 V4.0

Optional on request
- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

1) Series availability as from March 2015.

Compact electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**

Order code Hollow shaft [1]

8.M3688	.	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*
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*
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
4 = radial M12 connector

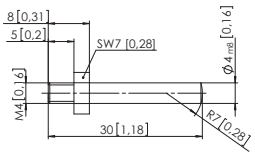
*) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3688.242A.2122.0030 (for cable length 3 m)

e *Fieldbus profile*
21 = CANopen encoder profil DS406 V4.0

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 with spring element		Order no.
Cylindrical pin, long for torque stops	With fixing thread	**8.0010.4700.0000**



Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 6 m [19.69'] PVC cable	**05.00.6091.A211.006M**

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	housing side	IP67
	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	aluminium
	housing	aluminium
	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 [2]
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	pending
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU

1) Series availability as from March 2015.
2) Short circuit proof to 0 V or to output when power supply correctly applied.

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)
Absoulte 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-colour 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 Behaviour 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 colours.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

1) Over the whole temperature range.

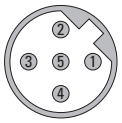
Compact electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**

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 colour:	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



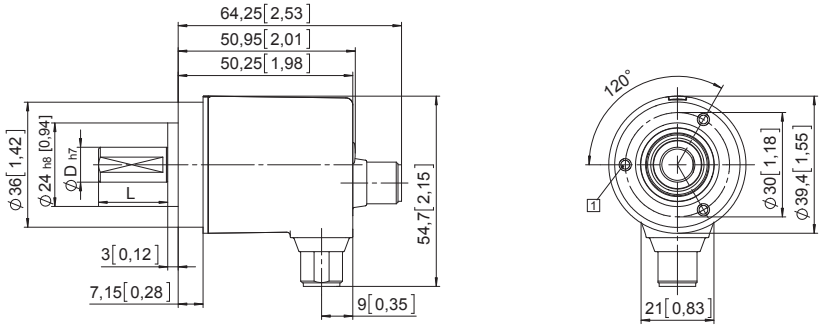
M12 connector, 5-pin

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

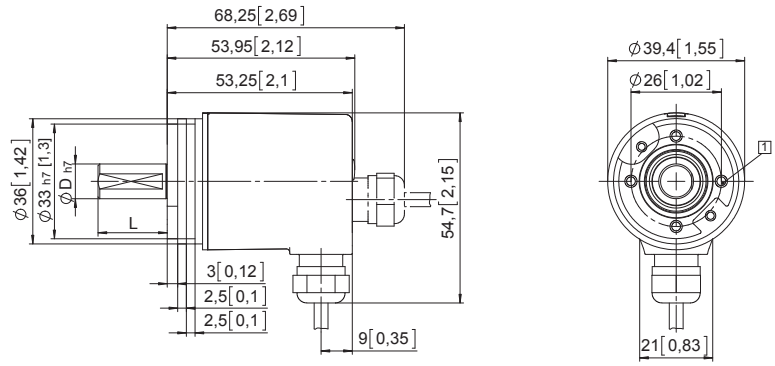
1 3 x M3, 6 [0.24] deep



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4“	12.5 [0.49]	h7

Synchro flange, ø 36 [1.42]
Flange type 2 and 4

1 4 x M3, 6 [0.24] deep



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4“	12.5 [0.49]	h7

Compact electronic multiturn, magnetic | **Sendix M3668 / M3688 (shaft / hollow shaft)** | **CANopen**

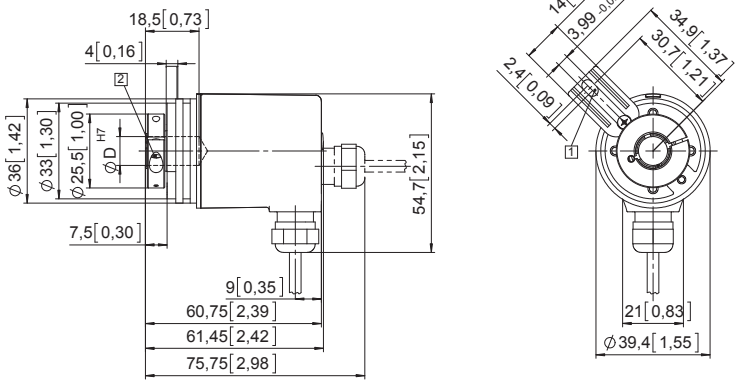
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 3 and 6

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

2 Recommended torque for the clamping ring 0.7 Nm

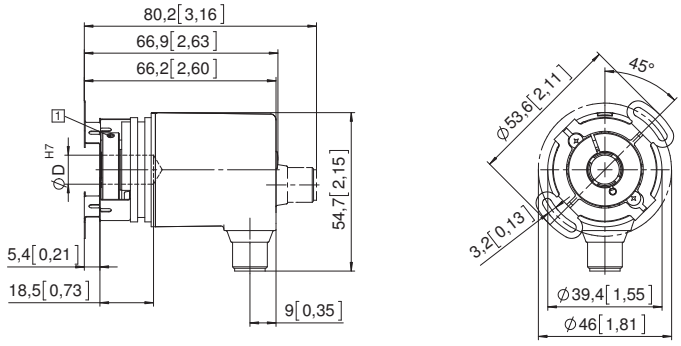


D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4“	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, ø 46 [1.81]
Flange type 2 and 5

1 Recommended torque for the clamping ring 0.7 Nm



D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4“	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

Compact electronic multiturn, optical | Sendix F3663 / F3683 (shaft / hollow shaft) | SSI / BiSS

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 | Optical sensor | 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.

Optimised 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)*
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.

Absolute encoders – multiturn

Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS**

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 *Hollow shaft*
1 = ø 6 mm [0.24"]
3 = ø 8 mm [0.32"]
4 = ø 10 mm [0.39"], blind hollow shaft
2 = ø 1/4"

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)]

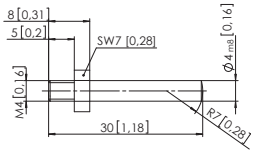
e *Code*
B = SSI, binary
C = BiSS, binary
G = SSI, gray

f *Resolution (singleturn)*
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		Order no.
Cylindrical pin, long for torque stops	 With fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PUR cable	**05.00.6051.8211.002M**

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	aluminium
	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.

Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS**

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 2004/108/EC 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
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.

Data refresh rate		
	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs

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]

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.

Power ON time

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.

DIR input

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

Response time (DIR input)		1 ms

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.

1) Short circuit proof to 0 V or to output when power supply correctly applied.

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 colour:	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 colour:	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 colour:	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 Vsens	+Vsens	A	$\overline{A}$	B	$\overline{B}$	⏚
			Cable colour:	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 colour:	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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin

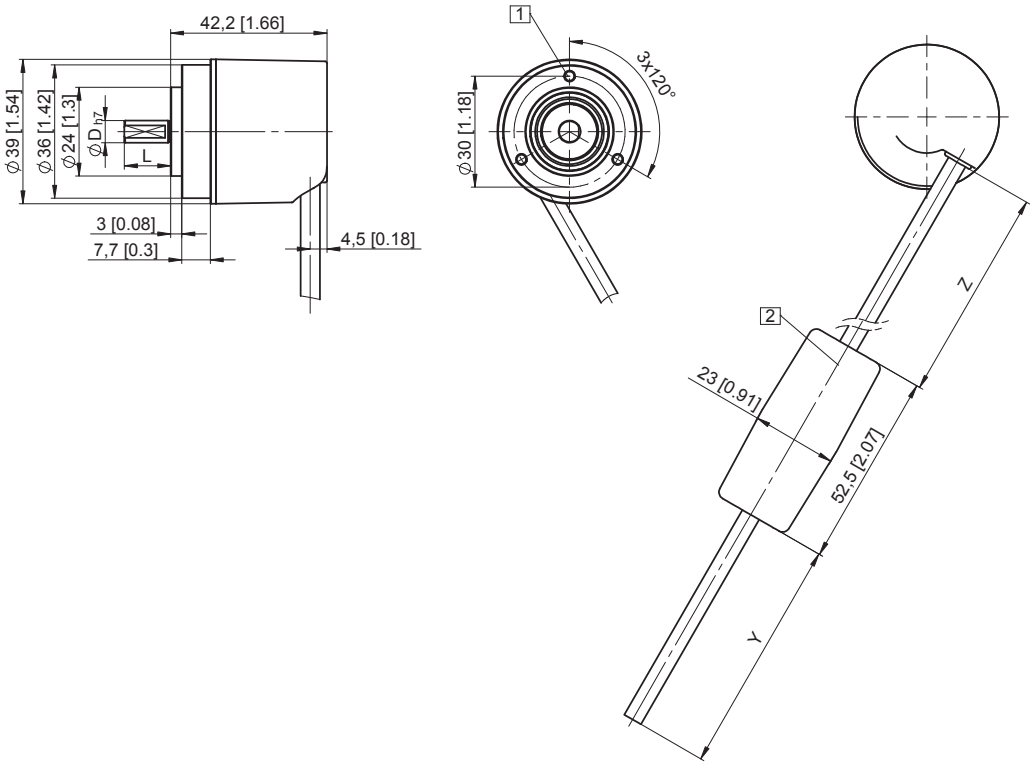
Compact electronic multiturn, optical | **Sendix F3663 / F3683 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

1 M3, 6 [0.24] deep
2 Battery (in the cable)

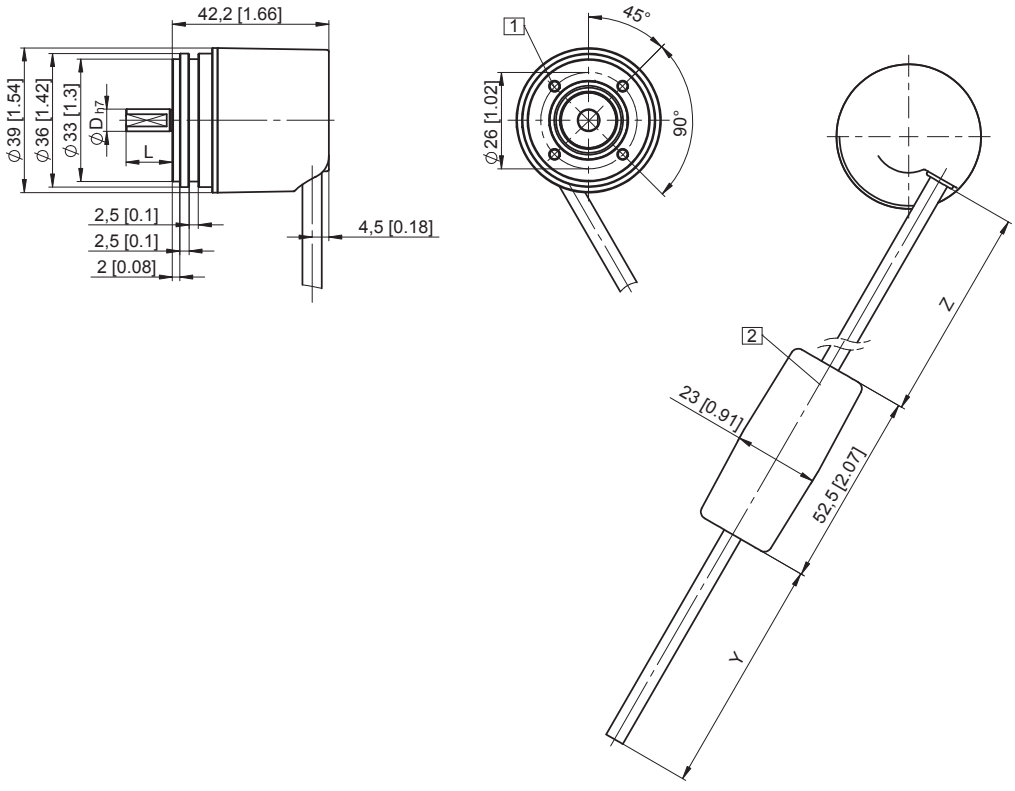


D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

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 M3, 6 [0.24] deep
2 Battery (in the cable)



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

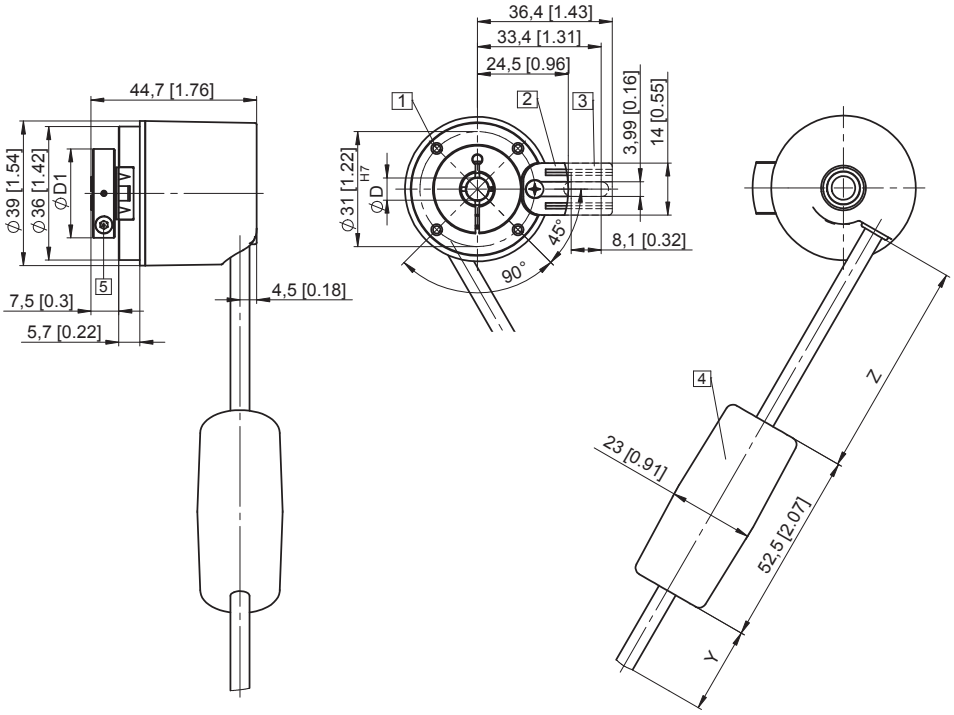
Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

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)



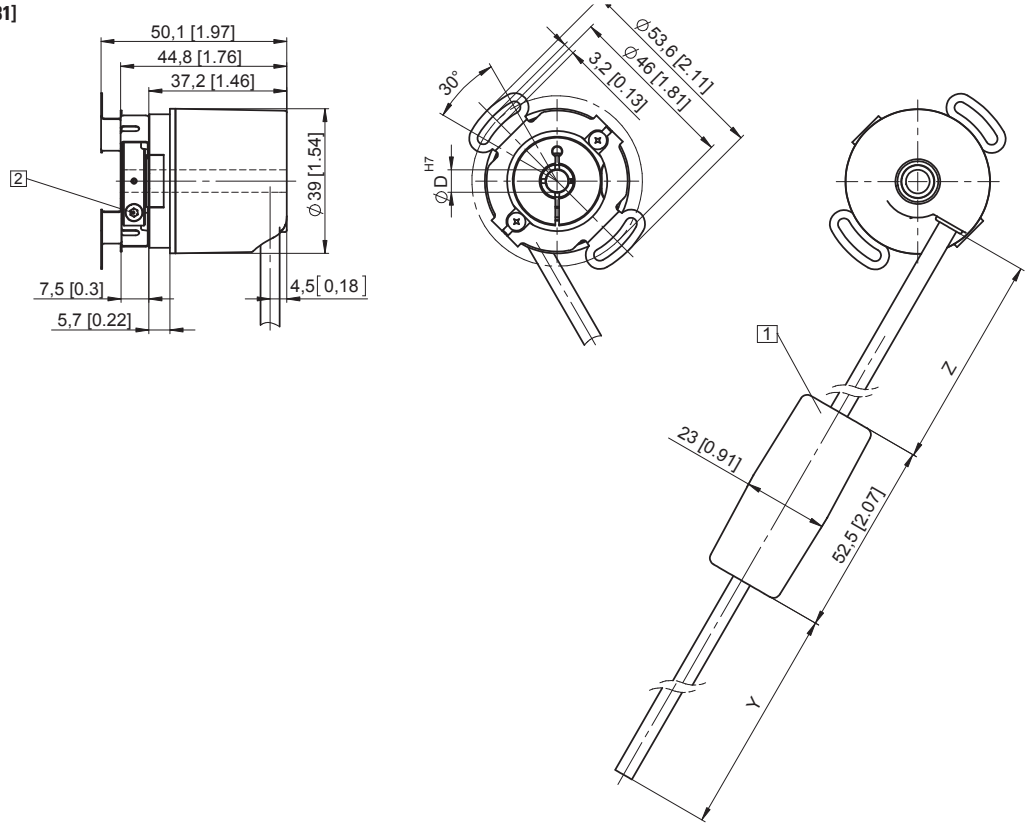
1 M2.5, 5 [0.20] deep
2 Spring element, short
recommendation:
cylindrical pin DIN 7, ø 4 [0.16]
3 Spring element, long
recommendation:
cylindrical pin DIN 7, ø 4 [0.16]
4 Battery (in the cable)
5 Recommended torque for the clamping ring 0.6 Nm

D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

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	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

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 | 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 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 encoder profile DS406 V3.2

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*
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

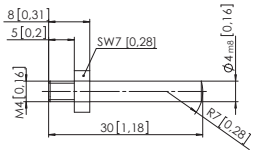
e *Fieldbus profile*
21 = CANopen encoder profile DS406 V3.2

Optional on request
- surface protection salt spray tested

Absolute encoders – multiturn

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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**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	aluminium
	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	ja
UL approval	file 224618
CE compliant acc. to	EMC guideline 2004/108/EC 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-colour, red/green)

LED ON or blinking	red	error display
	green	status display

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-colour 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 Behaviour 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 colours.
- 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 colour:	BN	WH	GY	GN	YE

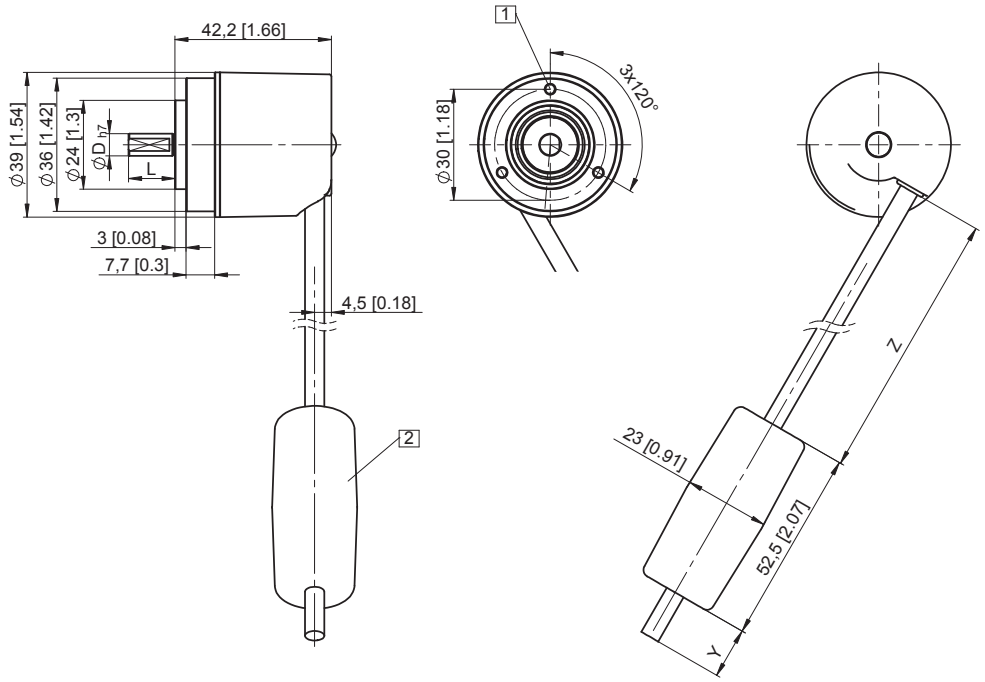
Compact electronic multiturn, optical | **Sendix F3668 / F3688 (shaft / hollow shaft)** | **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 36 [1.42]
Flange type 1 and 3

1 M3, 6 [0.24] deep
2 Battery (in the cable)

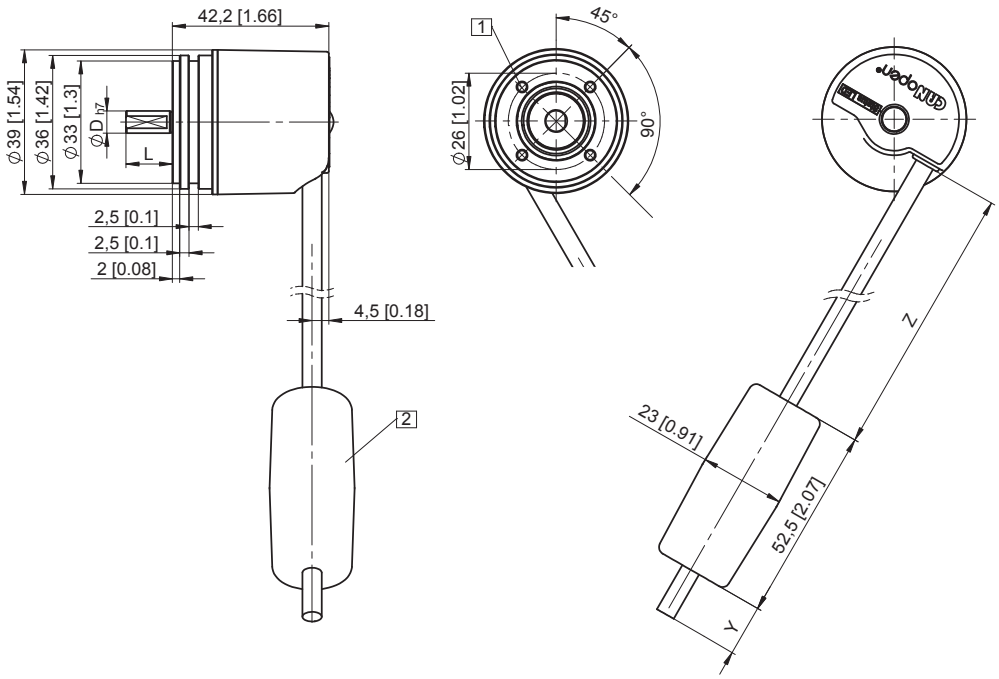


D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

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 M3, 6 [0.24] deep
2 Battery (in the cable)



D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

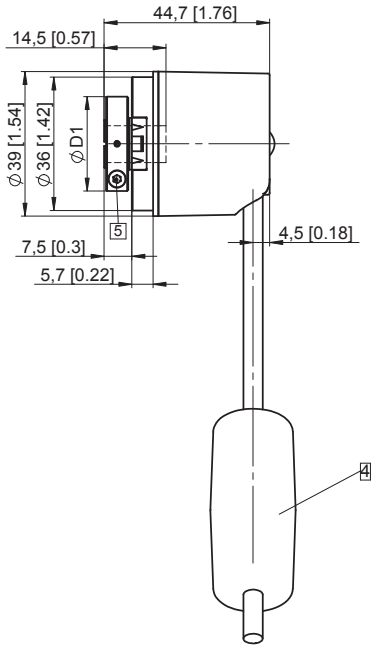
Compact electronic multiturn, optical | **Sendix F3668 / F3688 (shaft / hollow shaft)** | **CANopen**

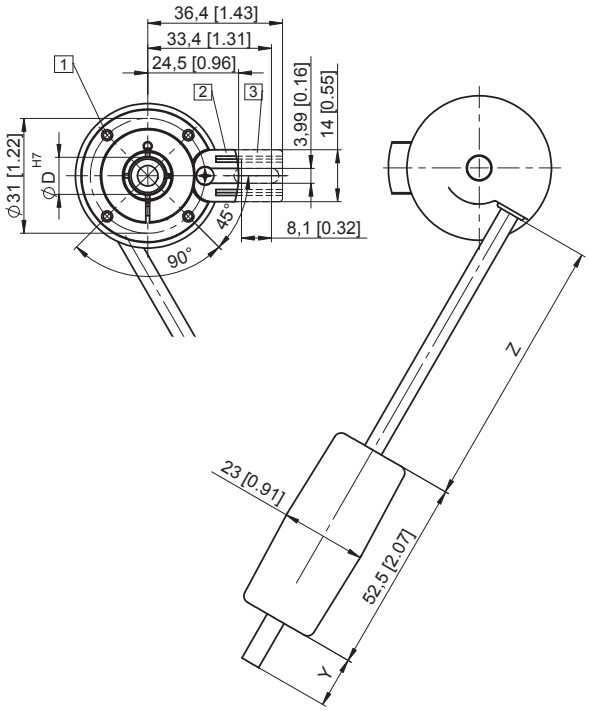
Dimensions hollow shaft version

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 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





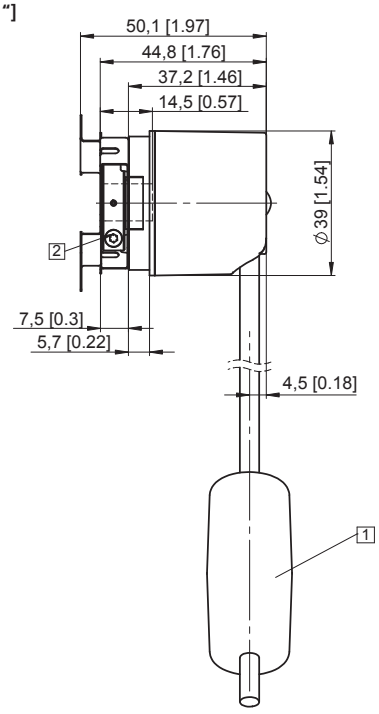
D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

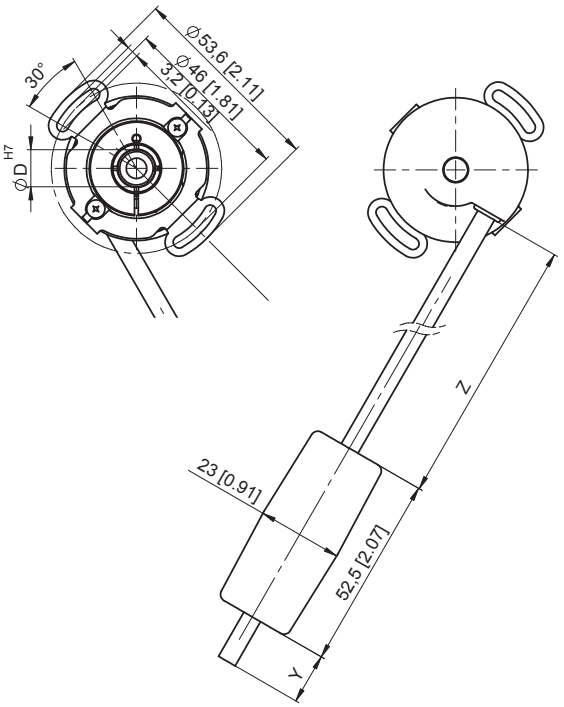
Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

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



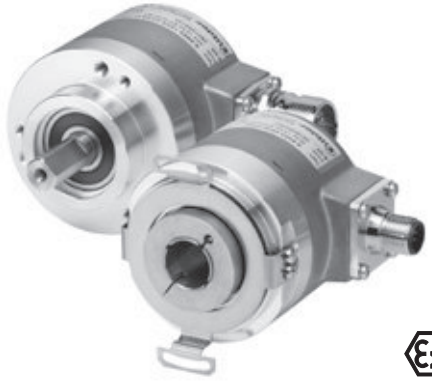


D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS**



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 | Surface protection salt spray-tested optional

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 (Type) . X(a) X(b) X(c) X(d) . X(e) X(f) 2(g) X(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

Optional on request

- Ex 2/22
- surface protection salt spray tested
- other singleturn resolutions

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**

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.

Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS**

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 *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
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
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

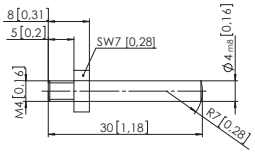
f *Resolution* [1]
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

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)
- 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			Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**

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.

Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS**

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	aluminium
	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		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 2004/108/EC 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
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.

Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs

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

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
Response time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET 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.

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.

Standard
mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS**

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.

DIR 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.

Power-ON time

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

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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	M23 connector													
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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector													
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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector													
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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

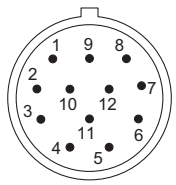
Interface	Type of connection	Features	M23 connector													
6, 9	3, 4	SinCos o. incr. RS422 sensor output	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
			Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	M12 connector									
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 Vsens / +Vsens: 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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

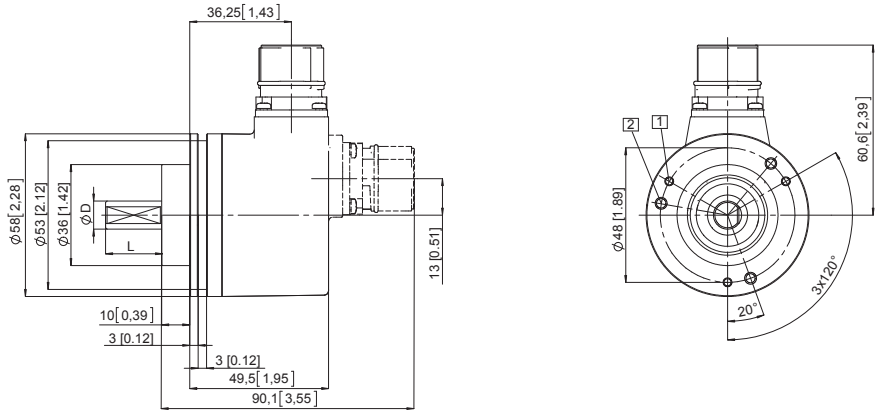
Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with M23 connector)

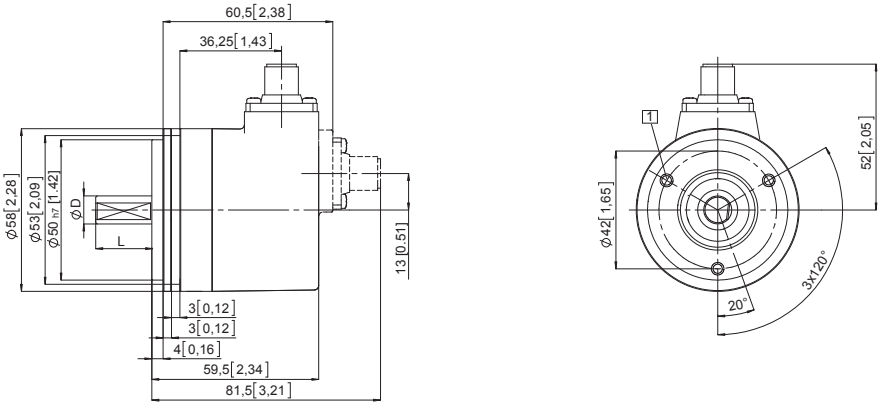
1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep



D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

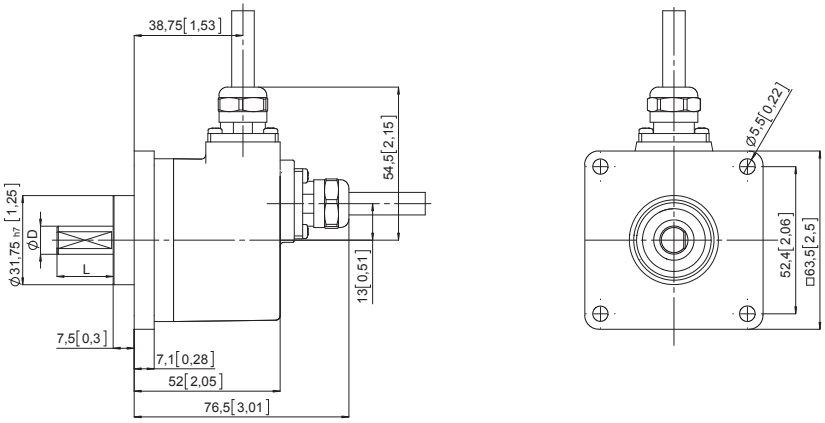
Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

1 M4, 6 [0.24] deep



D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)



D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

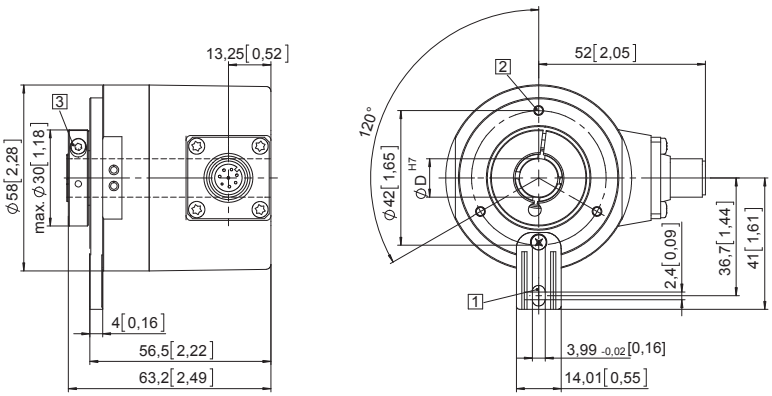
Standard
mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions hollow shaft version

Dimensions in mm [inch]

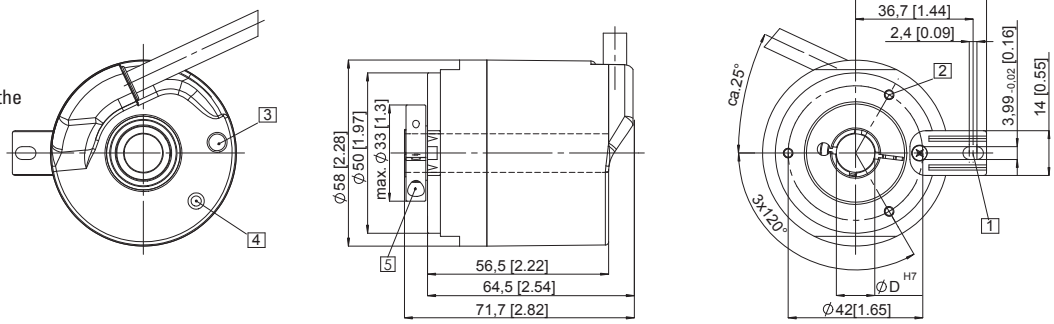
Flange with spring element, long
Flange type 1 and 2
(drawing with M12 connector)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 6 [0.24] deep
3 Recommended torque for the clamping ring 0.6 Nm



Flange with spring element, long
Flange type 1 and 2
(drawing with tangential cable)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 5.5 [0.21] deep
3 Status-LED
4 SET button
5 Recommended torque for the clamping ring 0.6 Nm



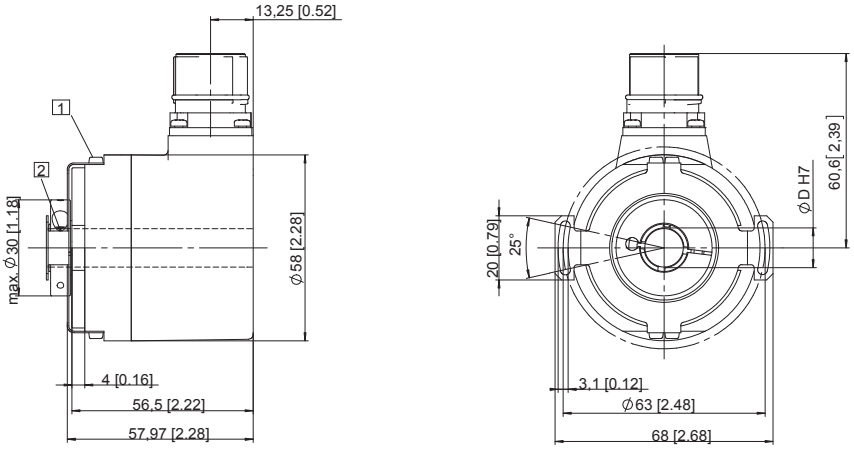
Standard mechanical multiturn, optical | **Sendix 5863 / 5883 (shaft / hollow shaft)** | **SSI / BiSS**

Dimensions hollow shaft version

Dimensions in mm [inch]

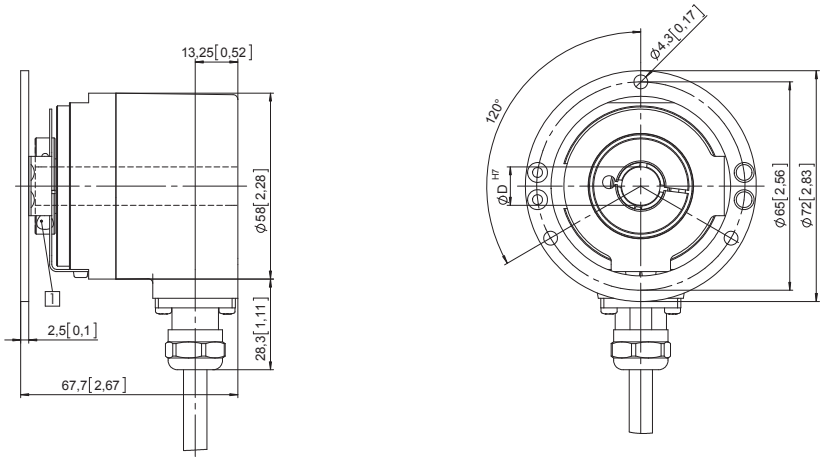
Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with M23 connector)

1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm

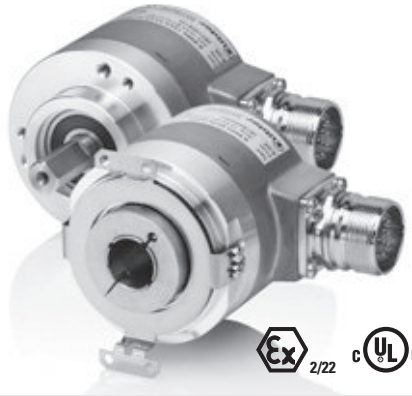


Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm



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
- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.

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 *Hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft

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)
- other singleturn resolutions

Accessory		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.	

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable [2]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 10 m [32.81'] PVC cable [2]	**8.0000.6901.0010.0031**
Connector, self-assembly (straight)	M23 female connector with coupling nut	**8.0000.5012.0000**
	M23 female connector with coupling nut, Ex zone 2/22	**8.0000.5012.0000.Ex**

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

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 / HFT = 1)
PFH_d value [3]	2.16 x 10^{-8} h^{-1}
Proof-test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

1) Resolution, preset value and count direction are factory-programmable.
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.

Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Mechanical characteristics

Maximum speed	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
shaft version	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
hollow shaft version	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)
Material	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PVC
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
Current consumption	5 V DC	max. 80 mA
(no load)	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 2004/108/EC 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

Power-ON time

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

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.

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
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.

Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs

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
Pulse rate	2048 ppr

SET input or SET button

Input		HIGH active
Input type		comparator
Signal level	HIGH	min: 60 % of +V, 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
Reaction time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET 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.

DIR 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.

1) Cable version: -30°C ... +90°C [-22°F ... +194°F].
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

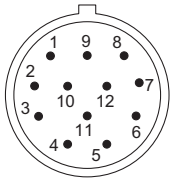
Terminal assignment

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 colour:	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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
A, $\overline{A}$: cosine signal
B, $\overline{B}$: sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



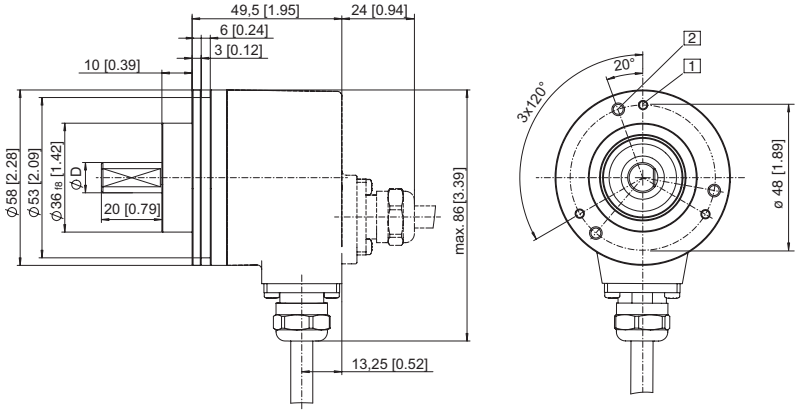
M23 connector, 12-pin

Dimensions shaft version

Dimensions in mm [inch]

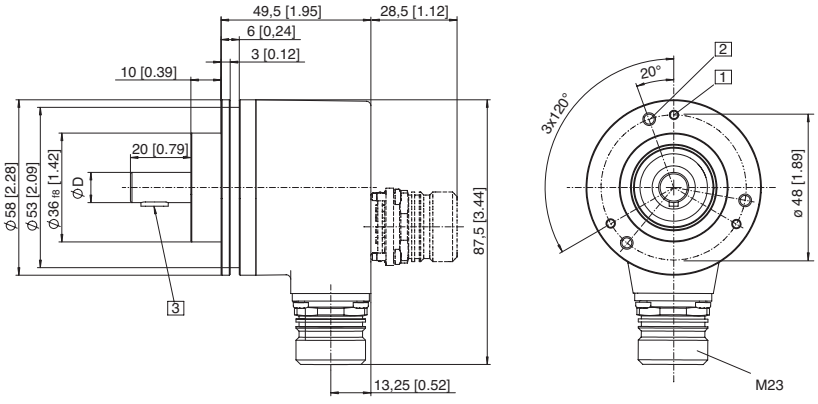
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 3 x M3, 6 [0.24] deep
2 3 x M4, 8 [0.32] deep
D = 10 ^{f7} [0.39]



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 = 10 ^{h7} [0.39]



Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

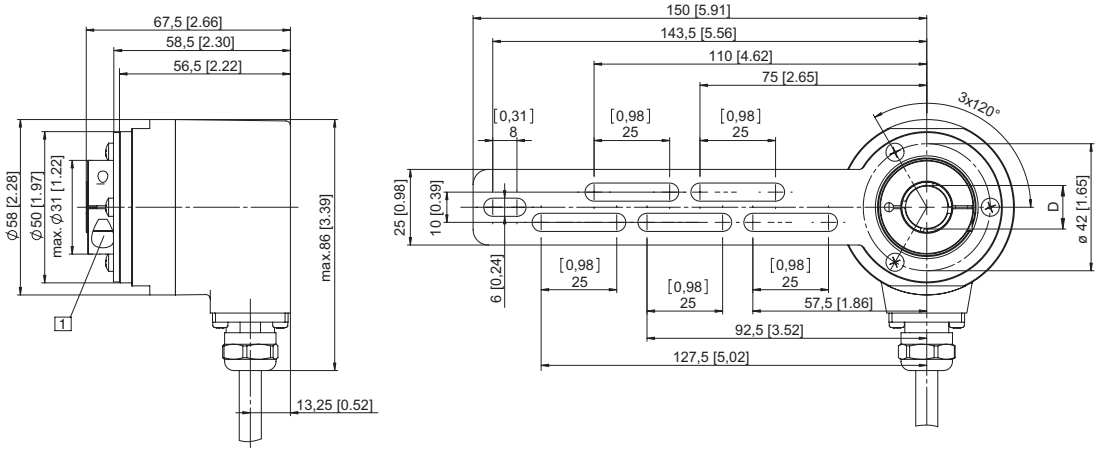
Dimensions hollow shaft version

Dimensions in mm [inch]

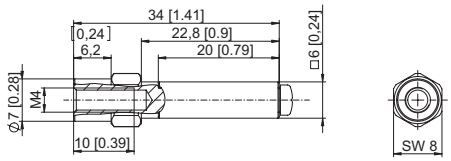
Flange with torque stop set, rigid
Flange type A
(drawing with cable)

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

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



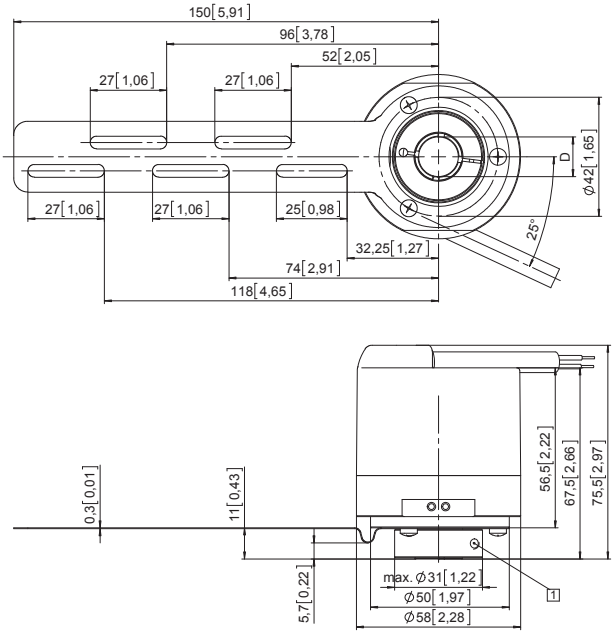
Torque pin with rectangular sleeve with M4 thread



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

1 Recommended torque for the clamping ring 2.5 Nm

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



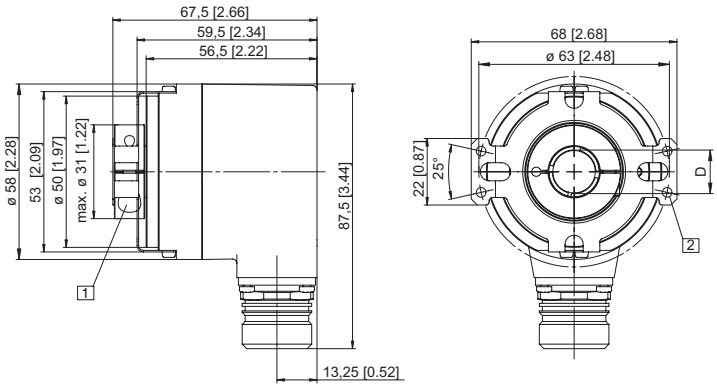
Standard
SIL2/PLd, mech. multiturn, optical | **Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

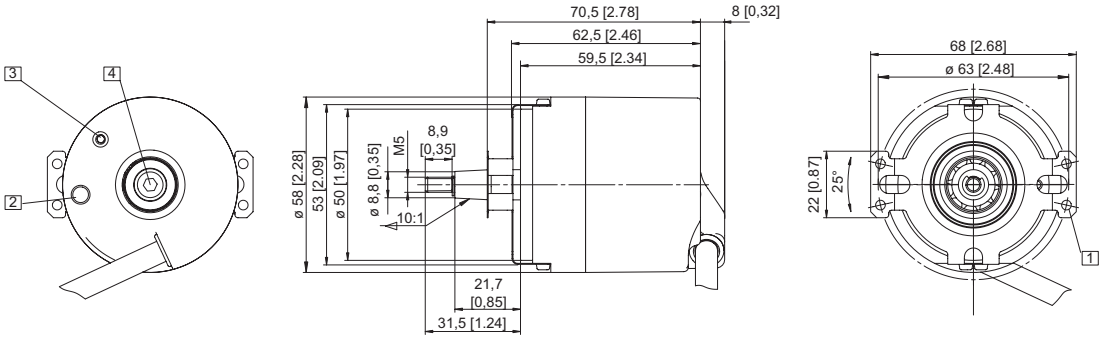
Flange with stator coupling, ø 63 [2.48]
and hollow shaft
Flange type B
(drawing with M23 connector)

1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw
D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]

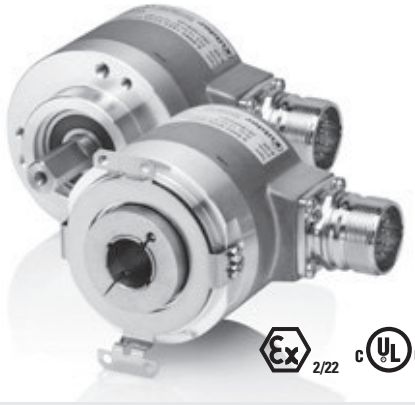


Flange with stator coupling, ø 63 [2.48]
and tapered shaft
Flange type B
(drawing with tangential cable outlet)

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



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
- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.

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 *Hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft

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)
- other singleturn resolutions

Accessory		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.	

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable [2]	**8.0000.6901.0002.0031**
	M23 female connector with coupling nut, 10 m [32.81'] PVC cable [2]	**8.0000.6901.0010.0031**
Connector, self-assembly (straight)	M23 female connector with coupling nut	**8.0000.5012.0000**
	M23 female connector with coupling nut, Ex zone 2/22	**8.0000.5012.0000.Ex**

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

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 / HFT = 1)
PFH_d value [3]	1.09 x 10^{-8} h^{-1}
Proof-test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

1) Resolution, preset value and count direction are factory-programmable.
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.

Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Mechanical characteristics

Maximum speed	up to 70°C [158°F]	12000 min^{-1}, 10000 min^{-1} (continuous)
shaft version	up to T_{max}	8000 min^{-1}, 5000 min^{-1} (continuous)
Maximum speed	up to 70°C [158°F]	9000 min^{-1}, 6000 min^{-1} (continuous)
hollow shaft version	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)
Material	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PVC
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
Current consumption	5 V DC	max. 80 mA
(no load)	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 2004/108/EC 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

Power-ON time

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

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.

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
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.

Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs

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
Pulse rate	2048 ppr

SET input or SET button

Input		HIGH active
Input type		comparator
Signal level	HIGH	min: 60 % of +V, 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
Reaction time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET 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.

DIR 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.

1) Cable version: -30°C ... +90°C [-22°F ... +194°F].
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

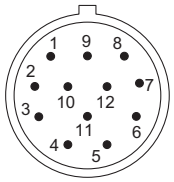
Terminal assignment

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 colour:	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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
A, $\overline{A}$: cosine signal
B, $\overline{B}$: sine signal
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base



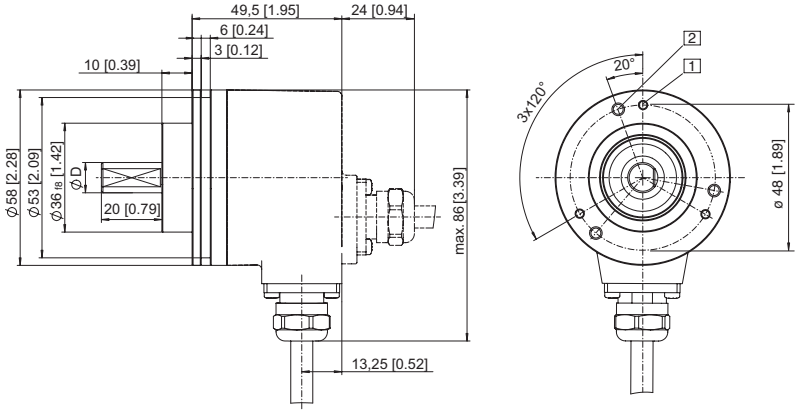
M23 connector, 12-pin

Dimensions shaft version

Dimensions in mm [inch]

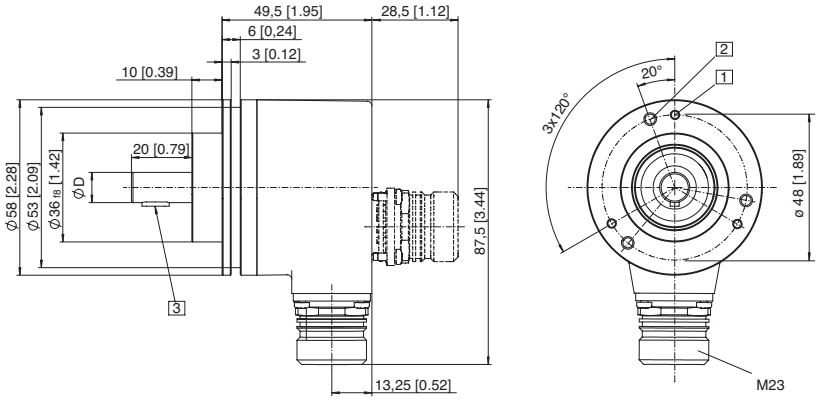
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
(drawing with cable)

1 M3, 6 [0.24] deep
2 M4, 8 [0.32] deep
D = 10 ^{f7} [0.39]



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

1 M3, 6 [0.24] deep
2 M4, 8 [0.32] deep
3 Feather key DIN 6885 - A - 3x3x6
D = 10 ^{h7} [0.39]



Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

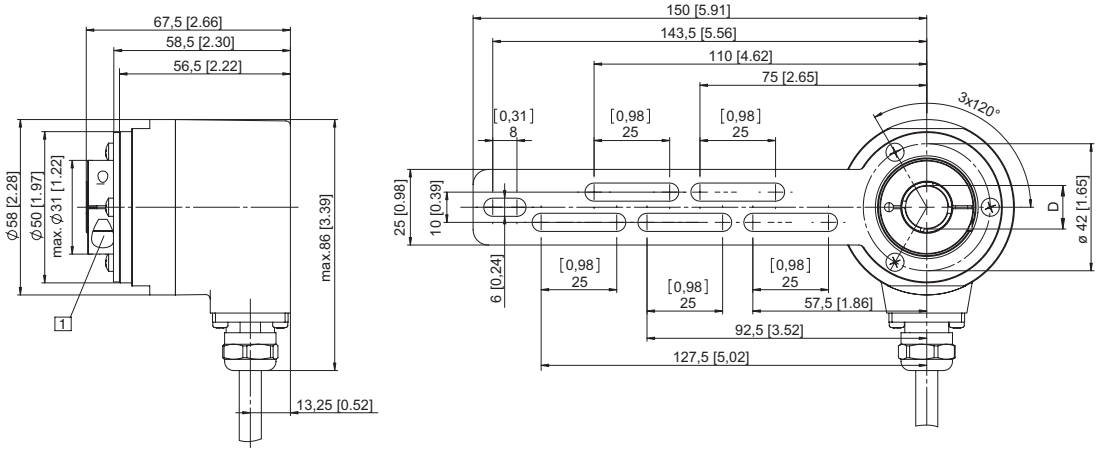
Dimensions hollow shaft version

Dimensions in mm [inch]

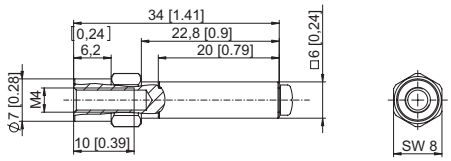
Flange with torque stop set, rigid
Flange type A
(drawing with cable)

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

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



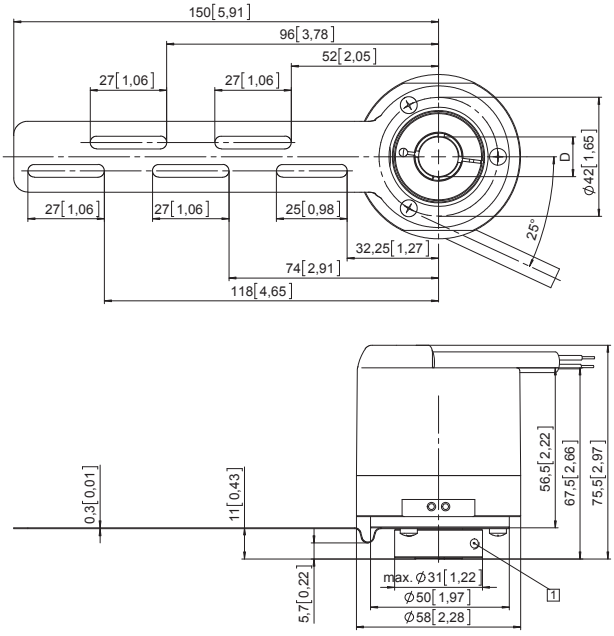
Torque pin with rectangular sleeve with M4 thread



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

1 Recommended torque for the clamping ring 2.5 Nm

D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]



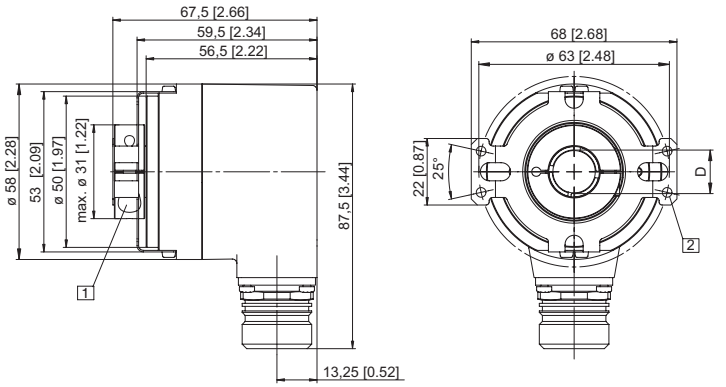
Standard
SIL3/PLe, mech. multiturn, optical | **Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)** | **SSI / BiSS + SinCos**

Dimensions hollow shaft version

Dimensions in mm [inch]

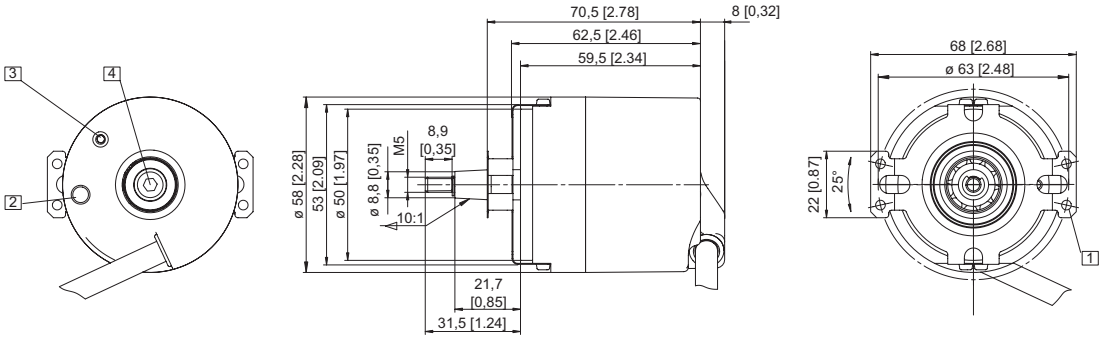
Flange with stator coupling, ø 63 [2.48] and hollow shaft
Flange type B
(drawing with M23 connector)

1 SW 3, recommended torque for the clamping ring 2.5 Nm
2 For (4x) M3 screw
D = ø 10 H7 [0.39]
ø 12 H7 [0.47]
ø 14 H7 [0.55]

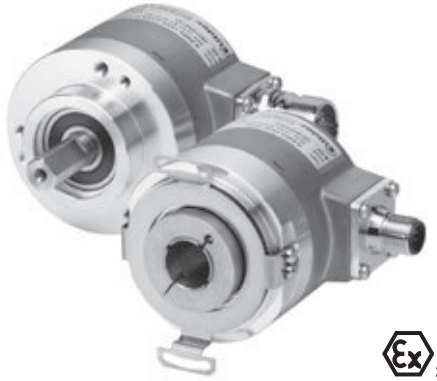


Flange with stator coupling, ø 63 [2.48] and tapered shaft
Flange type B
(drawing with tangential cable outlet)

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



Standard electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS**



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.

Ex 2/22 | cULus | 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


SinCos


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)
- A = 10 bit
- 1 = 11 bit
- 2 = 12 bit
- **3 = 13 bit**
- 4 = 14 bit
- 7 = 17 bit

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
- 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.

Absolute encoders – multiturn

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS**

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 *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)]
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
- Ex 2/22 (not for type of connection E, F)
- 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		Order no.
Cylindrical pin, long	with fixing thread	**8.0010.4700.0000**
for torque stops		

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**05.CMB 8181-0**
	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6041.8211.002M**
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**

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.

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS**

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	aluminium
	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		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]
CE compliant acc. to		EMC guideline 2004/108/EC 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
Short circuit proof outputs		yes [2]
Resolution singleturn		10 ... 17 bit
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
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.

Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs

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

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.

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]

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.

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.

Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS**

DIR input

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

Response time (DIR input) 1 ms

Power-ON time

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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield

Interface	Type of connection	Features	M23 connector													
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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector													
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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	Features	M23 connector													
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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

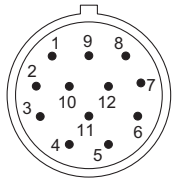
Interface	Type of connection	Features	M23 connector													
6	3, 4	SinCos o. incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	0 Vsens	+Vsens	⏚
		sensor output	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

Interface	Type of connection	Features	M12 connector										
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 Vsens / +Vsens: 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. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
PH ⏚: Plug connector housing (shield)

Top view of mating side, male contact base

M12 connector, 8-pin



M23 connector, 12-pin

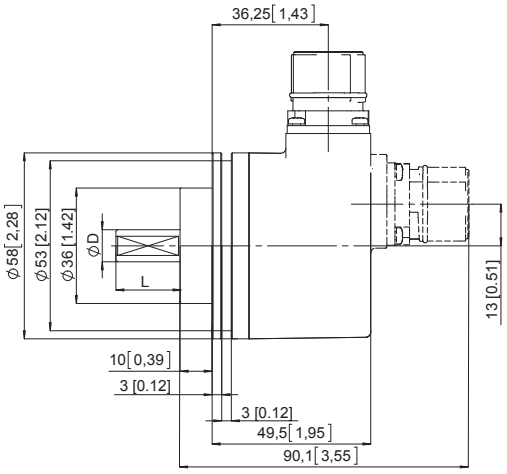
Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS**

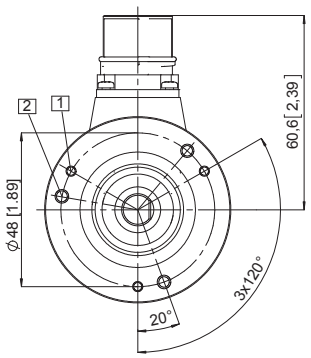
Dimensions shaft version

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

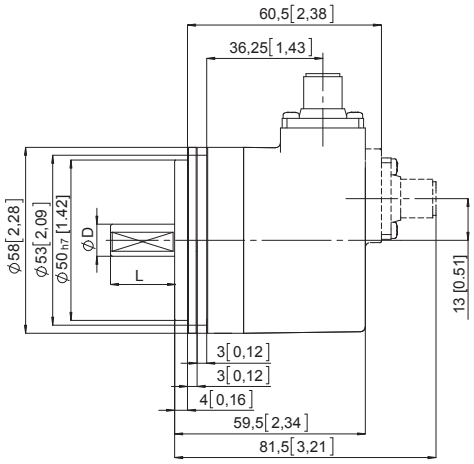


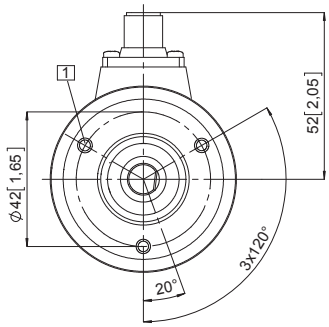


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

1 M4, 6 [0.24] deep





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

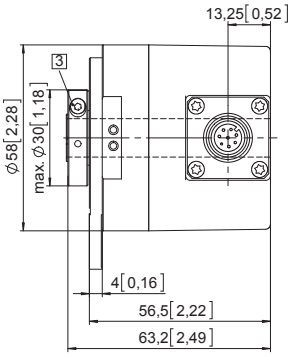
Standard
electronic multiturn, optical | **Sendix F5863 / F5883 (shaft / hollow shaft)** | **SSI / BiSS**

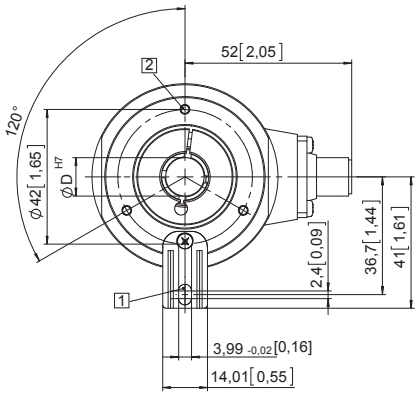
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with M12 connector)

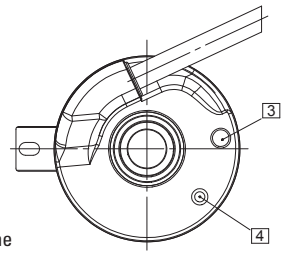
1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 6 [0.24] deep
3 Recommended torque for the clamping ring 0.6 Nm

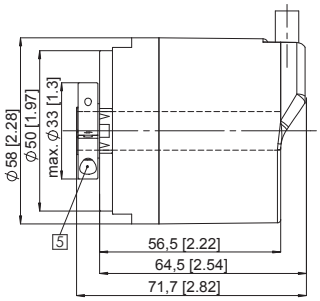


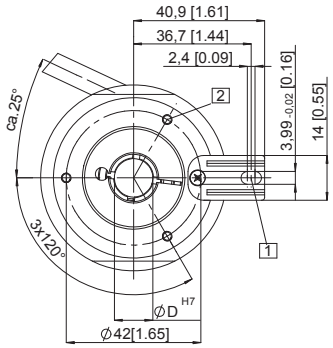


(drawing with tangential cable)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 5.5 [0.21] deep
3 Status-LED
4 SET button
5 Recommended torque for the clamping ring 0.6 Nm

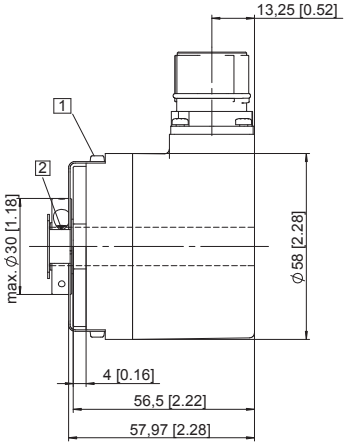


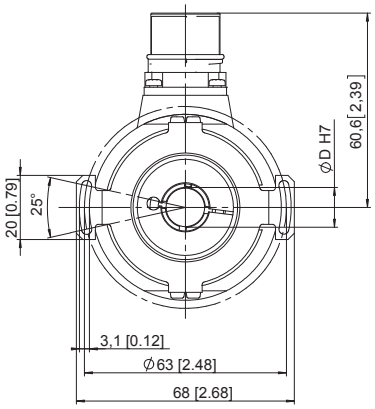




Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 mm [2.48]
(drawing with M23 connector)

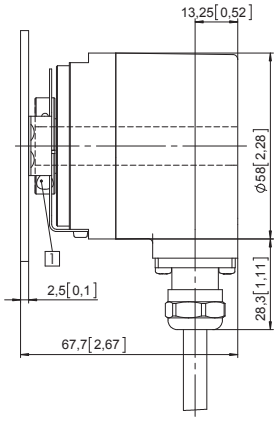
1 Fixing screws DIN 912 M3 x 8 (washer included in delivery)
2 Recommended torque for the clamping ring 0.6 Nm

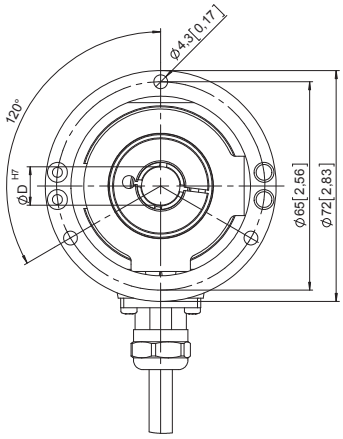




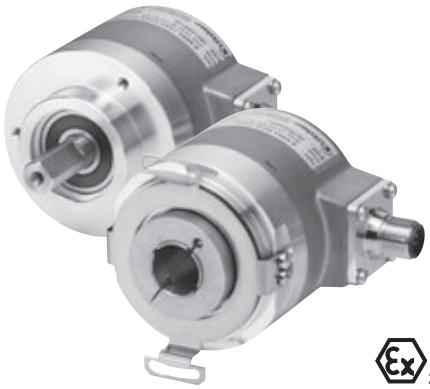
Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with cable)

1 Recommended torque for the clamping ring 0.6 Nm





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


SinCos


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 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.F5868.122B.2123.0030 (for cable length 3 m)

e *Fieldbus profile* 3)
21 = CANopen encoder profile DS406 V3.2

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.
3) CAN parameters can also be factory pre-set.

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 *Hollow shaft*
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
B = ø 12 mm, blind hollow shaft [1)]
5 = ø 14 mm [0.55"]
6 = ø 15 mm [0.59"]

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 [3)]*
21 = CANopen encoder profile DS406 V3.2

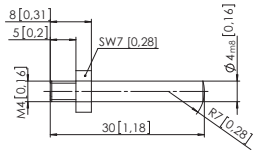
f *Options (service)*
2 = no option
3 = SET button

Optional on request
- Ex 2/22 (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

			Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology

		Order no.
Connector, self-assembly (straight)	coupling M12 for bus in	**8.0000.5116.0000**
	connector M12 for bus out	**8.0000.5111.0000**
Cordset, pre-assembled	M12, for bus in, 2 m [6.56'] PVC cable	**05.00.6091.A211.002M**
	M12, for bus out, 2 m [6.56'] PVC cable	**05.00.6091.A411.002M**

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

Mechanical characteristics

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] [4)]
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	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		100 m/s^2, 55 ... 2000 Hz

1) Can be combined only with type of connection F.
2) Can be combined only with blind hollow shaft ø12 mm [0.47"].
3) CAN parameters can also be factory pre-set.
4) Cable version: -30°C ... +75°C [-22°F ... +167°F].

Standard electronic multiturn, optical | Sendix F5868 / F5888 (shaft / hollow shaft) | CANopen

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 2004/108/EC RoHS guideline 2011/65/EU

Diagnostic LED (two-colour, 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), scaleable 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

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-colour 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 behaviour 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

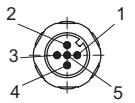
- Global support of node-ID and baud rate
- Selective protocol via identity object (1018h)

Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**

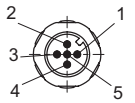
Terminal assignment

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
			Abbreviation:	0 V	+V	CL	CH	CG
			Cable colour:	WH	BN	YE	GN	GY

Interface	Type of connection	Function	2 x M12 connector					
2	F	Bus IN	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
			Abbreviation:	0 V	+V	CL	CH	CG
			Pin:	3	2	5	4	1
		Bus OUT	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
			Abbreviation:	CG	CL	CH	0 V	+V
			Pin:	3	2	5	4	1



Interface	Type of connection	Function	1 x M12 connector					
2	E	Bus IN	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
			Abbreviation:	0 V	+V	CL	CH	CG
			Pin:	3	2	5	4	1

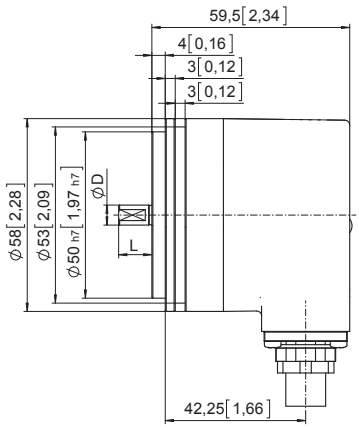


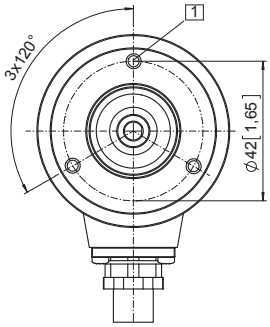
Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with 12 connector)

1 M4, 6 [0.24] deep

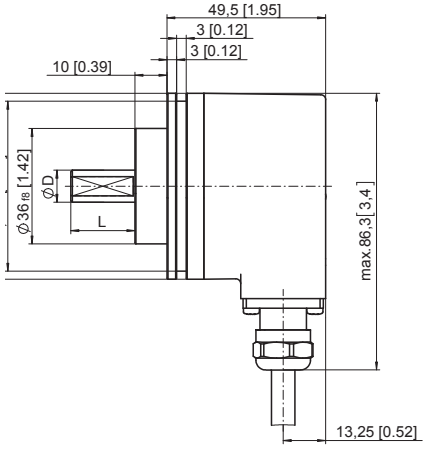


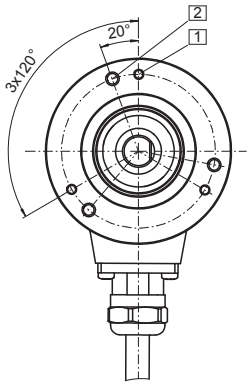


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

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	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

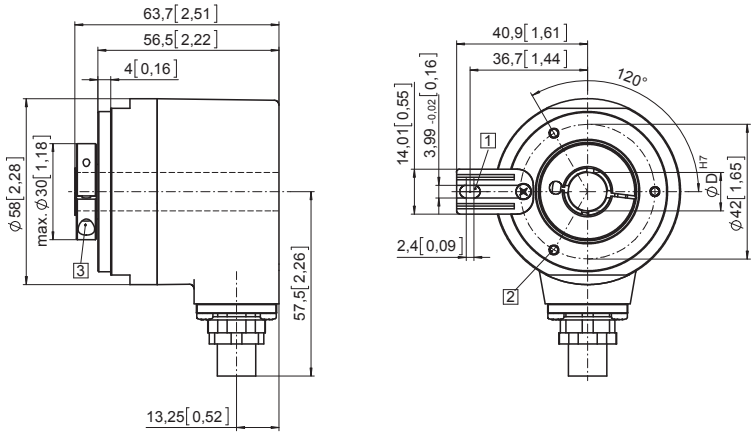
Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **CANopen**

Dimensions hollow shaft version

Dimensions in mm [inch]

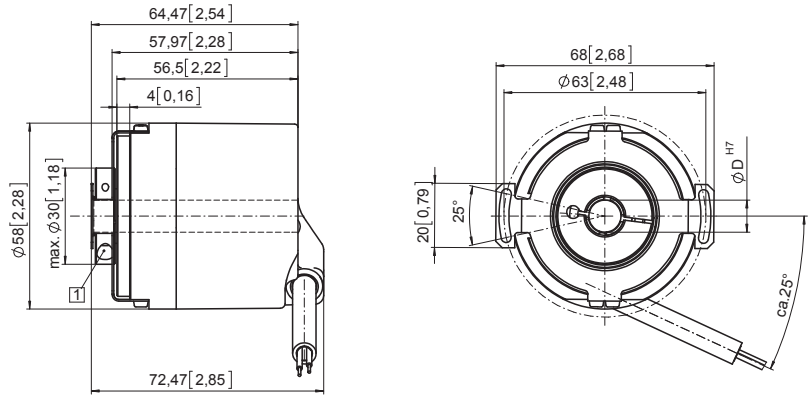
Flange with spring element, long
Flange type 1 and 2
(drawing with cable)

1 M3, 6 [0.24] deep
2 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
3 Recommended torque for the clamping ring 0.6 Nm



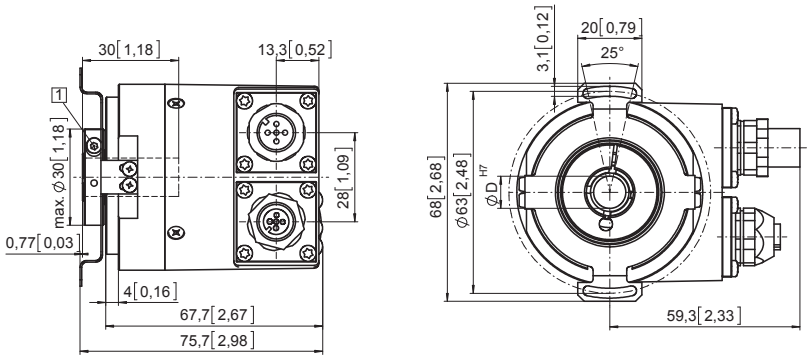
Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with tangential cable)

1 Fixing screws DIN7985 M2.5x6
2 Recommended torque for the clamping ring 0.6 Nm

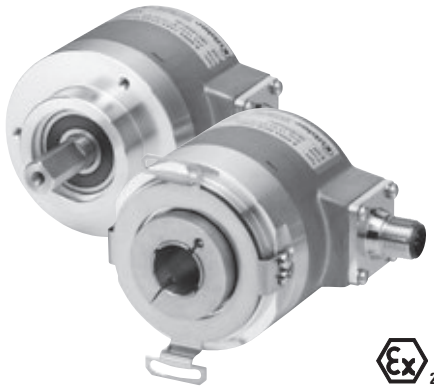


Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with 2 x M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm



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 pending | 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 | 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* [1)]
61 = Modbus RTU 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 *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* [1)]
61 = Modbus RTU V1_1b3

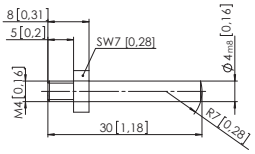
Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Parameters can also be factory pre-set.

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		Order no.
Cylindrical pin, long for torque stops	with fixing thread	**8.0010.4700.0000**



Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for bus in	**8.0000.5116.0000**
Cordset, pre-assembled	M12, for bus in, 2 m [6.56'] PVC cable	**05.00.6091.A211.002M**

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	aluminium
	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 2004/108/EC RoHS guideline 2011/65/EU

Diagnostic LED (two-colour, 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), scaleable 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), scaleable
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

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

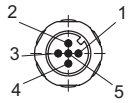
- Node address, baud rate and bus termination programmable.

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						
6	E Bus in	Signal:	0 V power supply	+V power supply	D0	D1	TG	
		Pin:	3	2	5	4	1	

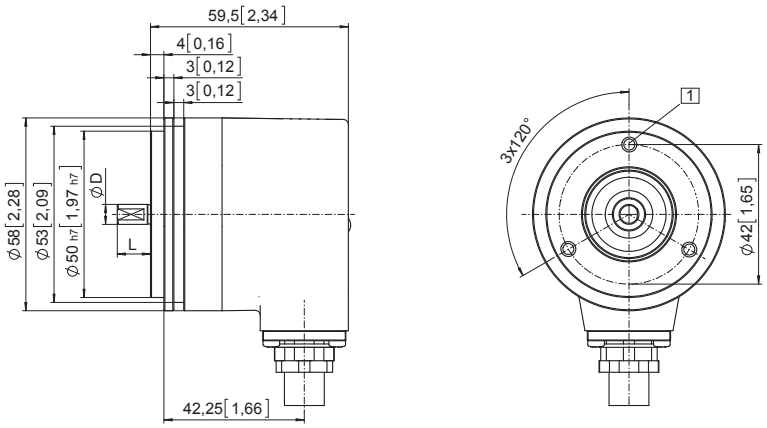
Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **Modbus**

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

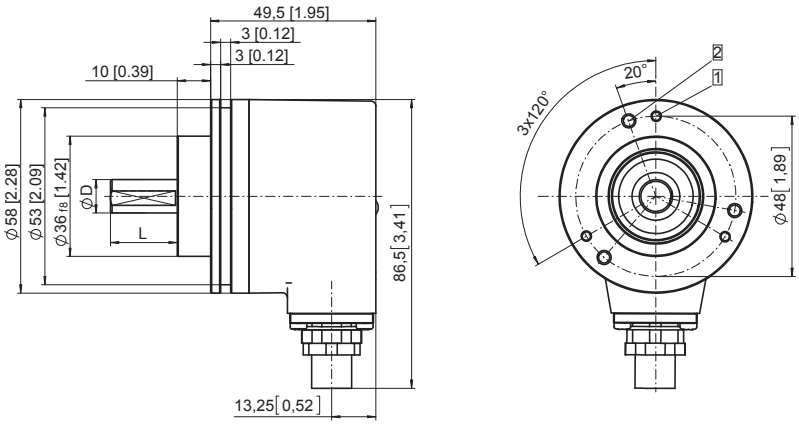
1 M4, 6 [0.24] deep



D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

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	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

Standard
electronic multiturn, optical | **Sendix F5868 / F5888 (shaft / hollow shaft)** | **Modbus**

Dimensions hollow shaft version

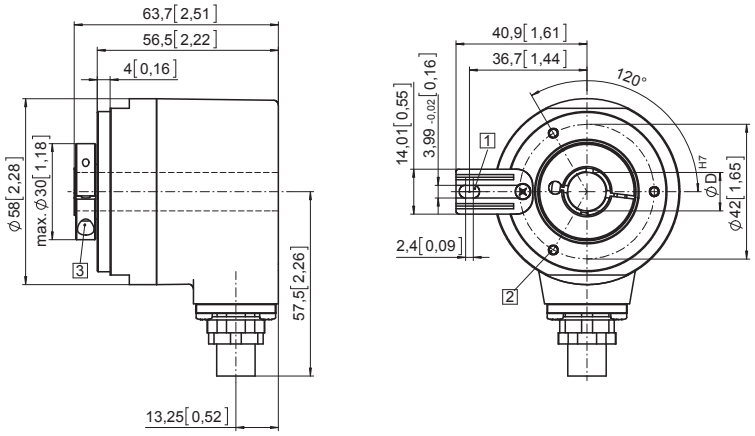
Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2

1 M3, 6 [0.24] deep

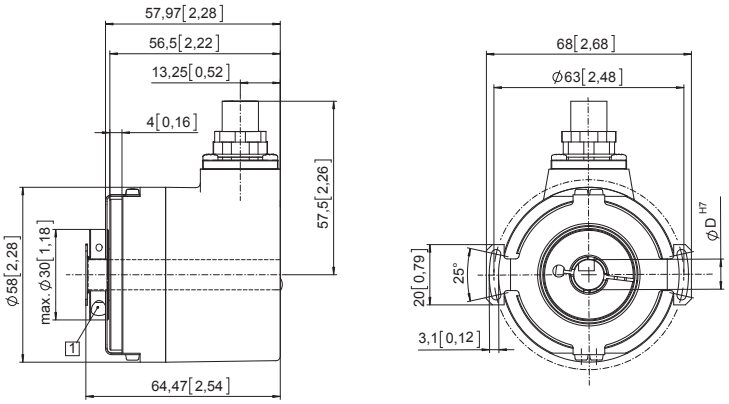
2 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]

3 Recommended torque for the clamping ring 0.6 Nm



Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

1 Recommended torque for the clamping ring 0.6 Nm



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.

Ex 2/22 · cULus · RoHS · PROFIBUS


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


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.
- 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	.	Xa	Xb	3c	Xd	.	31e	1	Xf
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 *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, 5-pin

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

8.5888	.	Xa	Xb	3c	Xd	.	31e	1	Xf
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 *Flange with torque stop*
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*
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, 5-pin

e *Fieldbus profile*
31 = PROFIBUS DP V0 encoder profile class 2

f *Options (service)*
2 = no option
3 = SET button

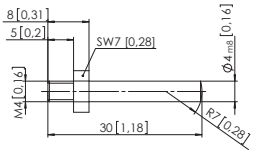
Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (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			Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for bus in	**05.BMWS 8151-8.5**
	connector M12 for bus out	**05.BMSWS 8151-8.5**
	connector M12 for power supply	**05.B8141-0**
Cordset, pre-assembled	M12 cordset for bus in , 6 m [19.68‘] PUR cable	**05.00.6011.3211.006M**
	M12 cordset for bus out, 6 m [19.68‘] PUR cable	**05.00.6011.3411.006M**
	M12 cordset for power supply, 2 m [6.56‘] PUR cable	**05.00.6061.6211.002M**

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	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	aluminium
	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		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 2004/108/EC 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)

Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFIBUS DP**

Interface characteristics PROFIBUS DP	
Resolution singleturn	1 ... 65536 (16 bit), scaleable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scaleable
Total resolution	1 ... 268.435.456 (28 bit), scaleable 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

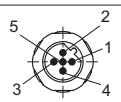
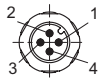
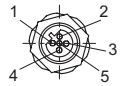
- Direction of rotation.
- Scaling (number of steps per revolution).
- Preset value.
- Diagnostics mode.

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				The shield of the connection cable must be connected over a large area via the cable gland.
3	1 (terminal box)	Signal:	B	A	0 V	+ V	0 V	+ V	B	A	
		Terminal:	1	2	3	4	5	6	7	8	

Interface	Type of connection	Function							
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.

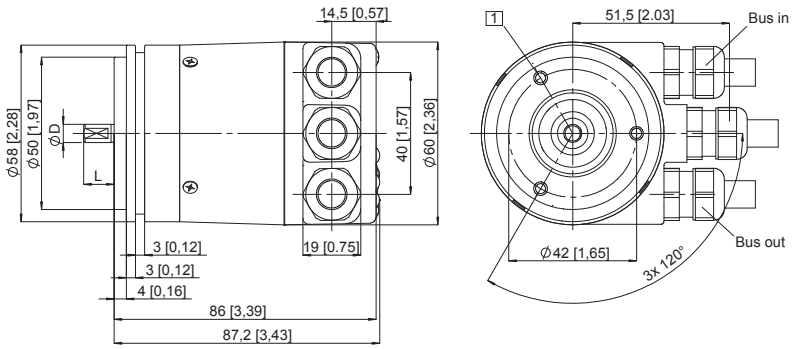
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFIBUS DP**

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)

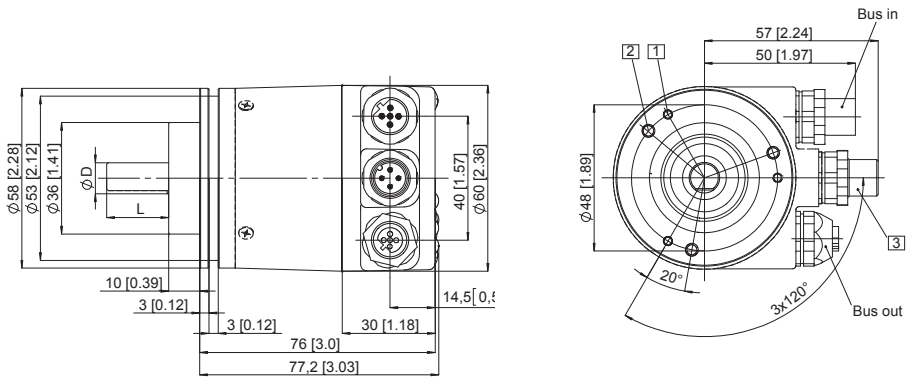
1 M4, 6 [0.24] deep



D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

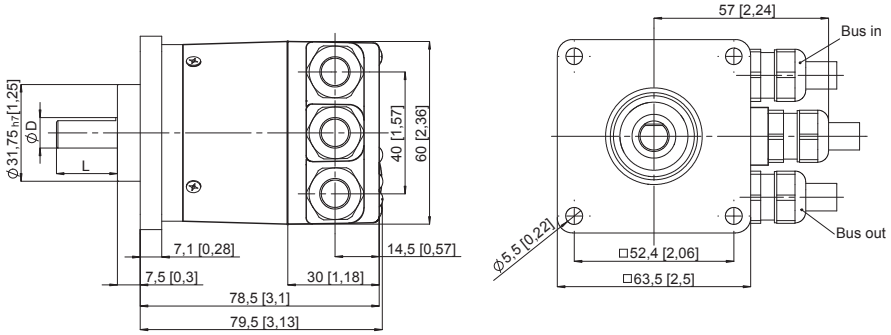
Clamping flange, ø 58 [2.28]
Flange type 1 and 3
(drawing with 3 x M12 connector)

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



D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)



D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

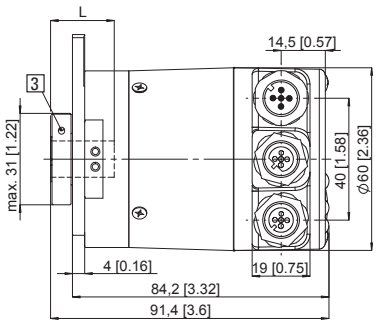
Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **Profibus-DP**

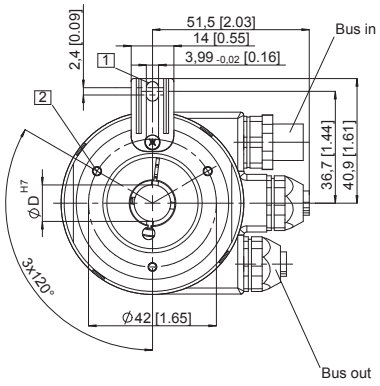
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 3 x M12 connector)

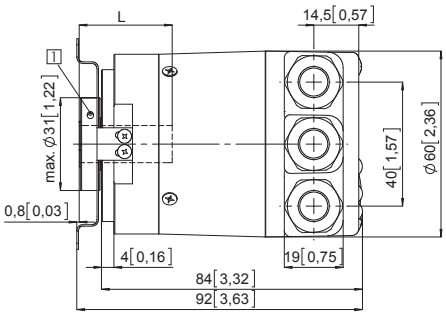
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
- 2 M3, 5.5 [0.21] deep
- 3 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [1.18]

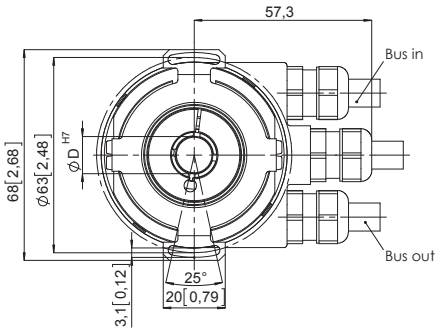




Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with cable)

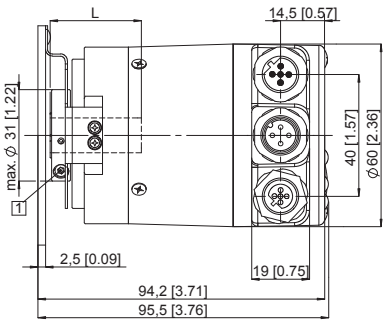
- 1 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [1.18]

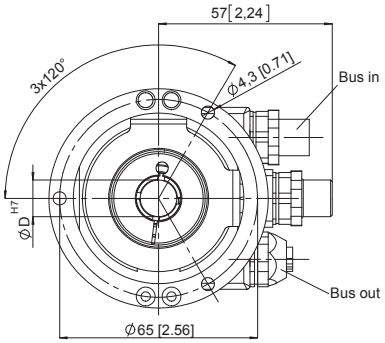




Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with 3 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [1.18]





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

High protection level


High shaft load capacity


Shock / vibration resistant


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.
- Universal scaling function.

Order code Shaft version

8.5868	.	X	X	X	X	.	XX	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"]
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 = M12 connector
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)

e *Fieldbus profile* 4)
21 = CANopen encoder profile DS406 V3.2
22 = CANlift DS417 V1.01

f *Options (service)*
2 = no options
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.
3) Only in conjunction with connection type 2.
4) CAN parameters can also be factory pre-set.

Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

Order code Hollow shaft

8.5888 . X X X X . X X 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 with torque stop*
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*
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 mit 2048 ppr incremental track (TTL-compatible) [1]

d *Type of connection*
removable bus terminal cover
1 = radial cable gland
2 = M12 connector
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

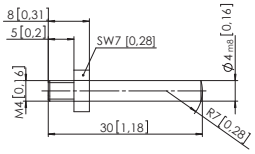
*) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5888.542B.2123.0030 (for cable length 3 m)

e *Fieldbus profile* [2]
21 = CANopen encoder profile DS406 V3.2
22 = CANlift DS417 V1.01

f *Options (service)*
2 = no options
3 = SET button

Optional on request
- Ex 2/22
- 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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for bus in	**8.0000.5116.0000**
	connector M12 for bus out	**8.0000.5111.0000**
Cordset, pre-assembled	M12, for bus in, 6 m [19.68'] PVC cable	**05.00.6091.A211.006M**
	M12, for bus out, 6 m [19.68'] PVC cable	**05.00.6091.A411.006M**

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) CAN parameters can also be factory pre-set.

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	aluminium
	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		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 2004/108/EC RoHS guideline 2011/65/EU

Interface characteristics CANopen/CANopenLift

Resolution singleturn	1 ... 65536 (16 bit), scaleable 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), scaleable 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.

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 behaviour 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 posititon in absolute measuring steps (steps).
- 1 virtual device delivers the posititon 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.

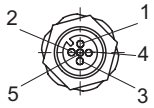
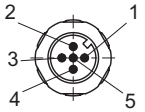
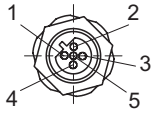
All profiles stated here: Key-features
The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

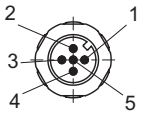
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

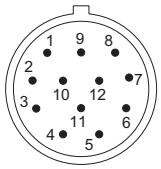
Terminal assignment

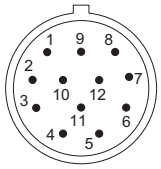
Interface	Type of connection	Cable gland (bus terminal cover with terminal box)										
			Bus OUT					Bus IN				
2, 5	1	Signal:	CAN_GND	CAN_L	CAN_H	0 V power supply	+V power supply	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Abbreviation:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG

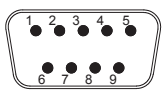
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)					
			Bus IN				
2, 5	A, B	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Cable colour:	WH	BN	YE	GN	GY

Interface	Type of connection	2 x M12 connector (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	
5	2		Incremental track					
		Signal:	A	$\overline{A}$	B	$\overline{B}$	0 V	
		Pin:	1	2	3	4	5	

Interface	Type of connection	1 x M12 connector						
			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						
			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						
			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						
			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	

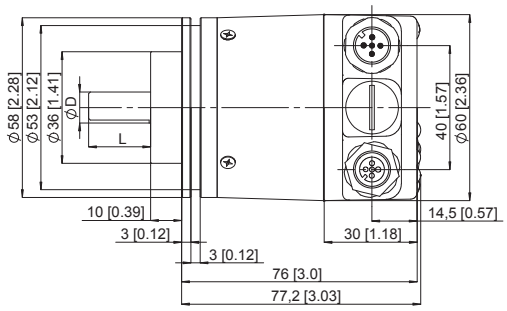
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

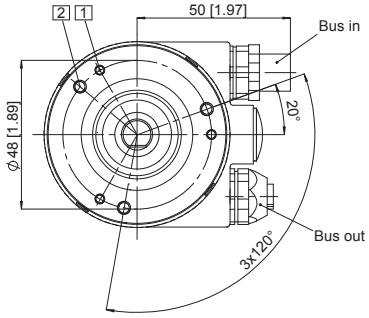
Dimensions shaft version, with removable bus terminal cover

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

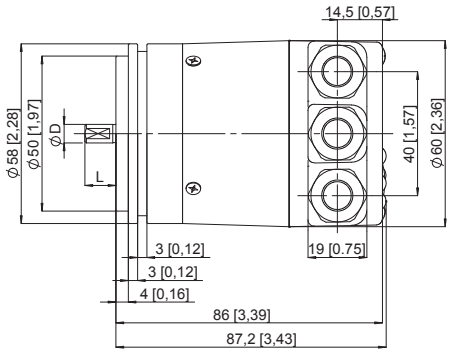


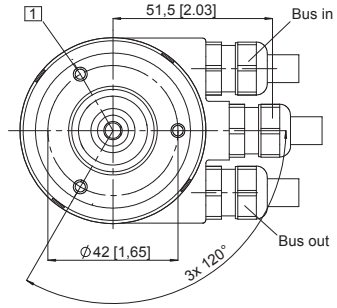


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with cable)

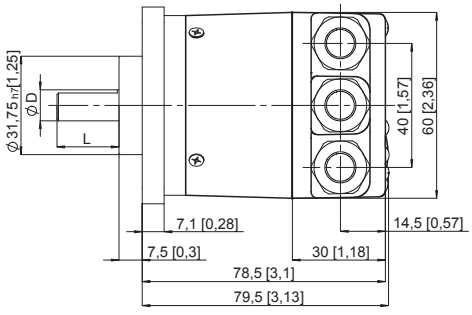
1 M4, 6 [0.24] deep

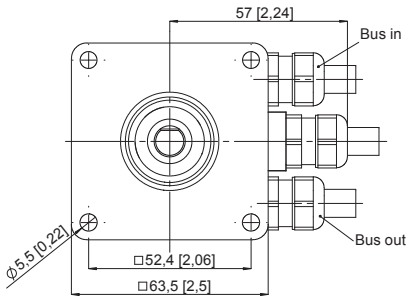




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with cable)





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

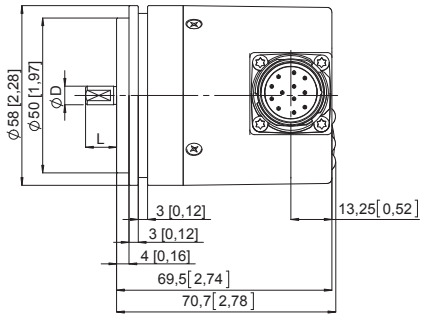
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

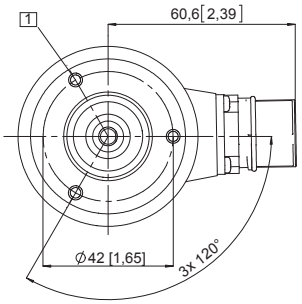
Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M23 connector)

1 M4, 6 [0.24] deep

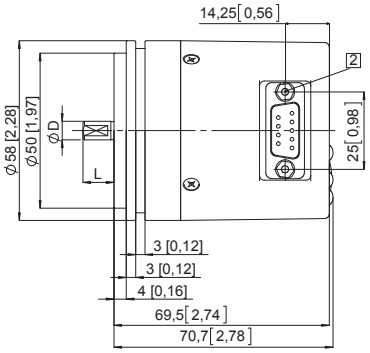


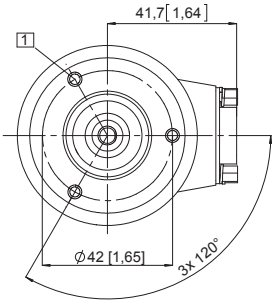


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with Sub-D connector)

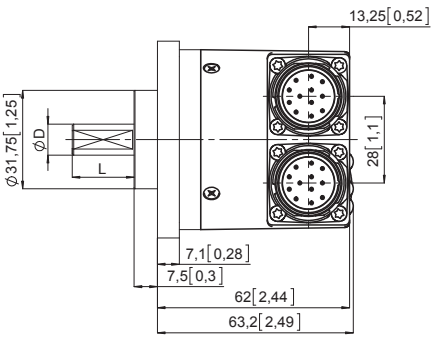
1 M4, 6 [0.24] deep
2 2 x 4/40 UNC; 3.0 [0.12] deep

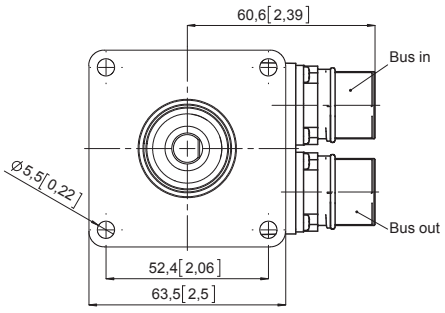




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7
(drawing with 2 x M23 connector)





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

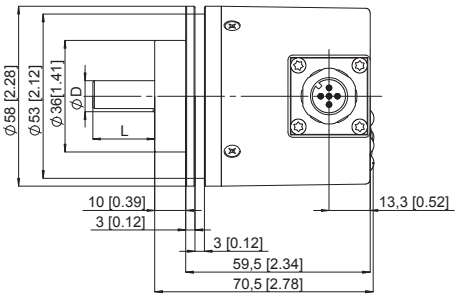
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

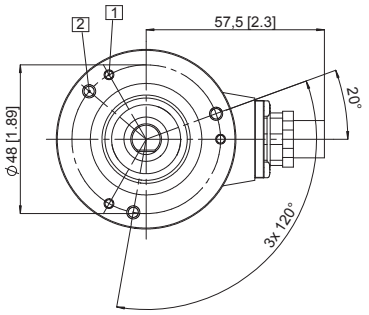
Dimensions shaft version, with fixed connection

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

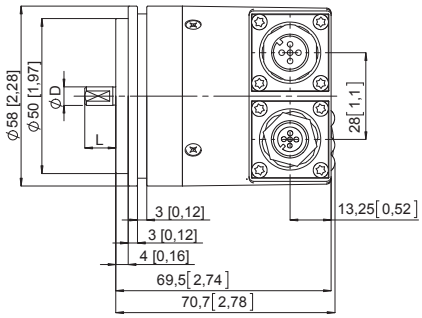


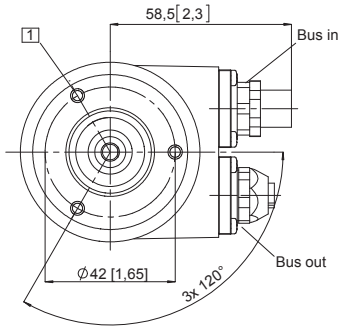


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4
(drawing with M12 connector)

1 M4, 8 [0.32] deep

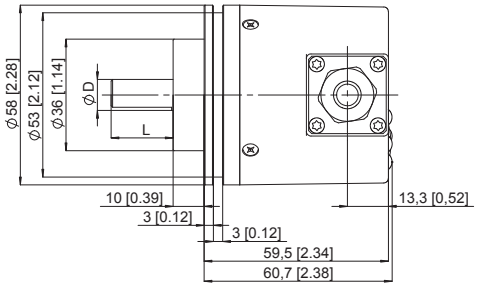


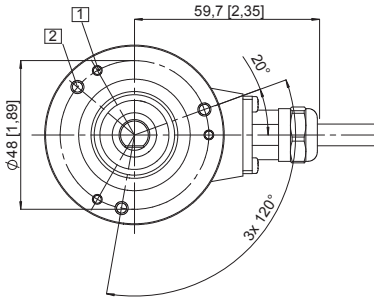


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

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	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

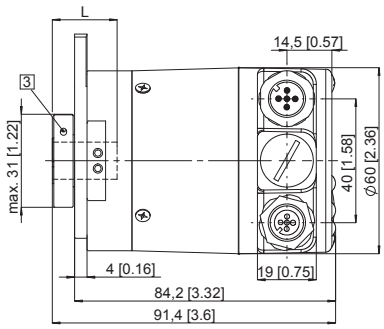
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

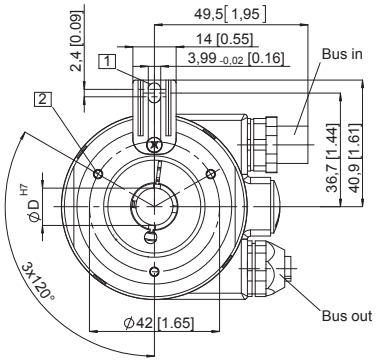
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

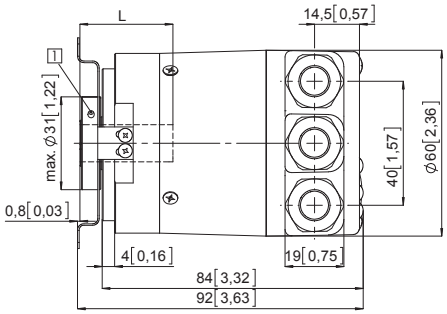
1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 5.5 [0.21] deep
3 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

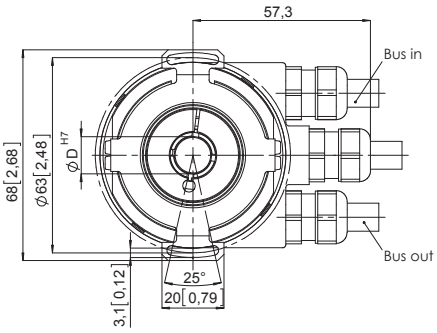




Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with cable)

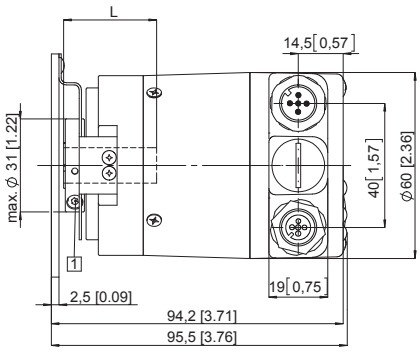
1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]

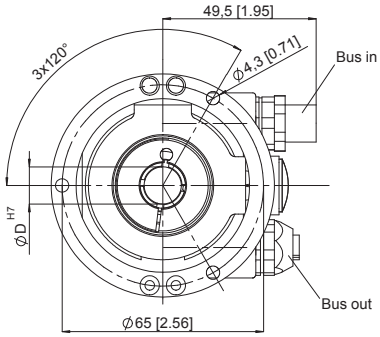




Flange with stator coupling, ø 65 [2.56]
Flange type 3 and 4
Pitch circle diameter for fixing screws 65 [2.56]
(drawing with 2x M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]





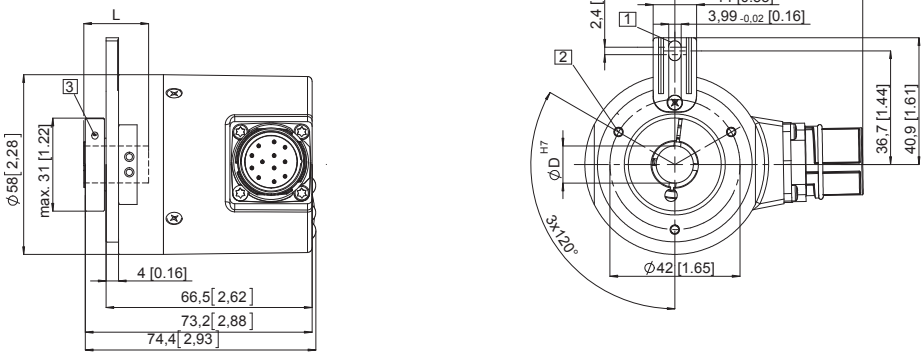
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

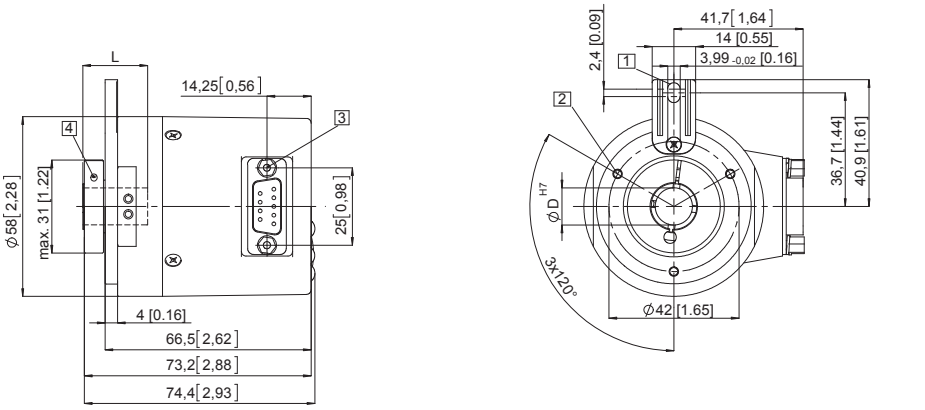
Flange with spring element, long
Flange type 1 and 2
(drawing with M23 connector)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 5.5 [0.21] deep
3 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]



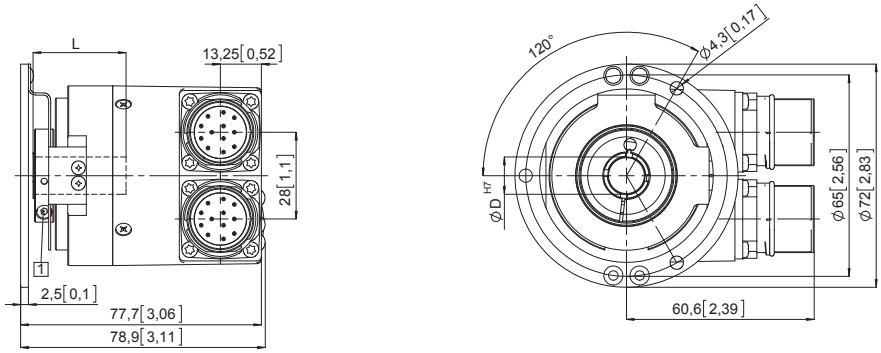
Flange with spring element, long
Flange type 1 and 2
(drawing with Sub-D connector)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 5.5 [0.21] deep
3 2 x 4/40 UNC; 3.0 [0.21] deep
4 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [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 2 x M23 connector)

1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]



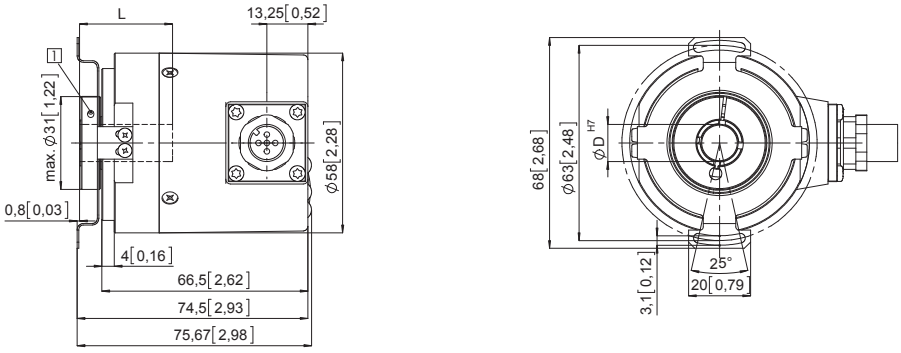
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **CANopen/CANopenLift**

Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

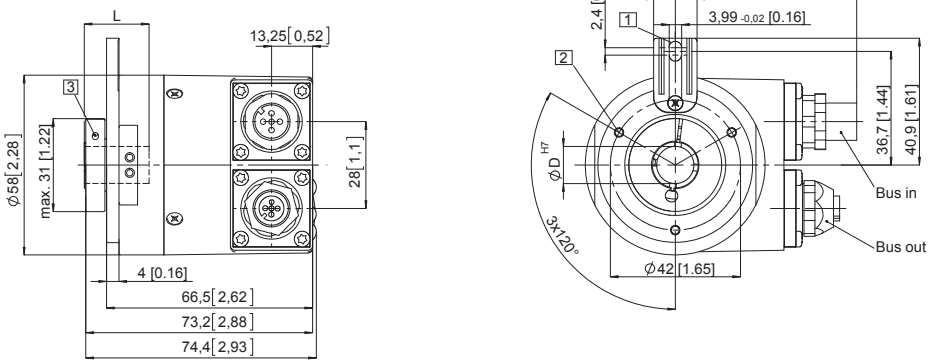
Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with M12 connector)

1 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [1.18]



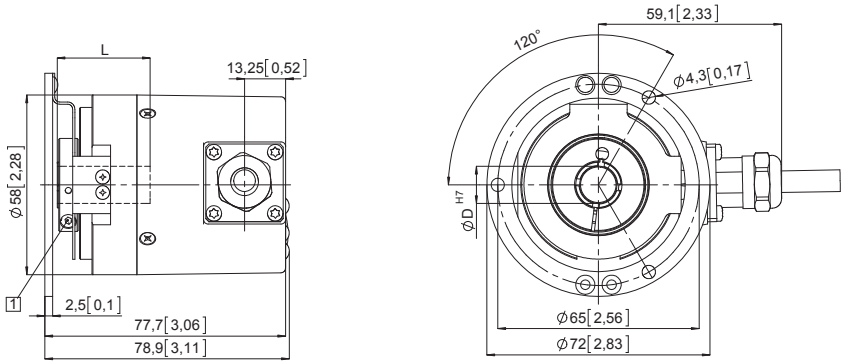
Flange with spring element, long
Flange type 1 and 2
(drawing with 2 x M12 connector)

1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
2 M3, 5.5 [0.21] deep
3 Recommended torque for the clamping ring 0.6 Nm
L: Insertion depth for blind hollow shaft: 30 [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
L: Insertion depth for blind hollow shaft: 30 [1.18]



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 · High protection level · 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.

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*
- 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)**

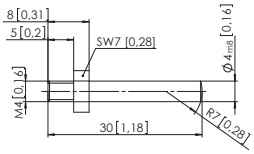
Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

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		Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0000**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for port IN and port OUT	**05.WASCSY4S**
	connector M12 for power supply	**05.B8141-0**
Cordset, pre-assembled	M12 for port IN and port OUT, 2 m [6.56’] PUR cable	**05.00.6031.4411.002M**
	M12 for power supply, 2 m [6.56’] PUR cable	**05.00.6061.6211.002M**

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	aluminium
	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 2004/108/EC RoHS guideline 2011/65/EU

Interface characteristics EtherCAT

Resolution singleturn	1 ... 65535 (16 bit), scaleable 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), scaleable 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

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.

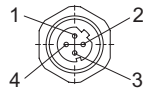
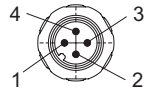
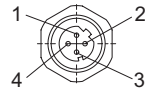
The following output values may be combined as PDO (PDO mapping): **position, speed, temperature values** and **working area state** as well as other process values.

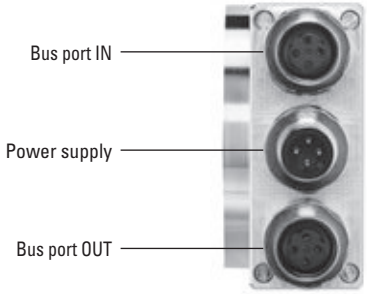
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

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.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector					
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	



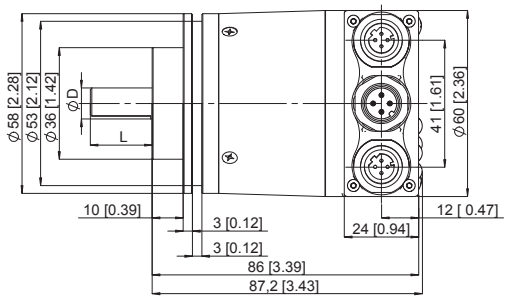
Standard mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **EtherCAT**

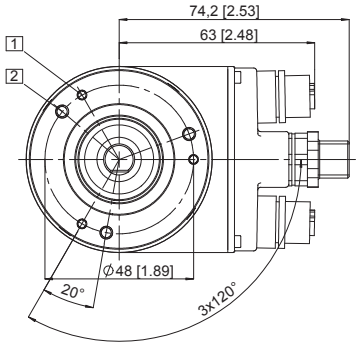
Dimensions shaft version, with removable bus terminal cover

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

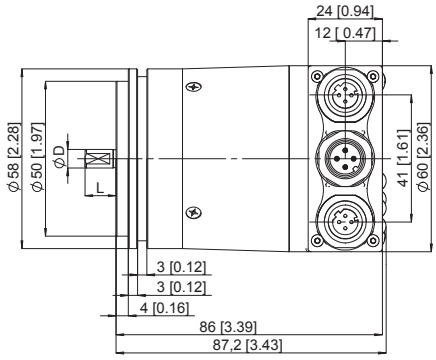


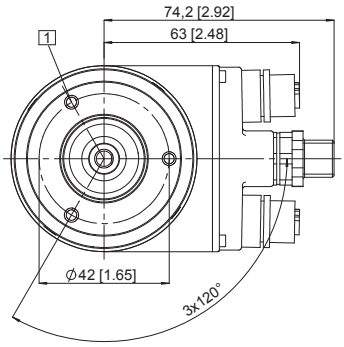


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

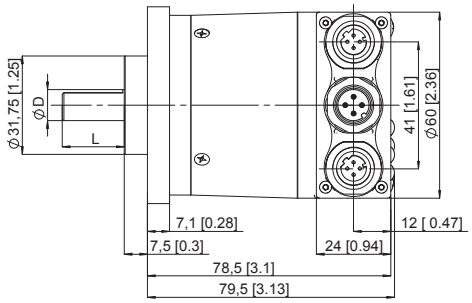
1 M4, 6.0 [0.24] deep

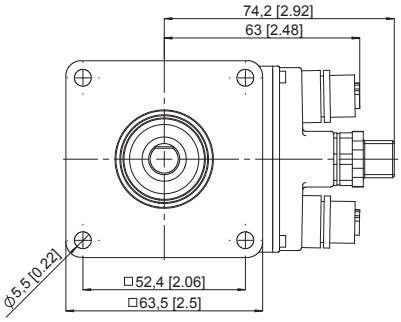




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

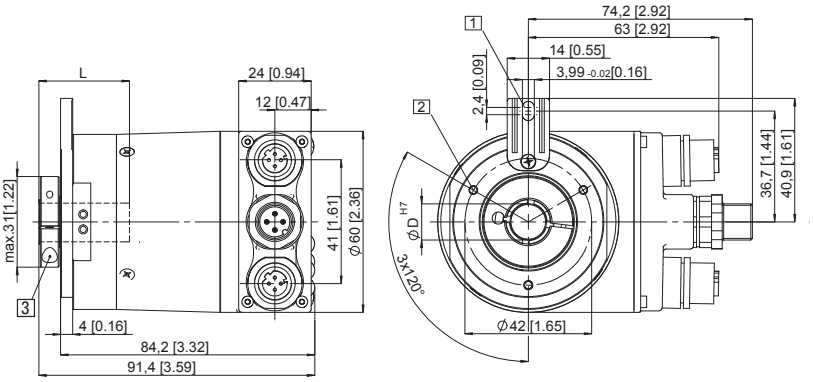
Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **EtherCAT**

Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

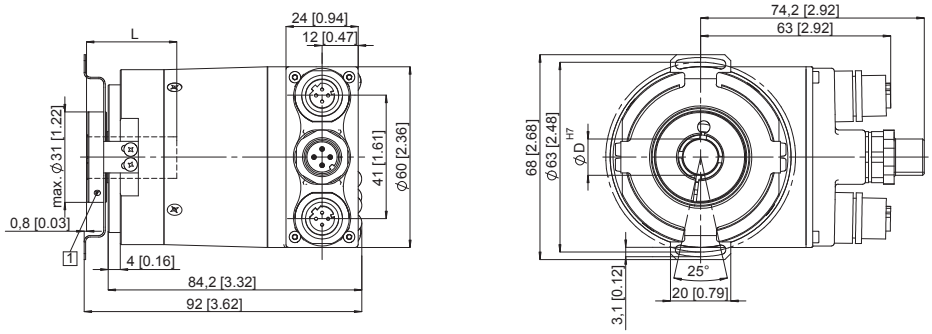
Flange with spring element, long
Flange type 1 and 2

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
- 2 M3, 5.5 [0.21] deep
- 3 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [1.18]



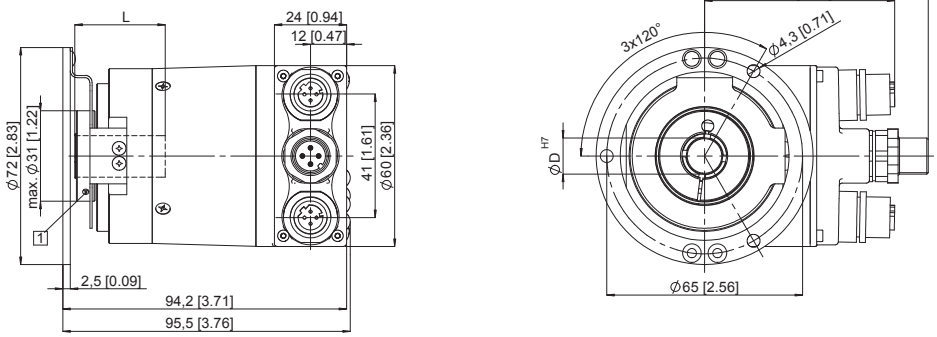
Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [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
- L: Insertion depth for blind hollow shaft: 30 [1.18]



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.

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

- IRT-Mode.
- Cycle time ≤ 1 ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.
- Faster, easier error-free connection thanks to M12 connectors.

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*
- 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**

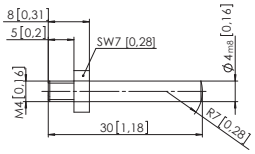
Optional on request
- Ex 2/22
- surface protection salt spray tested

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

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		Order no.
Cylindrical pin, long for torque stops	with fixing thread	**8.0010.4700.0000**



Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for port 1 and port 2	**05.WASCSY4S**
	connector M12 for power supply	**05.B8141-0**
Cordset, pre-assembled	M12 for port 1 and port 2, 2 m [6.56'] PUR cable	**05.00.6031.4411.002M**
	M12 for power supply, 2 m [6.56'] PUR cable	**05.00.6061.6211.002M**

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	aluminium
	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 2004/108/EC RoHS guideline 2011/65/EUU

Interface characteristics PRROFINET IO

Resolution singleturn	1 ... 65535 (16 bit), scaleable 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), scaleable default: 33.554.432 (25 bit)
Code	binary
Protocol	PROFINET IO

Link 1 and 2, LED (green / yellow)

two coloured	green	active link
	yellow	data transfer

Error LED (red) / PWR LED (green)

Functionality see manual

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.

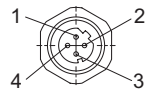
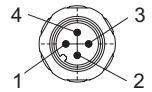
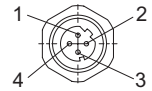
Position, speed and many other states of the encoder can be transmitted.

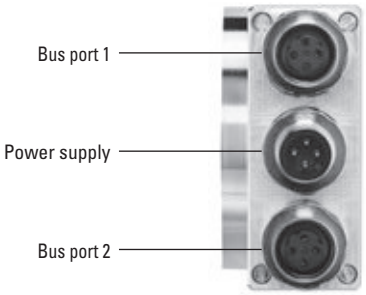
PROFINET IO

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**rotokoll 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					
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	



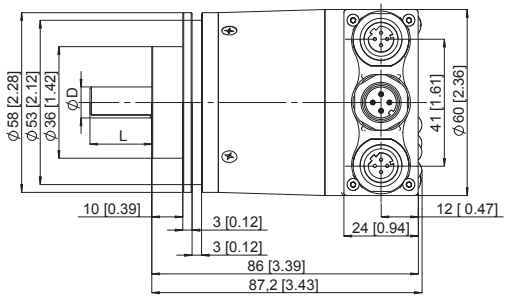
Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFINET IO**

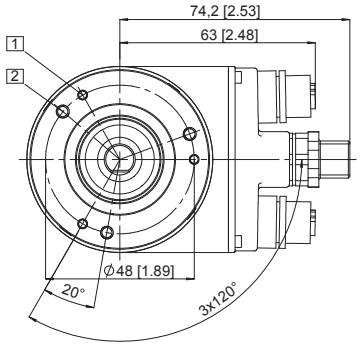
Dimensions shaft version, with removable bus terminal cover

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

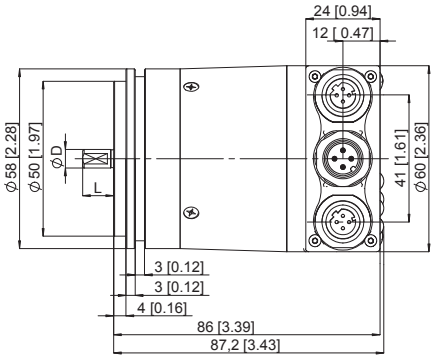


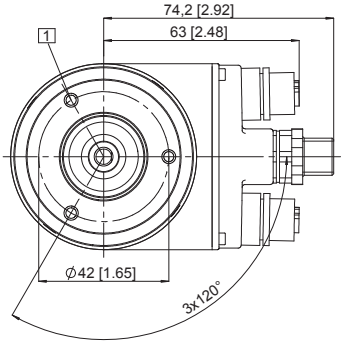


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

Synchro flange, ø 58 [2.28]
Flange type 2 and 4

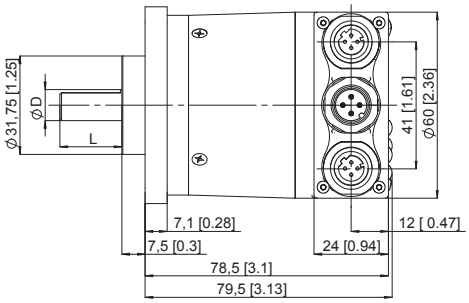
1 M4, 6.0 [0.24] deep

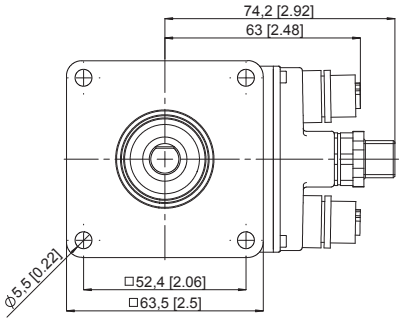




D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

Square flange, □ 63.5 [2.5]
Flange type 5 and 7





D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4“	7/8“	h7
3/8“	7/8“	h7

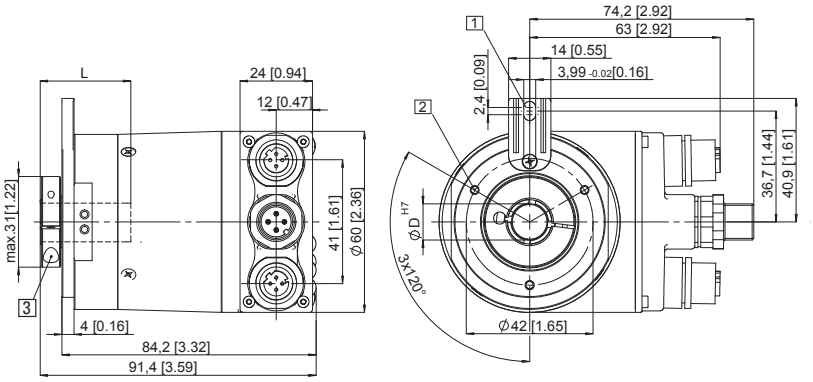
Standard
mechanical multiturn, optical | **Sendix 5868 / 5888 (shaft / hollow shaft)** | **PROFINET IO**

Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

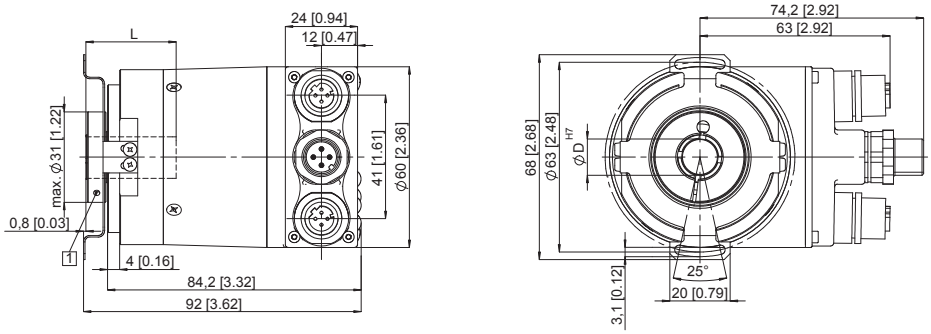
Flange with spring element, long
Flange type 1 and 2

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, ø 4 [0.16]
- 2 M3, 5.5 [0.21] deep
- 3 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [1.18]



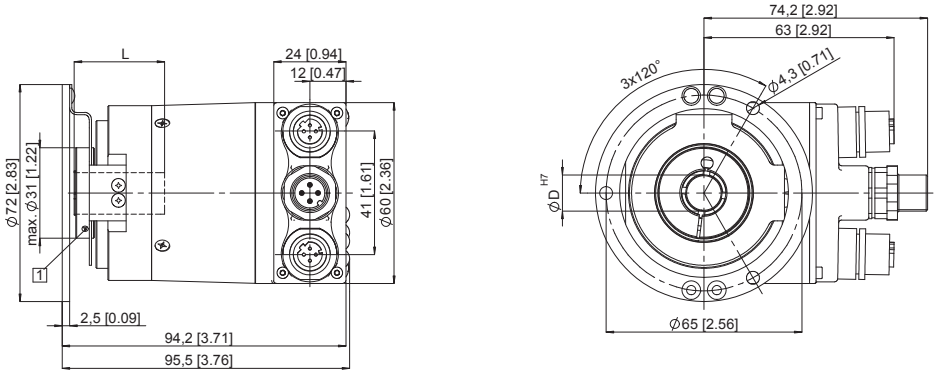
Flange with stator coupling, ø 63 [2.48]
Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [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
- L: Insertion depth for blind hollow shaft: 30 [1.18]



Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | **Sendix 7063 (shaft)** | **SSI/BiSS + SinCos**

The Sendix 7063 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable 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 | 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 aluminium.
- 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']
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, 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
- stainless steel version
- other singleturn resolutions

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.

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

Absolute encoders – multiturn

Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | **Sendix 7063 (shaft)** | **SSI/BiSS+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 IP6x
Directive 94/9/EC	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes[1)]
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

DIR input

A HIGH signal switches the direction of rotation from the default CW to CCW. The reverse 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.

Power-ON time

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

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
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.

Data refresh rate	ST resolution ≤ 14 bit	< 1 µ
	ST resolution ≥ 15 bit	4 µs

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

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
Response time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

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.

1) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | Sendix 7063 (shaft) | SSI/BiSS + SinCos

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

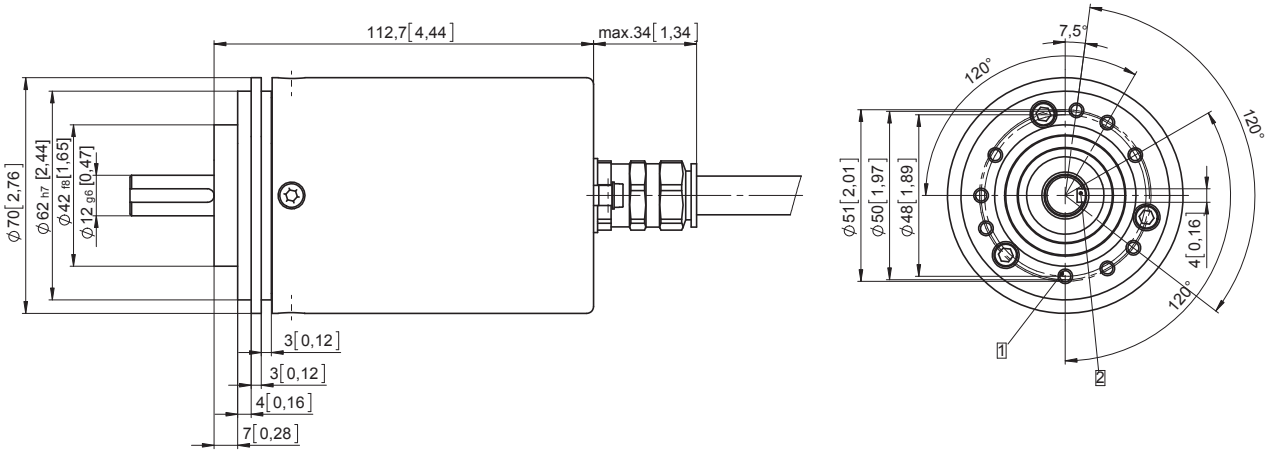
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
⏚: Protective earth

Dimensions

Dimensions in mm [inch]

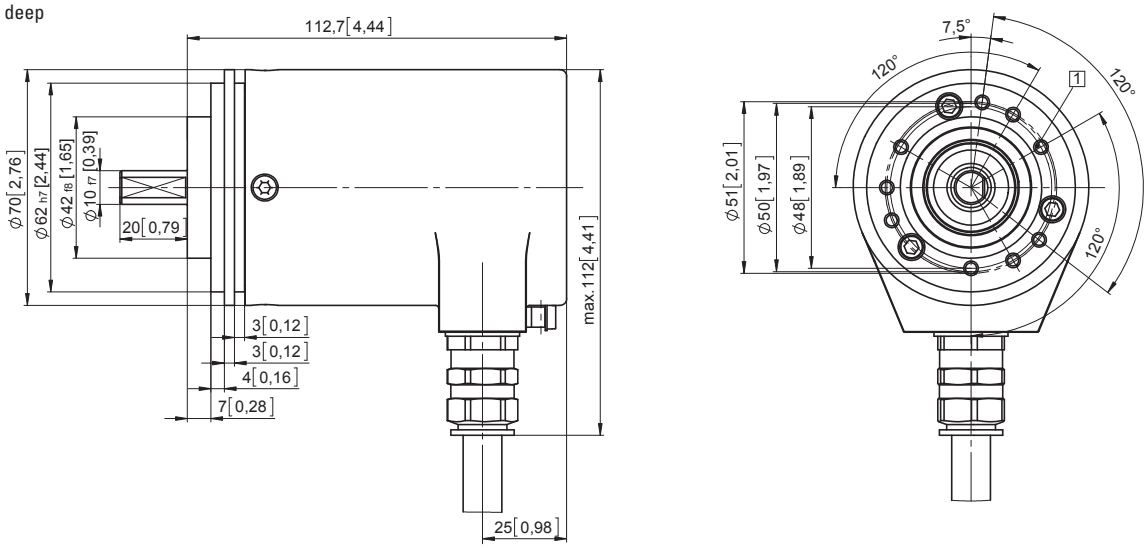
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX / IECEx – zone 1 / 21, SIL2/PLd, mech. 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 aluminium.

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
- stainless steel version
- other singleturn resolutions

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

Standard ATEX / IECEx – zone 1 / 21, SIL2/PLd, mech. multiturn, optical	Sendix SIL 7063FS2 (shaft)	SSI / BiSS + SinCos

Accessory		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)	Ⓔx II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ⓔx II 2D Ex tb IIIC T135°C - T85°C Db IP6x
Relevant standards	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
Relevant standards	IEC 60079-0:2007; IEC 60079-1:2007; 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 / HFT = 1)
PFH_d value [1]	2.16×10^{-8} h^{-1}
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 2004/108/EC ATEX guideline 94/9/EC 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

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
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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.

Absolute encoders – multiturn

Standard
ATEX / IECEx – zone 1 / 21, SIL2/PLd, mech. 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
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.

Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs

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
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.

Power-ON time

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

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. The current position becomes defined as position zero.
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

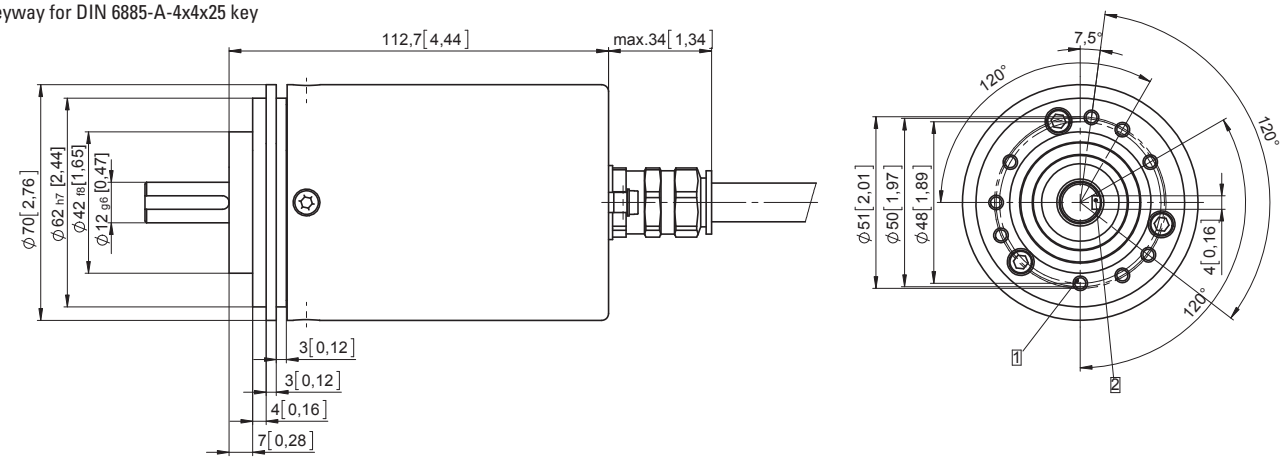
Standard
ATEX / IECEx – zone 1 / 21, SIL2/PLd, mech. multiturn, optical | **Sendix SIL 7063FS2 (shaft)** | **SSI / BiSS + SinCos**

Dimensions

Dimensions in mm [inch]

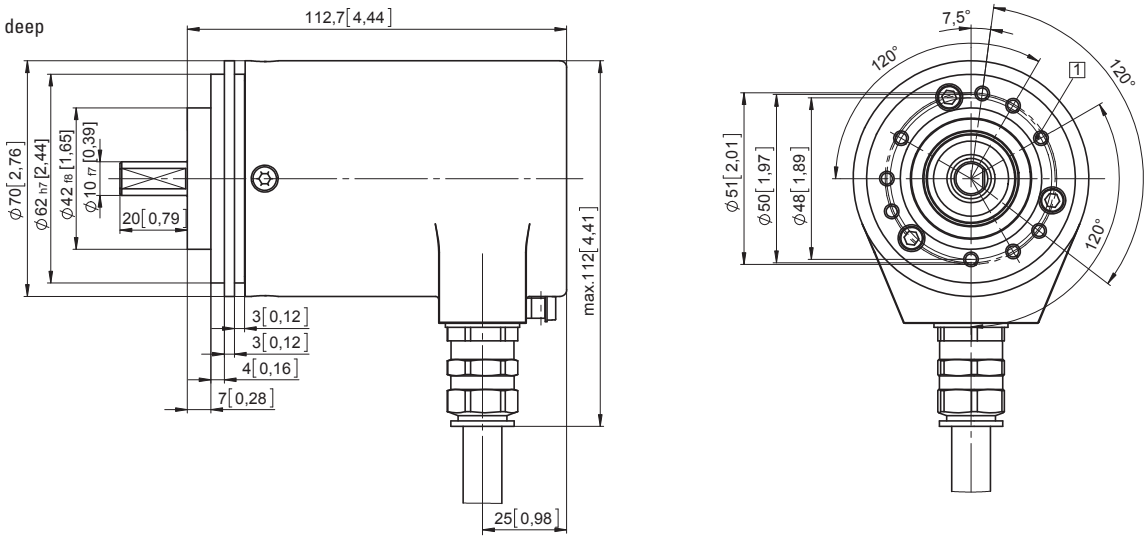
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX / IECEx – zone 1 / 21, SIL3/PLe, mech. 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 aluminium.

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
- stainless steel version
- other singleturn resolutions

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.

Standard ATEX / IECEx – zone 1 / 21, SIL3/PLe, mech. multiturn, optical	Sendix SIL 7063FS3 (shaft)	SSI / BiSS + SinCos

Accessory		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 IP6x
Relevant standards	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
Relevant standards	IEC 60079-0:2007; IEC 60079-1:2007; 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 / HFT = 1)
PFH_d value [1]	1.09×10^{-8} h^{-1}
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 2004/108/EC ATEX guideline 94/9/EC 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

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
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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.

Standard
ATEX / IECEx – zone 1 / 21, SIL3/PLe, mech. 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
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.

Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs

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
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.

Power-ON time

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

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. The current position becomes defined as position zero.
A, $\overline{A}$: Cosine signal
B, $\overline{B}$: Sine signal
⏚: Protective earth

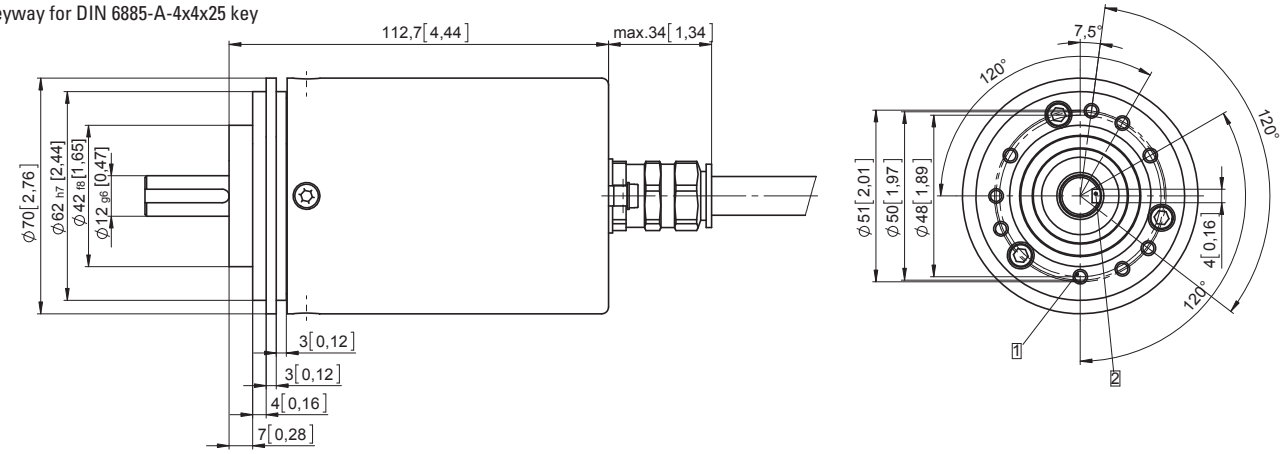
Standard
ATEX / IECEx – zone 1 / 21, SIL3/PLe, mech. multiturn, optical | **Sendix SIL 7063FS3 (shaft)** | **SSI / BiSS + SinCos**

Dimensions

Dimensions in mm [inch]

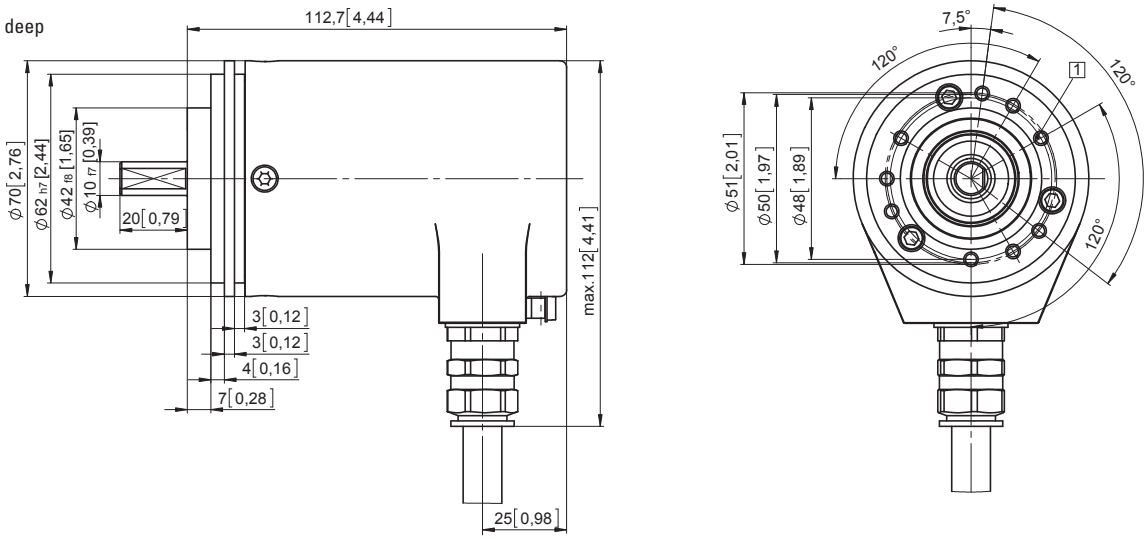
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | **Sendix 7068 (shaft)** | **PROFIBUS DP**

The Sendix 7068 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable 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.

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 aluminium.
- 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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

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
- stainless steel version

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.

1) Not applicable with connection types 1 and 2.

Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | Sendix 7068 (shaft) | PROFIBUS DP

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 IP6x
Directive 94/9/EC	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

Interface characteristics PROFIBUS DP

Resolution singleturn	1 ... 65536 (16 bit), scaleable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scaleable
Total resolution	1 ... 268.435.456 (28 bit), scaleable 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.

Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | **Sendix 7068 (shaft)** | **PROFIBUS DP**

Terminal assignment

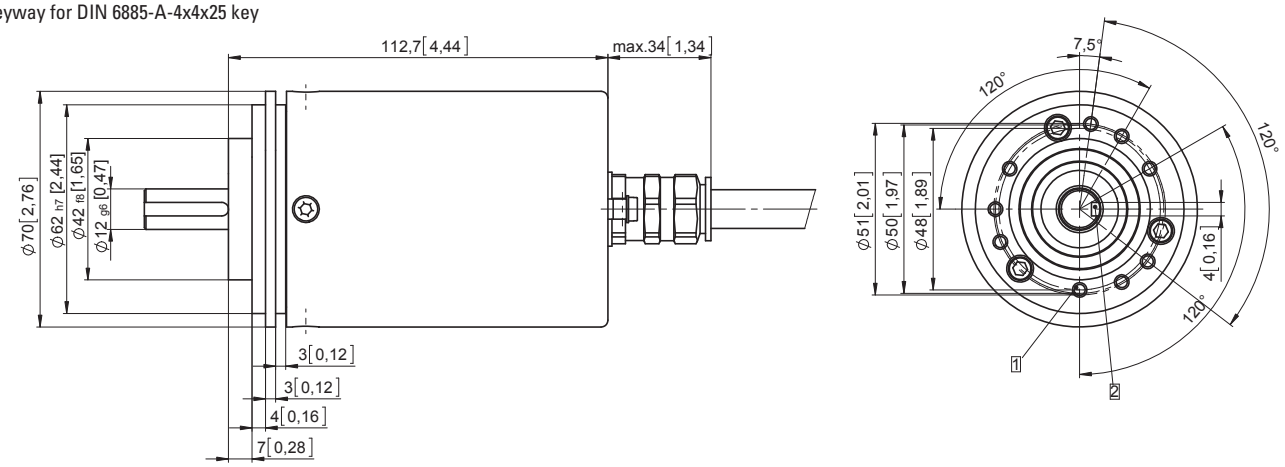
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

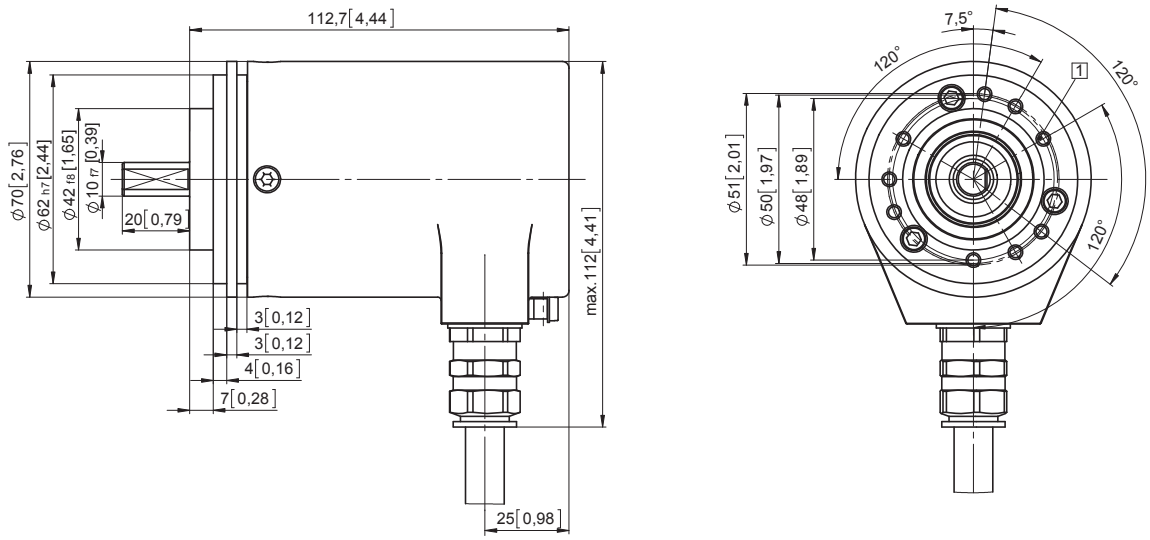
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | **Sendix 7068 (shaft)** | **CANopen**

The Sendix 7068 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable 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 aluminium.
- 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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

e *Fieldbus profile*
21 = CANopen encoder profile DS406 V3.2

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
- stainless steel version

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.

1) Not applicable with connection types 1 and 2.

Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | **Sendix 7068 (shaft)** | **CANopen**

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 IP6x
Directive 94/9/EC	EN 60079-0:2009; EN 60079-1:2007; EN 60079-31:2009

Explosion protection 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 IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
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 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

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 behaviour 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.

Standard
ATEX/IECEx – zone 1/21, mechanical multiturn, optical | **Sendix 7068 (shaft)** | **CANopen**

Terminal assignment

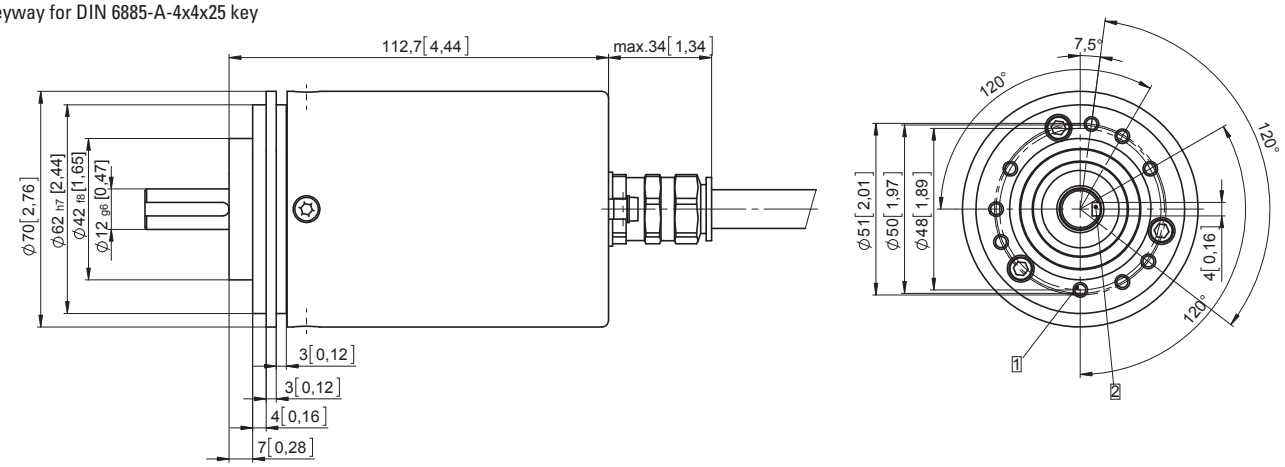
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

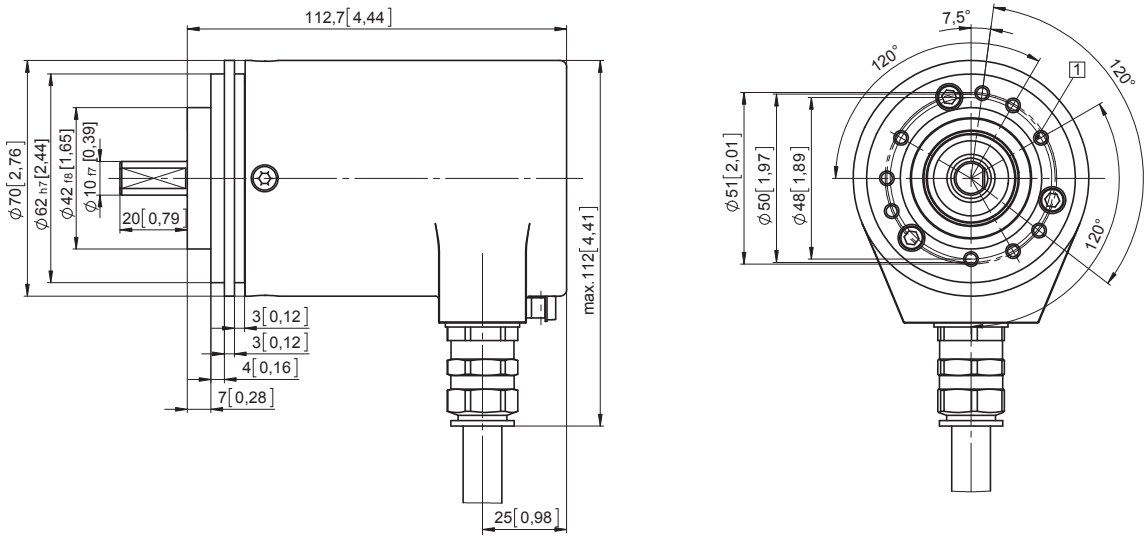
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Absolute encoders – multiturn

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7163 (shaft)** | **SSI/BiSS + SinCos**

The Sendix 7163 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']
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, 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.

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7163 (shaft)** | **SSI/BiSS + SinCos**

Technical data

Explosion protection ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Directive 94/9/EC	EN 60079-0:2012; EN 60079-1:2007

Explosion protection IECEx

Certificate of conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
IECEx	IEC 60079-0:2011; IEC 60079-1:2007

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Materials	shaft	stainless steel
	flange / housing	stainless steel
	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. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes[1)]
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

DIR input

A HIGH signal switches the direction of rotation from the default cw to ccw. The reverse 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.

Power-ON time

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

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
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.

Data refresh rate	ST resolution ≤ 14 bit	< 1 µ
	ST resolution ≥ 15 bit	< 4 µs

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

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
Response time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. 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.

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.

1) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7163 (shaft)** | **SSI/BiSS + SinCos**

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

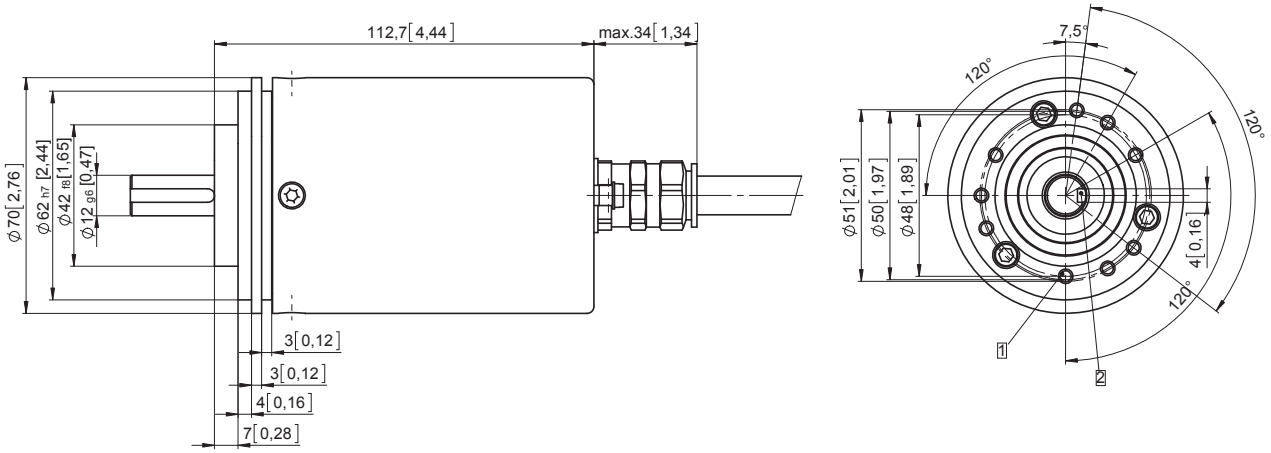
+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input. The current position becomes defined as position zero.
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
Stat: Status output
⏚: Protective earth

Dimensions

Dimensions in mm [inch]

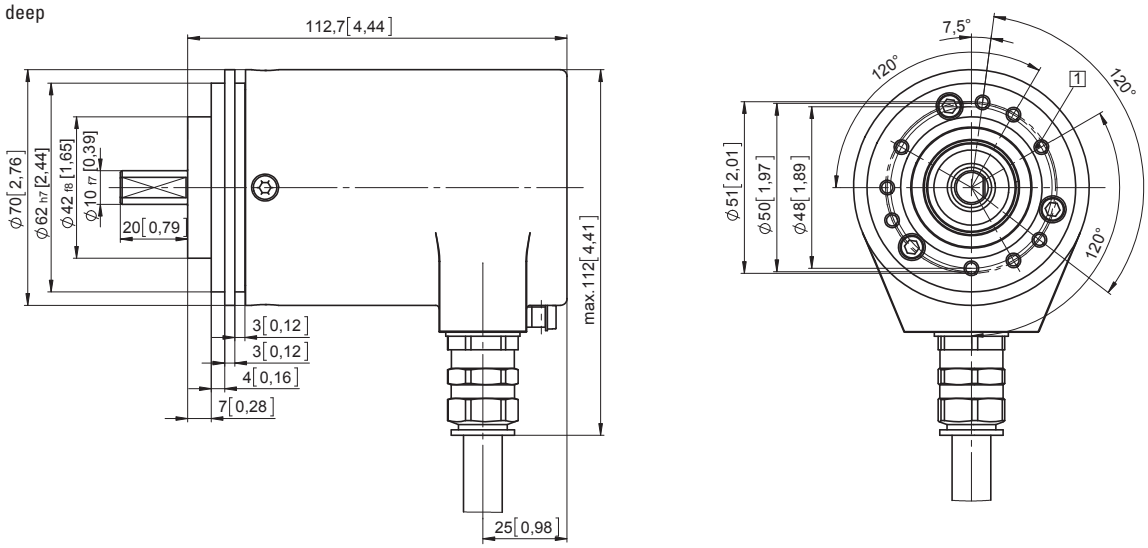
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7168 (shaft)** | **PROFIBUS DP**

The Sendix 7168 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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

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.

Absolute encoders – multiturn

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7168 (shaft)** | **PROFIBUS DP**

Technical data

Explosion protection ATEX

EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Directive 94/9/EC	EN 60079-0:2012; EN 60079-1: 007

Explosion protection IECEx

Certificate of conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
IECEx	IEC 60079-0:2011; IEC 60079-1:2007

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Materials	shaft	stainless steel
	flange / housing	stainless steel
	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 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

Interface characteristics PROFIBUS DP

Resolution Singleturn	1 ... 65536 (16 bit), scaleable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scaleable
Total resolution	1 ... 268.435.456 (28 bit), scaleable 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.

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7168 (shaft)** | **PROFIBUS DP**

Terminal assignment

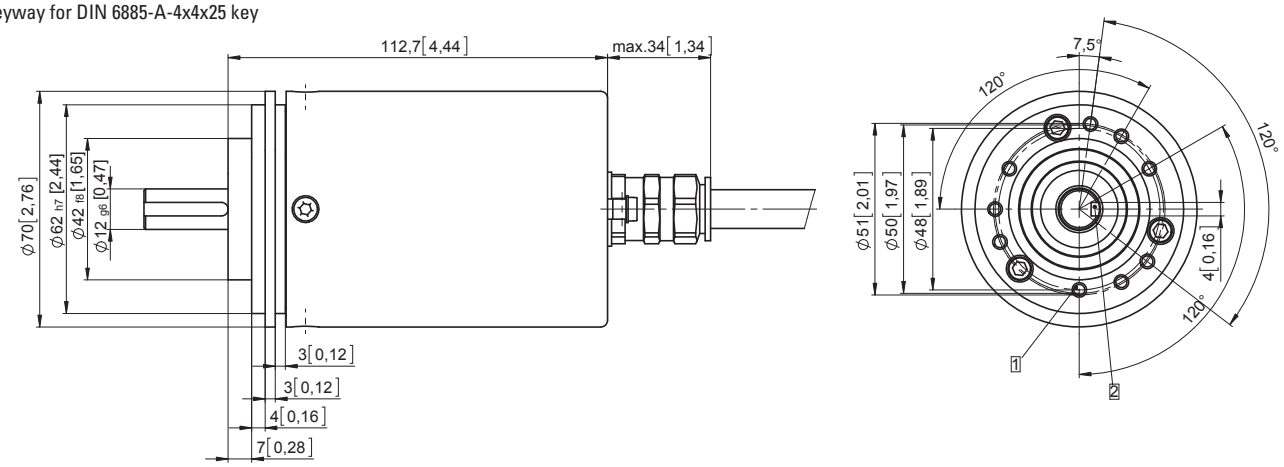
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
3	1, 2, A, B	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_ VDC	PB_A OUT	PB_B OUT
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

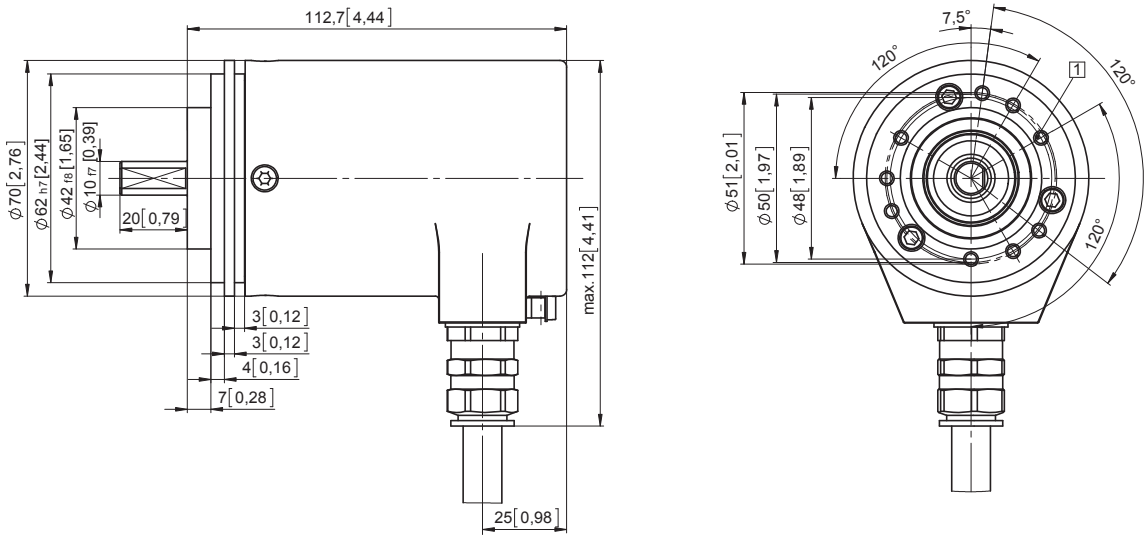
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Absolute encoders – multiturn

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7168 (shaft)** | **CANopen**

The Sendix 7168 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.

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']
preferred length see **f**, e. g.: 0100 = 10 m [32.81']

e *Fieldbus profile*
21 = CANopen encoder profile DS406 V3.2

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.

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | Sendix 7168 (shaft) | CANopen

Technical data

Explosion protection ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	Ex I M2 Ex d I/IIC T4 - T6 Mb
Directive 94/9/EC	EN 60079-0:2012; EN 60079-1:2007

Explosion protection IECEx	
Certificate of conformity (CoC)	IECEx IBE 14.0023 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
IECEx	IEC 60079-0:2011; IEC 60079-1:2007

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. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Material	shaft	stainless steel
	flange / housing	stainless steel
	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 2004/108/EC ATEX guideline 94/9/EC RoHS guideline 2011/65/EU

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 behaviour 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.

Standard
ATEX/IECEx – mining, mechanical multiturn, optical | **Sendix 7168 (shaft)** | **CANopen**

Terminal assignment

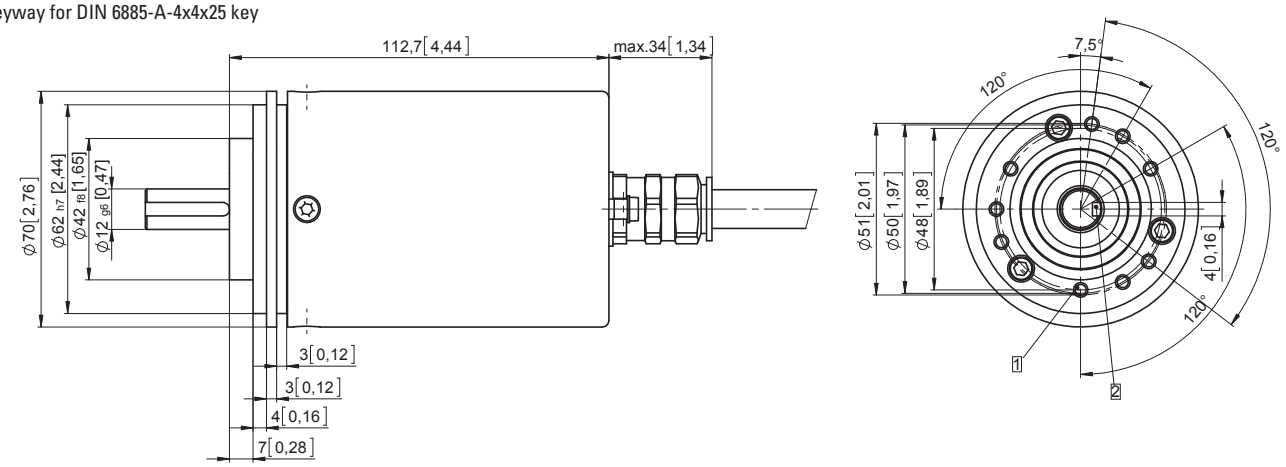
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
2	1, 2, A, B	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

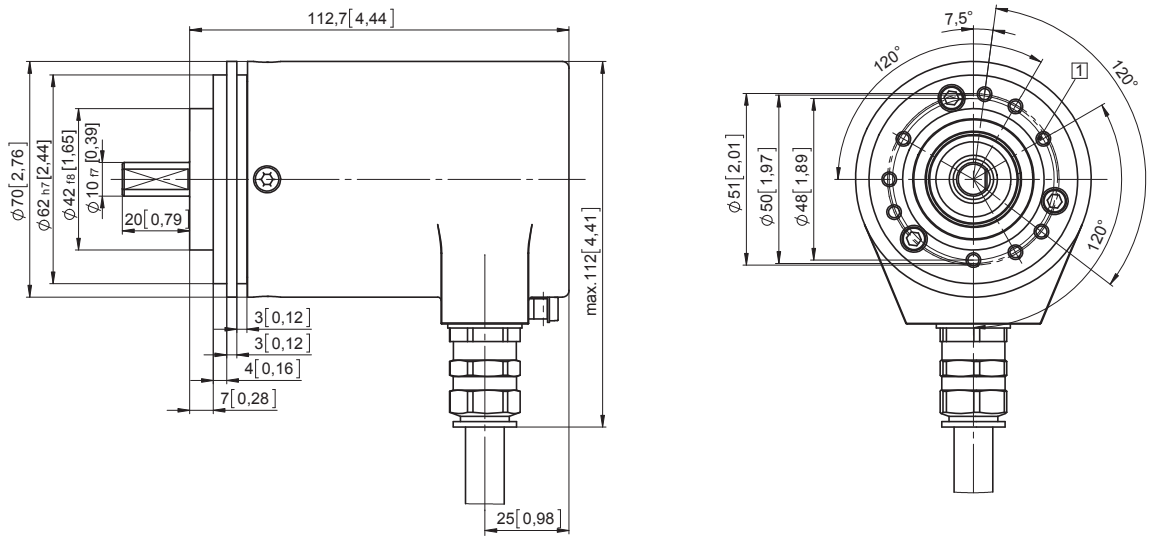
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep
2 Keyway for DIN 6885-A-4x4x25 key

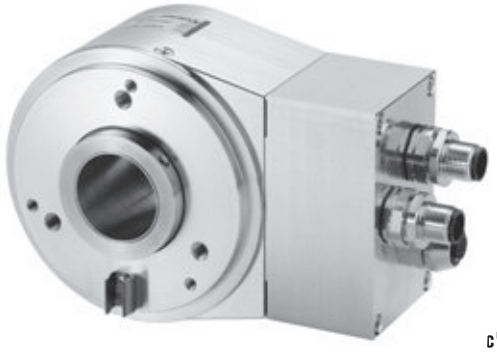


Clamping / synchronous flange, ø 70 [2.76]
Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep

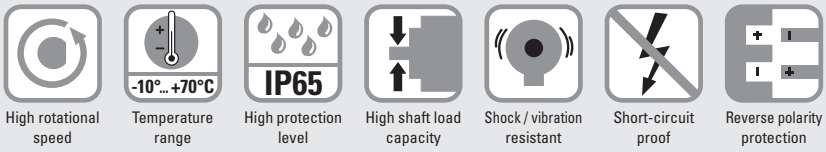


Large hollow shaft optical / magnetic | 9080 (hollow shaft) | PROFIBUS DP



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.



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

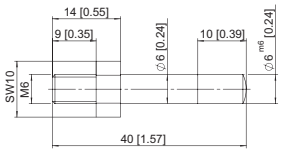
a *Flange*
1 = without mounting aid
2 = with spring element, short
3 = with spring element, long
4 = with mounting flange
5 = with tether arm, long

b *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, 5-pin

e *Fieldbus profile*
3001 = Profibus class 2

Mounting accessory for hollow shaft encoders		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0003**

Connection technology		Order no.
Connector, self-assembly (straight)	coupling M12 for bus in	**05.BMWS 8151-8.5**
	connector M12 for bus out	**05.BMSWS 8151-8.5**
	connector M12 for power supply	**05.B8141-0**
Cordset, pre-assembled	M12 cordset for bus in , 6 m [19.68']	**05.00.6011.3211.006M**
	M12 cordset for bus out, 6 m [19.68']	**05.00.6011.3411.006M**
	M12 cordset for power supply, 2 m [6.56']	**05.00.6061.6211.002M**

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.

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 2004/108/EC 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 adress	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.

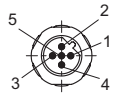
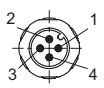
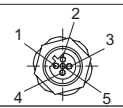
The following functionality is integrated:

- 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	

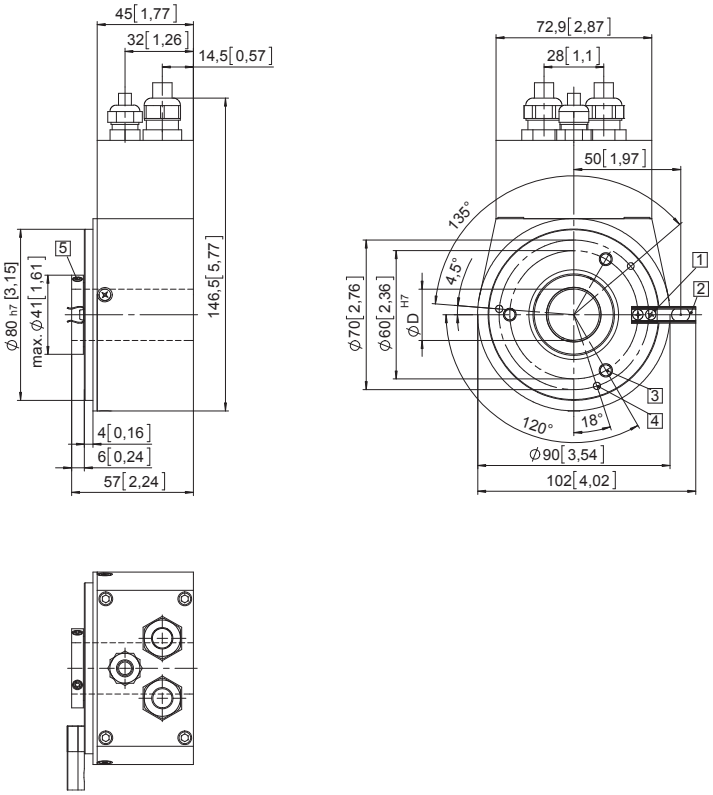
Large hollow shaft optical / magnetic | **9080 (hollow shaft)** | **PROFIBUS DP**

Dimensions

Dimensions in mm [inch]

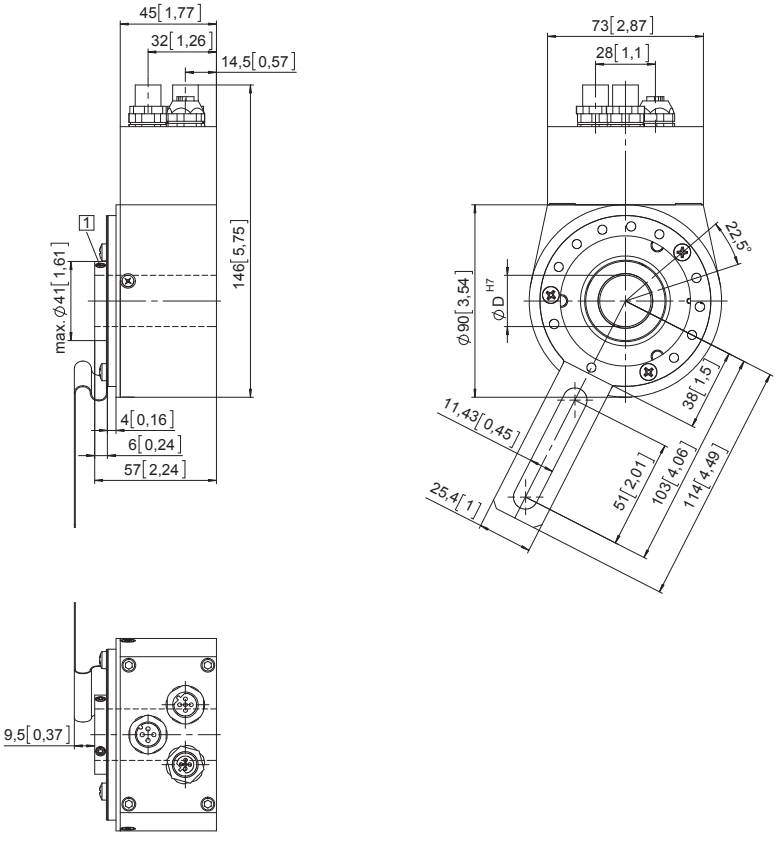
Flange with spring element

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



Flange with tether arm, long

1 Recommended torque for the clamping ring 1.0 Nm



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 *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

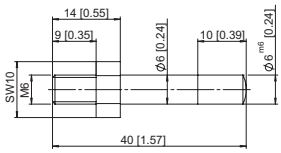
d *Type of connection, removable bus terminal cover*
1 = with cable gland M16 [1)]
2 = with 3 x M12 connector, 5-pin

e *Fieldbus profile*
1001 = DeviceNet
2001 = CANopen encoder profile DSP 406

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.

Large hollow shaft optical / magnetic	9080 (hollow shaft)	CANopen / DeviceNet

Mounting accessory for hollow shaft encoders		Order no.
Cylindrical pin, long for torque stops		with fixing thread	**8.0010.4700.0003**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling for bus in	**8.0000.5116.0000**
	M12 male connector with external thread for bus out	**8.0000.5111.0000**
Cordset, pre-assembled	CANopen, bus in, 6 m [19.68'] PVC cable	**05.00.6021.2211.006M**
	CANopen, bus out, 6 m [19.68'] PVC cable	**05.00.6021.2411.006M**
	DeviceNet, bus in, 6 m [19.68'] PVC cable	**05.00.6091.A211.006M**
	DeviceNet, bus out, 6 m [19.68'] PVC cable	**05.00.6091.A411.006M**

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 2004/108/EC RoHS guideline 2011/65/EU

Interface characteristics CANopen / DeviceNET

Resolution singleturn	1 ... 8192 (13 bit) scaleable 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), scaleable 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

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.
  - Total resolution.
- Number of revolutions.
- Preset value.
- Diagnostics mode.
- Resolution.

The following functionality is integrated:

- Galvanic isolation of the fieldbus stage with DC/DC converter.
- Addressing via DIP switches or software.
- Diagnostic LED for network and mode.
  Baud rate 125, 250 and 500 kbit/s programmable via DIP switches.
- Node address 0 ... 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.

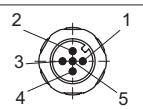
DeviceNet

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						
1, 2	2	Bus in	Signal:	DRAIN	+ V DC	– V DC	CAN_H	CAN_L	
			Pin:	1	2	3	4	5	
			Colour:	GY	RD	BK	WH	BU	
		Bus out	Signal:	DRAIN	+ V DC	– V DC	CAN_H	CAN_L	
			Pin:	1	2	3	4	5	
			Colour:	GY	RD	BK	WH	BU	

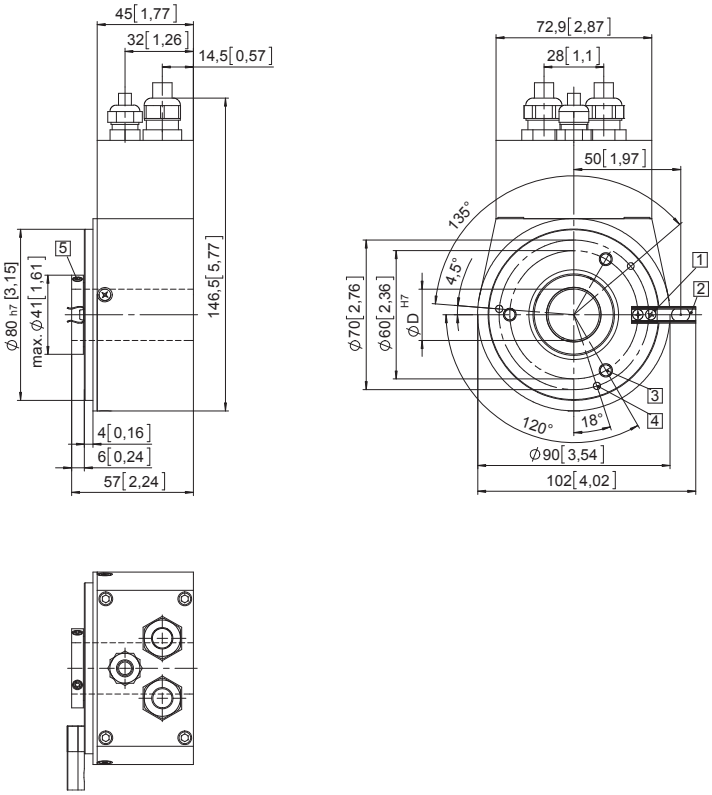
Large hollow shaft optical / magnetic | **9080 (hollow shaft)** | **CANopen / DeviceNet**

Dimensions

Dimensions in mm [inch]

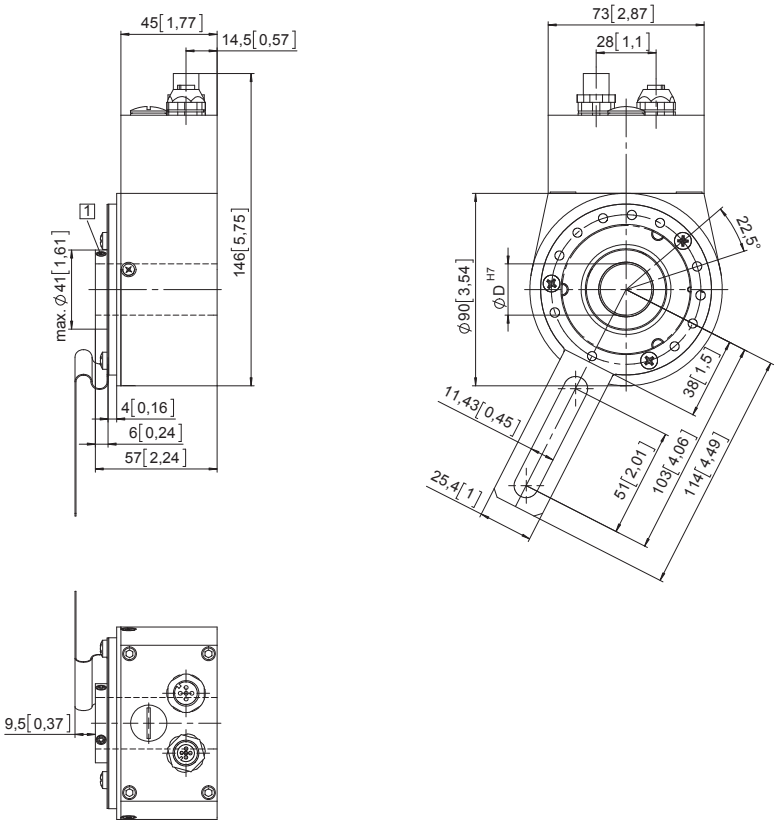
Flange with spring element

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



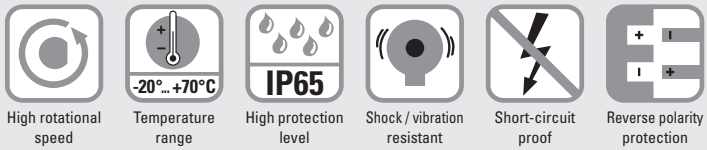
Flange with tether arm, long

1 Recommended torque for the clamping ring 1.0 Nm



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 | High protection level | Shock / vibration resistant | Short-circuit proof | Reverse polarity protection

Optimised 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	.	XXXX
Type		a	b	c	d		e

a *Flange*
3 = with spring element, long

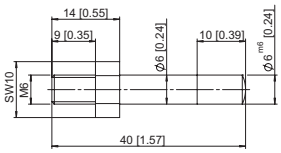
b *Hollow shaft*
3 = ø 20 mm [0.79"]
4 = ø 24 mm [0.94"]
5 = ø 28 mm [1.10"]
6 = ø 5/8"

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		Order no.
Cylindrical pin, long for torque stops	 with fixing thread	**8.0010.4700.0003**

Connection technology		Order no.
Connector, self-assembly (straight)	M23 female connector with coupling nut	**8.0000.5012.0000**
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**

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.

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 [4]
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 2004/108/EC 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), scaleable
Number of revolutions (multiturn)		1 ... 4096 (12 bit), scaleable
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) For shaft version only (at shaft end).
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.
4) The power supply at the encoder input must not be less than 4.75 V (5 V - 5%).

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

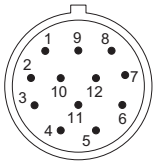
Output	Default-function
A1	battery control

Terminal assignment (SSI Synchronous Serial Interface with 12 pin connector)

Interface	Type of connection	Features	M23 connector										
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 colour:	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

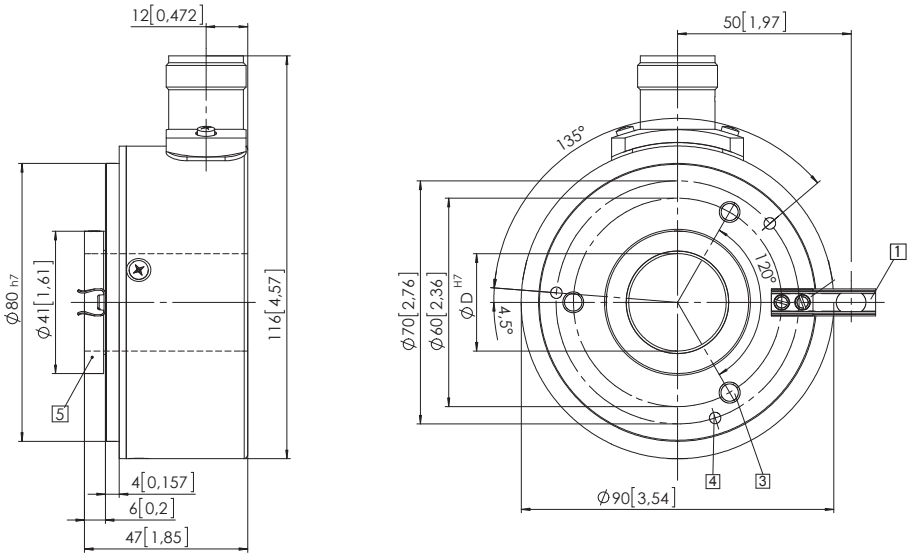


M23 connector, 12 pin

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




Made in Germany
Type: 8.LI50.1121.2250
S-Nr:
4,8-30 VDC
60 mA
0V
+V
A
Ai
WH
BN
GN
YE
shield
Fritz Kübler GmbH
www.kuebler.com

Linear measuring technology

		Type	Description	Page
Incremental magnetic measurement system	Sensor head, magnetic band	Limes LI20 / B1	Resolution min. 10 µm	**386**
	Sensor head, magnetic band	Limes LI50 / B2	Resolution min. 5 µm	**389**
Absolute magnetic measurement system	new Sensor head, magnetic band	Limes LA10 / BA1	Resolution min. 1 µm	**392**
	new Sensor head, magnetic band	Limes LA50 / BA5	Resolution min. 10 µm	**396**
Draw wire mechanics	new With analogue sensor	Draw wire encoder A30	Measuring length max. 0.6 m	**400**
	With analogue sensor	Draw wire encoder A40	Measuring length max. 1 m	**402**
	With encoder or analogue sensor	Draw wire encoder A50	Measuring length max. 1.25 m	**404**
	With incremental encoder	Draw wire encoder A40	Measuring length max. 2 m	**407**
	With analogue sensor	Draw wire encoder A41	Measuring length max. 2 m	**402**
	new With absolute encoder	Draw wire encoder A41	Measuring length max. 2 m	**409**
	new With encoder or analogue sensor	Draw wire encoder B75	Measuring length max. 3 m	**411**
	With encoder or analogue sensor	Draw wire encoder B80	Measuring length max. 3 m	**414**
	With encoder	Draw wire encoder C105	Measuring length max. 6 m	**417**
	With encoder or analogue sensor	Draw wire encoder C120	Measuring length max. 6 m	**419**
	With encoder or analogue sensor	Draw wire encoder D135	Measuring length max. 42.5 m	**422**
Lift measuring system	For shaft-copying	Encoder mounting fixture, guided-belt, LM3	Max. height 53 m	**427**
Length measuring kit	With encoder	Mini measurement system	Incremental	**429**
	With encoder / preset counter	With rack and pinion	Incremental / absolute	**430**
	With encoder / preset counter	Measuring wheelsystem	Incremental / absolute	**431**
	Flexible fastening	Spring encoder arm		**432**
	Measuring wheels	Various wheel coatings		**433**

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 aluminium 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 a 1 b X c 1 d . 2 e XXX f

Type

a *Model*
1 = IP67, standard
2 = IP68 / IP69k and humidity tested selon 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 a . 010 . XXXX b

Type

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 50 m

Stock types
8.B1.10.010.0010
8.B1.10.010.0020
8.B1.10.010.0050
8.B1.10.010.0100

1) With quadruple evaluation (only connected with magnetic band Limes B1)

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 analogue 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 analogue 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 + 0.04 x L) mm, L in [m], up to L = 50 m, at T = 20°C [+68°F]
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°

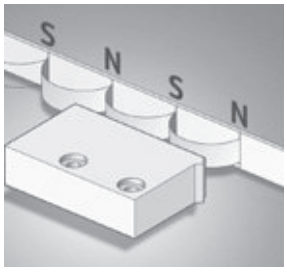
General data

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	IP67 acc. to EN 60529
	model 2	IP68 / IP69k acc. to EN 60529 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Housing		aluminium
Cable		2 m [6.56'] PUR 8 x 0.14 mm² [AWG25] 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.X020 et 8.LI20.XXXX.X050)
CE compliant acc. to		EMC guideline 2004/108/EC RoHS guideline 2011/65/EU

Magnetic band Limes B1

Pole gap		2 mm from pole to pole
Dimensions	width	10 mm
	thickness	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

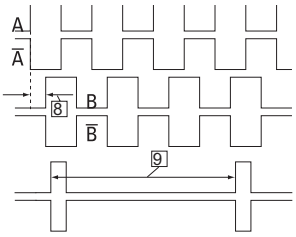
Function principle



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.

Incremental magnetic measurement system sensor head, magnetic band | Limes LI20 / B1 | Resolution min. 10 µm

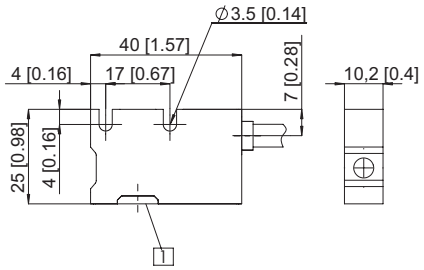
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	shield [1]

Dimensions

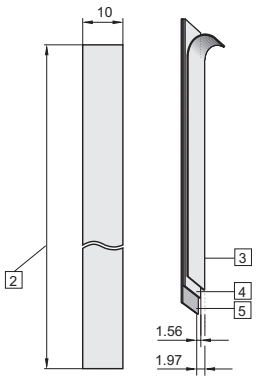
Dimensions in mm [inch]

Sensor head Limes LI20



1 Active measuring area

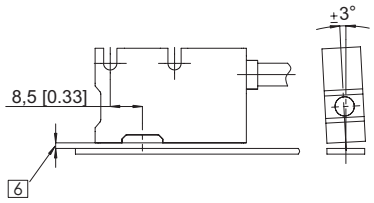
Magnetic band Limes B1



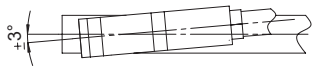
2 Length L, max. 50 m
3 Masking tape
4 Magnetic band
5 Carrier band

Permissible mounting tolerances

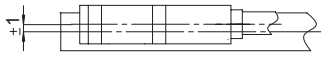
Tilting



Torsion



Offset



6 Distance sensor head / magnetic band:
0.1 ... 1.0 mm (recommended 0.4 mm)

1) Shield is attached to connector housing

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 aluminium 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 50 m

Stock types
8.B2.10.010.0010
8.B2.10.010.0020
8.B2.10.010.0050
8.B2.10.010.0100

1) With quadruple evaluation (only connected with magnetic band Limes B2)

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 analogue 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 analogue 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 + 0.04 x L) mm, L in [m], up to L = 50 m, at T = 20°C [+68°F]
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°

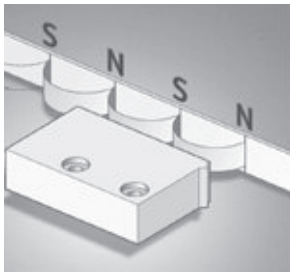
General data

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		aluminium
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 2004/108/EC 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

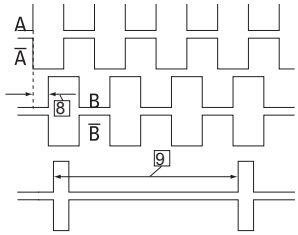
Function principle



Signal figures

[8] Pulse edge interval:
pay attention to the instructions in the technical data

[9] Periodic index signal
every 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.

Incremental magnetic measurement system sensor head, magnetic band | Limes LI50 / B2 | Resolution min. 5 µm

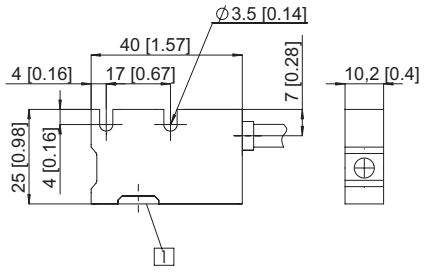
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	shield [1]

Dimensions

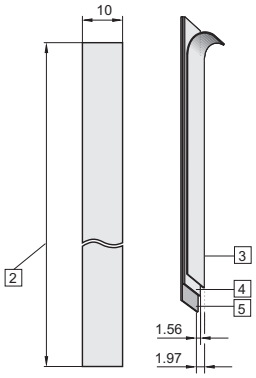
Dimensions in mm [inch]

Sensor head Limes LI50



1 Active measuring area

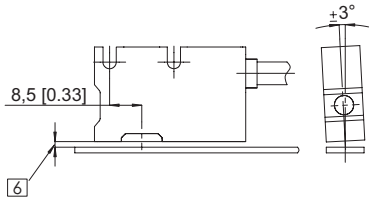
Magnetic band Limes B2



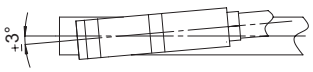
2 Length L, max. 50 m
3 Masking tape
4 Magnetic band
5 Carrier band

Permissible mounting tolerances

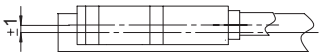
Tilting



Torsion



Offset



6 Distance sensor head / magnetic band:
0.1 ... 2.0 mm (recommended 1 mm)

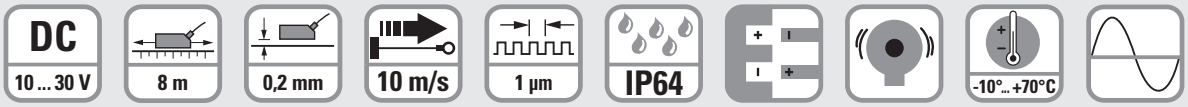
1) PH = Shield is attached to connector housing.

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.LA10.1222
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
0010 = 1 m
0020 = 2 m
0030 = 3 m
0040 = 4 m
0060 = 6 m
0080 = 8 m

Optional on request
- other lengths

Stock types
8.BA1.10.010.0080

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 analogue 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	aluminium
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 2004/108/EC 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 µm
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 LOW at I_{Load} = 20 mA	typ. 3.8 V 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	yes/no via order code
Node address	1 ... 15 (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

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 lenght in meters (e.g. 10 m = 0010).

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

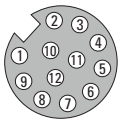
Output circuit	Type of connection	M12 connector, 12 pin											
2	2	Signal:	0 V	+V	C+	C-	D+	D-	A	$\overline{A}$	B	$\overline{B}$	–	–
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

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 colour assignment with M12 female connector	Connection cable with M12 connector, 12 pin (accessory) – for example 05.00.60B1.B211.005M												
	Colour:	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

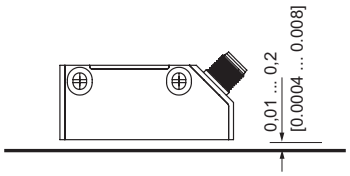


Absolute magnetic measurement system sensor head, magnetic band | **Limes LA10 / BA1** | **Measuring length max. 8 m Resolution min. 1 µm**

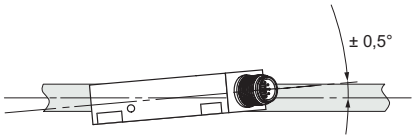
Permissible mounting tolerances

Dimensions in mm [inch]

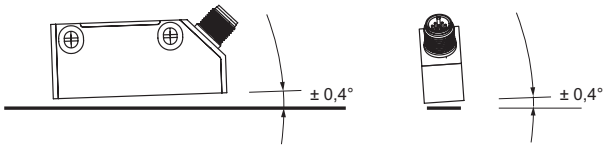
Distance sensor head / magnetic band (incl. masking tape)



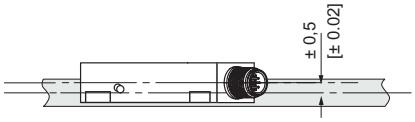
Torsion



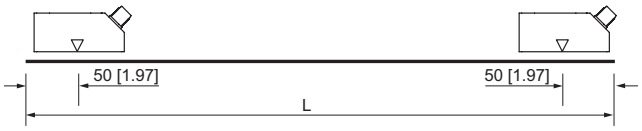
Tilting



Offset



Measuring range

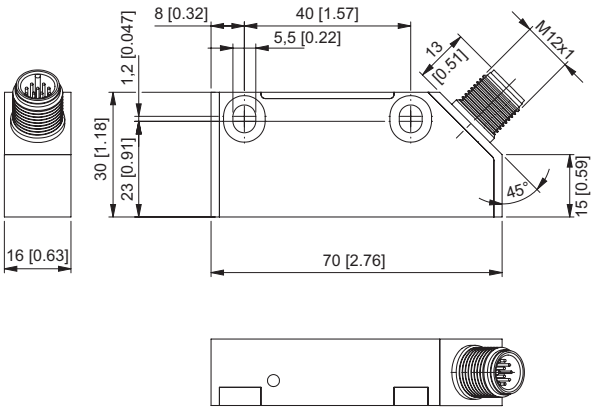


Observe mounting direction

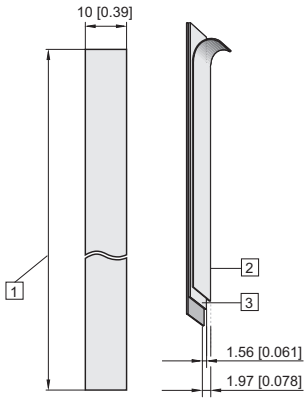
Dimensions

Dimensions in mm [inch]

Sensor head Limes LA10



Magnetic band Limes BA1



1 Length L, max. 8 m
2 Masking tape
3 Magnetic band

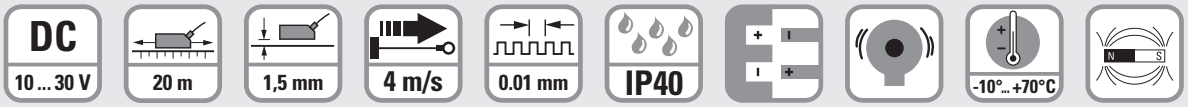
Absolute magnetic measurement system sensor head, magnetic band

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 vesatile

- Resolution 0.01 mm / measuring lengths max. 20 m.
- Rugged die-cast zinc housing.
- Positions changes are also detected when de-energised 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

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 analogue 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 2004/108/EC 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	±10 µm
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	yes/no via rotary switch
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

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 colour:	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 colour:	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

Absolute magnetic measurement system
Sensor head, magnetic band

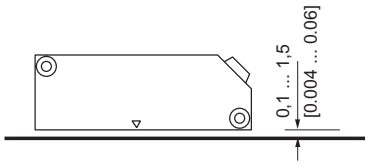
Limes LA50 / BA5

Measuring length max. 20 m
Resolution min. 10 µm

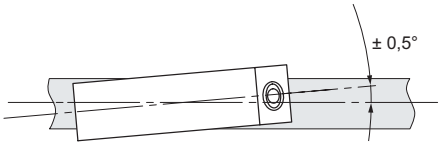
Permissible mounting tolerances

Dimensions in mm [inch]

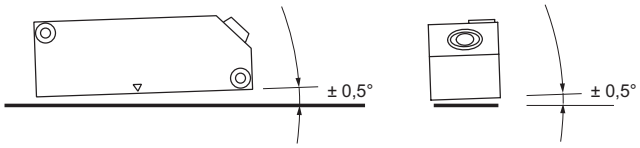
Distance sensor head / magnetic band (incl. masking tape)



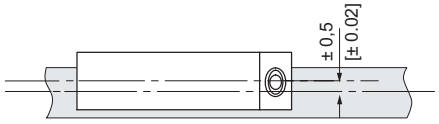
Torsion



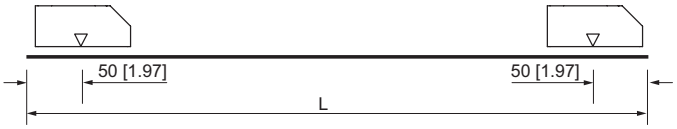
Tilting



Offset



Measuring range

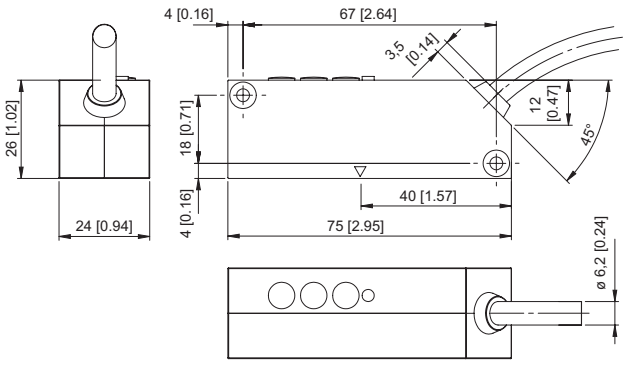


Observe mounting direction

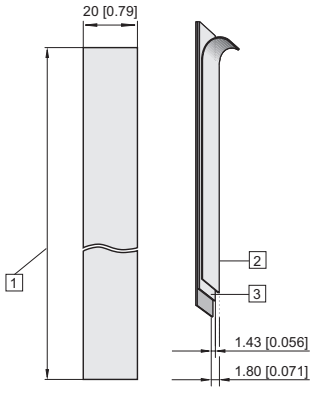
Dimensions

Dimensions in mm [inch]

Sensor head Limes LA50



Magnetic band Limes BA5



1 Length L, max. 20 m
2 Masking tape
3 Magnetic band

Draw wire mechanics with analogue sensor

Draw wire encoder A30

Measuring length max. 0.6 m
Traverse speed max. 0.8 m/s

The draw wire mechanics A30 with analogue output stands out with its miniaturised design. It is available with potentiometer, voltage or current output.

Miniaturised 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	ⓐ			ⓑ	ⓒ		

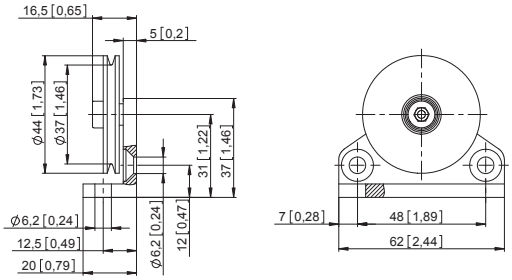
ⓐ *Measuring range*
A = 300 mm [1)]
B = 600 mm

ⓑ *Output circuit*
11 = analogue output 4 ... 20 mA
22 = analogue output 0 ... 10 V DC
power supply 15 ... 28 V DC
33 = potentiometer output 10 kΩ

ⓒ *Type of connection*
4 = radial cable, 0.5 m [1.64']

Guide pulley for draw wire encoder

Order no.



Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

1) Not suirable for potentiometer output.

Draw wire mechanics with analogue sensor | **Draw wire encoder A30** | **Measuring length max. 0.6 m**
Traverse speed max. 0.8 m/s

Technical data

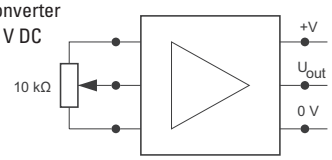
Mechanical characteristics (draw wire mechanics)		
Speed max.		0.8 m/s
Working temperature		-10°C ... +80°C [+14°F ... +176°F]
Protection acc. to EN 60529		IP50
Weight		approx. 60 g [2.12 oz]
Extension force F_{min}		3 N
Repeat accuracy		±0.15 mm
Linearity		±0.35 %
Material	housing	plastic
	wire	stainless-steel ø 0.4 mm plastic-coated

Electrical characteristics			
Analogue 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 2004/108/EC RoHS guideline 2011/65/EU		

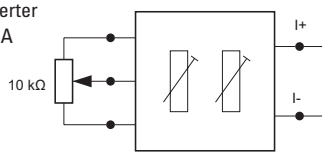
Terminal assignment

Colour	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

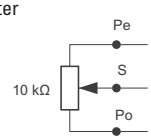
R/U converter
0 ... 10 V DC



R/I converter
4 ... 20 mA

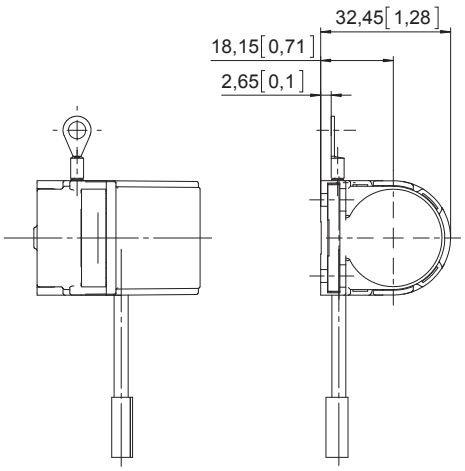


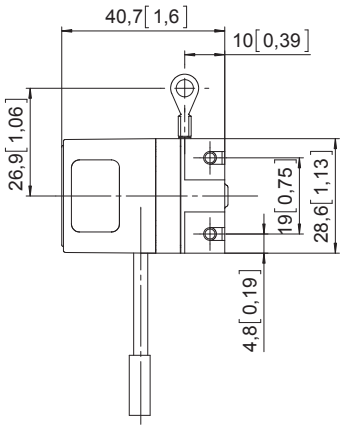
Potentiometer



Dimensions

Dimensions in mm [inch]

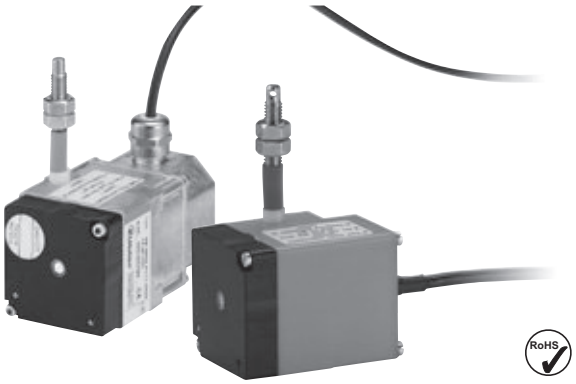




Draw wire mechanics with analogue sensor

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 analogue output is characterised by its compact design. They are available with a potentiometer, voltage or current 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

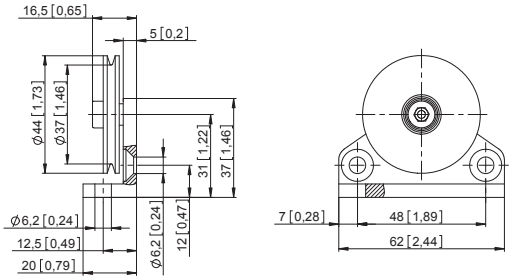
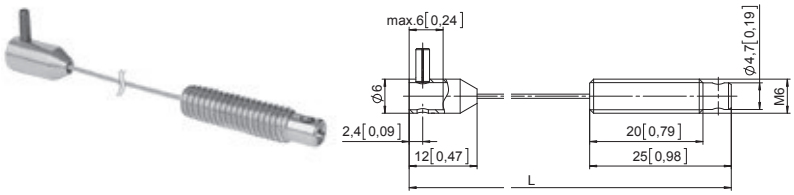
D5.350	X	.	A	XX	X	.	0000
Type	ⓐ			ⓑ	ⓒ		

ⓐ *Measuring range*
1 = 1000 mm
2 = 2000 mm

ⓑ *Output circuit*
11 = analogue output 4 ... 20 mA
22 = analogue output 0 ... 10 V DC
power supply 15 ... 28 V DC
33 = potentiometer output 10 kΩ

ⓒ *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

		Order no.
Guide pulley  	Order code for the set: - Guide pulley (anodised aluminium) - 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**

Draw wire mechanics with analogue 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 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	

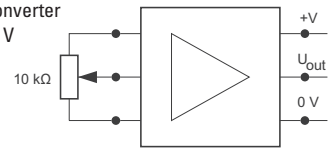
Electrical characteristics

Analogue 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 2004/108/EC RoHS guideline 2011/65/EU		

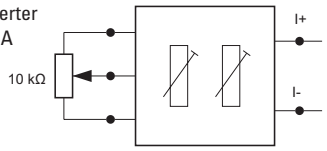
Terminal assignment

Colour	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.

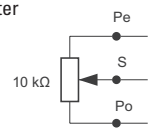
R/U converter
0 ... 10 V



R/I converter
4 ... 20 mA



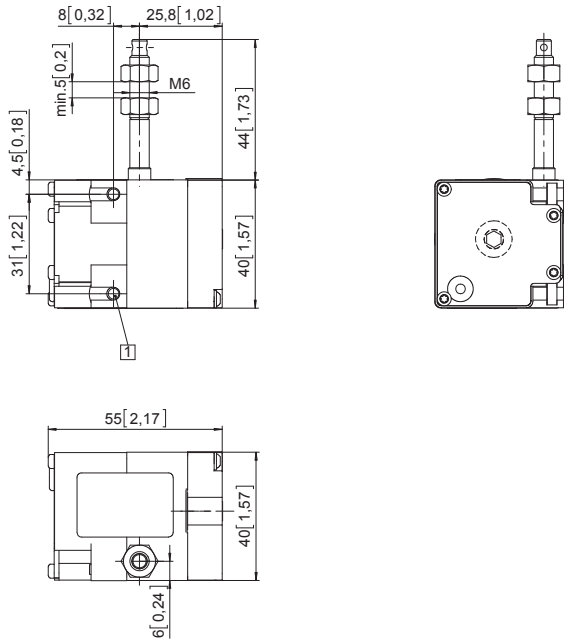
Potentiometer



Dimensions

Dimensions in mm [inch]

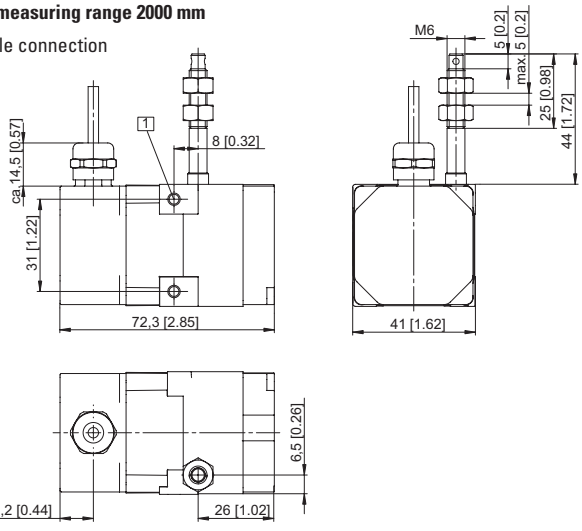
for measuring range 1000 mm



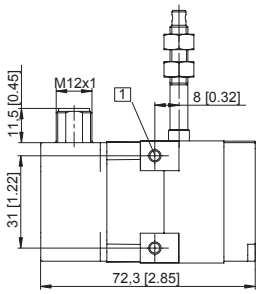
1 2 x M4, max. screw-in depth 8 mm [0.32"]

for measuring range 2000 mm

cable connection



M12 connector



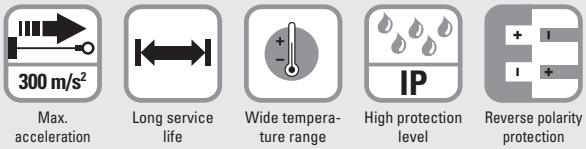
Draw wire mechanics with encoder or analogue sensor

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 analogue, incremental or absolute output. The maximum measuring length is 1.25 m.



Max. acceleration | Long service life | Wide temperature range | High protection level | Reverse polarity protection

Robust

- The titanium-anodised aluminium 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.

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.

Order code with encoder

D8.6A1	.	XXXX	.	XX	X	X	.	XXXX
Type		a		b	c	d		e

a *Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm

b *Encoder used*
36 = Sendix incremental 3610
F3 = Sendix absolute F3663, SSi
F8 = Sendix absolute F3668, 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

Optional on request
- Other measuring ranges
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Standard resolutions for draw wire with incremental encoder Sendix 3610, drum circumference 125 mm

Pulses / revolution	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 or F3668 CANopen, drum circumference 125 mm

Absolute encoder	F3663	F3668 CANopen
Pulses / revolution	4096 / 12 bit	4096, programmable via the bus / 12 bit
Pulses / mm	32.8	32.8
Resolution (mm)	~ 0.03	~ 0.03

Recommended standard devices

Order no. draw wire encoder	Mounted encoder		Interface	Power supply	Type of connection	Resolution / Protocol
D8.6A1.XXXX.3642.1250	3610	(8.3610.2342.1250)	PushPull with inv. signal	8 ... 30 V DC	radial cable 2 m [6.56']	1250 ppr
D8.6A1.XXXX.F321.G222	Sendix F3663	(8.F3663.4121.G222)	SSI	10 ... 30 V DC	tangential cable 1 m [3.28']	4096 ppr / SSI-Gray code
D8.6A1.XXXX.F821.2122	Sendix F3668	(8.F3663.4121.2122)	CANopen	10 ... 30 V DC	tangential cable 1 m [3.28']	CANopen encoder profile V3.2

Draw wire mechanics with encoder or analogue sensor

Draw wire encoder A50

Measuring length max. 1.25 m
Traverse speed max. 10 m/s

Order code with analogue sensor

D8.3A1	.	XXXX	.	XXX	X	.	0000
Type		ⓐ		ⓑ	ⓒ		

ⓐ *Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm

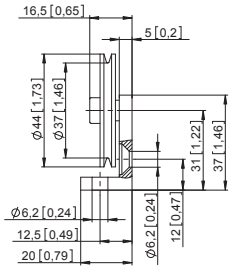
ⓑ *Analogue sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

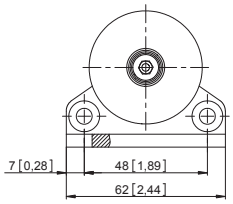
ⓒ *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
3 = axial M12 connector, 4-pin

Optional on request
- Other measuring ranges
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Increased linearity

Guide pulley for draw wire encoder

Order no.





Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analogue sensor

Order no.

Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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)				
	analogue output	±0.15 %	±0.1 %	±0.1 %
	with encoder	±0.05 %	±0.05 %	±0.05 %
Weight		approx. 330 g [11.64 oz] (depending on the sensor / encoder used)		
Material	housing	titanium-anodised aluminium		
	wire	stainless steel ø 0.5 mm		
Protection acc. to EN 60529		IP65 (sensor)		

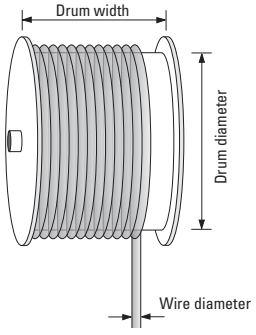
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

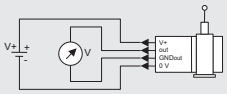
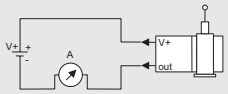
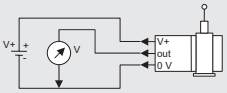
Operating principle

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.



Electrical characteristics (analogue output)

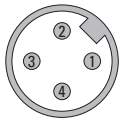
Analogue output	**0 ... 10 V**	**4 ... 20 mA**	**Potentiometer**
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 µA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]
Connection diagrams			
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU		

Draw wire mechanics with encoder or analogue sensor | **Draw wire encoder A50** | **Measuring length max. 1.25 m**
Traverse speed max. 10 m/s

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	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.

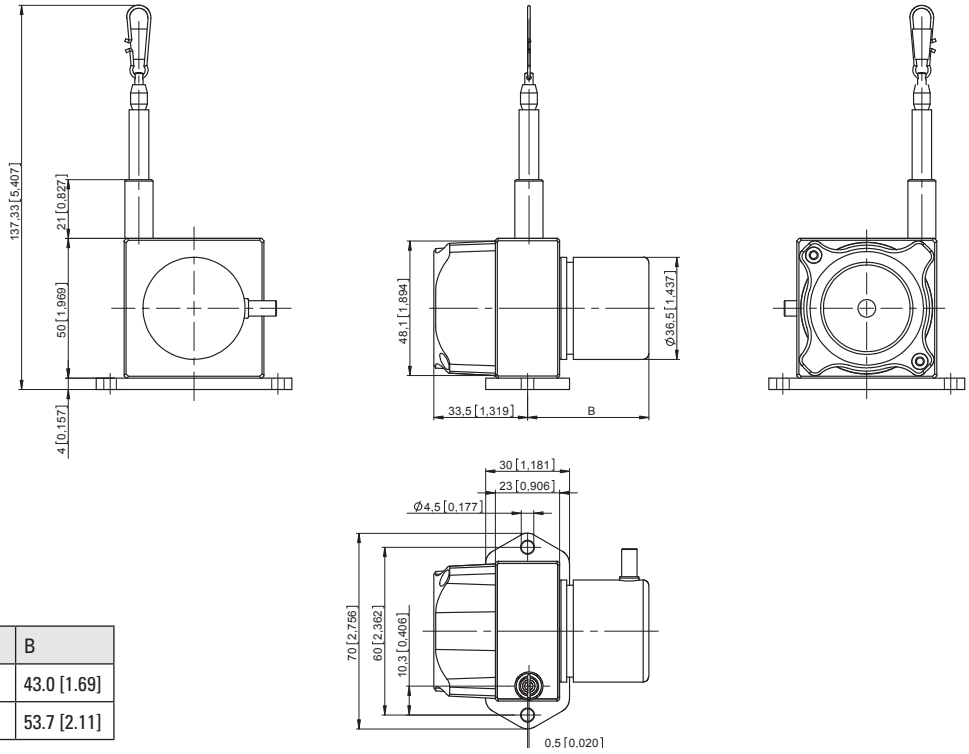
Connector (analogue output)



Dimensions

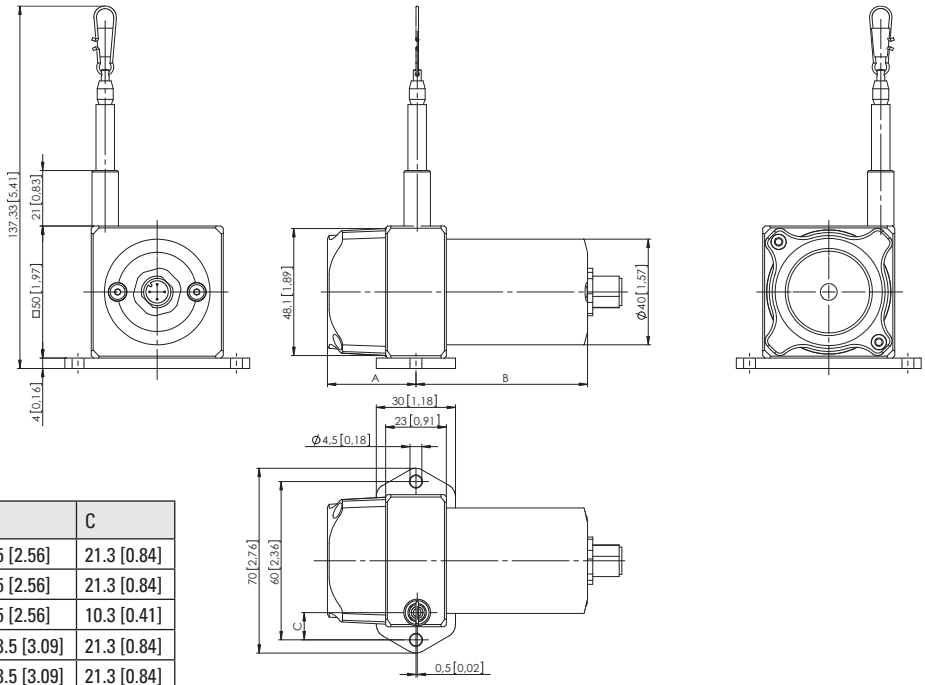
Dimensions in mm [inch]

Draw wire mechanics with encoder



Encoder type	Measuring length	B
Incremental	250 ... 1250 mm	43.0 [1.69]
Absolute	250 ... 1250 mm	53.7 [2.11]

Draw wire mechanics with analogue sensor

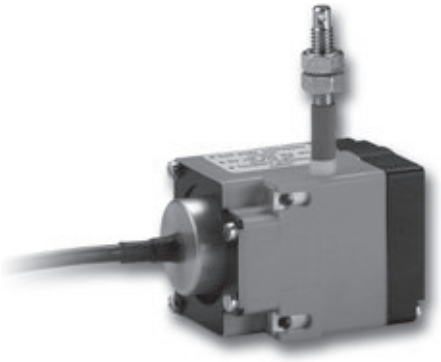


Sensor type	Measuring length	A	B	C
Potentiometer	250 mm	26.5 [1.04]	65 [2.56]	21.3 [0.84]
	500 mm	26.5 [1.04]	65 [2.56]	21.3 [0.84]
	1250 mm	33.5 [1.32]	65 [2.56]	10.3 [0.41]
4 ... 20 mA 0 ... 10 V	250 mm	26.5 [1.04]	78.5 [3.09]	21.3 [0.84]
	500 mm	26.5 [1.04]	78.5 [3.09]	21.3 [0.84]
	1250 mm	33.5 [1.32]	78.5 [3.09]	10.3 [0.41]

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

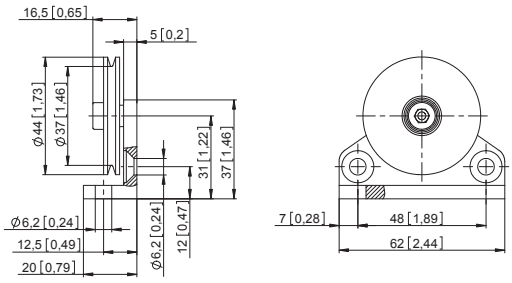
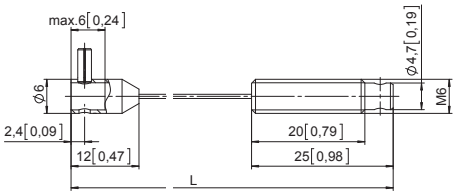
D5.2	XXX	.	24	XX	.	1000
Type	ⓐ			ⓑ		

ⓐ *Steel wire, length*
501 = 1000 mm
102 = 2000 mm

ⓑ *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
D5.2102.2441.1000
D5.2501.2421.1000
D5.2501.2441.1000

Accessories for draw wire encoder

	Order no.
Guide pulley   Order code for the set: - Guide pulley (anodised aluminium) - 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**

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 wire	reinforced plastic stainless steel ø 0.45 mm
Weight		approx. 210 g [7.41 oz]

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

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 LOW	min. +V - 2.5 V max. 0.5 V	min. +V - 3.0 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 2004/108/EC RoHS guideline 2011/65/EU	

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

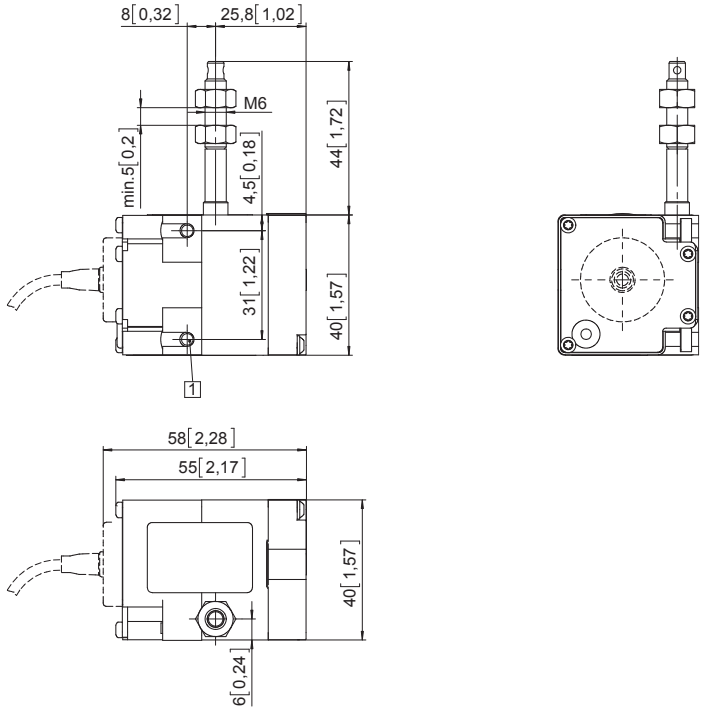
Signal	0 V	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$
Cable colour	WH	BN	GN	YE	GY	PK	BU	RD

Isolate unused outputs before initial start-up.

Dimensions

Dimensions in mm [inch]

1 2 x M4, max. screw-in depth 8 mm [0.32"]



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 metres.

Compact and simple

- Measuring length up to 2000 mm.
- For applications with low traverse speeds.
- Easy mounting.

Order code with encoder

D5.55	02	.	XX	X	X	.	XXXX
Type	a		b	c	d		e

a *Measuring range*
02 = 2000 mm

b *Encoder used*
F3 = Sendix absolute F3663, SSI
F8 = Sendix absolute F3668, 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 or F3668 CANopen, drum circumference 100 mm		
Absolute encoder	F3663	F3668 CANopen
Pulses / revolution	4096 / 12 bits	4096, programmable via the bus / 12 bit
Pulses / mm	41	41
Resolution (mm)	~ 0.02	~ 0.02

Recommended standard devices

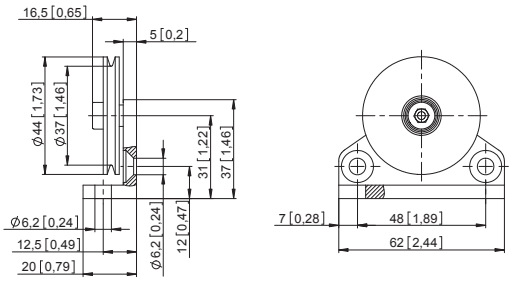
Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Résolution / Protocole
D5.5502.F321.G222	Sendix F3663 (8.F3663.4121.G222)	SSI	10 ... 30 V DC	tangential cable 1 m	4096 ppr / SSI Gray code
D5.5502.F821.2122	Sendix F3668 (8.F3668.4121.2122)	CANopen	10 ... 30 V DC	tangential cable 1 m	CANopen encoder profile V3.2

Draw wire mechanics with absolute encoder | **Draw wire encoder A41** | **Measuring length max. 2 m Traverse speed max. 1 m/s**

Guide pulley for draw wire encoder

Order no.

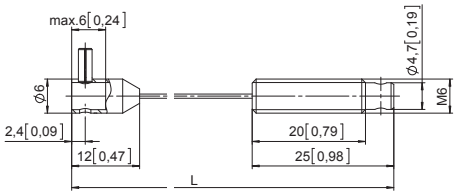
Guide pulley



Order code for the set:
- Guide pulley (anodised aluminium)
- 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)

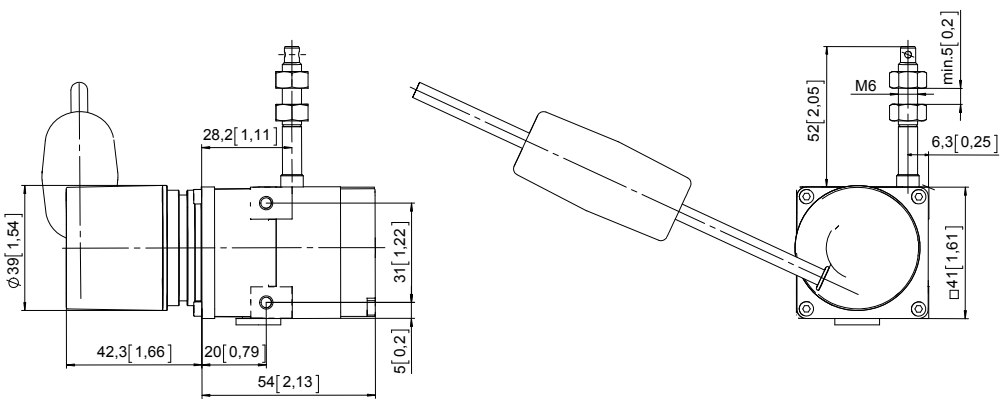
Measuring range		up to 2000 mm
Traversing speed		max. 1000 mm/s
Working temperature		-10°C ... +80°C [+14°F ... +176°F]
Weight		approx. 200 g [7.06 oz]
Required force		≥ 2 N (on wire)
Linearity		±0.35 % for the whole measuring range
Repetition accuracy		±0.15 mm per direction of travel
Material	housing wire	zinc die-cast stainless steel ø 0.45 mm

Electrical characteristics (encoder)

The electrical characteristics can be found in the data sheets of the encoders.

Dimensions

Dimensions in mm [inch]



Draw wire mechanics with encoder or analogue 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 metres.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analogue sensors.

Compact and versatile

- Compact housing.
- Variable mounting possibilities.
- Low-wear wire exit.

Order code with encoder

D8.15	03	.	XX	X	X	.	XXXX
Type	a		b	c	d		e

a *Measuring range*
03 = 3000 mm

b *Encoder used*
2Z = Sendix incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868

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 200 mm

Pulses / revolution	200	2000	4000
Pulses / mm	1	10	20
Resolution (mm)	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix F5863 / F5868 or 5863 / 5868, drum circumference 200 mm

Absolute encoder	F5863 / 5863	F5868 / 5868
Pulses / revolution	2048 / 11 bit	4096, programmable via the bus / 12 bit
Pulses / mm	10.24	20.48
Resolution (mm)	-0.1	~ 0.05

Recommended standard devices

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Options
D8.1503.2Z54.2000	Sendix 5000 (8.5000.B154.2000)	PushPull with inv. signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	no option
D8.1503.F324.G123	Sendix F5863 (8.F5863.2124.G123)	SSI	10 ... 30 V DC	1 x radial M23 connector	SSI-Gray-Code	Set button + Status LED
D8.1503.6324.G123	Sendix 5863 (8.5863.2124.G123)	SSI	10 ... 30 V DC	1 x radial M23 connector	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	no option
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	no option

Order code with analogue sensor

D8.35	03	.	XXX	2	.	0000
Type	a		b	c		

a *Measuring range*
03 = 3000 mm

b *Analogue 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 exit direction)

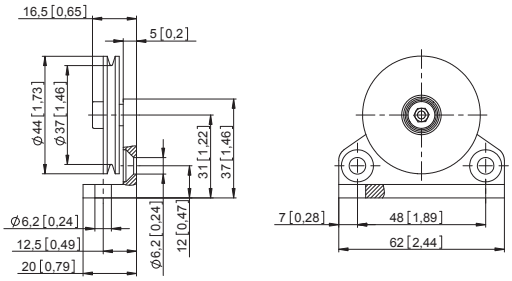
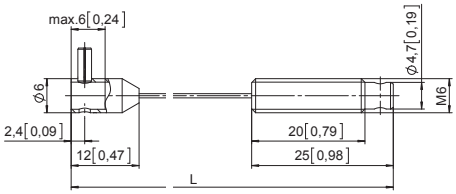
Optional on request
- Other measuring ranges

Draw wire mechanics with encoder or analogue sensor

Draw wire encoder B75

Measuring length max. 3 m
Traverse speed max. 0.8 m/s

Accessories for draw wire encoder

		Order no.
Guide pulley  	Order code for the set: - Guide pulley (anodised aluminium) - 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'] Steel wire 5 m [16.40'] Steel wire 10 m [32.81'] Paraleine 2 m [6.56']	**8.0000.7000.0033** **8.0000.7000.0034** **8.0000.7000.0035** **8.0000.7000.0032**

Connection technology for analogue sensor

		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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

Analogue 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 2004/108/EC RoHS guideline 2011/65/EU		

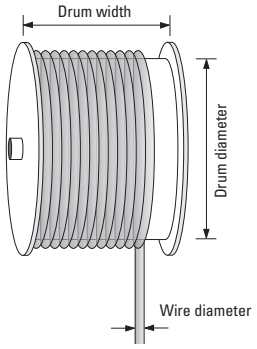
Electrical characteristics (digital output)

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.

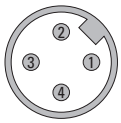
Note
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Terminal assignment (analogue output)

Colour	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.

Connector (analogue output)

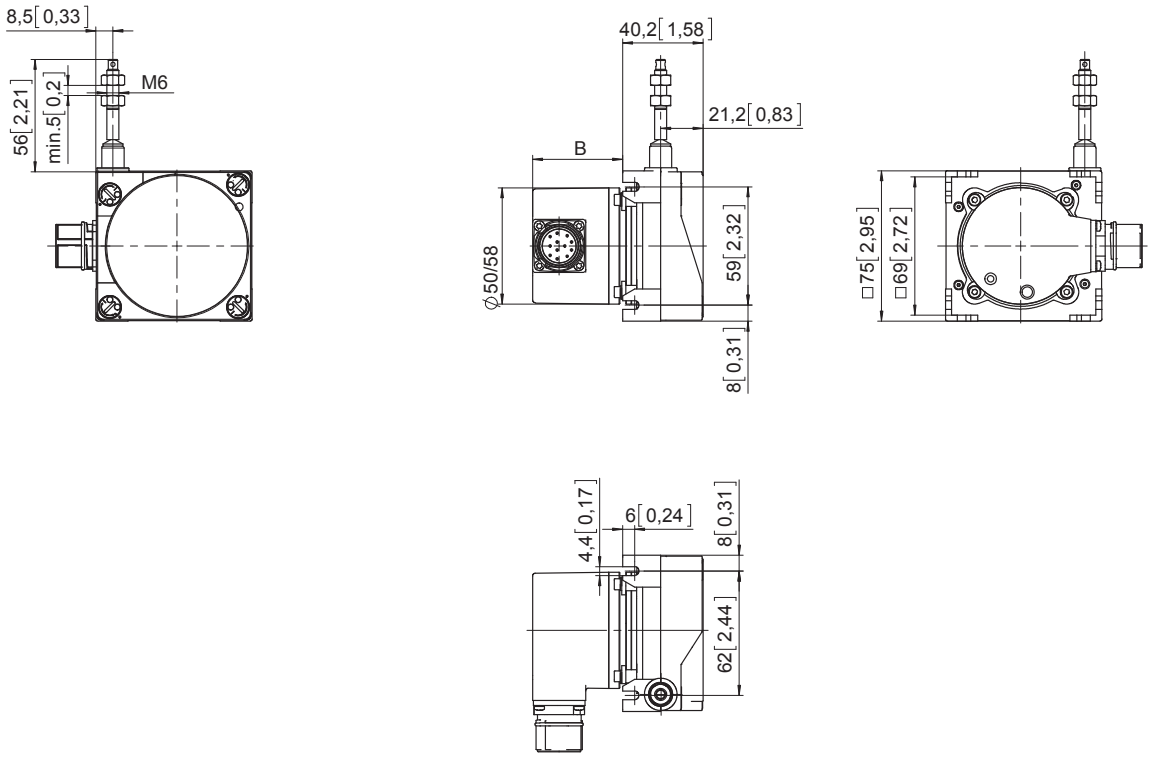


Draw wire mechanics with encoder or analogue sensor	Draw wire encoder B75	Measuring length max. 3 m Traverse speed max. 0.8 m/s

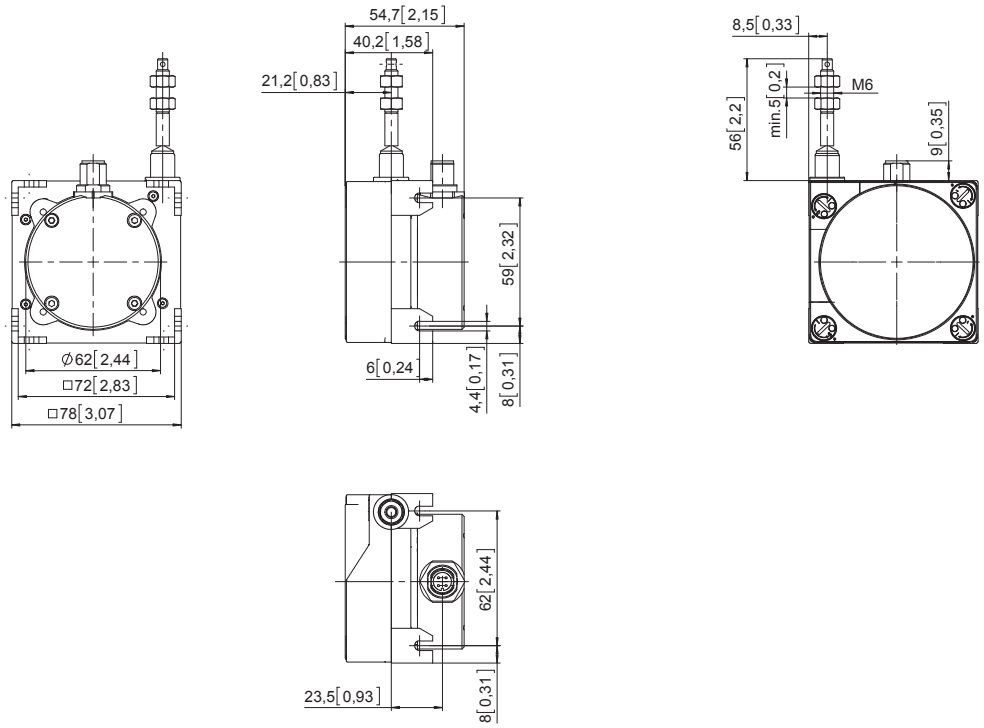
Dimensions

Dimensions in mm [inch]

With encoder



With analogue sensor



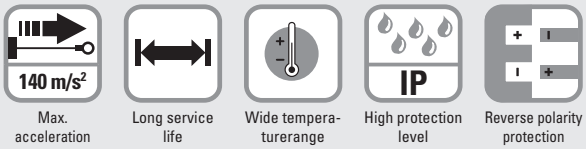
Draw wire mechanics with encoder or analogue sensor

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 metres.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analogue sensors.



Max. acceleration | Long service life | Wide temperaturerange | High protection level | Reverse polarity protection

Robust

- The titanium-anodised aluminium 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.

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.

Order code with encoder

D8.4B1	.	XXXX	.	XX	X	X	.	XXXX
Type		a		b	c	d		e

a *Measuring range*
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm

b *Encoder used*
00 = Sendix incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868

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
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 200 mm

Pulses / revolution	200	2000	4000
Pulses / mm	1	10	20
Resolution (mm)	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix F5863 / F5868 or 5863 / 5868, drum circumference 200 mm

Absolute encoder	F5863 / 5863	F5868 / 5868
Pulses / revolution	2048 / 11 bits	4096, programmable via the bus / 12 bit
Pulses / mm	10.24	20.48
Resolution (mm)	-0.1	~ 0.05

Recommended standard devices

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Options
D8.4B1.XXXX.0054.2000	Sendix 5000 (8.5000.8354.2000)	PushPull with inv. signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	no option
D8.4B1.XXXX.F324.G123	Sendix F5863 (8.F5863.1224.G123)	SSI	10 ... 30 V DC	1 x radial M23 connector	SSI-Gray-Code	Set button + Status LED
D8.4B1.XXXX.6324.G123	Sendix 5863 (8.5863.1224.G123)	SSI	10 ... 30 V DC	1 x radial M23 connector	SSI-Gray-Code	Set button + Status LED
D8.4B1.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
D8.4B1.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
D8.4B1.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
D8.4B1.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	no option
D8.4B1.XXXX.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	Profinet	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	no option

Draw wire mechanics with encoder or analogue sensor | **Draw wire encoder B80** | **Measuring length max. 3 m, Traverse speed max. 10 m/s**

Order code with analogue sensor

D8.3B1	.	XXXX	.	XXX	X	.	0000
Type		ⓐ		ⓑ	ⓒ		

ⓐ *Measuring range*
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm

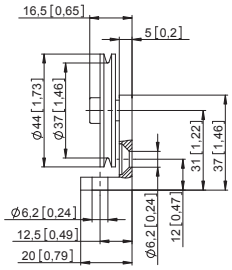
ⓑ *Analogue sensor output / Power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

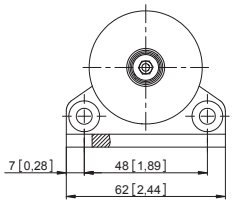
ⓒ *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
3 = M12 connector, 4-pin

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Increased linearity

Guide pulley for draw wire encoder

Order no.





Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analogue sensor

		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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)				
analogue output		±0.15 %	±0.1 %	±0.1 %
with encoder		±0.05 %	±0.05 %	±0.05 %
Weight		approx. 750 g [26.45 oz] (dep. on the sensor/encoder used)		
Material	housing	titanium-anodised aluminium		
	wire	stainless steel ø 0.5 mm (ø 1 mm can be supplied as a special up to measuring range 1500 mm)		
Protection acc. to EN 60529		IP65 (sensor)		

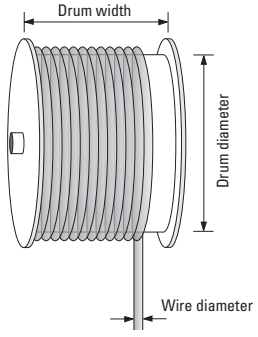
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

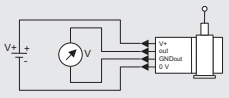
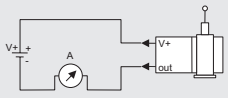
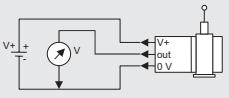
Operating principle

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.



Electrical characteristics (analogue output)

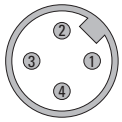
Analogue output	**0 ... 10 V**	**4 ... 20 mA**	**Potentiometer**
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 µA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]
Connection diagrams			
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU		

Draw wire mechanics with encoder or analogue sensor | Draw wire encoder B80 | Measuring length max. 3 m Traverse speed max. 10 m/s

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	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.

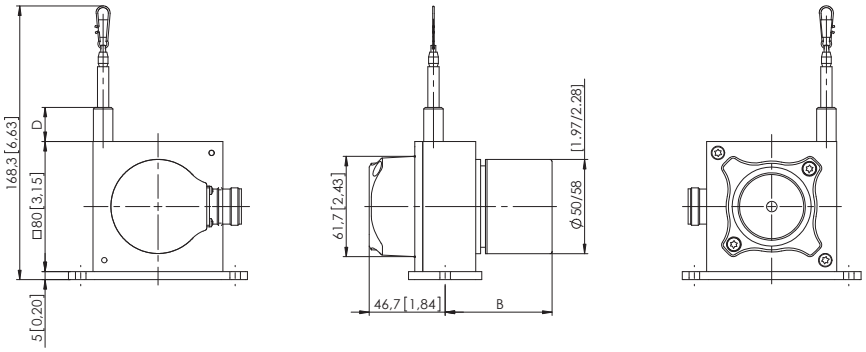
Connector (analogue output)



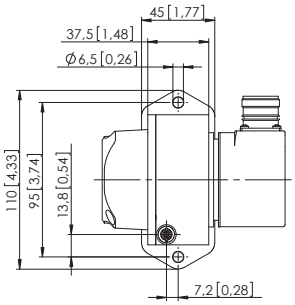
Dimensions

Dimensions in mm [inch]

Draw wire mechanics with encoder

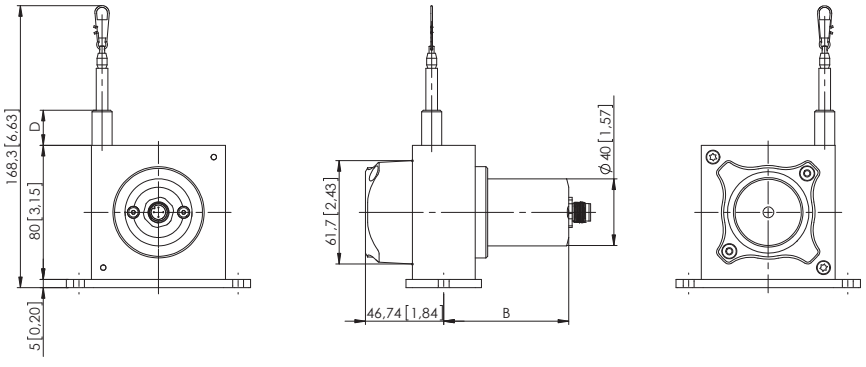


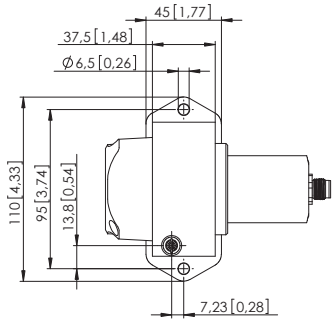
Measuring range	D
1000 mm	21 [0.83]
2000 mm	35 [1.38]
3000 mm	35 [1.38]



Dimension **B** depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.4B1.XXXX.00XX.XXXX	54.25 [2.12]
Sendix absolute (5863) D8.4B1.XXXX.63XX.XXXX	66.75 [2.63]
Sendix absolute (5868) D8.4B1.XXXX.68XX.XXXX	93.25 [3.67]

Draw wire mechanics with analogue sensor





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]

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.

Flexible and simple

- Possibility for user to exchange encoder.
- Measuring lengths 2800 mm or 6000 mm.
- Simple installation.

Order code with encoder

D8.1	XXX	.	XX	X	X	.	XXXX
Type	a		b	c	d		e

a *Measuring range*
106 = 6000 mm
2A1 = 2800 mm

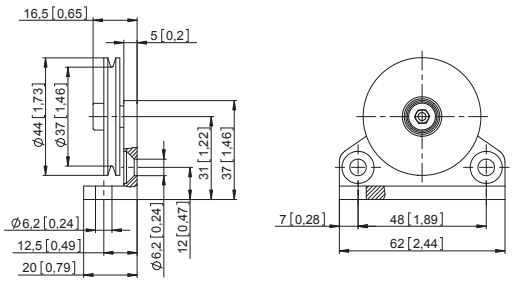
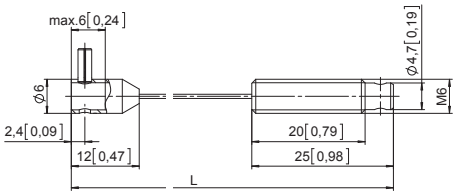
b *Mounted encoder*
05 = 5805
2Z = 5000
04 = 5804
62 = 5862
60 = 5860
63 = 5863
68 = 5868

c *Output circuit* [1)]

d *Type of connection* [1)]

e *Resolution / pulses / protocol* [1)]

Accessories for draw wire encoder

		Order no.
Guide pulley  	Order code for the set: - Guide pulley (anodised aluminium) - 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'] Steel wire 5 m [16.40'] Steel wire 10 m [32.81'] Paraleine 2 m [6.56']	**8.0000.7000.0033** **8.0000.7000.0034** **8.0000.7000.0035** **8.0000.7000.0032**

1) These data depend on the chosen encoder.

Draw wire mechanics with encoder | **Draw wire encoder C105** | **Measuring length max. 6 m**
Traverse speed max. 3 m/s

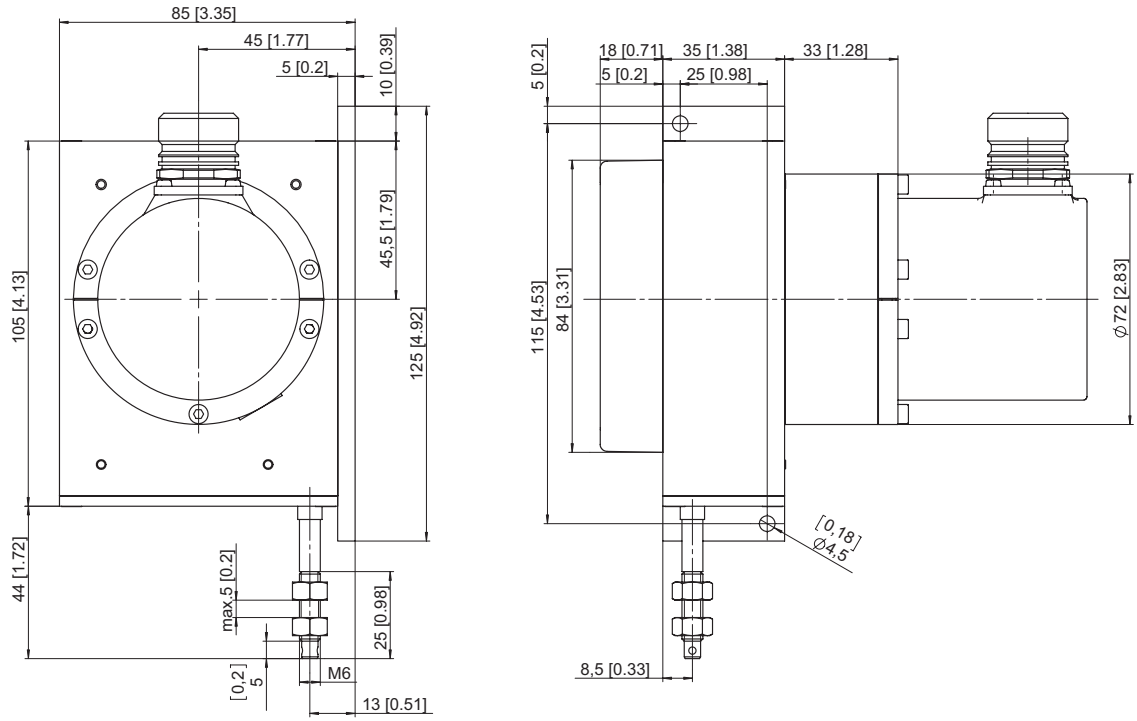
Technical data

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	paraleine– with ø 1.05 mm
	6000 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.

Dimensions

Dimensions in mm [inch]



Draw wire mechanics with encoder or analogue 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 metres.

This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analogue sensors.

Max. acceleration | Long service life | Wide temperature range | High protection level | Reverse polarity protection

Robust

- The titanium-anodised aluminium 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.

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.

Order code with encoder

D8.4C1	.	0600	.	XX	X	X	.	XXXX
Type		a		b	c	d		e

a *Measuring range*
0600 = 6000 mm

b *Encoder used*
00 = Sendix incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868

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
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 317.68 mm

Pulses / revolution	500	2000
Pulses / mm	1.6	6.3
Resolution (mm)	~ 0.63	~ 0.16

Standard resolutions for draw wire with absolute encoder Sendix F5863 or F5868 / 5863 or 5868, drum circumference 317.68 mm

Absolute encoder	F5863 / 5863	F5868 / 5868
Pulses / revolution	2048 / 11 bit	4096, programmable via the bus / 12 bit
Pulses / mm	6.4	12.9
Resolution (mm)	~ 0.16	~ 0.08

Recommended standard devices

Order no. draw wire encoder	Mounted encoder		Interface	Power supply	Type of connection	Resolution / Protocol	Options
D8.4C1.XXXX.0054.2000	Sendix 5000	(8.5000.8354.2000)	PushPull with inv. signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	no option
D8.4C1.XXXX.F324.G123	Sendix F5863	(8.F5863.1224.G123)	SSI	10 ... 30 V DC	1 radial M23 connector	SSI-Gray-Code	Set button + Status LED
D8.4C1.XXXX.6324.G123	Sendix 5863	(8.5863.1224.G123)	SSI	10 ... 30 V DC	1 radial M23 connector	SSI-Gray-Code	Set button + Status LED
D8.4C1.XXXX.F82E.2123	Sendix F5868	(8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 radial M12 connector	CANopen encoder profile DS406 V3.2	Set button
D8.4C1.XXXX.6822.2123	Sendix 5868	(8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 radial M12 connector	CANopen encoder profile DS406 V3.2	Set button
D8.4C1.XXXX.6832.3113	Sendix 5868	(8.5868.1232.3113)	Profibus	10 ... 30 V DC	3 radial M12 connector	PROFIBUS DP V0 encoder profile Class 2	Set button
D8.4C1.XXXX.68B2.B212	Sendix 5868	(8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 radial M12 connector	EtherCAT with CoE 3.2.10	no option
D8.4C1.XXXX.68C2.C212	Sendix 5868	(8.5868.12C2.C212)	Profinet	10 ... 30 V DC	3 radial M12 connector	PROFINET encoder profile version 4.1	no option

Draw wire mechanics with encoder or analogue sensor

Draw wire encoder C120

Measuring length max. 6 m
Traverse speed max. 10 m/s

Order code with analogue sensor

D8.3C1	.	0600	.	XXX	X	.	0000
Type		ⓐ		ⓑ	ⓒ		

ⓐ *Measuring range*
0600 = 6000 mm

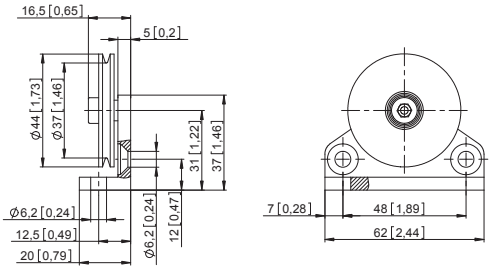
ⓑ *Analogue sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

ⓒ *Type of connection*
1 = axial cable, 2 m [6.56'] PVC
3 = M12 connector, 4-pin

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Increased linearity

Guide pulley for draw wire encoder

Order no.



Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analogue sensor

Order no.

Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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		
analogue output		±0.1 % (of the measuring range)
with encoder		±0.05 % (of the measuring range)
Weight		approx. 1600 g [56.44 oz] (depending on the sensor/encoder used)
Material	housing	titanium-anodised aluminium
	wire	stainless steel ø 0.5 mm (ø 1 mm can be supplied as a special up to measuring range 3000 mm)
Protection selon EN 60529		IP65 (sensor)

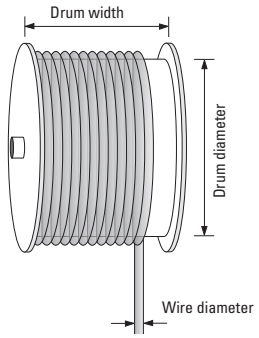
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders

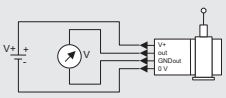
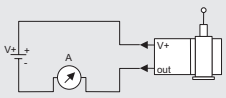
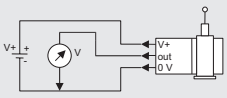
Operating principle

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 (analogue output)

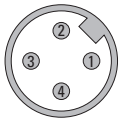
Analogue output	**0 ... 10 V**	**4 ... 20 mA**	**Potentiometer**
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 µA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]
Connection diagrams			
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU		

Draw wire mechanics with encoder or analogue sensor | Draw wire encoder C120 | Measuring length max. 6 m Traverse speed max. 10 m/s

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	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.

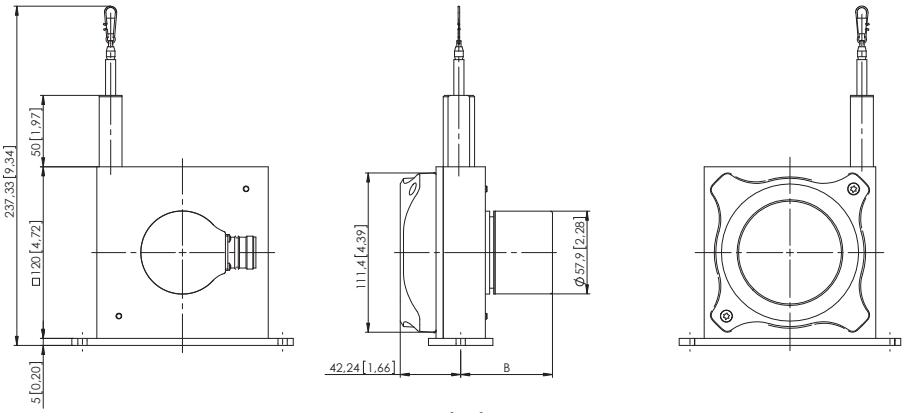
Connector (analogue output)

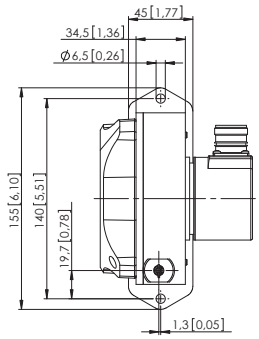


Dimensions

Dimensions in mm [inch]

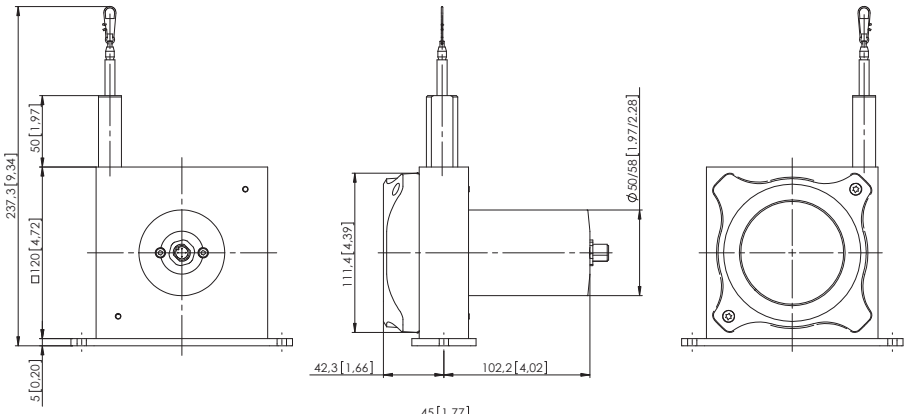
Draw wire mechanics with encoder

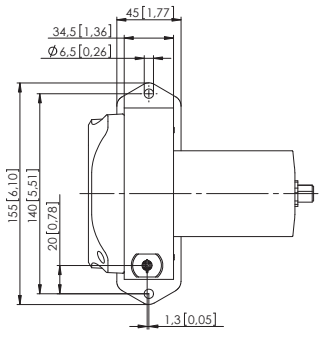




Dimension **B** depends on the encoder used	
Encoder	**B**
Sendix incremental (5000) D8.4C1.XXXX.00XX.XXXX	54.25 [2.12]
Sendix absolute (5863) D8.4C1.XXXX.63XX.XXXX	66.75 [2.63]
Sendix absolute (5868) D8.4C1.XXXX.68XX.XXXX	93.25 [3.67]

Draw wire mechanics with analogue sensor





Draw wire mechanics with encoder or analogue 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 metres.

This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analogue sensors.

With its compact construction, the D135 suits perfectly all measuring tasks from 8 up to 42.5 metres.

RoHS

Max. acceleration | Long service life | Temperature | High protection level | Reverse polarity protection

Robust

- The titanium-anodised aluminium 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.

Versatile

- High traverse speed and high acceleration.
- Flexible mounting thanks to fastening tabs or fastening grooves.
- Various connection possibilities available.

Order code with encoder

D8.4D1	.	XXXX	.	XX	X	X	.	XXXX
Type		ⓐ		ⓑ	ⓒ	ⓓ		ⓔ

ⓐ *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 incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868

ⓒ *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
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 333.33 mm (357.14 mm for the 8 000 mm measuring range)

Pulses / revolution	500	2000
Pulses / mm	1.5 (1.4)	6 (5.6)
Resolution (mm)	~ 0.66 (0.71)	~ 0.17 (0.18)

Standard res. for draw wire with absolute encoder Sendix F5863 or F5868 – 5863 or 5868, drum circumference 333.33 mm (357.14 mm for the 8 000 mm measuring range)

Absolute encoder	F5863 / 5863	F5868 / 5868
Pulses / revolution	2048 / 11 bit	4096, programmable via the bus / 12 bit
Pulses / mm	6.14 (5.73)	12.28 (11.47)
Resolution (mm)	~ 0.16 (0.17)	~ 0.08 (0.09)

Recommended standard devices

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Options
D8.4D1.XXXX.0054.2000	Sendix 5000 (8.5000.8354.2000)	PushPull with inv. signal	10 ... 30 V DC	1 radial M12 connector	2000 ppr	no option
D8.4D1.XXXX.F324.G123	Sendix F5863 (8.F5863.1224.G123)	SSI	10 ... 30 V DC	1 radial M23 connector	SSI-Gray-Code	Set button + Status LED
D8.4D1.XXXX.6324.G123	Sendix 5863 (8.5863.1224.G123)	SSI	10 ... 30 V DC	1 radial M23 connector	SSI-Gray-Code	Set button + Status LED
D8.4D1.XXXX.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 radial M12 connector	CANopen encoder profile DS406 V3.2	Set button
D8.4D1.XXXX.6822.2123	Sendix 5868 (8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 radial M12 connector	CANopen encoder profile DS406 V3.2	Set button
D8.4D1.XXXX.6832.3113	Sendix 5868 (8.5868.1232.3113)	Profibus	10 ... 30 V DC	3 radial M12 connector	PROFIBUS DP V0 encoder profile Class 2	Set button
D8.4D1.XXXX.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 radial M12 connector	EtherCAT with CoE 3.2.10	no option
D8.4D1.XXXX.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	Profinet	10 ... 30 V DC	3 radial M12 connector	PROFINET encoder profile version 4.1	no option

Draw wire mechanics with encoder or analogue sensor | **Draw wire encoder D135** | **Measuring length max. 42.5 m, Traverse speed max. 5 m/s**

Order code with analogue sensor

D8.3D1	.	XXXX	.	XXX	X	.	0000
Type		ⓐ		ⓑ	ⓒ		

ⓐ *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

ⓑ *Analogue 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*

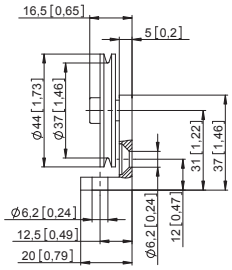
1 = axial cable, 2 m [6.56'] PVC
3 = M12 connector, 4-pin

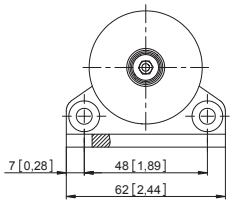
Optional on request

- Other measuring ranges
- Cable diameter 1 mm
- Ring eye instead of cable clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Increased linearity

Guide pulley for draw wire encoder

Order no.





Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analogue sensor

		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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	analogue output encoder	±0.1 % (of the measuring range) ±0.05 % (of the measuring range)				
Weight		depending on the measuring and the sensor/encoder used				
Material	housing wire	titanium-anodised aluminium 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)				

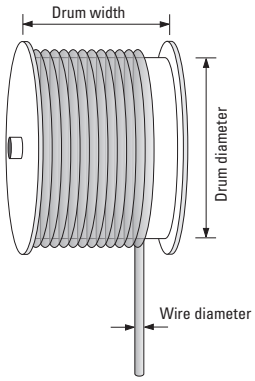
Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

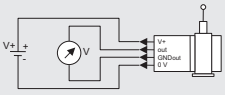
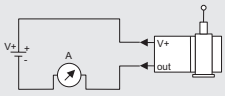
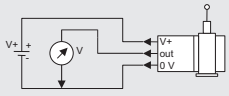
Operating principle

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.



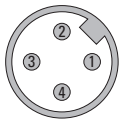
Draw wire mechanics with encoder or analogue sensor | **Draw wire encoder D135** | **Measuring length max. 42.5 m Traverse speed max. 5 m/s**

Electrical characteristics (analogue output)			
Analogue 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]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]
Connection diagrams			
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU		

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	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.

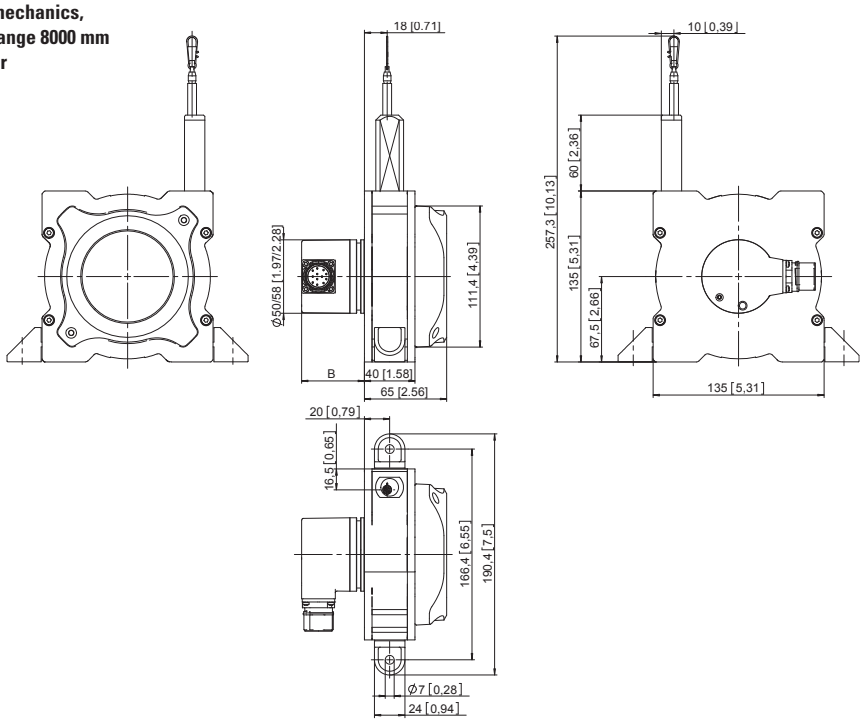
Connector (analogue output)



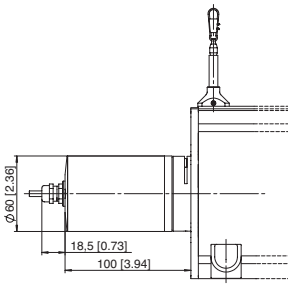
Dimensions

Dimensions in mm [inch]

Draw wire mechanics, measuring range 8000 mm with encoder



with analogue output



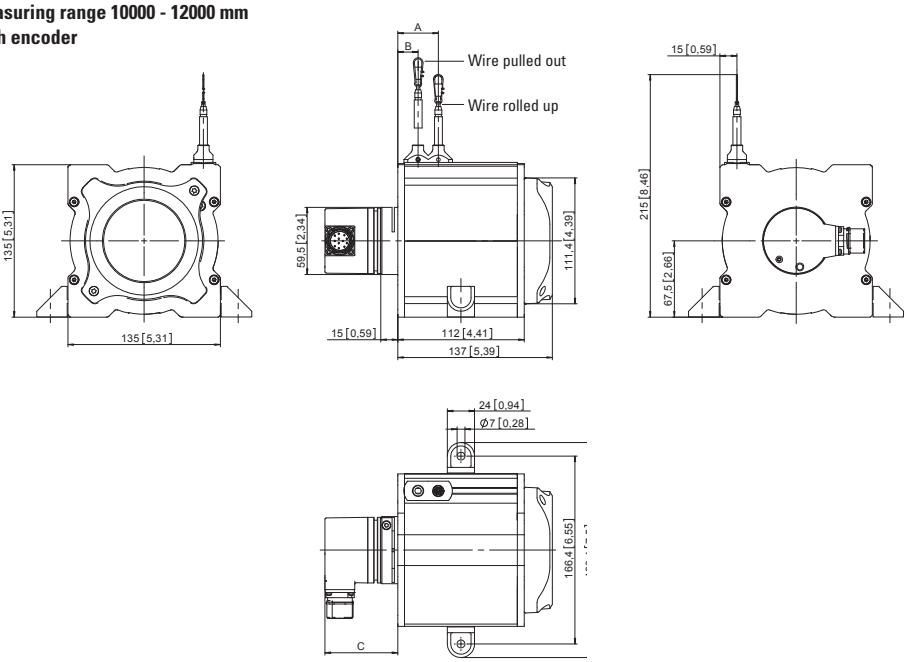
Dimension **B** depends on the encoder used		
Encoder		**B**
Sendix incremental (5000)	D8.4D1.XXXX.00XX.XXXX	37.00 [1.46]
Sendix absolute (5863)	D8.4D1.XXXX.63XX.XXXX	49.50 [1.95]
Sendix absolute (5868)	D8.4D1.XXXX.68XX.XXXX	76.00 [2.99]

Draw wire mechanics with encoder or analogue sensor | **Draw wire encoder D135** | **Measuring length max. 42.5 m Traverse speed max. 5 m/s**

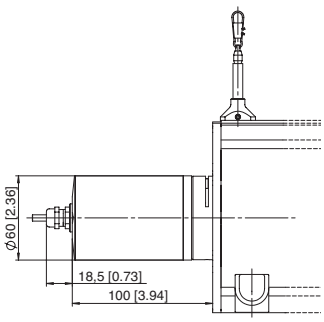
Dimensions

Dimensions in mm [inch]

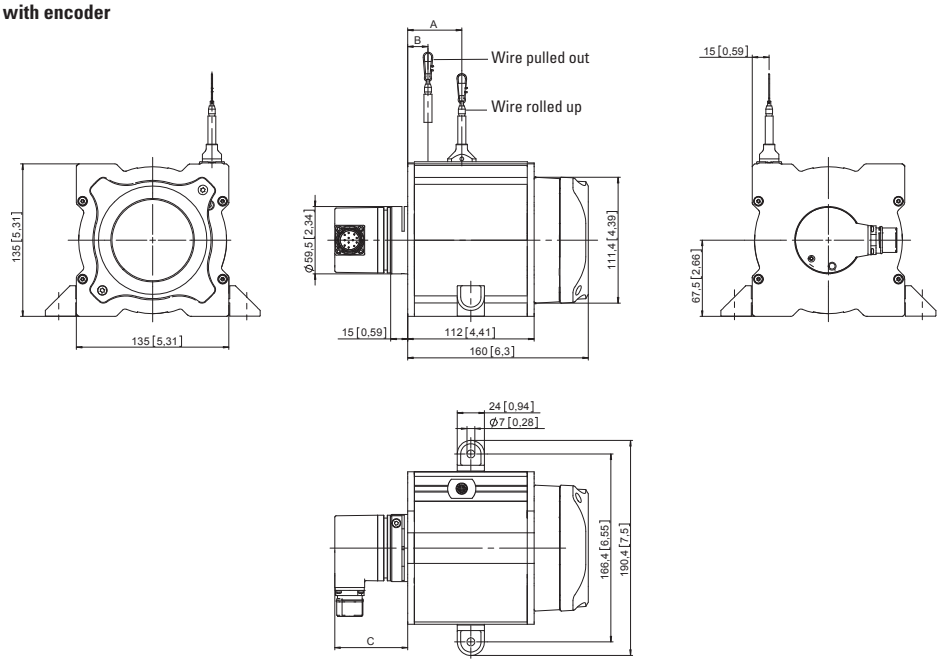
Draw wire mechanics, measuring range 10000 - 12000 mm with encoder



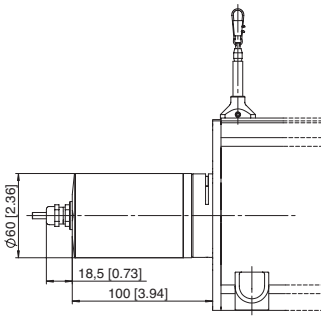
with analogue output



Draw wire mechanics, measuring range 15000 - 20000 mm with encoder



with analogue output



Dimension **C** depends on the encoder used		
Encoder		**C**
Sendix incremental (5000)	D8.4D1.XXXX.00XX.XXXX	37.00 [1.46]
Sendix absolute (5863)	D8.4D1.XXXX.63XX.XXXX	49.50 [1.95]
Sendix absolute (5868)	D8.4D1.XXXX.68XX.XXXX	76.00 [2.99]

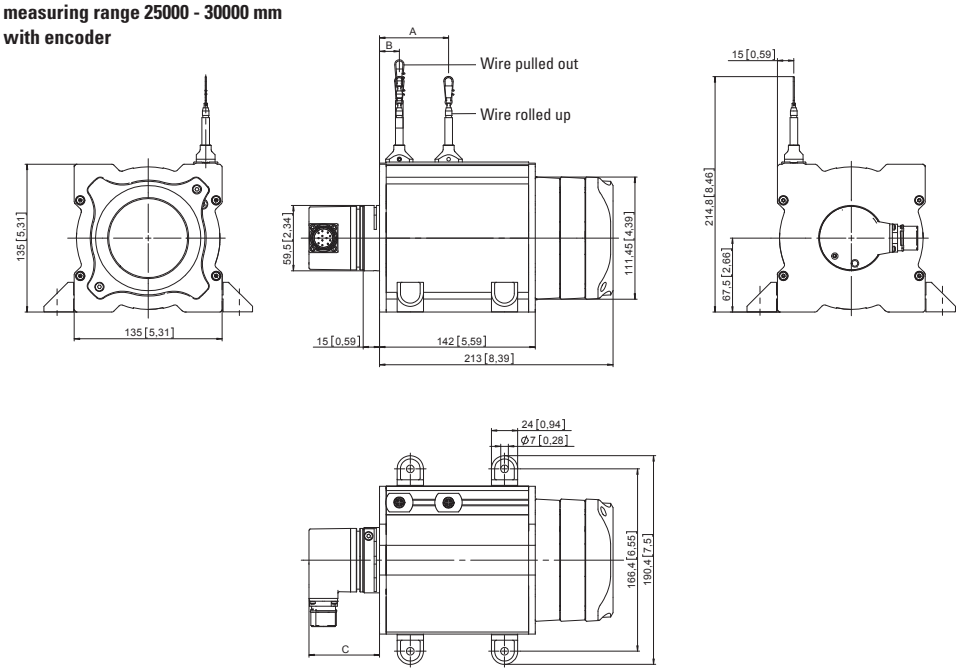
Measuring range	**A** - Wire rolled up	**B** - Wire pulled out
10000 mm	33 [1.30]	18 [0.71]
12000 mm	36 [1.42]	18 [0.71]
15000 mm	41 [1.61]	18 [0.71]
20000 mm	48 [1.89]	18 [0.71]

Draw wire mechanics with encoder or analogue sensor | **Draw wire encoder D135** | **Measuring length max. 42.5 m Traverse speed max. 5 m/s**

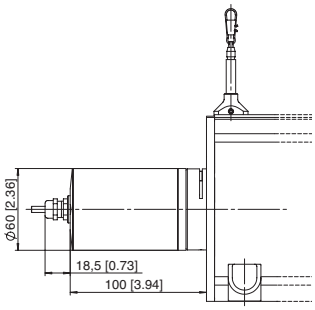
Dimensions

Dimensions in mm [inch]

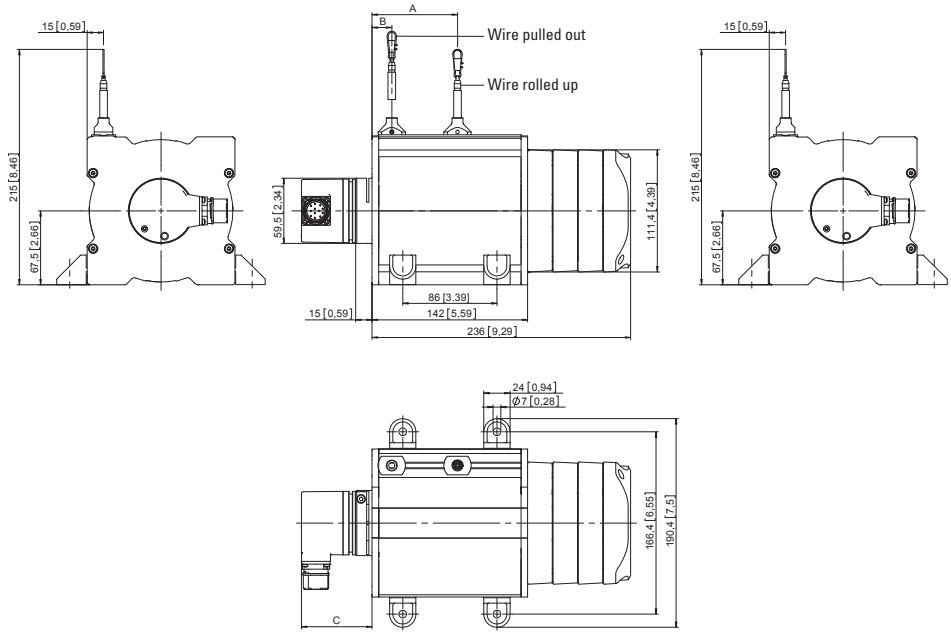
Draw wire mechanics, measuring range 25000 - 30000 mm with encoder



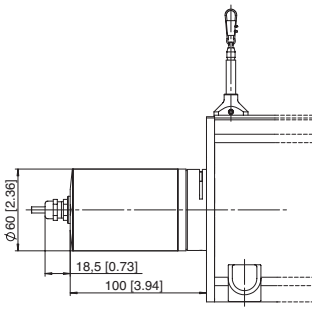
with analogue output



Draw wire mechanics, measuring range 35000 - 42500 mm with encoder



with analogue output



Dimension **C** depends on the encoder used		
Encoder		**C**
Sendix incremental (5000)	D8.4D1.XXXX.00XX.XXXX	37.00 [1.46]
Sendix absolute (5863)	D8.4D1.XXXX.63XX.XXXX	49.50 [1.95]
Sendix absolute (5868)	D8.4D1.XXXX.68XX.XXXX	76.00 [2.99]

Measuring range	**A** - Wire rolled up	**B** - Wire pulled out
25000 mm	56 [2.20]	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]

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:

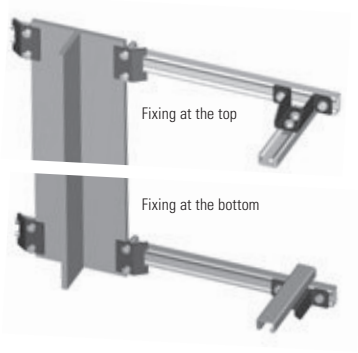
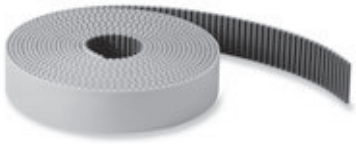
- Incremental encoder: 8.5000.83XX.XXXX
  calculation of pulse rate ppr =

$$\frac{300\ \text{mm}}{\text{resolution, e.g. } 0.5\ \text{mm}} = 600$$

- Absolute encoders:
  SSI: 8.5863.12XX.XXXX
  CANopen / CANopenLift: 8.5868.12XX.XXXX

Elevator measuring system for shaft-copying | Encoder mounting fixture, guided-belt, LM3 | max. height 53 m

Accessories for encoder mounting fixture LM3

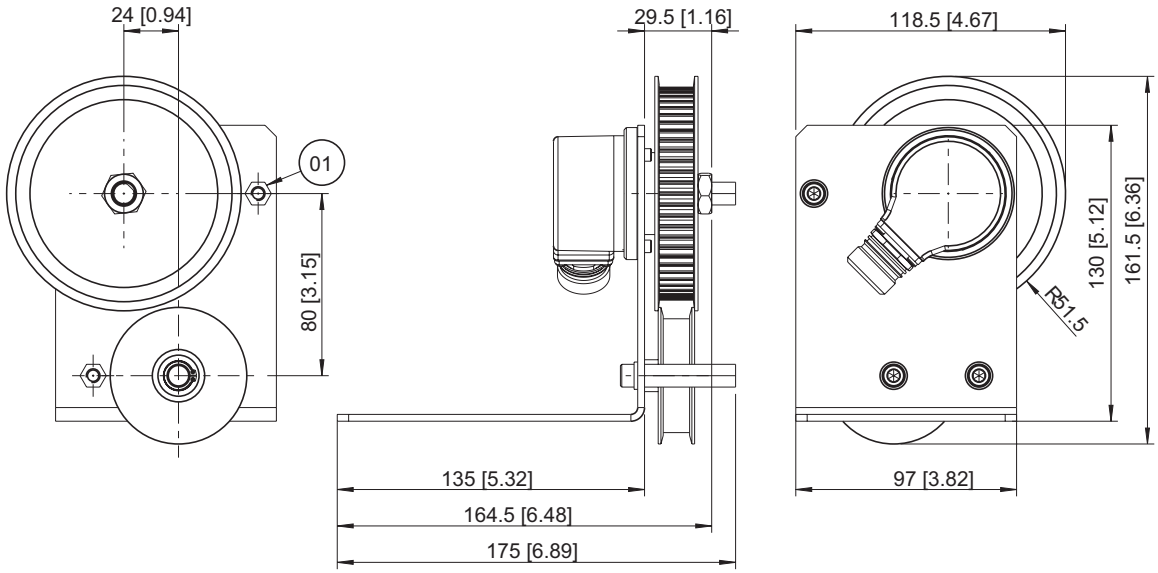
		Order no.
Fixing kit 	Complete kit consists of: - C-rails, 700 mm - Bracket - Screws - Other small components	**8.BLM2.01**
Toothed belt 	- Width 10 mm - Polyurethane, with single parallel steel cords - Low belt-stretch - High resistance to abrasive wear - Resistant to the effects of UV radiation - Maintenance-free - 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 metres 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]



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

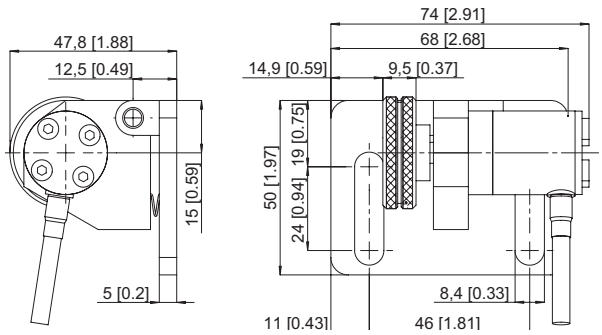
Cable outlet
radial cable, 2 m [6.56'] PVC

ⓐ *Measuring wheel*
45 = knurled aluminium
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]



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.

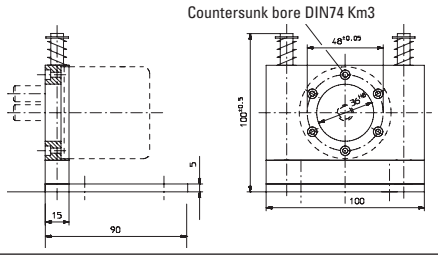
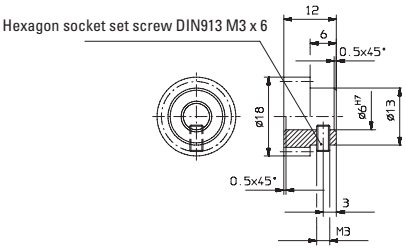
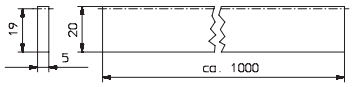
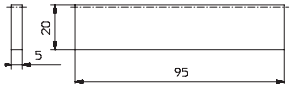
The holding device for the encoder (8.0010.7000.0004) is a movable support for encoders, to the shaft of which, for instance, a measuring wheel or pinion can be attached. Due to the fact that it is movable, optimum contact pressure is ensured and overload on the bearings of the encoder prevented.

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.

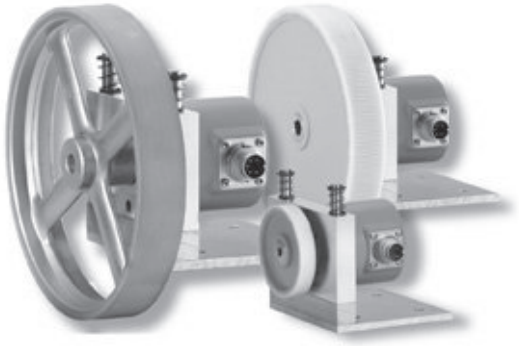
The absolute accuracy is 0.5 mm per meter. The resolution / repetition accuracy is 0.1 mm. Holding device, rack and pinion are available as a set for the purpose of displacement measurement (8.0010.7000.0005).

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		716 LED preset counter, 100 ... 240 V AC, 1 preset 923 LCD preset counter 100 ... 240 V AC, 1 preset	**6.716.010.000** **6.923.0100.000**

Length measuring kits with measuring wheel | **Measuring wheelsystem incl. encoder / preset counter** | **Incremental / absolute**



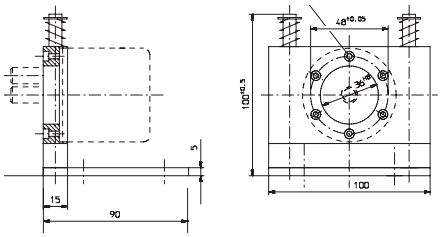
The (metric) measuring kit is a complete solution for the quick and simple implementation of length measurements on products in movement.

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 Countersunk bore DIN74 Km3  	**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	716 LED preset counter, 100 ... 240 V AC, 1 preset	**6.716.010.000**

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

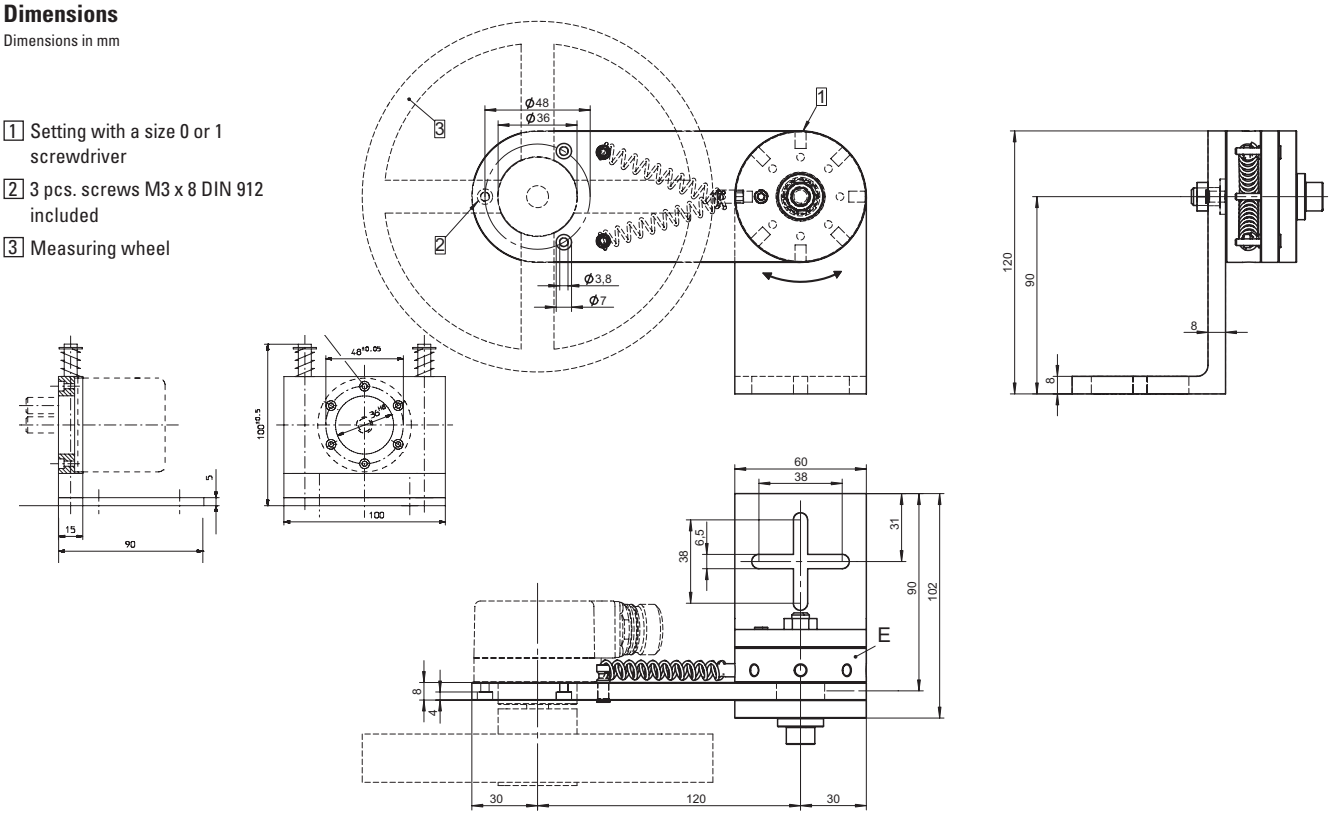
Dimensions

Dimensions in mm

1 Setting with a size 0 or 1 screwdriver

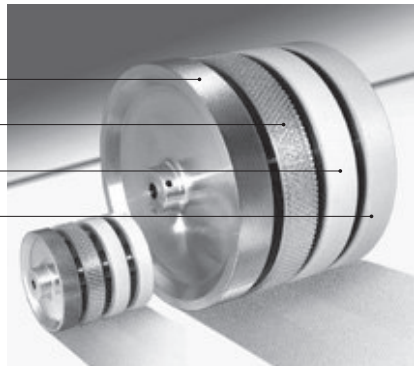
2 3 pcs. screws M3 x 8 DIN 912 included

3 Measuring wheel



Length measuring kits measuring wheels

Various wheel coatings



Measuring wheels for measuring the length of products in movement, e.g. in the paper, metal, textile, wood or plastic industry.

Various tyres 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 (a)	.	00	XX (b)

Measuring wheel Circumference / ø / width	Profile measuring wheels (s.o.)	Coating	Coating hardness Shore A	*Wheel no.* (a)	Weight	*Standard bore* (b) 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 (aluminium)		**217**	60 g [2.12 oz]	**06** = 6 mm [0.24"] **10** = 10 mm [0.39"]	aluminium	-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 (aluminium)		**517**	775 g [27.34 oz]	**10** = 10 mm [0.39"]	aluminium	-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"]	aluminium	-30°C ... +80°C [-22°F ... +176°F]

1) Other bore diameters on request

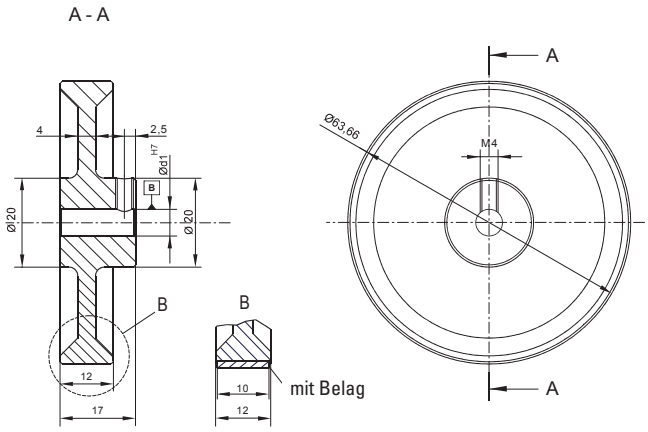
Length measuring kits measuring wheels

Various wheel coatings

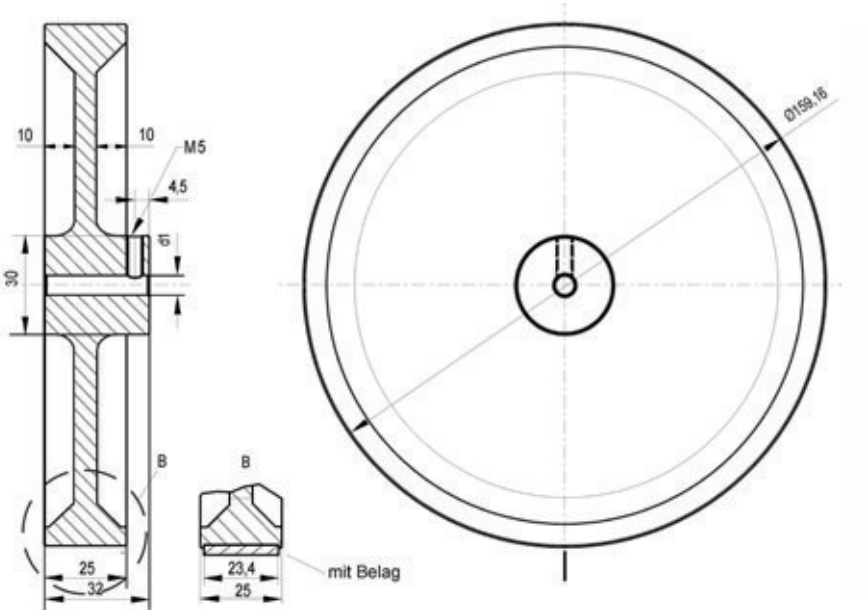
Dimensions

Dimensions in mm [inch]

Measuring wheel no. 2XX



Measuring wheel no. 5XX




www.kuebler.com

Inclinometers

		Type	Interface	Page
Inclinometers	new	IS40, 1-dimensional	Analogue	**438**
MEMS, capacitive		IS40, 2-dimensional	Analogue	**440**
	new	IS60, 1-dimensional	CANopen	**442**
		IS60, 2-dimensional	CANopen	**444**

Inclinometer MEMS / capacitive | IS40, 1-dimensional | Analogue

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.

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

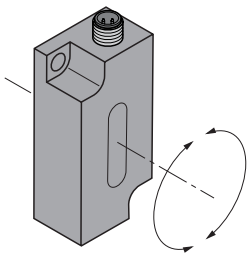
e *Type of connection*
1 = M12 connector

Accessories		Order no.
Teach adapter	for inductive encoders, linear position, angle and ultrasonic sensors	**05.TX40.1**

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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°

Inclinometer
MEMS / capacitive | **IS40, 1-dimensional** | **Analogue**

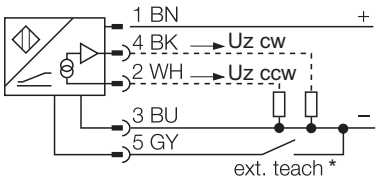
Technical data

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"]

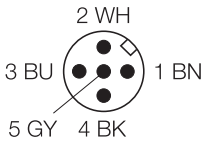
Interface characteristics	
Voltage output	0.1 ... 4.9 V DC short-circuit protected to +V
Load resistance voltage output	≥ 40 kΩ
Output impedance voltage output	99 ... 105 Ω
Current output	4 ... 20 mA
Load resistance current output	≤ 200 Ω

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 2004/108/EC RoHS guideline 2011/65/EU

Connections



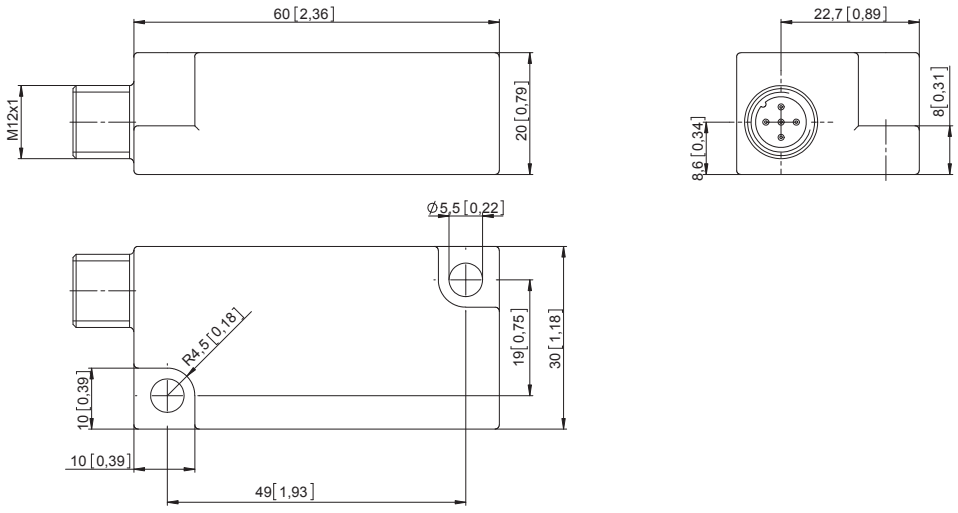
Terminal assignment



*) Teach adapter, accessory (Order no. 05.TX40.1)

Dimensions

Dimensions in mm [inch]



Inclinometer MEMS / capacitive | IS40, 2-dimensional | Analogue

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]

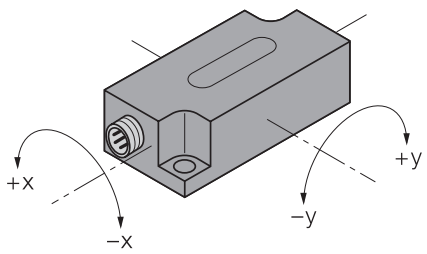
d *Power supply*
1 = 5 V DC
2 = 10 ... 30 V DC

e *Type of connection*
1 = M12 connector

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling	**8.0000.5116.0000**
Cordset, pre-assembled	M12 female connector with coupling, 2 m [6.56'] PVC cable	**05.00.6081.2211.002M**

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) Availablenly only in combination with power supply 10 ... 30 V DC
2) In relation to the power supply 5 V DC (Availablenly only in combination with power supply 5 V DC)

Inclinometer
MEMS / capacitive | **IS40, 2-dimensional** | **Analogue**

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"]

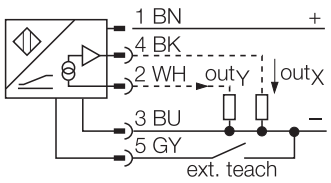
Interface characteristics

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

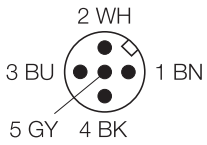
Power supply		5 V DC ±0.25 V or 10 ... 30 V DC (depending on version)
Power consumption (no load)		≤ 20 mA
Reverse polarity protection		yes
Measuring axes		2 (x/y)
Measuring range		±10°, ±45°, ±60°
Resolution	for version ±10° for version ±45° for version ±60°	≤ 0.05° ≤ 0.1° ≤ 0.15°
Repeat accuracy		≤ 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 2004/108/EC RoHS guideline 2011/65/EU

Connections



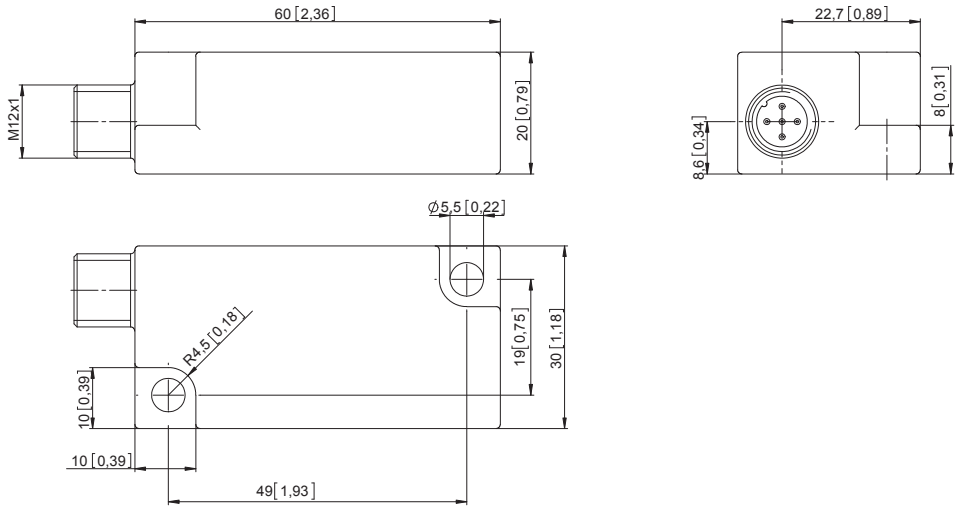
ext. teach: if this input is connected to 0 V, then the output of the inclinometer is reset to 0°.

Terminal assignment



Dimensions

Dimensions in mm [inch]



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 standardised CANopen interface, which enables easy configuration and start-up. All the parameters are stored in the internal permanent memory.

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	.	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*
1 = 1-dimensional

b *Measuring range*
4 = 360°

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.
Connector, self-assembly (straight)	M12 female connector with coupling, Bus in	**05.B-8151-0/9**
	M12 male connector with external thread, Bus out	**05.BS-8151-0/9**
Cordset, pre-assembled	M12 female connector with coupling, 6 m [19.69'] PVC cable, Bus in	**05.00.6021.2211.006M**
	M12 male connector with external thread, 6 m [19.69'] PVC cable, Bus out	**05.00.6021.2411.006M**

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

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), 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

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 2004/108/EC RoHS guideline 2011/65/EU

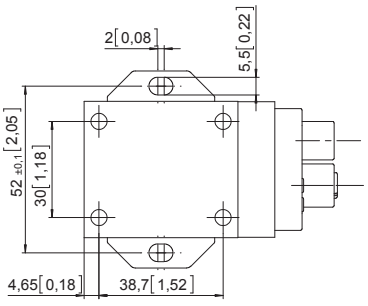
A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

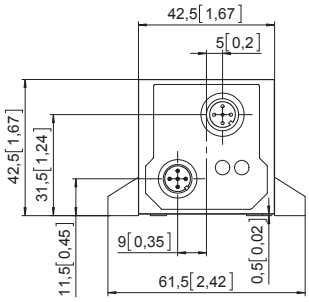
Terminal assignment

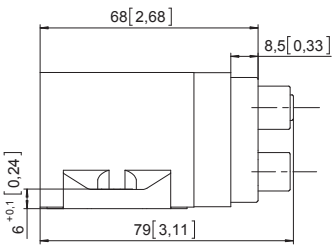
PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Supply voltage (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L-Bus cable

Dimensions

Dimensions in mm [inch]







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 standardised 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 parameterising.

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

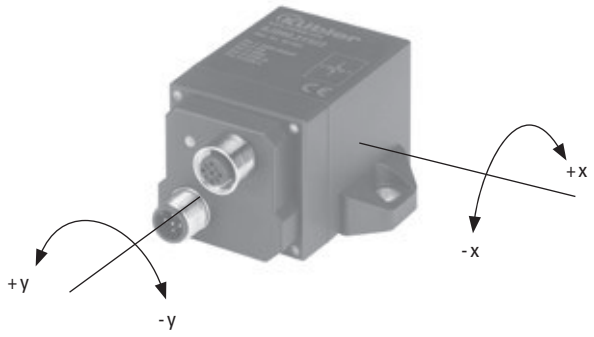
d *Power supply*
2 = 10 ... 30 V DC

e *Type of connection*
3 = 2 x M12 connector

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling, Bus in	**05.B-8151-0/9**
	M12 male connector with external thread, Bus out	**05.BS-8151-0/9**
Cordset, pre-assembled	M12 female connector with coupling, 6 m [19.69'] PVC cable, Bus in	**05.00.6021.2211.006M**
	M12 male connector with external thread, 6 m [19.69'] PVC cable, Bus out	**05.00.6021.2411.006M**

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



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 2004/108/EC RoHS guideline 2011/65/EU

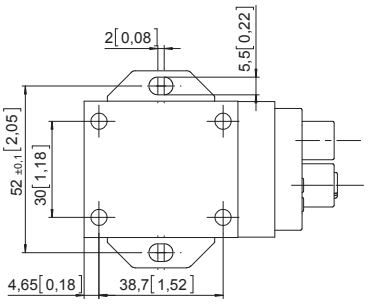
A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

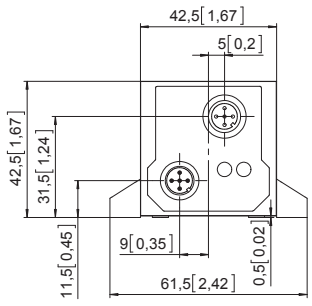
Terminal assignment

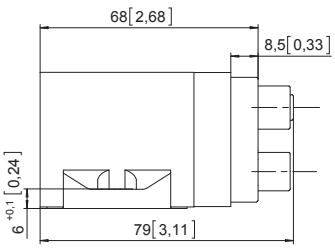
PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Power supply (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L Bus cable

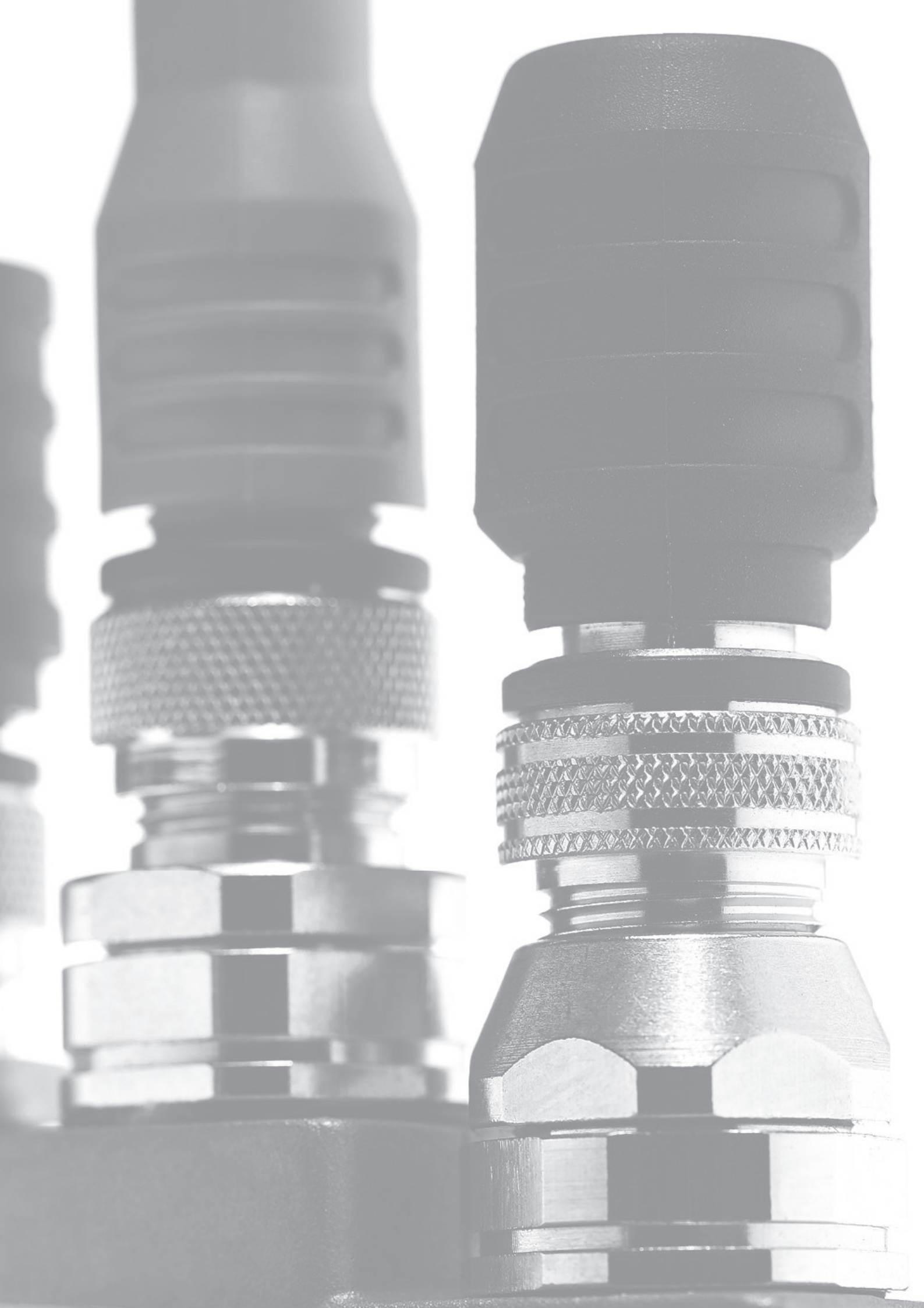
Dimensions

Dimensions in mm [inch]









Connection technology

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:	**8.0000.6300.XXXX** 1)
	Permanent working temperature range flexible installation	-5°C ... +70°C [+23°F ... +158°F]	incremental encoders without inversions	
	secure installation	-30°C ... +70°C [-22°F ... +158°F]		
	Bending radius flexible installation	min. 70 mm [2.76"]		
	secure installation	min. 45 mm [1.77"]		
	Cable diameter	approx. 4.7 mm ±0.2 mm		
TPE electronic trailing cable halogen-free, silicon-free 	**Cross section**	5 x 0.75 mm² [AWG18]	suitable for:	**8.0000.6600.XXXX** 1)
	Permanent working temperature range flexible installation	-35°C ... +100°C [-31°F ... +212°F]	H100 with speed switch, robust incremental encoders without inversions	
	secure installation	-40°C ... +100°C [-40°F ... +212°F]		
	Bending radius flexible installation	min. 40 mm [1.57"]		
	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:	**8.0000.6P00.XXXX** 1)
	Permanent working temperature range flexible installation	-20°C ... +90°C [-4°F ... +194°F]	Limes, 365X, 368X SSI and analogue Safety-M	
	secure installation	-40°C ... +90°C [-40°F ... +194°F]		
	Bending radius flexible installation	min. 65 mm [2.56"]		
	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:	**8.0000.6F00.XXXX** 1)
	Permanent working temperature range flexible installation	-40°C ... +90°C [-40°F ... +194°F]	Limes, 365X, 368X SSI and analogue Safety-M	
	secure installation	-50°C ... +90°C [-58°F ... +194°F]		
	Bending radius flexible installation	min. 111 mm [4.37"]		
	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:	**8.0000.6400.XXXX** 1)
	Permanent working temperature range flexible installation	-40°C ... +90°C [-40°F ... +194°F]	H100, H120 LA10 , LA50 Safety-M	
	secure installation	-50°C ... +90°C [-58°F ... +194°F]		
	Bending radius flexible installation	min. 95 mm [3.74"]		
	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)

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	-30°C ... +80°C [-22°F ... +176°F]	robust incremental encoders	
	Permanent working temperature range secure installation	-50°C ... +90°C [-58°F ... +194°F]		
	Bending radius flexible installation	min. 50 mm [1.97“]		
	Bending radius secure installation	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	-10°C ... +90°C [+14°F ... +194°F]	incremental encoders standard cable	
	Permanent working temperature range secure installation	-30°C ... +90°C [-22°F ... +194°F]		
	Bending radius flexible installation	min. 100 mm [3.94“]		
	Bending radius secure installation	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	-30°C ... +90°C [-22°F ... +194°F]	robust incremental encoders LA10	
	Permanent working temperature range secure installation	-40°C ... +90°C [-40°F ... +194°F]		
	Bending radius flexible installation	min. 90 mm [3.54“]		
	Bending radius secure installation	min. 40 mm [1.57“]		
	Cable diameter	approx. 7.5 mm ±0.2 mm		
TPE 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	-25°C ... +110°C [-13°F ... +230°F]		
	Permanent working temperature range secure installation	-40°C ... +135°C [-40°F ... +275°F]		
	Bending radius flexible installation	min. 90 mm [3.54“]		
	Bending radius secure installation	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	-5°C ... +70°C [+23°F ... +158°F]	absolute encoders with SSI or 4 ... 20 mA analogue output, twisted pair conductors	
	Permanent working temperature range secure installation	-30°C ... +80°C [-22°F ... +176°F]		
	Bending radius flexible installation	min. 110 mm [4.33“]		
	Bending radius secure installation	min. 75 mm [2.95“]		
	Cable diameter	approx. 7.3 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	-5°C ... +70°C [+23°F ... +158°F]	absolute encoders with parallel output, twisted pair conductors	
	Permanent working temperature range secure installation	-30°C ... +80°C [-22°F ... +176°F]		
	Bending radius flexible installation	min. 120 mm [4.72“]		
	Bending radius secure installation	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)

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 BM31, 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, Safety-M BM11
	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 fieldbus encoders, Safety-M BM21, 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 BMB1 and BMC1, 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)

M12 connection technology | Connectors, self-assembly

4 pin

Order no.

Female connector with coupling nut
A coded, straight
power supply

screw connections,
for cable ø 4 ... 6 mm [0.16 ... 0.24“]

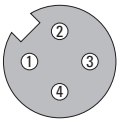
suitable for our series:

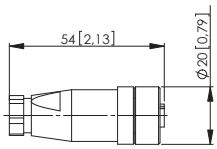
EMIO.SIO.10xP

5858 / 5878
5868 / 5888
9080

05.B8141-0

Housing: plastic, IP67





Female connector with coupling nut
A coded, right-angle
power supply

screw connections,
for cable ø 4 ... 6 mm [0.16 ... 0.24“]

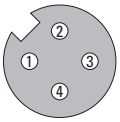
suitable for our series:

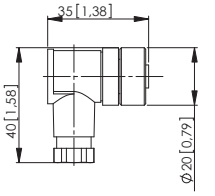
EMIO.SIO.10xP

5858 / 5878
5868 / 5888
9080

05.B8241-0

Housing: plastic, IP67





Male connector with external thread
A coded, straight
power supply

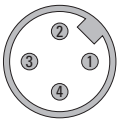
screw connections,
for cable ø 4 ... 6 mm [0.16 ... 0.24“]

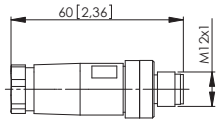
suitable for:

versions with
cable outlet

05.BS8141-0

Housing: metal / plastic, IP67





Male connector with external thread
D coded, straight

screw connections,
for cable ø 4 ... 9 mm [0.16 ... 0.35“]

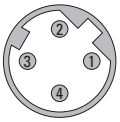
suitable for our series:

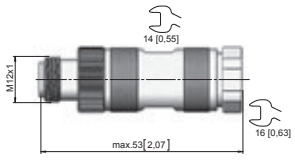
5858 / 5878
5868 / 5888

EtherCAT Conformance tested
PROFINET

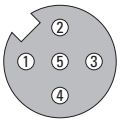
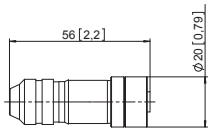
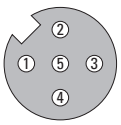
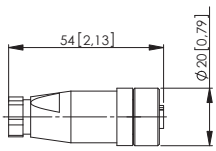
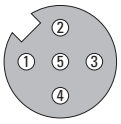
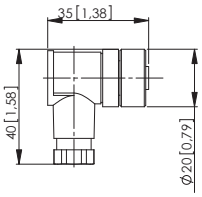
05.WASCSY4S

Housing: metal, IP67

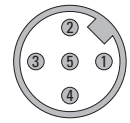
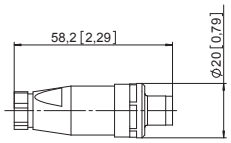
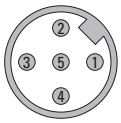
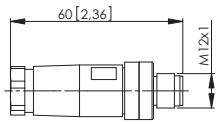
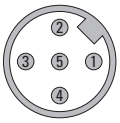
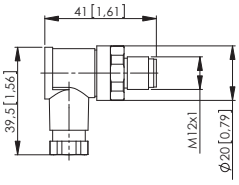




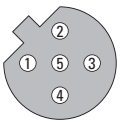
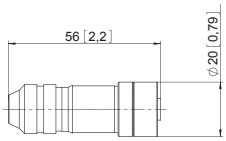
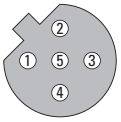
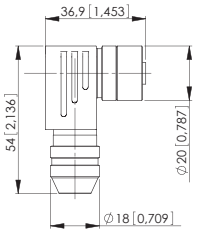
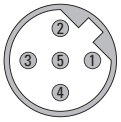
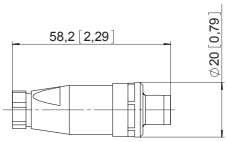
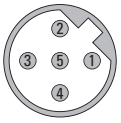
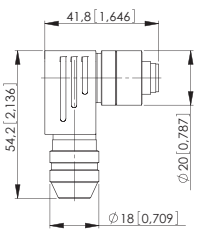
M12 connection technology | Connectors, self-assembly

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 3651 / 3671 F3658 / F3658 F3668 / F3688 M3658 / M3678 M3668 / M3688 M3668R / M3688R F5868 / F5888 5858 / 5878 5868 / 5888 9080 IS60 CANopen DeviceNet.	**8.0000.5116.0000**
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 3651 / 3671 9080 IS60 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 3651 / 3671 9080 IS60 DeviceNet.	**05.B-8251-0/9**

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 F3668 / F3688 M3658 / M3678 M3668 / M3688 M3668R / M3688R F5868 / F5888 5858 / 5878 5868 / 5888 9080 IS60 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 DeviceNet EMIO.SIO.10xP	**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 DeviceNet	**05.BS-8251-0/9**

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 PROFIBUS	**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 PROFIBUS	**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 PROFIBUS	**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 PROFIBUS	**05.BMSWS 8251-8.5**

M12 connection technology | Connectors, self-assembly

8 pin

Order no.

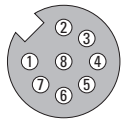
Female connector with coupling nut
A coded, straight

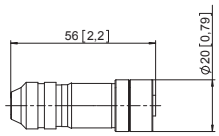
screw connections,
for cable ø 6 ... 8 mm [0.24 ... 0.32"]

suitable for our series:

3610 / 3620	5821
F3653 / F3673	5814 / 5834
F3663 / F3683	5853 / 5873
5000 / 5020	5863 / 5883
5006 / 5026	58x4FSx
A020 / A02H	5876

Housing: metal, IP67





Order no.: 05.CMB 8181-0

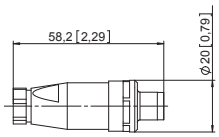
Male connector with external thread
A coded, straight

screw connections,
for cable ø 6 ... 8 mm [0.24 ... 0.32"]

suitable for:

versions with cable outlet

Housing: metal, IP67



Order no.: 05.CMBS 8181-0

12 pin

Order no.

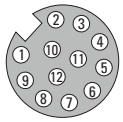
Female connector with coupling nut
A coded, straight

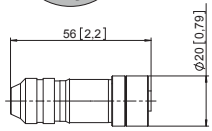
screw connections,
for cable ø 6 ... 8 mm [0.24 ... 0.32"]

suitable for:

LA10

Housing: metal, IP67





Order no.: 8.0000.5162.0000

M12 connection technology — Connectors, self-assembly

Accessories

Order no.

Securing clip for M12 connectors — **8.0000.5000.0006**

against accidental disconnection under load

Material: plastic

working temperature range
-25°C ... +90°C [-13°F ... +194°F]

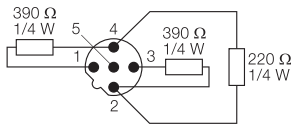
Terminating resistor
Male connector with external thread
B coded, straight — **05.RSS4.5-PDP-TR**

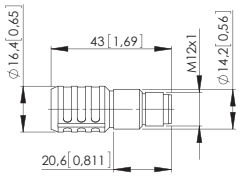
Housing: metal / plastic, IP67

suitable for our series:

5858 / 5878
5868 / 5888
9080

PROFIBUS





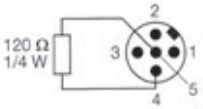
Terminating resistor
Male connector with external thread
A coded, straight — **05.RSE 57 TR2**

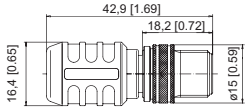
Housing: metal / plastic, IP67

suitable for our series:

F5868 / F5888
5858 / 5878
5868 / 5888
9080

CANopen
DeviceNet





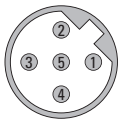
M12 lead-through
B coded, straight — **05.FKW-FSW45/M12**

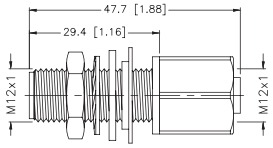
Housing: metal, IP67

suitable for our series:

5858 / 5878
5868 / 5888
9080

PROFIBUS





T-junction
A coded, 5 pin — **05.FKM5-FKM5-FSM5**

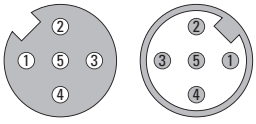
2 x female connector with coupling nut
1 x male connector with external thread

Housing: metal / plastic, IP67

suitable for:

M12 connectors

CANopen
DeviceNet



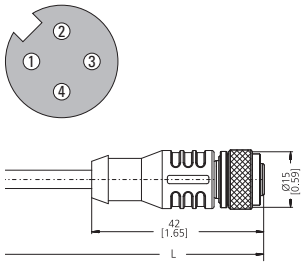
M12 connection technology | Cordsets, pre-assembled

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



suitable for our series:

EMIO.SIO.10xP

5858 / 5878
5868 / 5888
9080

Terminal assignment

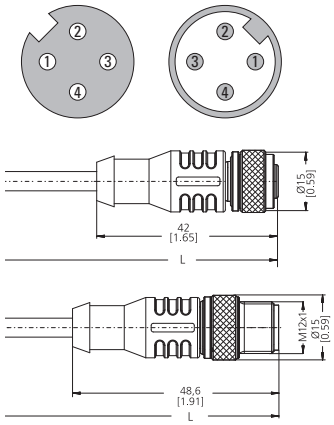
Pin female contacts:	1	2	3	4
Wire colour:	BN	WH	BU	BK

Cable length [1]

2 m [6.56']	**05.00.6061.6211.002M**
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**

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]

2 m [6.56']	**05.00.6061.6462.002M**
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**

1) Other cable lengths on request.

M12 connection technology | Cordsets, pre-assembled

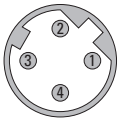
With connector, 4 pin

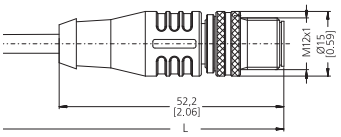
Working temp. -30°C ... +80°C [-22°F ... +176°F]

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

EtherCAT Conformance tested
PROFINET

Terminal assignment

Pin male contacts:	1	2	3	4
Wire colour:	YE	OG	WH	BU

Cable length [1]	Order no.
2 m [6.56']	**05.00.6031.4411.002M**
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**

1) Other cable lengths on request.

M12 connection technology — Cordsets, pre-assembled

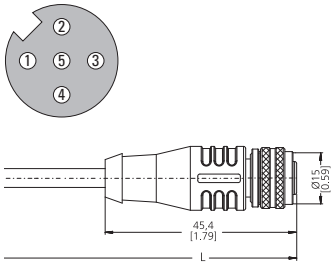
With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + single-ended
A coded, straight

Cable: PVC, 5 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67

suitable for our series:
A50, B80, C120, D135
IS40



Terminal assignment

Pin female contacts:	1	2	3	4	5	PH [2]
Wire colour:	BN	WH	BU	BK	GY	PH [2]

Cable length [1]

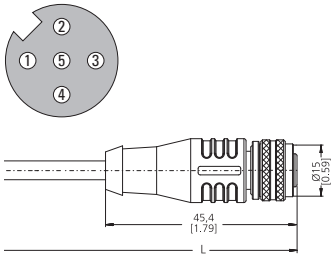
2 m [6.56']	**05.00.6081.2211.002M**
5 m [16.40']	**05.00.6081.2211.005M**
10 m [32.81']	**05.00.6081.2211.010M**
15 m [49.21']	**05.00.6081.2211.015M**

Female connector with coupling nut + single-ended
A coded, straight

Bus-in

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67

suitable for our series:
9080
IS60
DeviceNet



Terminal assignment

Pin female contacts:	1	2	3	4	5
Wire colour:	⏚ [3]	RD	BK	WH	BU

Cable length [1]

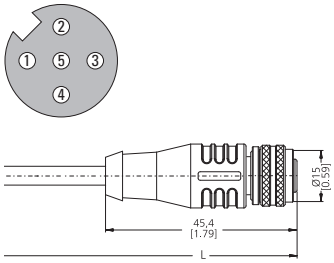
2 m [6.56']	**05.00.6021.2211.002M**
5 m [16.40']	**05.00.6021.2211.005M**
10 m [32.81']	**05.00.6021.2211.010M**
15 m [49.21']	**05.00.6021.2211.015M**

Female connector with coupling nut + single-ended
A coded, straight

Bus-in

Cable: PVC, 3 x 2 x 0.25 mm²
Housing: metal / plastic, IP67

suitable for our series:
M3658 / M3678
F5868 / F5888
5858 / 5878
5868 / 5888
CANopen



Terminal assignment

Pin female contacts:	1	2	3	4	5	PH [2]
Wire colour:	GY	BN	WH	GN	YE	PH [2]

Cable length [1]

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**

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

M12 connection technology | Cordsets, pre-assembled

With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Male connector with external thread + single-ended
A coded, straight

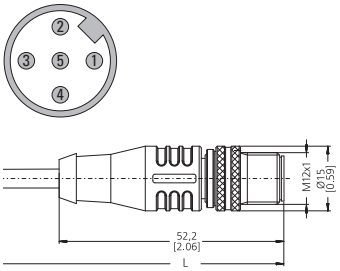
Bus out

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67

suitable for our series:

9080
IS60

DeviceNet



Terminal assignment

Pin male contacts:	1	2	3	4	5
Wire colour:	⏚ 3)	RD	BK	WH	BU

Cable length 1)

	Order no.
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**

Male connector with external thread + single-ended
A coded, straight

Bus out

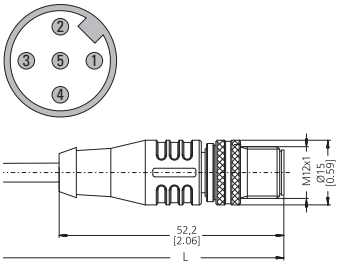
Cable: PVC, 3 x 2 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67

suitable for our series:

EMIO.SIO.10xP

M3658 / M3678
F5868 / F5888
5858 / 5878
5868 / 5888

CANopen



Terminal assignment

Pin male contacts:	1	2	3	4	5	PH 2)
Wire colour:	GY	BN	WH	GN	YE	PH 2)

Cable length 1)

	Order no.
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**

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

M12 connection technology | Cordsets, pre-assembled

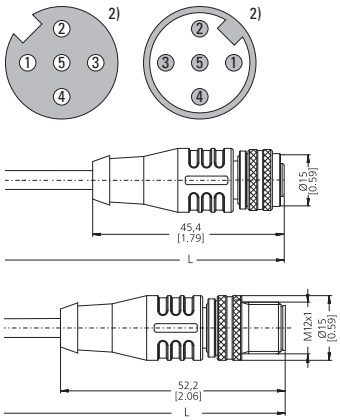
With connector, 5 pin

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

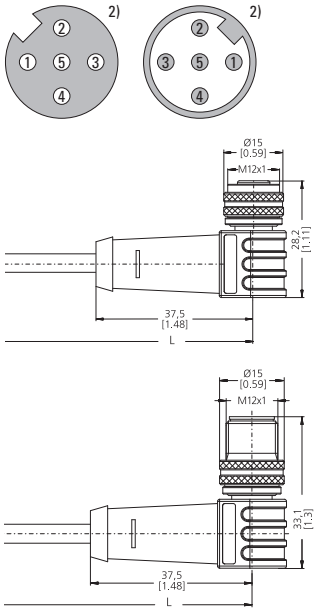
9080 DeviceNet

Cable length 1)	Order no.
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**

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)	Order no.
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**

1) Other cable lengths on request.
2) Shield with pin 1.

M12 connection technology — Cordsets, pre-assembled

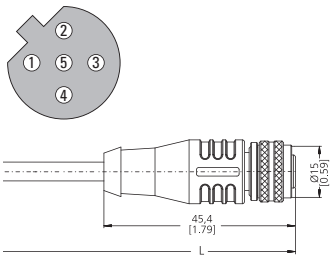
With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] — Order no.

Female connector with coupling nut + single-ended
B coded, straight

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67

Bus in



suitable for our series:

5858 / 5878
5868 / 5888
9080

Terminal assignment

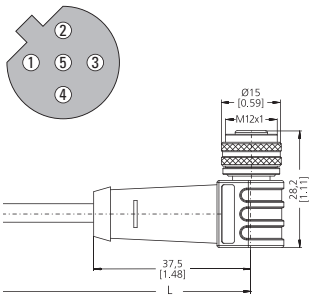
Pin female contacts:	1	2	3	4	5	PH [2]
Wire colour:	n.c.	GN	n.c.	RD	n.c.	PH [2]

Cable length [1]	Order no.
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**

Female connector with coupling nut + single-ended
B coded, right-angle

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67

Bus in



suitable for our series:

5858 / 5878
5868 / 5888
9080

Terminal assignment

Pin female contacts:	1	2	3	4	5	PH [2]
Wire colour:	n.c.	GN	n.c.	RD	n.c.	PH [2]

Cable length [1]	Order no.
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**

1) Other cable lengths on request.
2) Shield on housing.

M12 connection technology | Cordsets, pre-assembled

With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

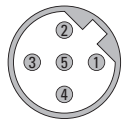
Male connector with external thread + single-ended
B coded, straight

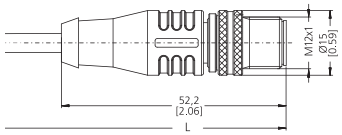
Bus out

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67

suitable for our series:

5858 / 5878
5868 / 5888
9080





Terminal assignment

Pin male contacts:	1	2	3	4	5	PH [2]
Wire colour:	n.c.	GN	n.c.	RD	n.c.	PH [2]

Cable length [1]

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**

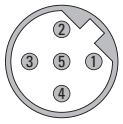
Male connector with external thread + single-ended
B coded, right-angle

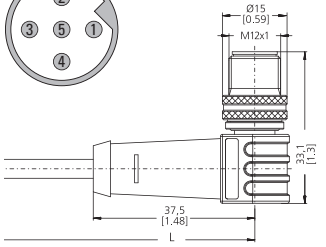
Bus out

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67

suitable for our series:

5858 / 5878
5868 / 5888
9080





Terminal assignment

Pin male contacts:	1	2	3	4	5	PH [2]
Wire colour:	n.c.	GN	n.c.	RD	n.c.	PH [2]

Cable length [1]

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**

1) Other cable lengths on request.
2) Shield on housing.

M12 connection technology | Cordsets, pre-assembled

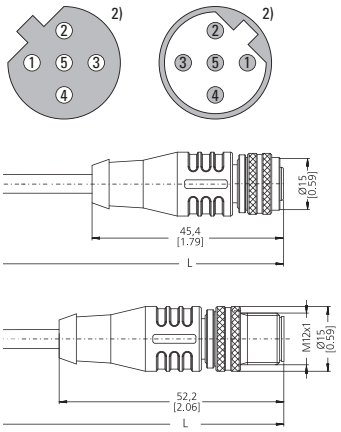
With connector, 5 pin

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

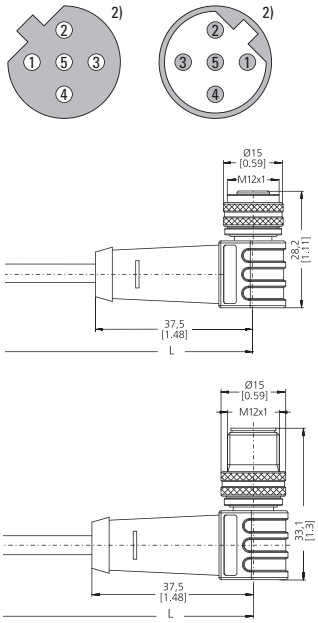
PROFIBUS

Cable length [1]	Order no.
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**

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.
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**

1) Other cable lengths on request.
2) Shield on housing.

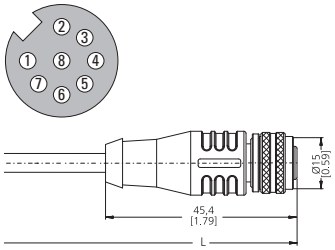
M12 connection technology | Cordsets, pre-assembled

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 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

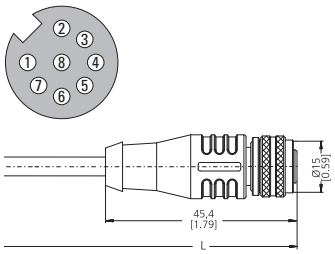
Pin female contacts:	1	2	3	4	5	6	7	8	PH [2]
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	PH [2]

Cable length [1]

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**

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
5876

Terminal assignment

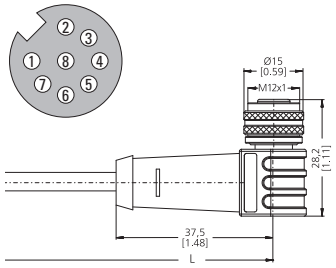
Pin female contacts:	1	2	3	4	5	6	7	8	PH [2]
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	PH [2]

Cable length [1]

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**

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
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 colour:	WH	BN	GN	YE	GY	PK	BU	RD	PH [2]

Cable length [1]

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**

1) Other cable lengths on request.
2) Shield on housing.

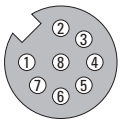
M12 connection technology — Cordsets, pre-assembled

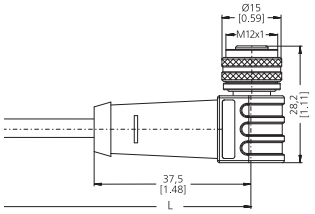
With connector, 8 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] — Order no.

Female connector with coupling nut + single-ended
A coded, right-angle
with integrated control LEDs

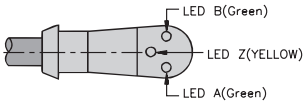
Cable: PVC, 8 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67





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 colour:	WH	BN	YE	GN	PK	GY	RD	BU	PH [2]

Cable length [1]

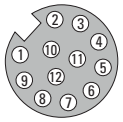
2 m [6.56']	**05.E-WKC 8T-PX3-930-0002**
5 m [16.40']	**05.E-WKC 8T-PX3-930-0005**
10 m [32.81']	**05.E-WKC 8T-PX3-930-0010**
15 m [49.21']	**05.E-WKC 8T-PX3-930-0015**

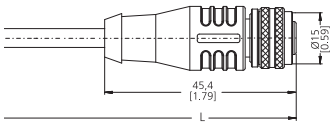
With connector, 12 pin

Working temp. -30°C ... +90°C [-22°F ... +194°F] — Order no.

Female connector with coupling nut + single-ended
A coded, straight

Cable: PUR, 6 x 2 x 0.14 mm²
Housing: metal / plastic, IP67





suitable for our series:

LA10

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	PH [2]

Cable length [1]

2 m [6.56']	**05.00.60B1.B211.002M**
5m [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**

1) Other cable lengths on request.
2) Shield on housing.

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: 5000 / 5020 580X / 582X 5814 / 5834 5814FSx / 5834FSx F5863 / F5883 585x / 587x 5853FSx /5873FSx 586x / 588x 5863FSx /5883FSx 9000 908x A02x	**8.0000.5012.0000**

M23 connection technology | Connectors, self-assembly

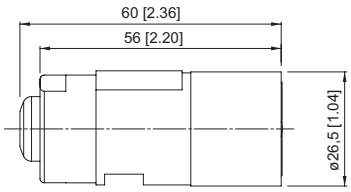
12 pin

Order no.

Female connector with coupling nut
pin socket assignment cw
(EX zone 2/22 on request)

Housing: metal, IP67

solder connections,
for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41“]



suitable for:

5000 / 5020
5814 / 5834
F5863 / F5883
585X / 587X
586X / 588X
9000
A02X
580X / 582X
5814FSx / 5834FSx
5853FSx /5873FSx
5863FSx /5883FSx
908X

8.0000.5012.0000.Ex

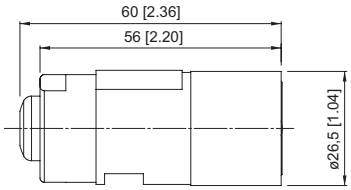
17 pin

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

M23 connection technology | Cordsets, pre-assembled

With connector, 12 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

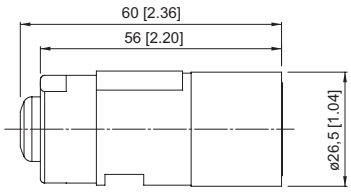
Female connector with coupling nut + single-ended

pin socket
assignment cw

suitable for our series with RS422 or SinCos output:

5000 / 5020 5803 / 5823
5804 / 5824 5805 / 5825
5814 / 5834 5814FSx / 5834FSx
A020 / A02H H120

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67



Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire colour:	PK	RD-BU	BU	RD	GN	YE	–	GY	–	WH	GY-PK	BN	PH [2]

Cable length [1]

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**

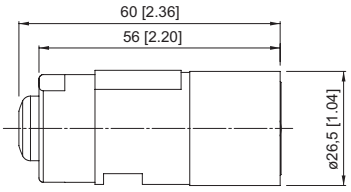
Female connector with coupling nut + single-ended

pin socket
assignment cw

suitable for our series with RS422 or SinCos output:

5000 / 5020 5803 / 5823
5804 / 5824 5805 / 5825
5814 / 5834 5814FSx / 5834FSx
A020 / A02H H120

Cable: PUR, 10 x 0.14 mm² [AWG25] + 2 x 0.5 mm² [AWG20]
Housing: metal, IP67



Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire colour:	PK	BN	BU	RD	GN	YE	–	GY	–	WH 0.5 mm²	WH	BN 0.5 mm²	PH [2]

Cable length [1]

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**

1) Other cable lengths on request.
2) Shield on housing.

M23 connection technology | Cordsets, pre-assembled

With connector, 12 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

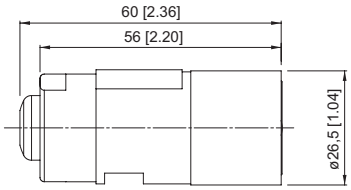
Female connector with coupling nut + single-ended

pin socket
assignment cw

suitable for our series with SSI or analogue output:

5850 / 5870 F5863 / F5883
5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
9081

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67



Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH [2]
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	PH [2]

Cable length [1]	
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**

1) Other cable lengths on request.
2) Shield on housing.

M23 connection technology | Cordsets, pre-assembled

With connector, 12 pin

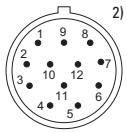
Working temp. -30°C ... +80°C [-22°F ... +176°F] | Order no.

Female connector with coupling nut + male connector with external thread

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67

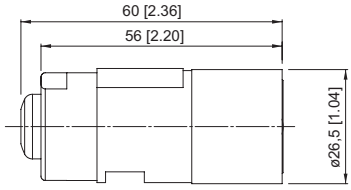
pin socket assignment cw

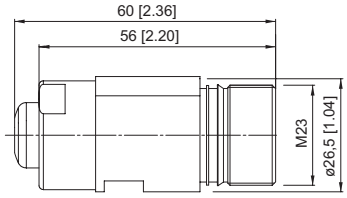
pin socket assignment ccw



suitable for our series:

5000 / 5020 5803 / 5823
5804 / 5824 5805 / 5825
5814 / 5834 5814FSx / 5834FSx
A020 / A02H H120





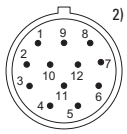
Cable length [1]	
2 m [6.56']	**8.0000.6905.0002**
5 m [16.40']	**8.0000.6905.0005**
10 m [32.81']	**8.0000.6905.0010**
15 m [49.21']	**8.0000.6905.0015**

Female connector with coupling nut + male connector with external thread

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67

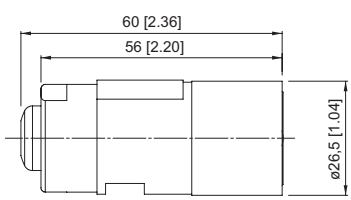
pin socket assignment cw

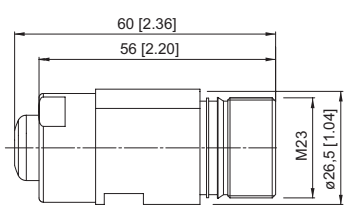
pin socket assignment ccw



suitable for our series with SSI output:

5850 / 5870 F5863 / F5883
5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
9081





Cable length [1]	
2 m [6.56']	**8.0000.6905.0002.0032**
5 m [16.40']	**8.0000.6905.0005.0032**
10 m [32.81']	**8.0000.6905.0010.0032**
15 m [49.21']	**8.0000.6905.0015.0032**

1) Other cable lengths on request.
2) Shield on housing.

M23 connection technology | Cordsets, pre-assembled

With connector, 17 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

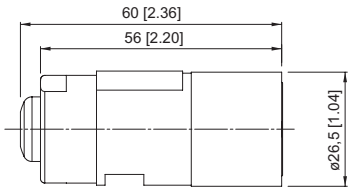
Female connector with coupling nut + single-ended

Cable: PVC, 18 x 0.14 mm² [AWG25]
Housing: metal, IP67

pin socket assignment ccw

suitable for our series:

5850 / 5870
5852 / 5872



Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	WH-GN	BN-GN	WH-YE	YE-BN	WH-GY

Cable length [1]	Order no.
2 m [6.56']	**8.0000.6741.0002**
5 m [16.40']	**8.0000.6741.0005**
10 m [32.81']	**8.0000.6741.0010**
15 m [49.21']	**8.0000.6741.0015**

1) Other cable lengths on request.

MIL connection technology | Connectors, self-assembly

7 pin

Order no.

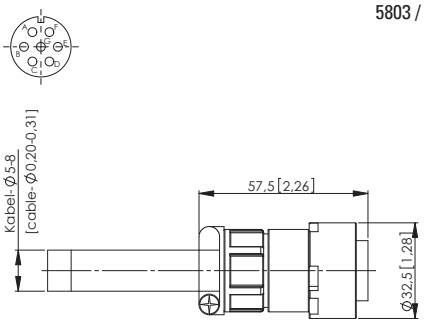
Female connector with coupling nut

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.

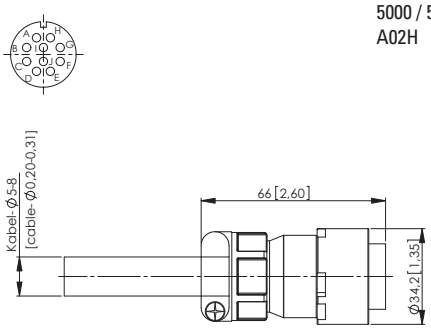
Female connector with coupling nut

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



Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M12 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

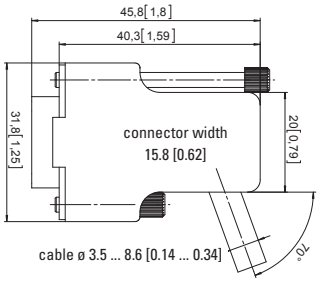
Order no.

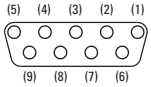
Sub-D male connector, 9 pin, cable outlet 70° + M12 female connector with coupling nut, 8 pin, A coded

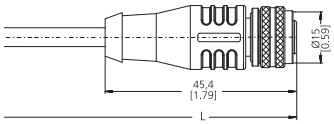
Cable: PVC, 6 x 2 x 0.14 mm² [AWG 25]
Housing Sub-D: ABS, metallised, IP20
Housing M12: metal / plastic, IP67

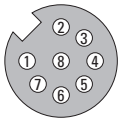
suitable for our series:

5000 / 5020 5006 / 5026
5814 / 5834 5814FSx / 5834FSx
5821
SMC1









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						

for terminal X6, X7 at SMC1

Cable length [1]

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.

Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

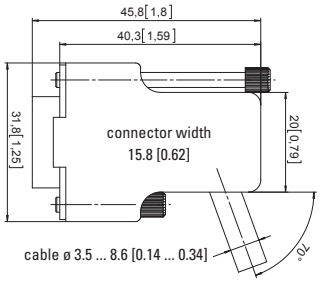
Order no.

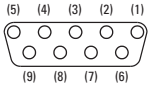
Sub-D female connector, 9-pin, cable outlet 70° + M23 female connector with coupling nut, 12 pin

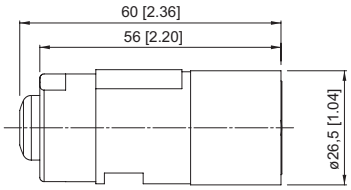
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing Sub-D: ABS, metallised, IP20
Housing M23: metal, IP67

suitable for our series:

5000 / 5020 5006 / 5026
5814 / 5834 5814FSx / 5834FSx
5821
SMC1







pin socket assignment cw

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

Cable length [1]

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.

Sub-D connection technology | Cordsets, pre-assembled

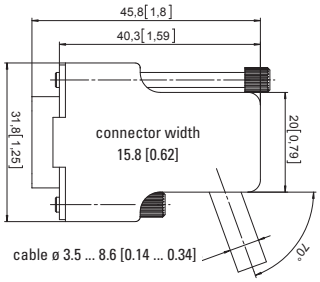
With Sub-D connector + M23 connector

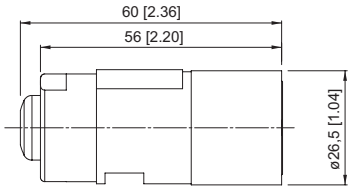
Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

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, metallised, IP20
Housing M23: metal, IP67

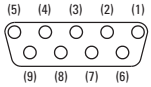




suitable for our series:

5000 / 5020 5006 / 5026
5814 / 5834 5814FSx / 5834FSx
5821

MS1, MSP1, MS2, MSP2



pin socket assignment cw

Terminal assignment

Pin Sub-D:	2	9	8	4	5	6	PH [2]
Pin M23:	1	2	9	10	11	12	PH [2]
	pins arranged below each other are connected internally						

Cable length [1]

for terminal		Order no.
X31, X32, X33, X34 at MS1, MSP1, MS2, MSP2	2 m [6.56']	**8.0000.6V00.0002.0081**
	5 m [16.40']	**8.0000.6V00.0005.0081**
	10 m [32.81']	**8.0000.6V00.0010.0081**
	15 m [49.21']	**8.0000.6V00.0015.0081**

1) Other cable lengths on request.
2) Shield on housing.

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.

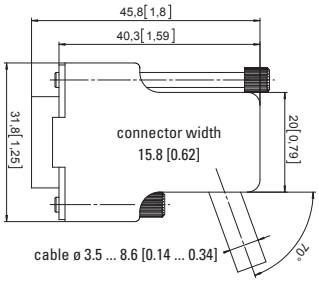
Sub-D male connector, 9-pin, cable outlet 70° + M23 female connector with coupling nut, 12 pin

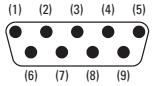
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing Sub-D: ABS, metallised, IP20
Housing M23: metal, IP67

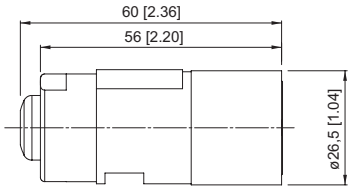
suitable for our series:

5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
F5863 / F5883

MS1, MSP1, MS2, MSP2







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]

for terminal X31, X32 at MS1, MSP1, MS2, MSP2	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						

for terminal X33, X34 at MSP1, MSP2	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.

Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

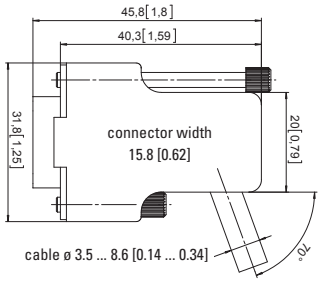
Order no.

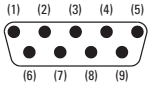
2 x Sub-D male connector, 9-pin, cable outlet 70° +
M23 female connector with coupling nut, 12 pin

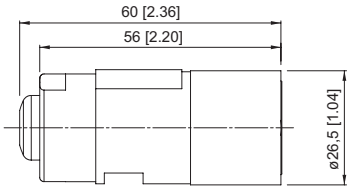
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing Sub-D: ABS, metallised, IP20
Housing M23: metal, IP67

suitable for our series:

5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
MSP1, MSP2







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										

for terminal X31/X33, X32/X34 at MSP1, MSP2

Cable length [1]

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.

Sub-D connection technology | Cordsets, pre-assembled

With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

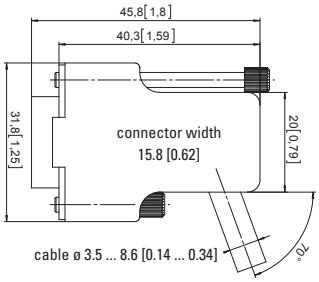
Order no.

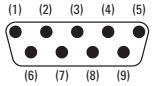
2 x Sub-D male connector, 9-pin with SET and DIR, cable outlet 70° + M23 female connector with coupling nut, 12 pin

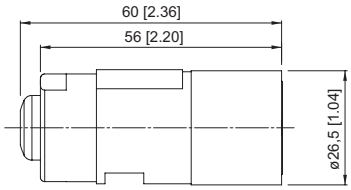
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing Sub-D: ABS, metallised, IP20
Housing M23: metal, IP67

suitable for our series:

5853 / 5873 5853FSx / 5873FSx
5863 / 5883 5863FSx / 5883FSx
MSP1, MSP2







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 colour:							BU SET	RD DIR					
	pins arranged below each other are connected internally												

for terminal X31/X33, X32/X34 at MSP1, MSP2

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.

Sub-D connection technology | Cordsets, pre-assembled

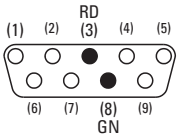
With Sub-D connector

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

Safety-M
safety modules

Terminal assignment

Pin Sub-D:	1	2	3	4	5	6	7	8	9	PH [2]
Wire colour:	–	–	RD	–	–	–	–	GN	–	

Cable length [1]	Order no.
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.

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.

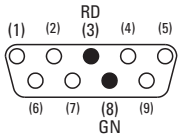
Sub-D male connector, 9 pin, cable outlet 90°
Profibus master with terminating resistor +
M12 female connector with coupling nut,
5 pin, B coded

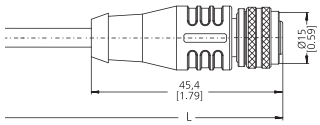
Bus in

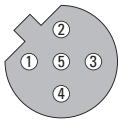
suitable for our series:

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing Sub-D: ABS, metallised
Housing M12: metal / plastic

5858 / 5878
5868 / 5888
9080







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**

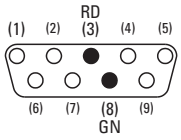
Sub-D male connector, 9 pin, cable outlet 90°
Profibus master with terminating resistor +
M12 male connector with external thread,
5 pin, B coded

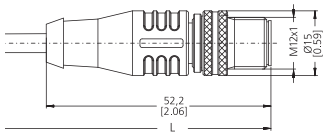
Bus out

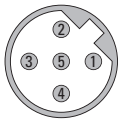
suitable for our series:

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing Sub-D: ABS, metallised
Housing M12: metal / plastic

5858 / 5878
5868 / 5888
9080







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.

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.

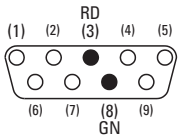
Sub-D male connector, 9 pin, cable outlet 90°
Profibus master with terminating resistor +
M12 male connector with external thread and
M12 female connector with coupling nut,
5 pin, B coded

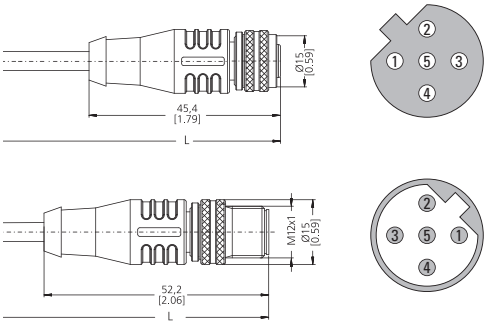
Bus in, Bus out

suitable for our series:

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing Sub-D: ABS, metallised
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.

Optical fibre 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 fibre transmitter and an optical fibre receiver. The optical fibre transmitter converts the electrical signals of a normal incremental encoder into a light signal for transmission by means of an optical fibre.

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 fibre.
- Safe signal transmission up to 1000 m.
- Input frequency up to 400 kHz.
- Input level 10 ... 30 V or RS422.
- Inverted input signals.
- Resists extremely strong electro-magnetical 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 fibre transmitter / receiver

6.LWL X(a) . X(b) X(c)

a
S = Optical fibre transmitter
E = Optical fibre 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 fibre 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 fibre module
- Multilingual operating manual

Optical fibre transmitter versions can be combined with any version of the optical fibre receivers.

Accessories		Order no.
Simplex Patch cable ST-ST - Multimode 	Connector: 2 x ST/PC, optical fibre: 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 fibre signal cable + costs of transmitter + costs of receiver.

Optical fibre 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 fibre transmitter	channels	A, $\overline{A}$, B, $\overline{B}$, 0, $\overline{0}$
Max. input frequency optical fibre transmitter and output frequency optical fibre receiver		400 kHz
Input level optical fibre transmitter		10 ... 30 V or RS 422
Optical wavelength		820 nm
Optical transmission rate		120 Mbit/s
Optical fibre synchronisation display		LED on the receiver
Optical fibre connection		ST connector, ø 9 mm [0.35] on the bottom side of the housing
Glass fibre		multimode fibre, 50/125 µm, 62.5/125 µm

Input signals sampling rate		10 MSamples/s
Optical fibre transmission distance		max. 1000 m [3280.8']
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 fibre transmitter and optical fibre 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	–

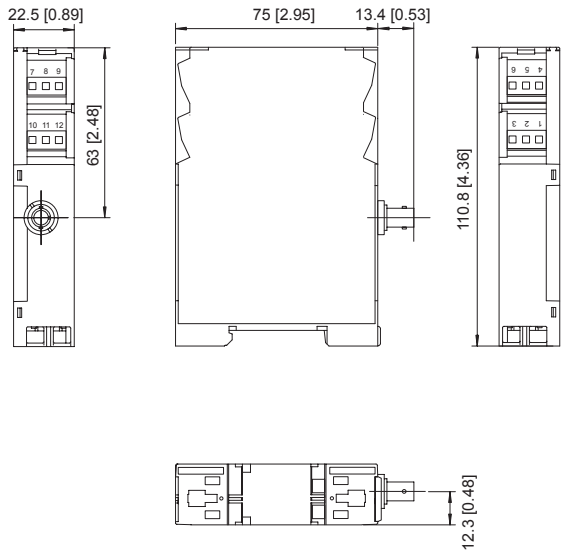
Type of connection	HD-Sub D15, optical fibre transmitter												Terminal	
1	Signal	$\overline{A}$	$\overline{B}$	$\overline{0}$ ($\overline{C}$)	A	B	0 (C)	$\overline{D}$	D	$+V_{out}$ to encoder	0 V linked internally	Shield	0 V linked internally	$+V_{out}$ to encoder, linked internally
	Terminal	8	6	3	9	7	4	1	2	15	11, 12	13	1	2

Type of connection	HD-Sub D15, optical fibre 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

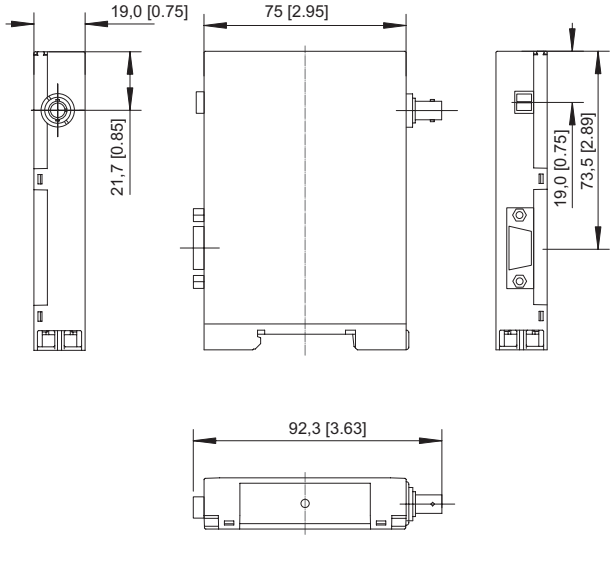
Dimensions

Dimensions in mm [inch]

Terminal clamp



Plug-in connector, HD-Sub D15



Optical fibre transmission modules | Transmitter and receiver | SSI

eco plus

Cost advantage compared to conventional wiring over 150 m length*

Optical fibre transmission system for SSI absolute encoders

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

The optical fibre 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 fibre. The receiving module converts the optical signal back into electrical signals.

Absolute signals can be transmitted safely through one glass fibre 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 fibre.
- 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 fibre transmitter / receiver

6.LWLA . X(a) X(b) X(c)

a
S = Optical fibre transmitter
E = Optical fibre 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 fibre transmission module
- Operating manual, dual language, German and English

Accessories		Order no.
Simplex Patch cable ST-ST - Multimode 	Connector: 2 x ST/PC, Optical fibre: 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 fibre signal cable + costs of transmitter + costs of receiver

Optical fibre transmission modules | Transmitter and receiver | SSI

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 fibre transmitter / receiver)	Clock C+ and C-, RS422 Data D+ and D-, RS422 NPN error input on transmitter Open-Drain outut on receiver
SSI clock rate	max. 1 MHz
Optical wavelength	820 nm (infrared)
Optical fibre connection	ST connector, on the bottom side of the housing
Glass fibre	multimode fibre, 50/125 µm, 62.5/125 µm
Optical fibre 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 fibre 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 fibre 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

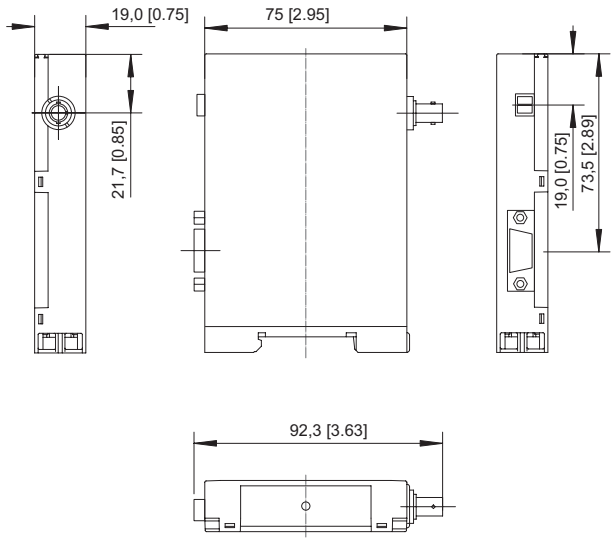
	Screw terminal, 2 pin		
	Signal:	0 V	+V
	Pin female contact:	1	2

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

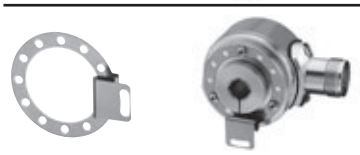
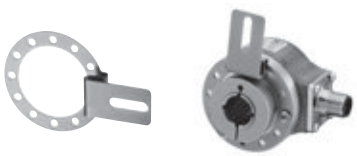
Dimensions

Dimensions in mm [inch]



Accessories

Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Overview

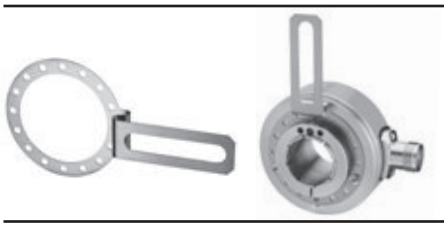
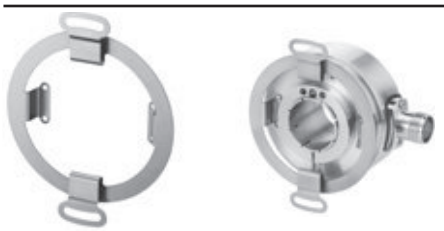
Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	Incremental encoders			Absolute singleturn encoders				Absolute multiturn encoders			
					3620, 3720	5020	5823, 5824, 5825	3670, 3671, M3678	F3673, F3678	5873, 5878	5870, 5872	F3683, F3688	5883, 5888	F5883, F5888	5882
	**Spring 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	**493**	X	X	X	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	**493**	X	X	X	X	X	X	X	X	X	X	X
	**Fastening arm, 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	**493**		X	X			X	X		X	X	X
	**Fastening arm, 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	**493**		X	X			X	X		X	X	X
	**Fastening arm, 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	**494**		X	X			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	**494**	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	**494**		flange C+ D	X			X	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	**495**		flange C+ D	X			X	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	**495**		X	X			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	**495**		X	X			X	X		X	X	X

Accessories

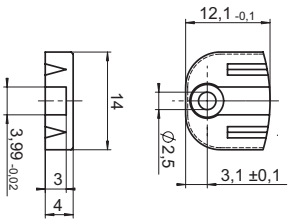
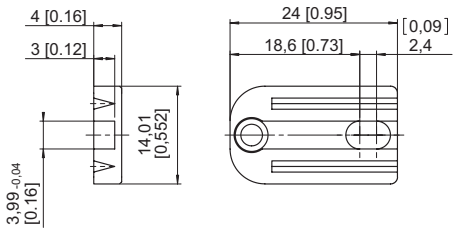
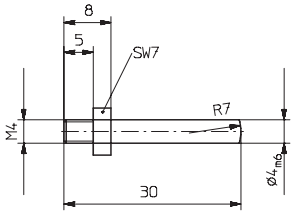
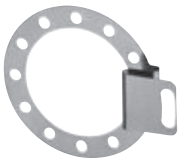
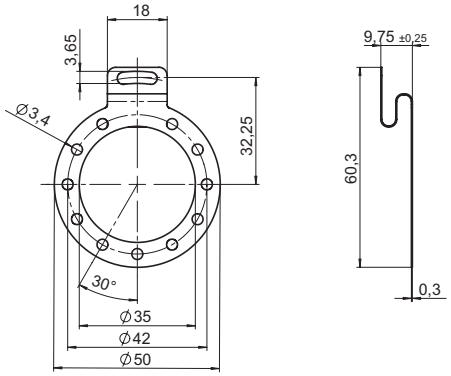
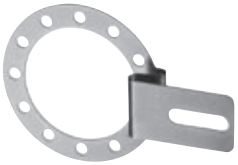
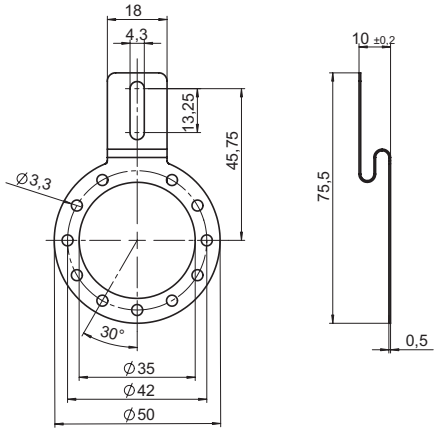
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Overview

Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	Incremental encoders			Absolute singleturn encoders				Absolute multiturn encoders			
					5834FSx	5020	5823, 5824, 5825	5873FSx	5873, 5878			5883FSx	5883, 5888	F5883, F5888	5882
	**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	**496**	X	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	**496**	X	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	**497**	X	X	X	X	X			X	X	X	X

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	**498**	X	X	X	
	**Spring element, long** For applications with high axial play	110 [4.33]	**8.0010.4K00.0000** *Connection to the application:* cylindrical pin	**498**	X	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	**498**			X	
	**Fastening arm, short** For applications with axial play	149 [5.87]	**8.0010.4T00.0000** *Connection to the application:* s. details	**498**	X	X	X	
	**Fastening arm, 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	**499**	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]	**8.0010.40S0.0000** **8.0010.40T0.0000** **8.0010.40U0.0000** *Connection to the application:* 1 screw	**499**	X	X	X	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	**499**	X	X		X

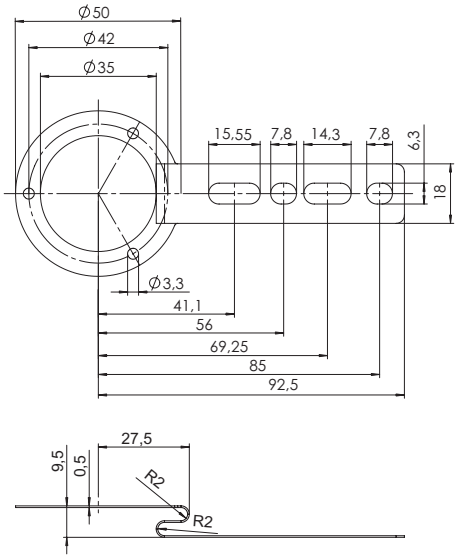
Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

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**
Fastening arm, 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**
Fastening arm, 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**

Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details	Order no.

Fastening arm, long

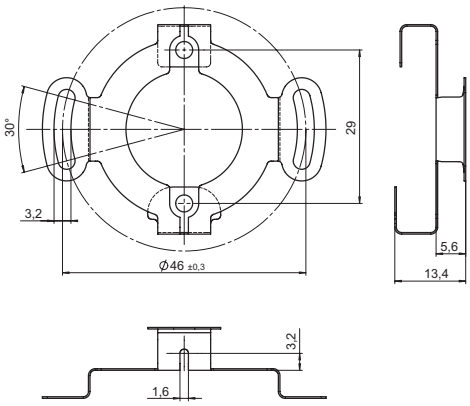


Scope of delivery:
- Fastening arm (stainless steel)
- 3 screws for fixing to the encoder

Connection to application:
- 1 screw (not supplied)

8.0010.4R00.0000

Stator coupling, double-winged
for front fixing onto the encoder flange

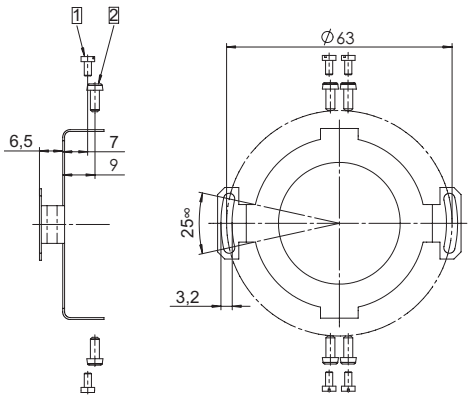


Scope of delivery:
- Stator coupling (stainless steel)
- 2 screws for fixing to the encoder

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)
- 1 4 screws M2 x 4 [0.16] for fixing to the encoder 5882
- 2 4 screws M2.5 x 6 [0.24] for fixing to the encoders 582X, 587X, 502X

Connection to application:
- 2 socket head screws M3 x 8 [0.32] with washer (supplied)

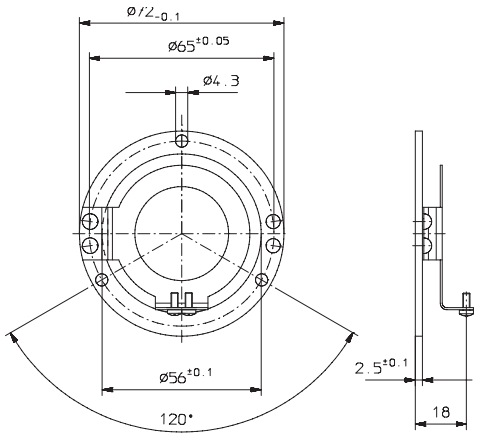
8.0010.4D00.0000

Accessories

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

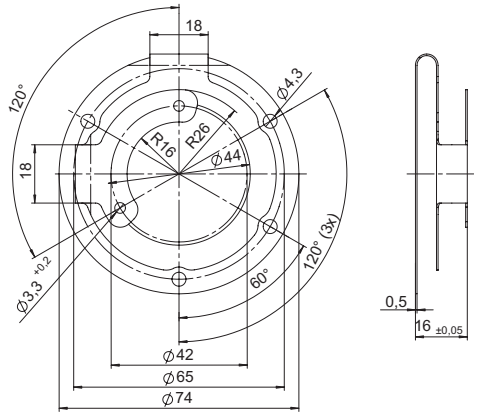


Scope of delivery:
- Stator coupling (stainless steel)
- 4 screws M2 x 4 mm for fixing to the encoder 5882
- 4 screws M2,5 x 6 mm for fixing to the encoder 582X, 587X, 502X, 58x3, F58x3

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

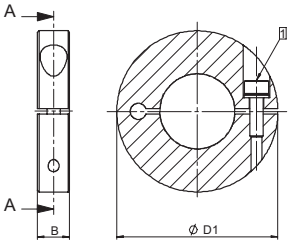
Spring tether element

Scope of delivery:
- Drahtfederelement
- 1 Schraube zur Befestigung am Drehgeber

Connection to application:
- 1 screw (not supplied)

8.0010.40W0.0000

Clamping ring
Stainless steel, for high rotational speeds



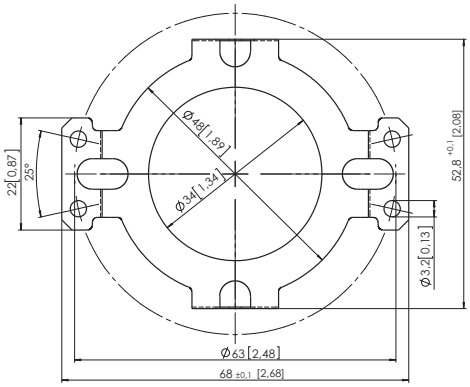
for encoder	*B*	*D1*	*for hollow shaft ø*	
582X	6 [0.236]	29 [1.14]	10 [0.39]	**8.0000.4V00.0000**
	6.2 [0.244]	30 [1.18]	12 [0.47]	**8.0000.4W00.0000**
5020	6.2 [0.244]	30 [1.18]	12 [0.47]	**8.0010.4W01.0000**

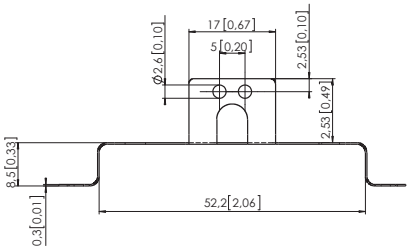
[1] screw DIN 912 A2 M2.5, max. tightening torque 0.45 Nm

Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details — Dimensions in mm [inch] — Order no.

Stator coupling





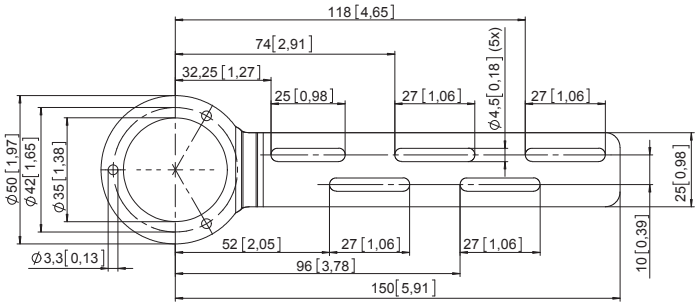
Scope of delivery:
- Stator coupling (stainless steel)
- 4 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder

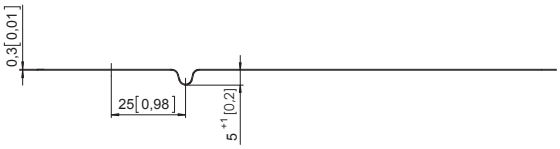
Connection to application:
- 4 screws (not supplied)

Max. permissible shaft connection tolerances:
- Axial offset < ± 0,25 mm
- Radialversatz < ± 0,20 mm
- Winkelversatz < 1°

8.0010.4048.00FS

Fastening arm, 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)

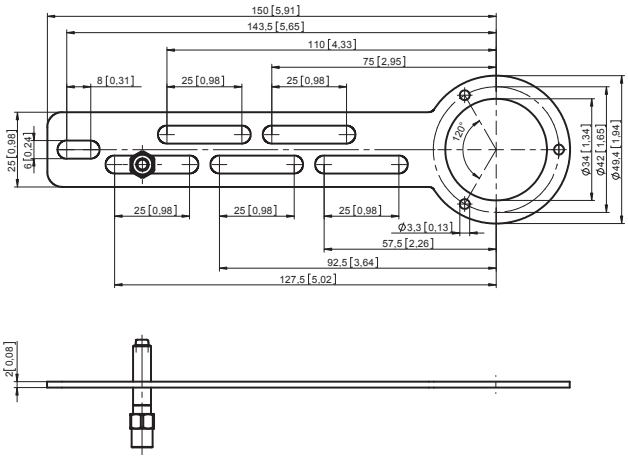
Max. permissible shaft connection tolerances:
- Axial offset < ± 0,25 mm
- Radial offset < ± 0,20 mm
- Angular offset < 1°

8.0010.4047.00FS

Fixing components for hollow shaft encoders | For encoders up to ø 58 mm | Details

Dimensions / Details	Dimensions in mm [inch]	Order no.

Fastening arm set, rigid



Scope of delivery:
- Fastening arm (stainless steel)
- 3 screws M3x6 mm [M3 x 0.24“] for fixing to the encoder

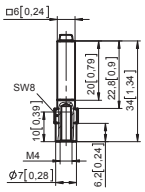
Connection to application:
- 1 screw

(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)

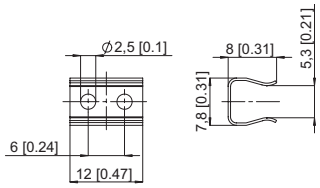
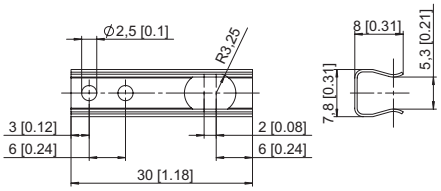
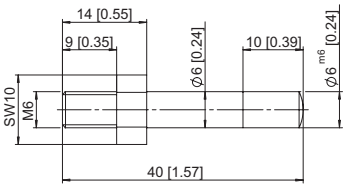
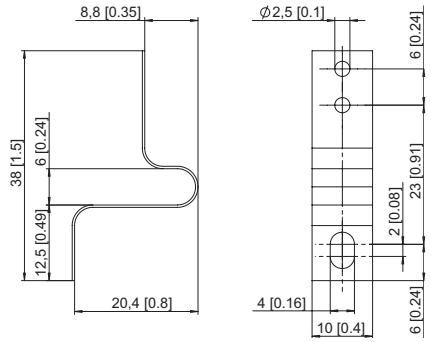
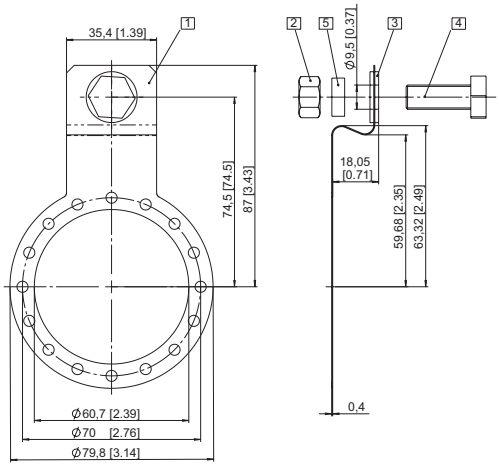


suitable for:

Fastening arm 8.0010.4051.00FS

8.0010.4049.0075

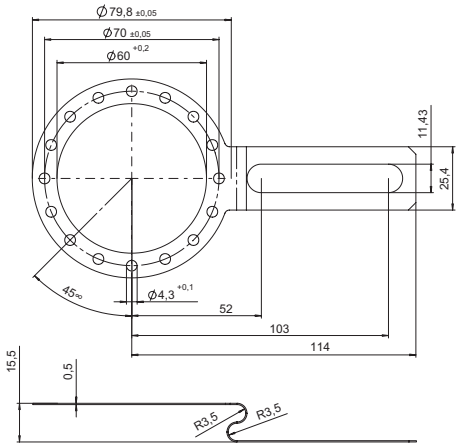
Fixing components for hollow shaft encoders | For encoders > ø 58 mm | Details

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**
Fastening arm, 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**

Fixing components for hollow shaft encoders | For encoders > ø 58 mm | Details

Dimensions / Details	Dimensions in mm [inch]	Order no.

Fastening arm, short



Scope of delivery:
- Fastening arm (stainless-steel)
- 3 screws for fixing to the encoder

Connection to application:
- 1 screw (not supplied)

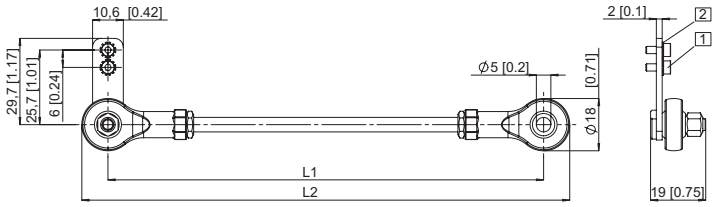
8.0010.4E00.0000

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
- [1] 2 socket cap screws M2.5 x 6 [0.24]
- [2] 2 lock washers for fixing to the encoder

Connection to application:
- 1 screw (not supplied)

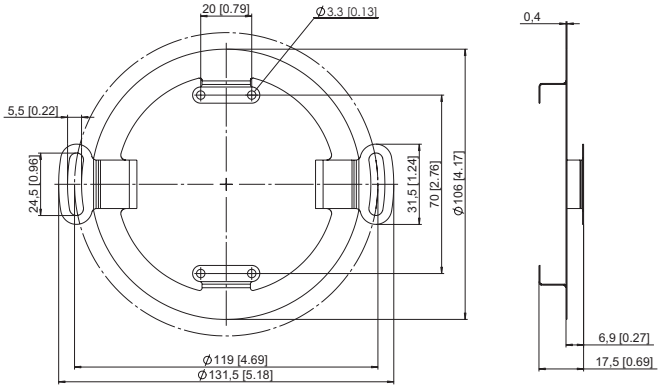


Stator coupling

Scope of delivery:
- Stator coupling (stainless steel)
- 4 screws for fixing to the encoder

Connection to application:
- 2 screws (not supplied)

8.0010.40V0.0000



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

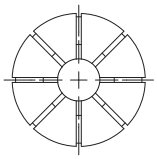
for A02H with hollow shaft, ø 38 mm [1.50“]

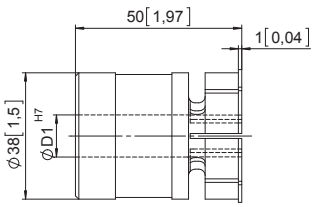
For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling.
An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.
Included in the set:
- Insert for cone blind hole, cone 1:10, 17 mm [0.67“] length
- 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**

Fixing components for shaft encoders

Overview

Overview

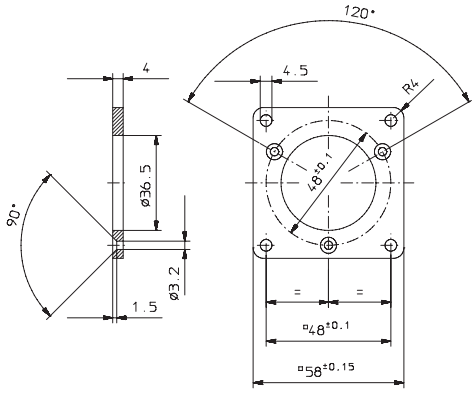
Figure	Description	Order no.	Details s.page	Incremental encoders 5000	Incremental encoders 5803, 5804, 5805	Incremental encoders 7000	Abs. singleturn encoders 5853, 5858	Abs. singleturn encoders 5850, 5852	Abs. singleturn encoders 7053, 7058	Abs. multiturn encoders 5863, 5868	Abs. multiturn encoders F5863, F5868	Abs. multiturn encoders 7063, 7068
	**Flange, square** Suitable for shaft encoders with clamping flange											
	☐ 58.0 [2.28“] 4 [0.16“] thick	**8.0010.2100.0000**	**502**	X	X		X	X		X	X	
	☐ 63.5 [2.5“] 3 [0.12“] thick	**8.0010.2120.0000**	**502**	X	X		X	X		X	X	
	☐ 70.0 [2.76“] 10 [0.39“] thick	**8.0010.2600.0000**	**502**	X	X		X	X		X	X	
	☐ 80.0 [3.15“] 4 [0.16“] thick	**8.0010.2800.0000**	**502**	X	X		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**	**503**	X	X		X	X		X	X	
	**Flange, ø 115 mm [4.53“]** **Euroflange**	**8.0010.2160.0000** **8.0010.2170.0000**	**503**	X	X	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**	**503**	X	X		X	X		X	X	
	**Flange, ø 90 mm [3.54“]** Mechanically compatible with former encoder Type 9000	**8.0010.2270.0000**	**504**	X	X		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**	**504**	X	X		X	X		X	X	
	**Assembly bell** Electrical and thermal isolation by means of glass fibre reinforced plastic and isolating spring washer coupling – supplied as complete set	**8.0000.4500.XXYY**	**505**	X	X		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**	**506**	see table page 506								

Fixing components for shaft encoders

Details

Dimensions / Details Dimensions in mm [inch] Order no.

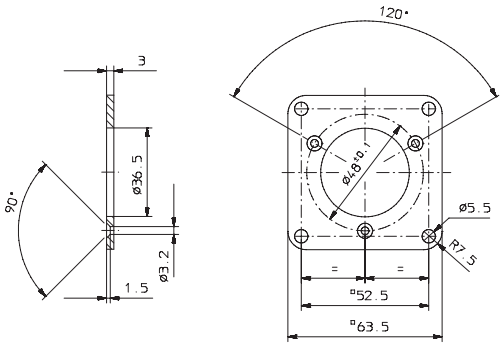
Flange, square



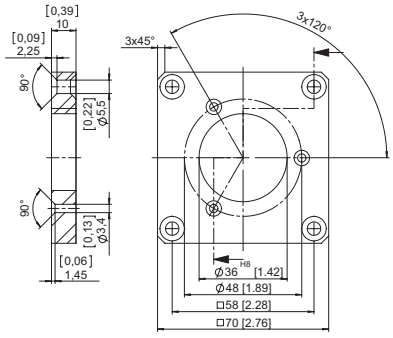
Scope of delivery:
- flange (aluminium)
- 3 screws for fixing to the encoder

Connection to application:
- 4 screws (not supplied)

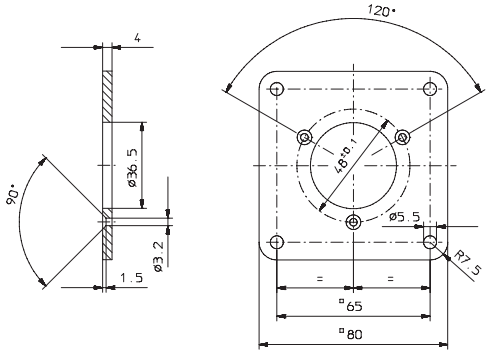
8.0010.2100.0000



8.0010.2120.0000



8.0010.2600.0000



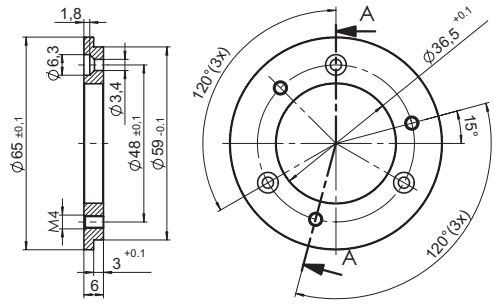
8.0010.2800.0000

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].



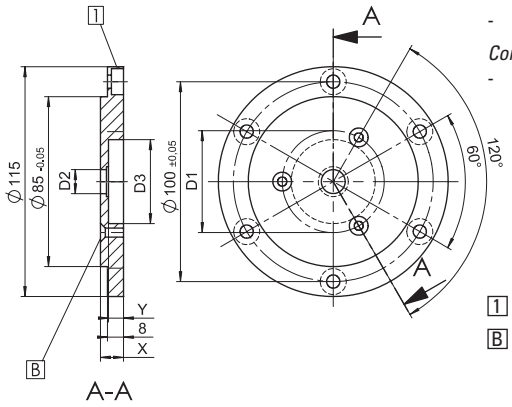
Scope of delivery:
- flange (aluminium)
- 3 screws for fixing to the encoder

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	
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**



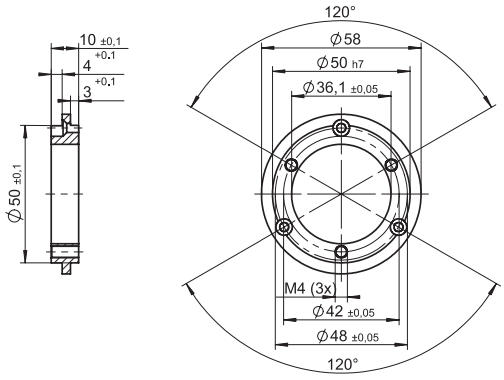
Scope of delivery:
- flange (aluminium)
- 3 screws for encoder mounting

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 (aluminium)
- 3 screws for encoder mounting

Connection to application:
- 3 screws (not supplied)

8.0010.2180.0000

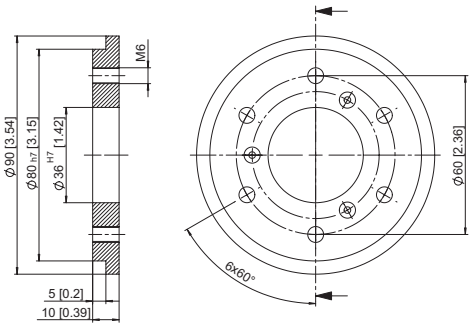
Fixing components for shaft encoders

Details

Dimensions / Details	Dimensions in mm [inch]	Order no.

Flange, ø 90 [3.54]

Mechanically compatible with former encoder type 9000

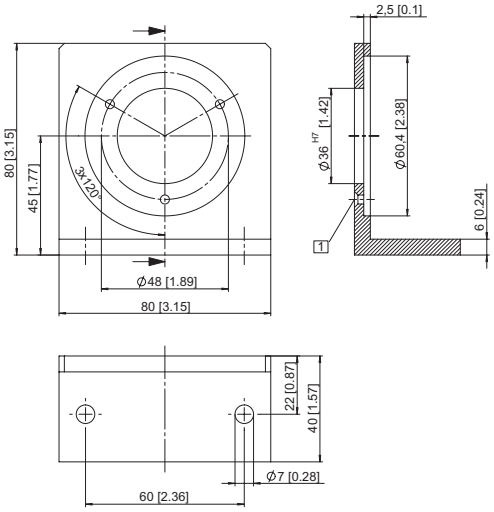


Scope of delivery:
- flange
- 3 screws for encoder mounting

Connection to application:
- 6 screws (not supplied)

8.0010.2270.0000

Angular flange



Scope of delivery:
- angular flange (aluminium)
- 3 screws for encoder mounting

Connection to application:
- 2 screws (not supplied)

1 Countersunk DIN 74-Hm6

8.0010.2300.0000

Fixing components for shaft encoders

Details

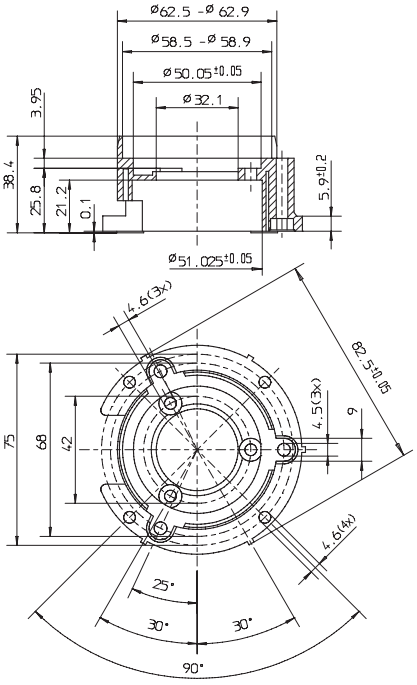
Dimensions / Details

Dimensions in mm [inch]

Order no.

Assembly bell

- Easy and quick encoder mounting
- Electrical and thermal isolation by means of glass fibre reinforced plastic and isolating spring washer coupling
- Supplied as complete set

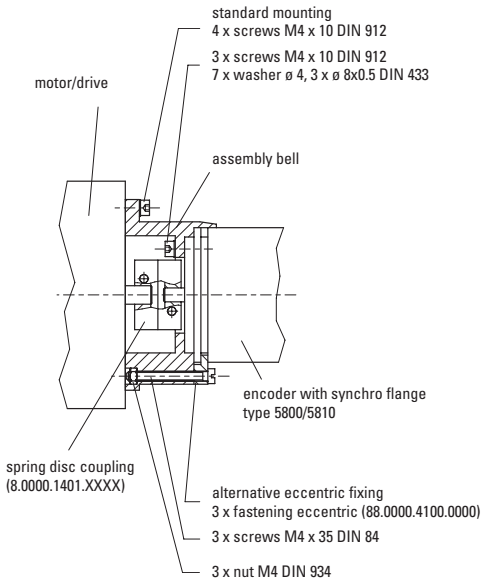


Scope of delivery:

- 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



Fixing components for shaft encoders

Details

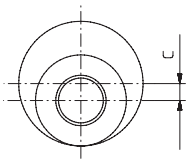
Dimensions / Details

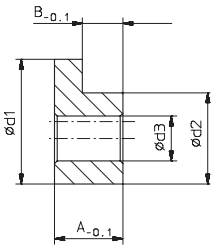
Dimensions in mm [inch]

Order no.

Fastening eccentrics
for encoders with synchro flange

- Suitable for Kübler encoders with synchro flange
- Material ACu Zn 39 Pb 3
- Surface finish: galvanised Ni





encoder type	*D1*	*D2*	*D3*	*A*	*B*	*C*	Order no.
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]	1,2 [0.047]	**8.0010.4100.0000**

Scope of delivery:
- 3 eccentrics
- 3 screws

(Use at least three fastening eccentrics to mount the encoder)

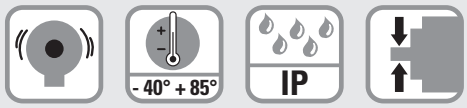
Robust bearing unit

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

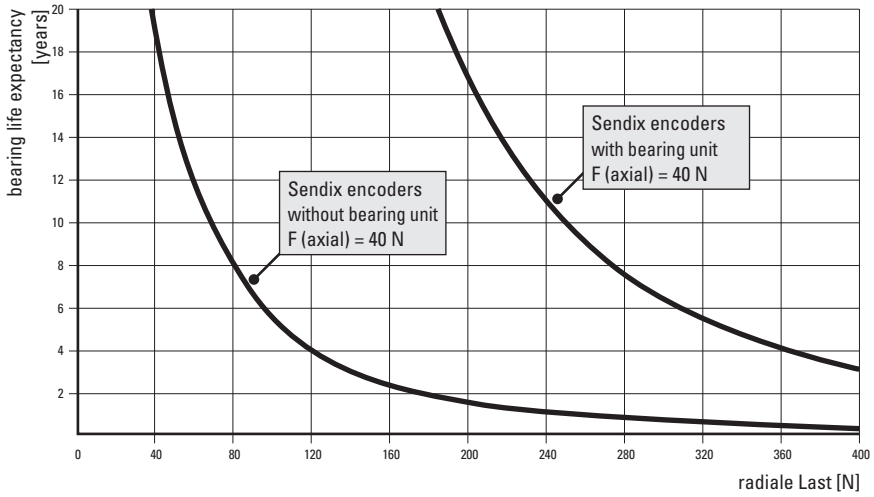
Robust bearing unit

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	aluminium optional: seawater resistant
	shaft	stainless steel

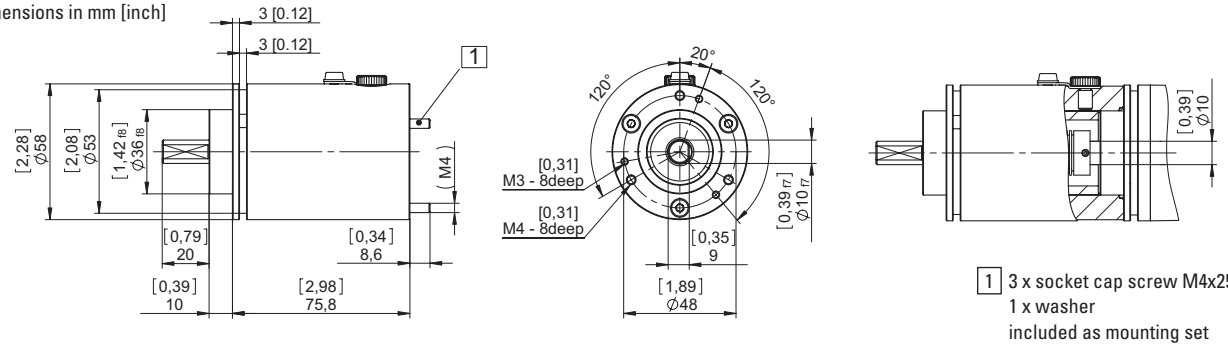
Bearing life expectancy L10

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

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, anodised	Al, anodised	Al, anodised	Al, anodised	Al, anodised
	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.

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.

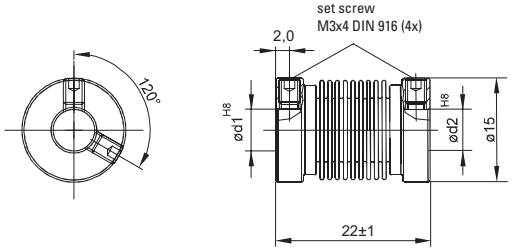
Spring washer-type couplings (.1301 und .1401)

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.

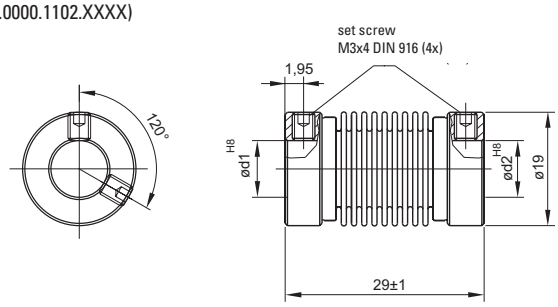
Dimensions

Dimensions in mm

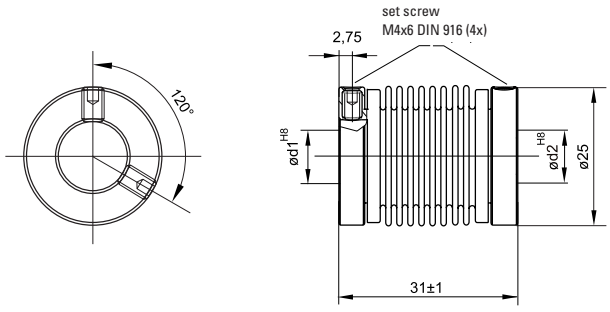
Bellows-type coupling ø 15 [0.59]
(8.0000.1202.XXXX)



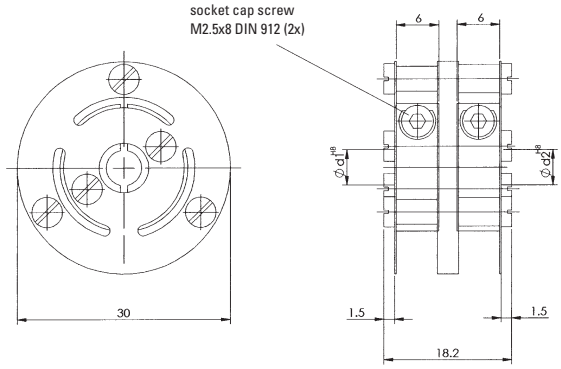
Bellows-type coupling ø 19 [0.75]
(8.0000.1102.XXXX)



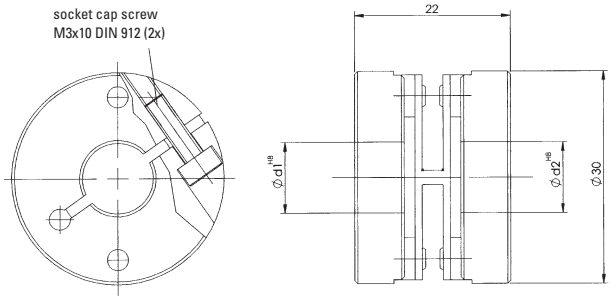
Bellows-type coupling ø 25 [0.98]
(8.0000.1502.XXXX)



Spring washer-type coupling, one-part
(8.0000.1301.XXXX)

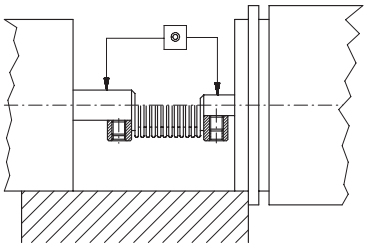


Spring washer-type coupling, three part, plug-in
(8.0000.1401.XXXX)



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.



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

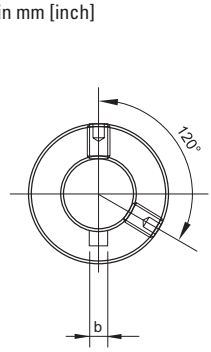
Mechanical characteristics

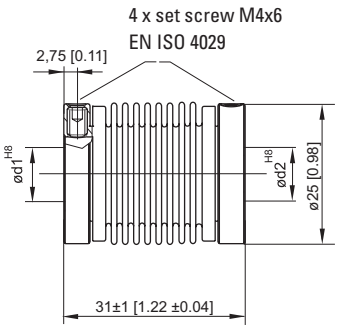
Max. speed		10000 min^{-1}
Max. torque		200 Ncm
Max. shaft offset	radial	± 0.3 mm
	axial	± 0.45 mm
	angular	± 3°
Torsion spring stiffness		183 Nm/rad
Radial spring stiffness		17.8 N/mm
Moment of inertia		9.1 gcm^2
Headless set screw tightening torque		
	min.	80 Ncm
	max.	100 Ncm

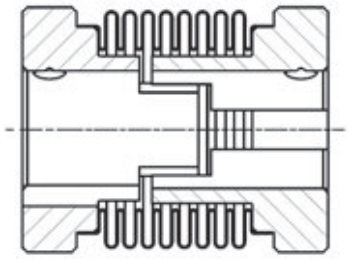
Working temperature range		-30°C ... +120°C [-22 ... +248°F]
Weight approx.		54 g
Material	flange	stainless steel 1.4104
	bellows	stainless steel 1.4571
Standard bore diameter	(d1 / d2)	10 / 10 mm [0.39 / 0.39"]
		10 / 12 mm [0.39 / 0.47"]
		12 / 12 mm [0.47 / 0.47"]
Insertion depth	min.	6 mm [0.24"]
	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]

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

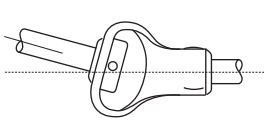
Bore diameter both sides 10 mm [0.39"]	**8.0000.1K01.1010**
Bore diameter 11 mm [0.43"] and 12 mm [0.47"] with keyway	**8.0000.1L01.1112**

Technical data

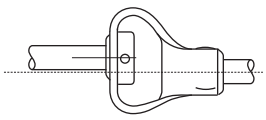
		Size 1	Size 2
Max. speed		3000 min^{-1}	3000 min^{-1}
Max. torque		0.5 Nm	2,0 Nm
Max. offset of shafts	radial	± 2 mm	± 3 mm
	axial	± 2 mm	± 4 mm
	angular	± 10°	± 12°
Torsion spring stiffness		13 Nm/rad	28 Nm/rad
Radial spring stiffness		13 N/mm	7 N/mm
Moment of intertia		41 gcm²	106 gcm²
Max. clamping 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	
	conecting element	Polyurethane	

Functional principle

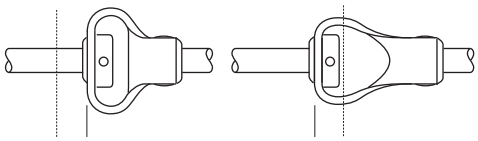
Compensation of an angular misalignment



Compensation of a radial misalignment



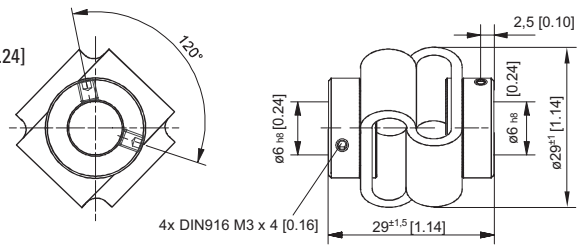
Compensation of a axial misalignment



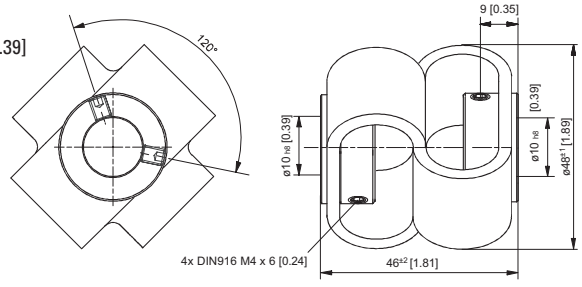
Dimensions

Dimensions in mm

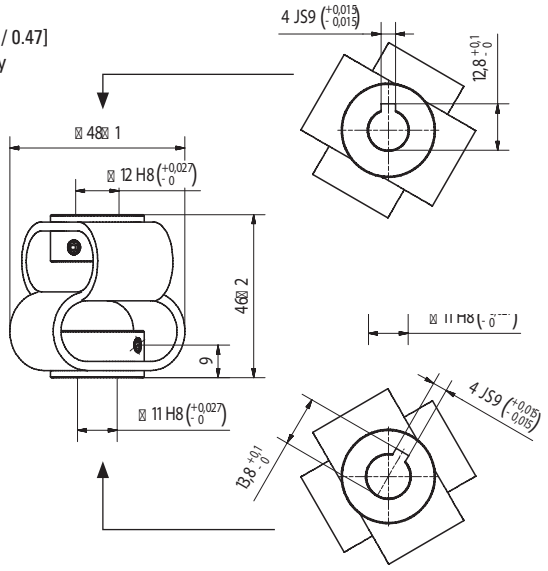
Size 1
6 / 6
[0.24 / 0.24]



Size 2
10 / 10
[0.39 / 0.39]



Size 2
11 / 12 [0.43 / 0.47]
with keyway



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**

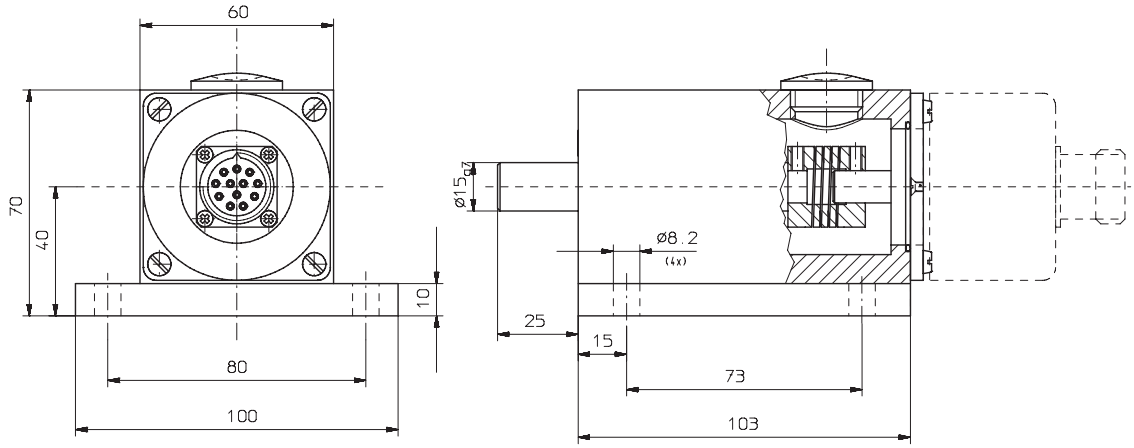
Scope of delivery

- 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



General accessories

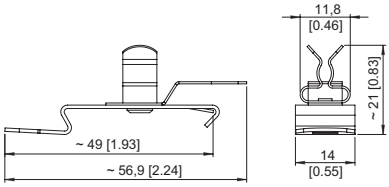
Dimensions / Details	Dimensions in mm [inch]	Order no.

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

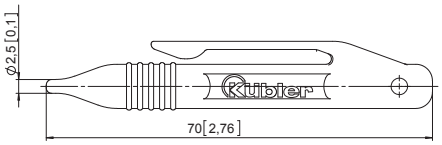
EMC shield terminal



For an EMC-compliant installation of the encoder cable,
top-hat rail mounting,
Shield diameter 3.0 ... 6.0 mm,
Clamp (spring steel, galvanised)
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

Accessories

Addresses

Kübler worldwide

Kübler Group

Fritz Kübler GmbH,
Germany
Schubertstraße 47
D-78054
Villingen-Schwenningen
Phone +49 7720 39 03-0
Fax +49 7720 21 56 4
info@kuebler.com
www.kuebler.com

Fritz Kübler SARL,
France
2 rue de Grande Bretagne
F-68310 Wittelsheim
Phone +33 3 89 53 45 45
Fax +33 3 89 53 66 77
info@kuebler-sarl.com
www.kuebler.fr

Kübler Italia S.r.l.,
Italy
Viale Sarca, 96
I-20125 Milano MI
Phone +39 026 423 345
Fax +39 026 611 3843
info@kuebler.it
www.kuebler.it

Kubler SP. Z O.O.,
Poland
l. Dabrowskiego 441
PL-60-451 Poznan
Phone +48 61 84 99 902
Fax +48 61 84 99 903
info@kubler.pl
www.kubler.pl

Kübler Turkey Otomasyon Ticaret Ltd. Sti.
Turkey
Yeni mahalle Balikesir Cad.
Uprise Elit Residence C1 AB Blok
No:180 Soganlik
TR - 34880 Kartal/Istanbul
Phone: +90 216 999 9791
Fax:+90 216 999 9784
cengizhan.temurcin@kuebler.com
www.kuebler.com

Kuebler (Beijing) Automation Trading Co. Ltd.,
China
Rm 1603, B Area, Tower 2,
Wangjing Soho,
No.1 Futong East Street,
Chaoyang, Beijing, China,100102
Phone +86 10 8471 0818
Fax: +86 10 8471 0819
beijing@kuebler.com
www.kuebler.com

Kuebler Automation India Pvt. Ltd.
India
Plot No 677, S.No. 269/3,
Paud Road, Bhugaon,
Pune 412 115,
Maharashtra
Phone +91 99 7065 5599
Tel. +91 20 6790 1-200 / 230 / 214 / 202
Fax +91 20 6790 1232
info@kuebler.in
www.kuebler.in

Kuebler Korea (by F&B),
South Korea
578, Kwaebop-dong, Sasang-ku
Pusan Industrial Supplies
Market 9-116
ROK-PUSAN
Phone +82 51 319 12 30
Fax +82 51 319 12 50
fnb@kuebler.co.kr
www.kuebler.kr

Kuebler Inc.
USA
5245-3 Old Dowd Road
Charlotte, NC 28208
Phone +1-704-705-4711
Toll Free +1-855-KUEBLER (583-2537)
Fax +1-704-733-9170
usa@kuebler.com
www.kuebler.com/usa

Europe

Austria
Balluff GmbH
Industriestraße B16
A-2345 Brunn am Gebirge
Phone +43 22 36 3 25 21-0
Fax +43 22 36 3 25 21 46
sensor@balluff.at
www.balluff.at

Belarus
FEK Company
Pushkin Ave., 29B
BY-220015 Minsk
Phone +375 17 202 68 00
Fax +375 17 202 68 01
turck@fek.by
www.turck.by

Belgium
Multiprox N.V
Lion d'Orweg 12
B-9300 Aalst
Phone +32 53 76 65 66
Fax +32 53 78 39 77
mail@multiprox.be
www.multiprox.be

Bulgaria
Sensomat Ltd.
Ul.Stratsin 4, vh.A, app.1
P.O.B. 116
BG-9300-Dobrich
Phone +359-888 403 570
Fax +359-58-603 033
info@sensomat.info
www.sensomat.info

Croatia
Bering d.o.o.
Naselje Tršinski 7b
HR-49210 Zabok
Phone +385 49 221 182
Fax +385 49 223 658
bering@email.t-com.hr
www.bering.hr

Czech Republic
TURCK s.r.o
Hradecká 1151
CZ-500 03 Hradec Králové
Phone +420 - 4 95 51 87 66
Fax +420 - 4 95 51 87 67
turck-cz@turck.com
www.turck.cz

Denmark
Hans Følsgaard A/S
Theilgaards Torv 1
DK-4600 Køge
Phone + 45 43 20 86 00
Fax + 45 43 96 88 55
hf@hf.net
www.hf.net

Estonia
Standel AS
Kiisa 8
EE-11313 Tallinn
Phone +372 6 558 180
Fax +372 6 558 179
standel@standel.ee
www.standel.ee

Finland
Sähkölehto Oy
Holkkitie 14
FIN-00880 Helsinki
Phone +358 9 774 6420
Fax +358 9 759 1071
office@sahkolehto.fi
www.sahkolehto.fi

France
Fritz Kübler S.à.r.l.
Compteurs et codeurs industriels
2 rue de Grande Bretagne
F-68310 Wittelsheim
Phone +33 3 89 53 45 45
Fax +33 3 89 53 66 77
info@kuebler-sarl.com
www.kuebler.fr

Great Britain
OEM Automatic Ltd
Whiteacres, Cambridge Road
Whetstone
GB-Leicester LE8 6ZG
Phone +44 116 284 99 00
Fax +44 116 284 17 21
information@uk.oem.se
www.oem.co.uk

Greece
Industrial Automation Systems
L.J. Skourgialos
241, El. Venizelou Ave.
GR-176 73 Kallithea - Athens
Phone +30 210 9510260
Fax +30 210 9511048
info@ias.gr
www.ias.gr

Hungary
Kvalix Automatika Kft.
Kiss Ernö u. 1-3
H-1046 Budapest
Phone +36 1 272 2242
Fax +36 1 272 2244
info@kvalix.hu
www.kvalix.hu

Iceland
Reykjafell Ltd.
Skipholti 35
IS-125 Reykjavik
Phone +354 5 88 60 00
Fax +354 5 88 60 88
reykjafell@reykjafell.is
www.reykjafell.is

Ireland
Kübler Group
Fritz Kübler GmbH
Schubertstr. 47
D-78054
Villingen-Schwenningen
Phone +49 7720 3903-0
Fax +49 7720 21564
info@kuebler.com
www.kuebler.com

Italy
• Encoders:
Kübler Italia Srl.
Viale Sarca, 96
I-20125 Milano MI
Phone +39 026 423 345
Fax +39 026 611 3843
info@kuebler.it
www.kuebler.it

• Counters and process devices:
MAS AUTOMAZIONE S.R.L.
Via G. Galilei 20
I-20090 Segrate (MI)
Phone +39 02 26 92 20 90
Fax +39 02 26 92 16 87
info@masautomazione.it
www.masautomazione.it

Lithuania
UAB FEK Elektronika
Naugarduko 91-415
LT-03160, Vilnius, Lietuva
Phone +370 700 01760
Phone +3705 2133603
Fax + 3705 2159198
info@fek.lt
www.fek.lt

Netherlands
Duranmatic B.V.
Robijn 800
NL-3316 KE Dordrecht
Phone +31 78 631 05 99
Fax +31 78 613 11 33
info@duranmatic.nl
www.duranmatic.nl

Norway
ELTECO AS
Floodmyrveien 24
N-3946 Porsgrunn
Phone +47 35 56 20 70
Fax +47 35 56 20 99
firmapost@elteco.no
www.elteco.no

Poland
Kubler Sp. z o.o.
ul. Dabrowskiego 441
PL-60-451 Poznan
Phone +48 61 849 99 02
Fax +48 61 849 99 03
info@kubler.pl
www.kubler.pl

ASTAT sp. z o.o.
ul. Dabrowskiego 441
PL-60-451 Poznan
Phone +48 61 848 8871
Fax +48 61 848 8276
info@astat.com.pl
www.astat.com.pl

• Electronic counters and process displays:
IMPOL-1 Sp.J.
ul. Krakowiaków 103
PL-02-255 Warszawa
Phone +48 22 886 56 02
Fax +48 22 886 56 04
biuro@impol-1.pl
www.impol-1.pl

• Encoders:
OEM AUTOMATIC Sp. z o.o.
ul. Działkowa 121 A
PL-02-234 Warszawa
Phone +48 22 863 27 22
Fax +48 22 863 27 24
info@pl.oem.se
www.oemautomatic.pl

Portugal
LA2P – Tecnologias de Automação, LDA
Rua Teófilo Braga, 156 A
Escrit. F - Edifício S. Domingos Cabeço do Mouro
PT-2785 - 122 S. Domingos de Rana
Phone +351 21 444 70 70
Fax +351 21 444 70 75
la2p@la2p.pt
www.la2p.pt

Romania
Syscom 18 SRL
Calea Plevnei 139B, Sector 6
RO-060011 Bucharest
Phone +40 21 310 26 78
Fax +40 21 316 91 76
syscom@syscom18.com
www.syscom.ro

Russia
Servotechnica ZAO
Klara Tsetkin str., 33/35
RUS-125130 Moscow
Phone +7 495 797 8866
Fax +7 495 450 0043
info@servotechnica.ru
www.servotechnica.ru

Sweden
OEM AUTOMATIC AB
Dalagatan 4, Box 1011
S-57328 Tranas
Phone +46 75-242 4100
Fax +46 75-242 4119
info@aut.oem.se
www.oemautomatic.se

Serbia
RAP Electronics d.o.o.
Dorda Stanojevica 11-17
SRB-11070 Novi Beograd
Phone +381 11 6300636
Fax +381 11 6300635
office@rapelectronics.co.rs

Slovakia
S.D.A. s. r. o.
Jána Bottu 4
SK-974 01 Banská Bystrica
Phone +421 48 472 34 11
Fax +421 48 472 343 69
sekretariat@s-d-a.sk
www.s-d-a.sk

Slovenia
Balluff d.o.o.
Livadna ulica 1
SLO-2204
Miklavž na Dravskem polju
Phone +386 2 6 29 03 00
Fax +386 2 6 29 03 02
senzorji.sb@siol.net
www.senzorji-sb.si

Spain
Elion, S.A.
Farell, 5
E-08014 Barcelona
Phone +34 93 298 20 00
Fax +34 93 431 18 00
elion@elion.es
www.elion.es

Switzerland
(French)
Fritz Kübler S.à.r.l.
2 rue de Grande Bretagne
F-68310 Wittelsheim
Phone +33 3 89 53 45 45
Fax +33 3 89 53 66 77
info@kuebler-sarl.com
www.kuebler.fr

(Italian)
Kübler Italia Srl.
Viale Sarca, 96
I-20125 Milano MI
Phone +39 026 423 345
Fax +39 026 611 3843
info@kuebler.it
www.kuebler.it

(German)
Fritz Kübler GmbH
Schubertstraße 47
D-78054
Villingen-Schwenningen
Phone +49 7720 39 03-58
Fax +49 7720 21 56 4
vedrana.solic@kuebler.com
www.kuebler.com

Turkey
Kübler Turkey Otomasyon Ticaret Ltd. Sti.
Yeni mahalle Balikesir Cad.
Uprise Elit Residence C1 AB Blok
No:180 Soganlik
TR - 34880 Kartal/Istanbul
Phone +90 216 999 9791
Fax:+90 216 999 9784
cengizhan.temurcin@kuebler.com
www.kuebler.com

• Encoders, process devices and transmission technology:
Sanil Teknik
Elektrik San. ve Tic. Ltd. Sti.
Okçumusa Caddesi
Tusak Sokak
No: 27/5 Karaköy
TR-34420 Istanbul
Phone +90 212 256 94 28
Fax +90 212 256 94 04
sanil@sanil.com.tr
www.sanil.com.tr

• Counters:
ERUZ Elektrik San. ve Tic. A.S.
Necatibey Caddesi
Sait Demirbag Han No.5 K.1
TR-34425 Istanbul
Phone +90 212 2 93 60 36
Fax +90 212 2 44 51 56
eruzelektrik@eruzelektrik.com.tr
www.eruzelektrik.com.tr

Ukraine
SV Altera Ltd.
4, Ivana Lepse blvd, Kyiv,
UA-03680 Ukraine
Phone +38 044 496-18-88
Fax +38 044 496-18-18
office@sv-altera.com
www.svaltera.ua

America, Asia, Australia, Africa

Catalogue distributors:
(Europe)

Austria
Farnell GmbH
Birkenstrasse 2
A-5300 Salzburg/Hallwang
Phone +43 662 - 218 06 80
Fax +43 662 - 218 06 70
verkauf.at@farnell.com
www.farnell.at

RS Components
Albrechtser Straße 11
A-3950 Gmünd
Phone +43 28 52 505
Fax +43 28 52 53 223
www.rs-components.at

France.
RS Components SAS
Rue Norman King BP 40453
F-60031 Beauvais CEDEX
Phone +33 3 44 10 16 48
Fax +33 3 44 10 16 44
www.radiospares.fr

Farnell France SAS
81-83 rue Henri Depagneux
BP 60426 Limas
F-69654 Villefranche sur
Saône
Cedex
Phone +33 4 74 68 99 99
Fax +33 4 74 68 99 90
ventes@farnell.com
www.farnell.fr

Great Britain
RS Components Ltd.
PO Box 99, Corby
GB-Northants NN17 9RS
Phone +44 84 58 50 99 00
Fax +44 15 36 40 56 78
www.rs-components.com

Farnell
Canal Road
GB-Leeds, LS12 2TU
Phone +44 8447 11 11 11
Fax +44 8447 11 11 13
sales@farnell.co.uk
www.farnell.co.uk

Italy.
RS Components S.p.A.
Via De Vizzi 93/95
I-20092, Cinisello Balsamo,
Milano
Phone +39 02 660 581
Fax +39 02 660 580 51
www.rs-components.it

Distrelec Italia s.r.l.
Via Canova 40/42
I-20020 Lainate (Mi)
Phone +39 02 - 93 75 51
Fax +39 02 - 93 75 57 55
info-it@distrelec.com
www.distrelec.com

Switzerland
Distrelec AG
Grabenstraße 6
CH-8606 Nänikon
Phone +41- 44 9 44 99 11
Fax +41- 44 9 44 99 88
www.distrelec.com

Farnell AG
Brandschenkestr. 178
Postfach 1703
CH-8027 Zürich
Phone +41 1 - 204 64 64
Fax +41 1 - 204 64 54
verkauf.ch@farnell.com
www.farnell.ch

Micronor AG
Pumpwerkstraße 32
CH-8105 Regensdorf
Phone +41 44 843 40 20
Fax +41 44 843 40 39
sales@micronor.ch
www.micronor.ch

Argentina
AUMECON S.A.
Acassuso 4768
1605 Munro
Prov. de Buenos Aires
Phone +54 11 47 56 1251
Fax +54 11 47 62 63 31
ventas@aumecon.com.ar
www.aumecon.com.ar

Australia
Balluff Leuze Pty. Ltd.
12 Burton Court
Bayswater, Vic. 3153
Phone +61 3 97 20 41 00
Fax +61 3 97 38 26 77
sales@balluff.com.au
www.balluff.com.au

Brazil
Balluff Controles Eletricos Ltda.
Rua Francisco Foga 25,
Cx. Postal 189
CEP 13280-000 Vinhedo-SP
Phone +55 19 38 76 99 99
Fax +55 19 38 76 99 90
vendas@balluff.com.br.
www.balluff.com.br

Canada
Turck Chartwell Canada Inc.
140 Duffield Drive
Markham, Ontario L6G 1B5
Phone +1 905 513 7100
Fax +1 905 513 7101
sales@www.chartwell.ca
www.chartwell.ca

China.
Kuebler (Beijing) Automation
Trading Co. Ltd.
Rm 1603, B Area, Tower 2,
Wangjing Soho,
No.1 Futong East Street,
Chaoyang, Beijing,
China,100102
Phone +86 10 8471 0818
Fax: +86 10 8471 0819
beijing@kuebler.com
www.kuebler.com

Egypt.
AEE Advanced Electronic
Engineering Co.
3 Hassan El-Sheraie St.Off
El-Horiya St-Heliopolis
Cairo
Phone +20 2 2418 50 20
Fax +20 2 2415 92 65
hfarid@aeecontrols.com
www.aeecontrols.com

Hong Kong
Po Kwong Electric (HK) Ltd.
Rm. 177-180, 1/F., Blk C,
Hang Wai Ind. Ctr.,
6 Kin Tai St., Tuen Mun, N.T
Phone +852 24 23 66 22
Fax +852 24 61 10 02
sales@pokwong.com
www.pokwong.com

India
Kuebler Automation India Pvt Ltd
Plot No 677, S. No. 269/3,
Paud Road, Bhugaon,
Pune 412 115,
Maharashtra
Phone +91 99 7065 5599
Tel. +91 20 6790 1-200 / 230 /
214 / 202
Fax +91 20 6790 1232
info@kuebler.in
www.kuebler.in

Rajdeep Automation Pvt. Ltd.
G3A, Anand Estate, Ground floor
Sane Guruji Marg, Mahalaxmi
Mumbai 400 011
Phone +91 22 23 00 28 37 / 8
Fax +91 22 23 00 2839
info@rajdeep.in
www.rajdeep.in

Indonesia
SUPRA Engineering
Jl. Pecenongan 17 D
RI-10120 Jakarta
Phone +62 21 345 73 55
Fax +62 21 345 73 18
astina@centrin.net.id
www.supra.co.id

Israel
Omega Engineering
P.o.Box 190
Ein Carmel 30860
Phone +972-4-9544993
Fax +972-4-9544992
info@omegae.net
www.omegae.net

Lebanon
Industrial Technologies S.A.L
(ITEC)
Blvd. Fouad Chehab
Point Center, Sin El Fil, Beirut
Phone +961 (1) 491161
Fax +961 (1) 491162
info@iteclb.com
www.iteclb.com

Malaysia
dpstar Smart Solutions Sdn Bhd
No. 37-1, Jalan OP 1/2
Pusat Perdagangan One Puchong,
Off Jalan Puchong,
47160 Puchong,
Selangor Darul Ehsan,
Malaysia
Phone +603 8074 8866
Fax +603 8074 8666
chrisliau@dpstar.com.my
www.dpstar.com.my

Mexico
Turck Mexico S.de R.L.de C.V.
Parque Industrial La Angostura
Zacatecas Km 4.5 Nave 8A
Saltillo, Coahuila 25315
Phone +52 844 411 6650
Toll Free: 01-800-01-TURCK
(Mexico only)
Fax +52 844 482 6926
mexico@turck.com
www.turck.com.mx

Morocco
r2i Consult SARL
109 rue Montaigne Val
Fleuri Maarif Casablanca
Maroc
Phone +212522986960
Fax +212522989537
info@r2imaroc.ma
www.r2imaroc.com

New Zealand
Carrel-Electrade Ltd.
P.O. Box 11-078
Ellerslie
NZ-Auckland 1542
Phone +64 95251753
Fax +64 95251756
sales@carrel-electrade.co.nz
www.carrel-electrade.co.nz

Peru
Techpro SAC
Calle Alberto del Campo 414
Magdalena del Mar
Lima 17 - Peru
Phone +51 98943 58-54
Fax +51 17272 685
techpro.peru@techprocorp.net
www.techprocorp.net

Philippines.
Technorand Sales Coporation
122 McArthur Highway
0 Malabon, Metro Manila
Phone +632 985 07 05
Fax +632 716 59 86
technorand@gmail.com

Singapore.
Raymond International Pte. Ltd.
Blk 219 Henderson Road #07-04
Henderson Industrial Park
Singapore 159556
Phone +65 62 76 37 38
Fax +65 62 76 37 39
sales@raymondcom.com
www.raymondcom.com

South Africa.
Kübler Group
Fritz Kübler GmbH
Schubertstr. 47
78054 Villingen-Schwenningen
Phone +49 7720 3903-0
Fax +49 7720 21564
info@kuebler.com
www.kuebler.com

South Korea
Kuebler Korea (by F&B)
578, Kwaebop-dong, Sasang-ku
Pusan Industrial Supplies
Market 9-116
PUSAN
Phone +82 51 319 12 30
Fax +82 51 319 12 50
fnb@kuebler.co.kr
www.kuebler.kr

Taiwan, R.O.C.
• Encoders, transmission
technology:
E-Sensors & Automation Int'l Corp.
6F-2, No.109, Chien Kuo 1st Rd.
Kaohsiung 80284
Taiwan, R.O.C.
Phone +886-7-7220371
Fax +886-7-7718161
ez-corp@umail.hinet.net
www.e-sensors.com.tw

• Electronic counters and
process devices:
Canaan Electric Corp.
6F-5, No. 63, Sec. 2
Chang An East Road
Taipei
Phone +886 225 08 23 31
Fax +886 225 08 47 44
sales@canaan-elec.com.tw
www.canaan-elec.com.tw

Thailand
Technology Instruments Co., Ltd.
549/9 Onnut Road Kwaeng
Pravet, Khet Pravet
Bangkok 10250
Phone +662 74 388 88
Fax +662 74 388 43
marketing@tic.co.th
www.tic.co.th

Tunisia
H2M Technologies
13, Rue El Moutanabi
TN-2037 El Menzah 7 -Tunis
Phone +216 71 42 76 77
Fax +216 71 42 76 88
h2m.tech@planet.tn

U.S.A.
Kuebler Inc.
5245-3 Old Dowd Road
Charlotte, NC 28208
Phone +1-704-705-4711
Toll Free +1-855-KUEBLER
(583-2537)
Fax +1-704-733-9170
usa@kuebler.com
www.kuebler.com/usa

• Counting and process
technology:
Global Industrial Products Inc.
8129 North Austin AVE
Morton Grove, IL 60053
Toll-free number:
1-800-951-8774
Phone 847 965 9808
Fax 847 901 9846
sales@globalepower.com
www.kueblerusa.com

United Arabe Emirates
Baer Measurements LLC
P.O. Box 111393
Al Gaith Tower 505,
Hamdan Street
Abu Dhabi - UAE
Phone +971 2 627 2097
Fax +971 2 627 2091
info@bml.ae
www.bml-international.com

Vietnam
GNN Co., Ltd
153, Nguyen Van Thu
Da Koa Ward, District 1
Ho Chi Minh City
Phone +84 8 3517 4923
Fax +84 8 3517 4924
contact@gnnvietnam.com
www.gnnvietnam.com

Contact partners in Germany

PLZ 01000 … 09999
PLZ 15000 … 15999
Kübler Vertriebsbüro Süd-Ost
Lars Meyer
Durchfahrt 9
09569 Oederan
Phone +49 37292 283500
Fax +49 37292 283501
lars.meyer@kuebler.com

PLZ 10000 … 14999
PLZ 16000 … 19999
PLZ 20000 … 32999
PLZ 38000 … 39999
Kübler Vertriebsbüro Nord
Hermi Herrmann
Mohnblumenweg 6
28876 Oyten
Phone +49 4207 6880-32
Fax +49 4207 6880-34
hermi.herrmann@kuebler.com

PLZ 33000 … 33999
Kübler Vertriebsbüro West
Torsten Czubkowski
Auf der Ümcke 11 a
59757 Arnsberg
Phone +49 2932 891898
Fax +49 2932 53311
torsten.czubkowski@
kuebler.com

PLZ 34000 … 37999
Kübler Vertriebsbüro Mitte
Stefan Heinigk
Gartenstraße 10
35759 Driedorf
Phone +49 2775 578427
Fax +49 2775 578428
stefan.heinigk@kuebler.com

PLZ 40000 … 47999
Kübler Vertriebsbüro West
Torsten Czubkowski
Auf der Ümcke 11a
59757 Arnsberg
Phone +49 2932 891898
Fax +49 2932 53311
torsten.czubkowski@
kuebler.com

PLZ 48000 … 49999
Kübler Vertriebsbüro Nord
Hermi Herrmann
Mohnblumenweg 6
28876 Oyten
Phone +49 4207 6880-32
Fax +49 4207 6880-34
hermi.herrmann@kuebler.com

PLZ 50000 … 54999
PLZ 55300 … 55999
PLZ 56500 … 56999
PLZ 58000 … 59999
Kübler Vertriebsbüro West
Torsten Czubkowski
Auf der Ümcke 11a
59757 Arnsberg
Phone +49 2932 891898
Fax +49 2932 53311
torsten.czubkowski@
kuebler.com

PLZ 55000 … 55299
PLZ 56000 … 56499
PLZ 57000 … 57999
Kübler Vertriebsbüro Mitte
Stefan Heinigk
Gartenstraße 10
35759 Driedorf
Phone +49 2775 578427
Fax +49 2775 578428
stefan.heinigk@kuebler.com

PLZ 60000 … 65999
PLZ 67000 … 67599
PLZ 68000 … 69999
Kübler Vertriebsbüro Mitte
Stefan Heinigk
Gartenstraße 10
35759 Driedorf
Phone +49 2775 578427
Fax +49 2775 578428
stefan.heinigk@kuebler.com

PLZ 66000 … 66999
PLZ 67600 … 67999
Kübler Vertriebsbüro West
Torsten Czubkowski
Auf der Ümcke 11a
59757 Arnsberg
Phone +49 2932 891898
Fax +49 2932 53311
torsten.czubkowski@
kuebler.com

PLZ 70000 … 79999
Kübler Vertriebsbüro
Süd-West
Philipp Lang
Lembergstraße 6
72119 Ammerbuch-Altingen
Phone +49 7032 2293665
Fax +49 7032 2993454
philipp.lang@kuebler.com

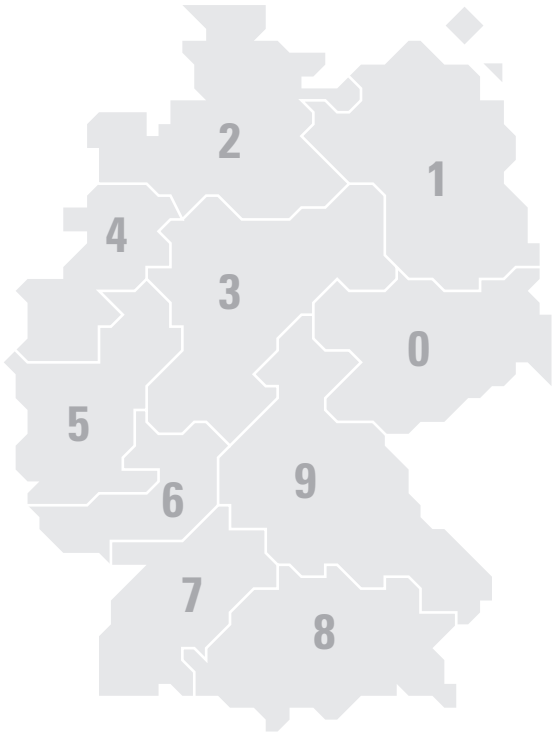
PLZ 80000 … 87999
PLZ 89200 … 89499
Kübler Vertriebsbüro Süd
Bernhard Preißler
Am Seeacker 8
93326 Abensberg
Phone +49 9443 9186926
Fax +49 9443 9186974
bernhard.preissler@kuebler.com

PLZ 88000 … 89199
PLZ 89500 … 89999
Kübler Vertriebsbüro
Süd-West
Philipp Lang
Lembergstraße 6
72119 Ammerbuch-Altingen
Phone +49 7032 2293665
Fax +49 7032 2993454
philipp.lang@kuebler.com

PLZ 90000 … 93999
PLZ 95000 … 95999
Kübler Vertriebsbüro Süd-Ost
Lars Meyer
Durchfahrt 9
09569 Oederan
Phone +49 37292 283500
Fax +49 37292 283501
lars.meyer@kuebler.com

PLZ 94000 … 94999
Kübler Vertriebsbüro Süd
Bernhard Preißler
Am Seeacker 8
93326 Abensberg
Phone +49 9443 9186926
Fax +49 9443 9186974
bernhard.preissler@kuebler.com

PLZ 96000 … 99999
Kübler Vertriebsbüro Mitte
Stefan Heinigk
Gartenstraße 10
35759 Driedorf
Phone +49 2775 578427
Fax +49 2775 578428
stefan.heinigk@kuebler.com



Approved system partners/ distributors

22149 Hamburg
Hermann Seidel GmbH
Techn. Vertretungen
Rahlstedter Str. 16
Phone +49 40 675085-0
Fax +49 40 675085-85
info@seidel-gmbh.de
www.seidel-gmbh.de

42499 Hückeswagen
Fuhrmeister + Co. GmbH
Industrie-Elektronik
Stahlschmidtsbrücke 61
Phone +49 2192 851122
Fax +49 2192 851127
info@fuhrmeister-gmbh.de
www.fuhrmeister-gmbh.de

66287 Göttelborn
Herbert Neundörfer
GmbH & Co. KG
Werksvertretungen
Am Campus 5
Phone +49 6825 9545-0
Fax +49 6825 9545-99
info@herbert-neundoerfer.de
www.herbert-neundoerfer.de

82069 Hohenschäftlarn
Bachmann
Electronic GmbH
Am Wagnerfeld 4
Phone +49 8178-8676-0
Fax +49 8178-8676-50
info@bachmann-electronic.de
www.bachmann-electronic.de

Catalogue distributors (Germany):

28359 Bremen
Distrelec Schuricht GmbH
Lise Meitner-Str. 4
Phone +49 1805 2234-35
Fax +49 1805 2234-36
scc@distrelec.de
www.distrelec.de

64546 Mörfelden-Walldorf
RS Components GmbH
Hessenring 13 b
Phone +49 6105 401234
Fax +49 6105 401100
www.rs-components.de

82041 Oberhaching
Farnell GmbH
Keltenring 14
Phone +49 89 61393939
www.farnell.de

92240 Hirschau
Conrad Electronic SE
Klaus-Conrad-Straße 1
92240 Hirschau
Phone +49 9604 408 787
www.conrad.com

Headquarters in Villingen-Schwenningen

www.kuebler.com

Kübler

Position and Motion Sensors

Functional Safety

Transmission Technology

Counters and Process Devices

Kübler Group
Fritz Kübler GmbH
Schubertstrasse 47
D-78054 Villingen-Schwenningen
Germany
Phone +49 7720 3903-0
Fax +49 7720 21564
info@kuebler.com
www.kuebler.com

R.100.569 02 300 15 ES

pulses for automation