

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

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.



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.)



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



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



Safety Services

- Adapted service packages
- Individual customer solutions



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

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

Transmission Technology

- Slip Rings
- Optical Fibre Signal Transmission Modules
- Cables, Connectors and pre-assembled Cordsets

Functional Safety

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

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:

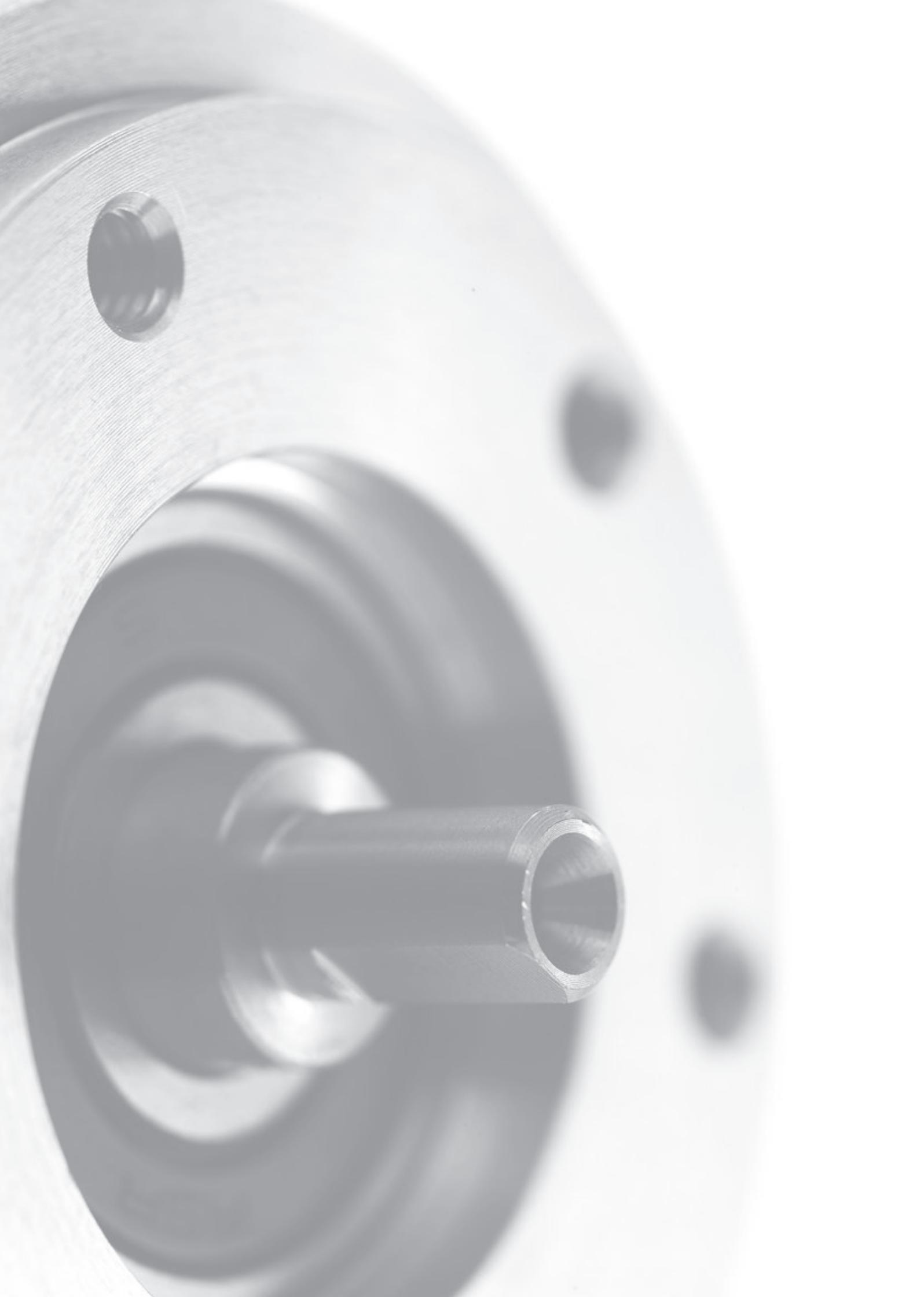


The high performance level and reliability of the Kübler products are based on our long experience in these demanding application sectors. Learn more about our application-specific solutions under:

www.kuebler.com/industries

Position and Motion Sensors 2015

Table of contents	
Product overview / Technical basics	5
Incremental encoders	47
Absolute encoders – singleturn	151
Absolute encoders – multiturn	259
Linear measuring technology	385
Inclinometers	437
Connection technology	447
Accessories	489
Addresses	519



Product overview		Page
Encoders	Incremental encoders	6
	Absolute encoders – singleturn	8
	Absolute encoders – multiturn	10
Linear measuring technology		13
Inclinometers		15
Connection technology		16
Technical basics		Page
Encoders	Introduction	18
	Functional principle	19
	Incremental encoders	20
	Absolute encoders	25
	Installing encoders	30
	Functional Safety	34
	Technology	42
	Glossar	44
Linear measuring technology	Technology magnetic measuring system Limes (incremental / absolute)	35
	Technology draw wire systems / Length measuring kits	37
Inclinometers	Technology	38
Connection technology	Introduction / Cables and connectors	39
Optical fibre signal transmission	General information	41

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	•	c UL US	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
	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	•	c UL US	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	•	c UL US	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	•	c UL US	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	•	c UL US 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	•	c UL US	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	•	c UL US	80
	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	•	c UL US 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	•	c UL US Ex 2/22 SIL2 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	•	c UL US Ex 2/22 SIL3 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	•	c UL US	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
	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 ... 30 10 ... 30	300	•	 	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 ... 30 8 ... 30	300	•	-	107
	Standard, optical ATEX/IECEX – zone 1/21 Sendix 7000 (shaft)	70 [2.76]	-	•	5.000	•	•	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 ... 30 10 ... 30	300	•	 	110
	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 ... 30 10 ... 30	400	•	  	113
	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 ... 30 10 ... 30	400	•	  	116
	Standard, optical ATEX/IECEX – mining Sendix 7100 (shaft)	70 [2.76]	-	•	5.000	•	•	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 ... 30 10 ... 30	300	•	 	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 ... 30 10 ... 30	300	•		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 ... 30 10 ... 30	300	•	  	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	•		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 ... 30 10 ... 30	300	•		138
	Bearingless, magnetic R120/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 R150/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 ... 20mA 0 ... 10V	–	–	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	•	c UL US	168
	Standard, optical parallell / analogue 5850 (shaft) 5870 (hollow shaft)	58 [2.28]	–	•	13	–	–	4 ... 20mA	•	–	12.000	-20 ... +85 [-4 ... +185]	IP66	cable M23	5 10 ... 30	•	c UL US	178
	Standard, optical parallell, highspeed 5852 (shaft) 5872 (hollow shaft)	58 [2.28]	–	•	14	–	–	–	•	–	12.000	-20 ... +85 [-4 ... +185]	IP66	cable M23	5 10 ... 30	•	c UL US	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	•	c UL US 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	•	c UL US Ex 2/22 SIL2 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	•	c UL US Ex 2/22 SIL3 PLe	199
	Standard, optical stainless-steel SSI / parallell 5876 (hollow shaft)	58 [2.28]	–	•	14	•	–	–	•	–	6.000	-20 ... +80 [-4 ... +176]	IP67	cable M12	5 10 ... 30	•	c UL US 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	Parallel interface	Additional incremental track	Speed max. in min ⁻¹	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Page
	Standard, optical ATEX/IECEx – zone 1/21 Sendix 7053 (shaft)	70 [2.76]	-	•	17	•	•	-	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	 	232
	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	•	 SIL2 PLd	235
	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	•	 SIL3 PLe	239
	Standard, optical ATEX/IECEx – mining Sendix 7153 (shaft)	70 [2.76]	-	•	17	•	•	-	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	 	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	•		160
	Compact, optical Sendix F3658 (shaft) Sendix F3678 (hollow shaft)	36 [1.43]	-	•	-	-	-	-	-	16	12.000	-40 ... +85 [-40 ... +185]	IP67	cable	10 ... 30	•		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	•	 	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	•	 	243
	Standard, optical ATEX/IECEx – mining Sendix 7158 (shaft)	70 [2.76]	-	•	•	-	•	-	-	16	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•	 	252

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	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
	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	•	 	260
	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	•	 	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	•		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	•	 	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	•	 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	•	 SIL3 PLe	300
	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	•	 	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	•		348
 	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	•	 	351
 	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	•	 	355
 	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	•		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	•		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	•	-	14+24	•	-	-	-	-	-	-	6.000	-40 ... +85 [-40...+185]	IP67	cable M12	10 ... 30	•	  	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	•		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	•	 	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	•	 	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	•	 	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	•	 	368
	Large hollow shaft, optical / magnetic 9080 (large hollow shaft)	90 [3.54]	-	•	13+12	•	-	•	•	-	-	-	6.000	-10 ... +70	IP65	cable M12	10 ... 30	•		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	10x25x40 [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	10x25x40 [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	16x30x70 [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	24x26x75 [0.94 x 1.02 x 2.95]	–	–	–	•	•	4	-10 ... +70 [+14 ... +158]	IP40	cable	•	396

Product overview

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 ... 20mA 0 ... 10V 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	40x40 x max. 72 [1.57 x 1.57 x 3.90]	–	4 ... 20mA 0 ... 10V 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	50x50x max. 99 [1.97 x 1.97 x 3.90]	•	4 ... 20mA 0 ... 10V 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 ... 20mA 0 ... 10V 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	40x40 x max. 72 [1.57 x 1.57 x 2.83]	•	4 ... 20mA 0 ... 10V 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	41x41 x max. 96.3 [1.61 x 1.61 x 3.79]	–	4 ... 20mA 0 ... 10V 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	75x75x max. 127.4 [2.95 x 2.95 x 5.02]	–	4 ... 20mA 0 ... 10V 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	80x80x max.144 [3.15 x 3.15 x 5.67]	•	4 ... 20mA 0 ... 10V 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	105x85x 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	120x120x max. 136 [4.72 x 4.72 x 5.35]	•	4 ... 20mA 0 ... 10V 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	135x135 x max. 318 [5.32 x 5.32 x 12.52]	•	4 ... 20mA 0 ... 10V 1kΩ	•	•	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
	53	±0.5mm	0.1	dep. on type	•	•	–	•	•	6 m/s	-20 ... +85 [-4 ... +185]	IP67	cable M12 M23 MIL	•	427
	8	±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
	8	0.5mm	0.1	dep. on rack	•	•	–	•	–	0.5 m/s	-20 ... +80 [-4 ... +176]	IP67	cable M12 M23 MIL	•	430
	8	±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
	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
	±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
	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
	±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 mm ²	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		N° of pins	Housing	Connection technology	Cable diameter Ø in mm	Straight connector	Right angle connector	Wall/panel lead-through	for fieldbus	Page
			M12	4/5/8/12	Metal	Screw terminals	6 - 8	•	•	•
	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

Basics

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.

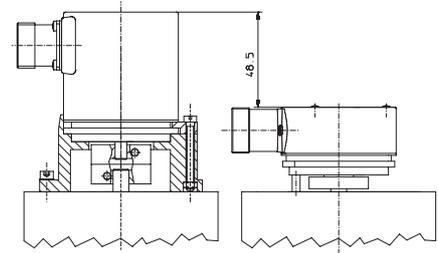
Incremental encoders generate pulses, where the number of pulses can be a measure of speed, length or position.

In absolute encoders, every position corresponds to a 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.

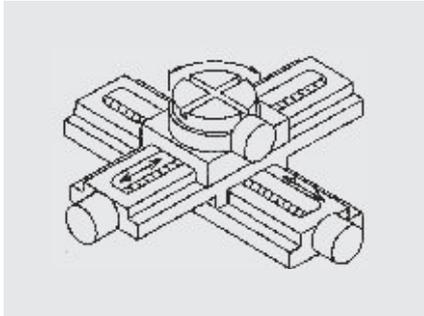
Using a hollow shaft encoder saves up to 30 % of costs and up to 50 % of the required space compared to a shaft encoder. This is achieved by avoiding additional couplings, brackets and other assembly aids.

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.

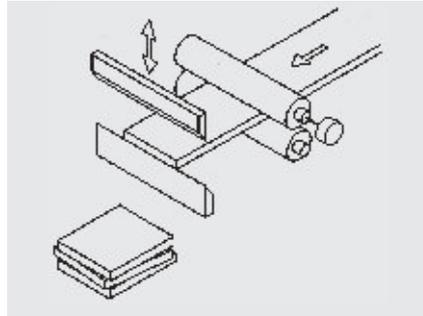


Application examples

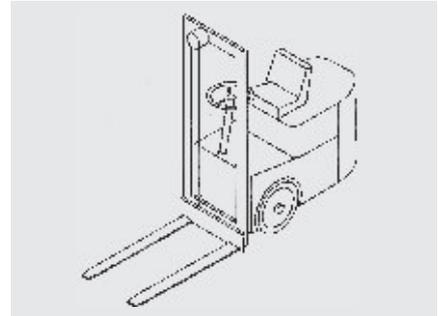
Angular measurement



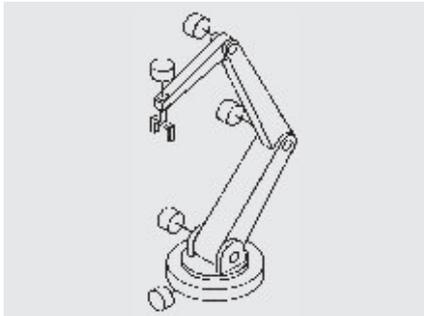
Positioning



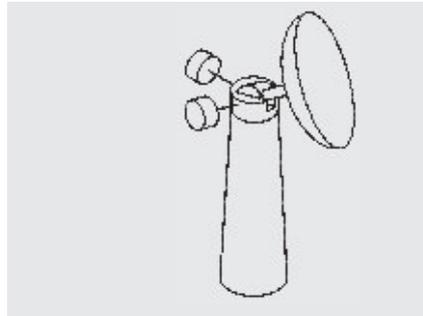
Detecting of fork's position



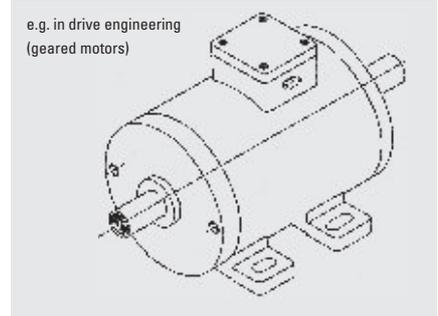
Detecting of position



Angular measurement



Velocity measurement



Encoders Functional principle

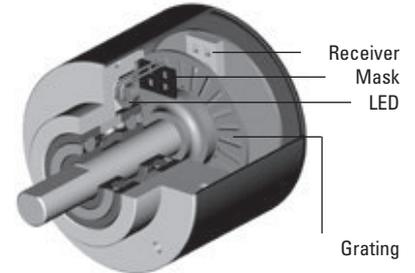
Assembly and function

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.



Product overview
Basics

Optical scanning (absolut)

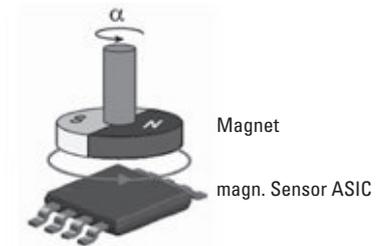
The light that is emitted by an LED is modulated by a code pattern, which is applied to a rotating disc; this is scanned by a special Kübler Opto ASIC. A unique bit pattern is assigned to each position and this is generally available as Gray Code.

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

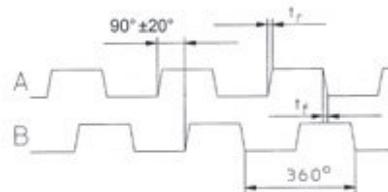
Encoders with one output channel:

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.

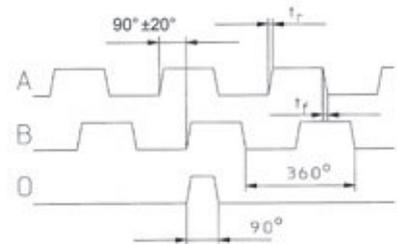
- Shaft turning clockwise, top-view of shaft / for hollow shaft encoders, viewing the flange
 - Inverted signals available
- t_r = rise time
 t_f = fall time



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 an 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.

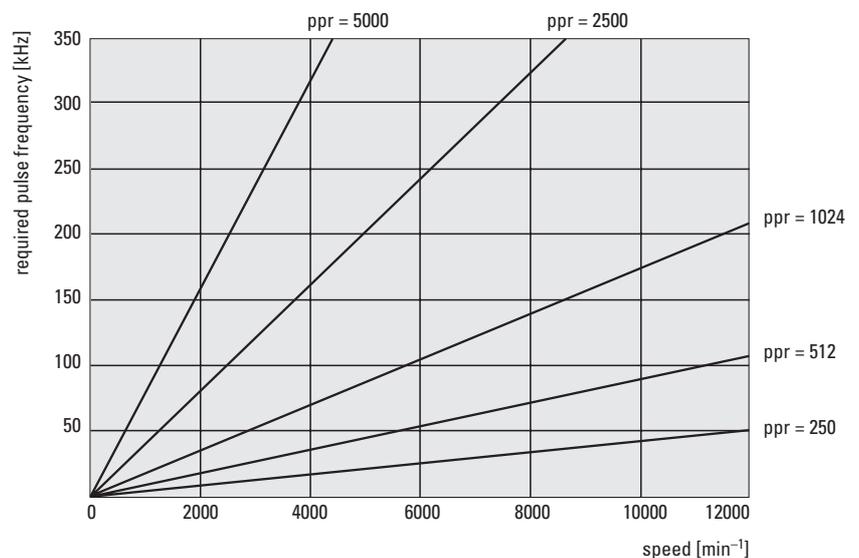
Example:

- 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

Basics

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

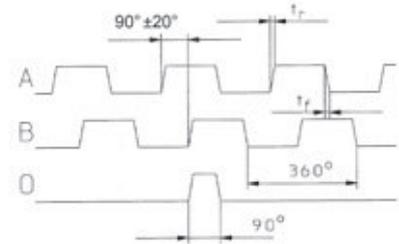
The sine wave signal from the optical system is first digitised to have square wave signals available.

- 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:

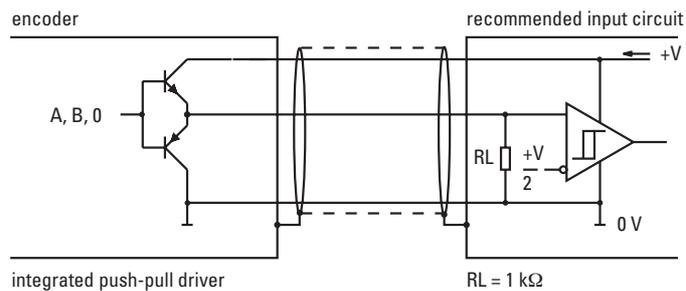
Push-pull:

- 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):

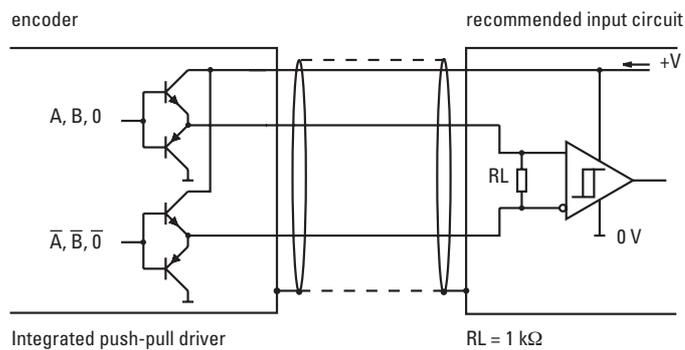
- Universal line driver 5 ... 30 V with low-level (max 0.5 V)
- Recommended for cable lengths up to 30 m
- With inverted signals

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

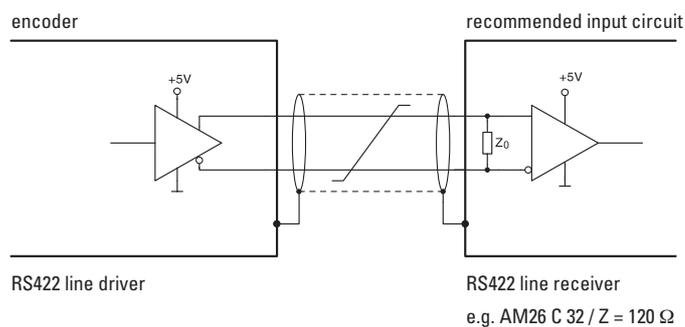


Encoders Incremental encoders

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



RS422
Output circuit and recommended input circuit (TTL)

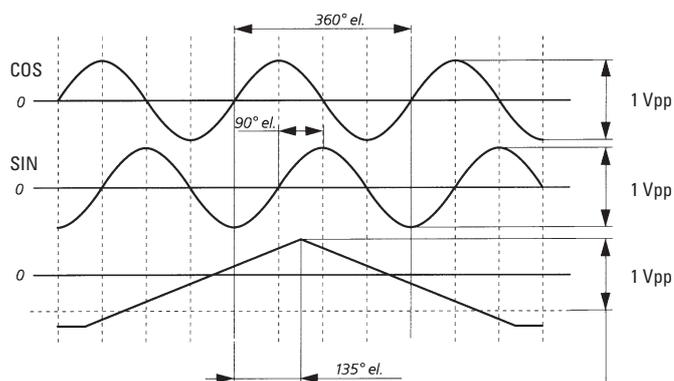


Sine wave outputs

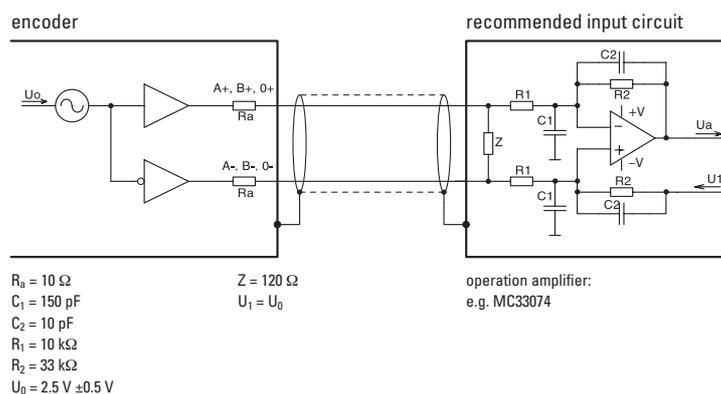
The sine wave signals are available as voltage signals. They can be further processed in the evaluation electronics. Due to the interpolation of the two signals, which are 90° out of phase, a very high resolution can be achieved.

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



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 mm²
- The core diameter of the voltage supply cores should be large enough depending on the cable length, that the voltage supply of the encoder is high enough and the signals do not go below the minimum levels!

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.

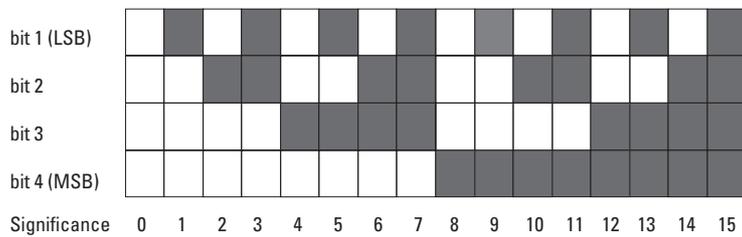
Multiturn encoders are suitable for angular measurement over more than one turn of a shaft, for example with longer traverse paths, such as high rack storage areas, cranes or machine tools.

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

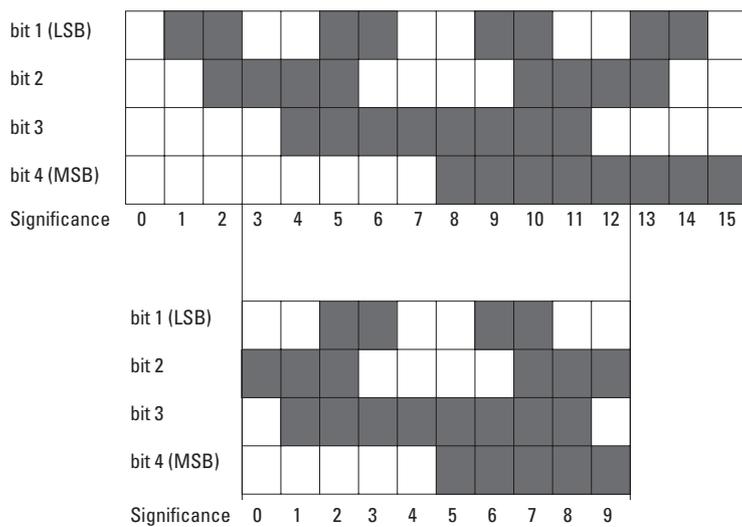
The Gray Code is a single-step code, which guarantees that from one position to the next only 1 bit changes.

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



- 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™



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

Encoders Absolute encoders

Outputs

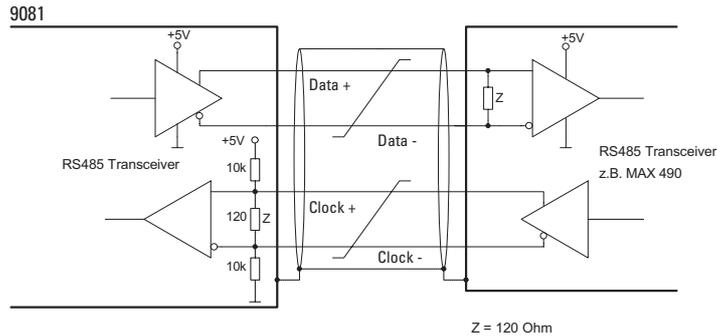
To transfer the position data to a controller, different interfaces are available.

Synchronous serial interface (SSI)

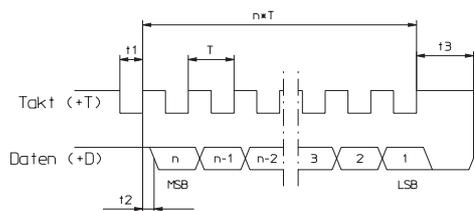
Compared to the parallel interface, the SSI interface needs less components and the EMC characteristics are much better.

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

Output circuit and recommended input circuit



Data transmission SSI



- $t_1 = T / 2$
- $t_2 < 1 / (4 \times f_{max})$
- $t_3 = \text{Monoflop time (see below)}$
- $n = \text{Resolution in bit}$
- $1 / f_{max} \leq T \leq 1 / f_{min}$
- $f_{min} = \text{min. clock rate (see data sheet)}$
- $f_{max} = \text{max. clock rate (see data sheet)}$

At rest, the clock and data lines are at a high level. With the first falling clock-pulse edge, the current encoder data are stored in the buffer ready to be sent. With the next rising clock-pulse edge, the data are transmitted bit by bit, starting with the MSB. The transfer of a complete data word requires $n+1$ rising clock-pulse edges (n =resolution in bit), e.g. 14 clock signals for a complete readout of a 13 bit encoder.

After the last positive-going clock-pulse edge the data line will remain for the duration of the monoflop time t_3 at a low level, until the encoder is ready for a new data word. The clock line must stay high for at least as long, and then can begin a new read-out sequence again with the next falling edge.

Please note!

Only for type 5850, 5870 and 9081:

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

A periodic read-out of the encoder in the application is therefore recommended, using appropriately short cycle times, so that current position values are constantly maintained. It is not possible to read out the same data word several times.

Monoflop time of the encoder: $t_3 = \text{max. } 40\mu\text{s}$

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: $t_3 = \text{see data sheet}$.

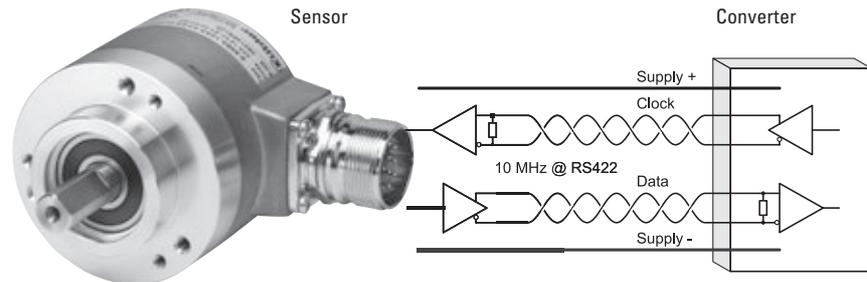
BiSS interface

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.

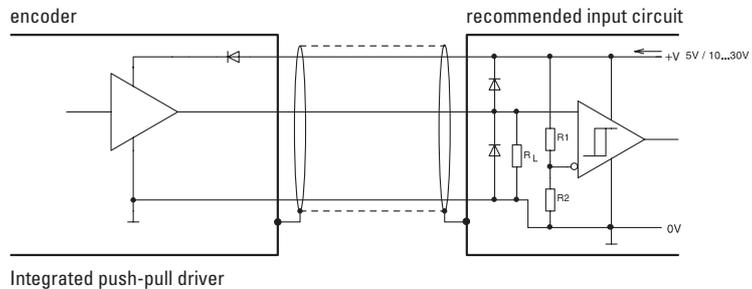
Details about our BiSS interface can be found on our website at: www.kuebler.com/service/biss_en.pdf.

Encoders Absolute encoders

Parallel output

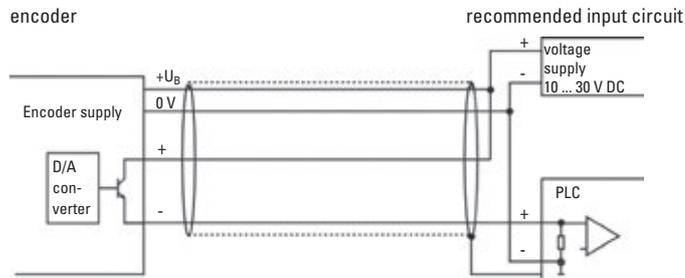
This type of transfer is very fast. All bits of a position are transferred simultaneously each via a separate line.

Output circuit and recommended input circuit



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 $\geq 0.14 \text{ mm}^2$
- 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 $f = 250 \text{ kHz}$ L_{max} approx. 50 m

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.

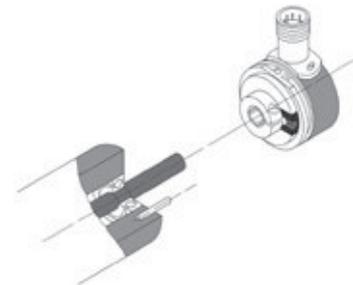
In order to avoid permanent damage of the encoder, certain bearing loads should not be exceeded. If hollow shaft encoders are correctly installed and the torque stops or stator couplings that are available from Kübler are used, then no problems should occur. For solid shaft encoders the maximum permitted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

Mounting options for hollow shaft encoders

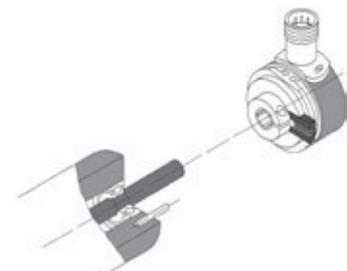
Hollow shaft encoder with torque stop and pin

(easiest and fastest mounting)

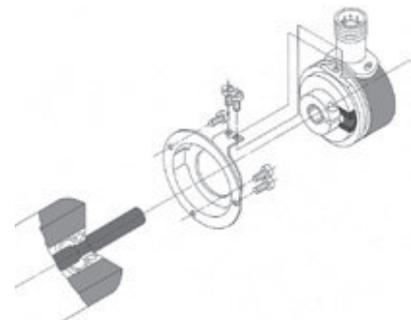
Standard hollow shaft encoders are equipped with the torque stop (cylindrical pin not supplied).



Extended torque stop and long pin



Stator coupling

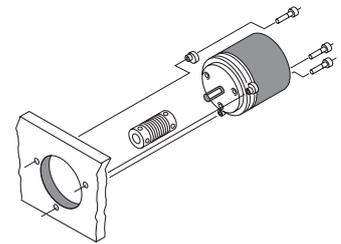


Encoders

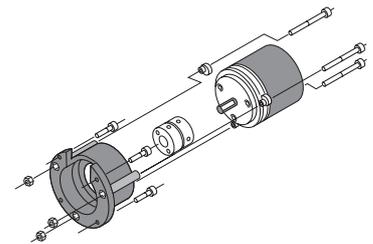
Installing encoders

Mounting examples for shaft encoders with synchronous flange

Fastening eccentrics + coupling
(to reduce shaft overload)

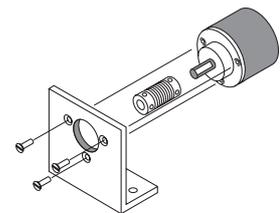


Assembly bell, fastening eccentrics + coupling
(to prevent shaft overload and to isolate the encoder thermally and electrically)

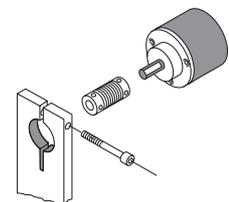


Mounting examples for shaft encoders with clamping bracket

Angular bracket + coupling
(to reduce shaft overload)



Clamping device + coupling
(to reduce shaft overload)



Encoders

Installing encoders

Loading of encoder shaft bearings using coupling forces

With all spring couplings (shaft coupling, stator coupling, fixing bracket), alignment and axial errors are converted to a force that corresponds to the spring constant of the coupling.

This force has to be absorbed by the encoder shaft bearings. When installing an encoder, this should be done with as little force as possible, i.e. without any unnecessary initial tension on the coupling. If this is adhered to, then with all Kübler couplings adequate tolerance compensation is guaranteed for the whole service life of the encoder bearings.

This force does not occur with torque stops for hollow shaft encoders, where the encoder is prevented from turning also by means of a pin or rod.

Although the encoder is prevented from rotating due to a rigid interlock, the encoder is still free to move in any other direction. This is of course dependent on it being mounted in such a way that it has freedom to move radially and especially axially (thermal linear expansion of the drive shaft!).

Possible errors in accuracy due to couplings

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

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

The following applies:

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

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

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

Resolution	binary	10 bit	11 bit	12 bit	13 bit	14 bit	17 bit
	ppr		1024	2048	4096	8192	16384
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

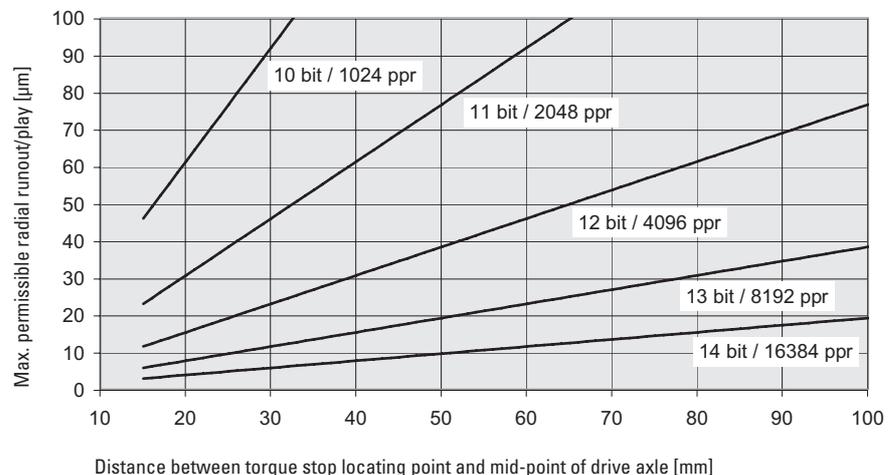
2. Deviations in accuracy caused by radial play in the drive shaft with asymmetrical mounting of the couplings

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 asymmetrical 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



Encoders	Installing encoders	
-----------------	----------------------------	--

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

Measuring wheels, toothed wheels or gear pulleys, which are mounted directly on the encoder shaft, exert radial forces on the latter, dependent on prestressing and angular acceleration. Kübler encoders are designed so that they can absorb these forces to a great extent. The maximum permissible load capacity of the shaft is shown in the technical data for the encoder.

If these load values may be exceeded in a particular application, then the encoder shaft must be isolated from the radial load by interposing an appropriate shaft with its own bearings that can absorb the forces. Kübler offers suitable bearing blocks and bearing boxes for this purpose (please refer to the 'Accessories' section in the catalogue).

Product overview
Basics

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

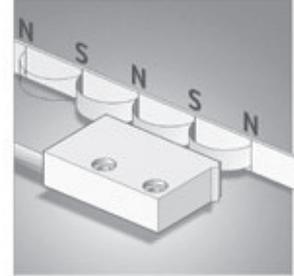


The idea:

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.



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

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

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

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

Overview of features:

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

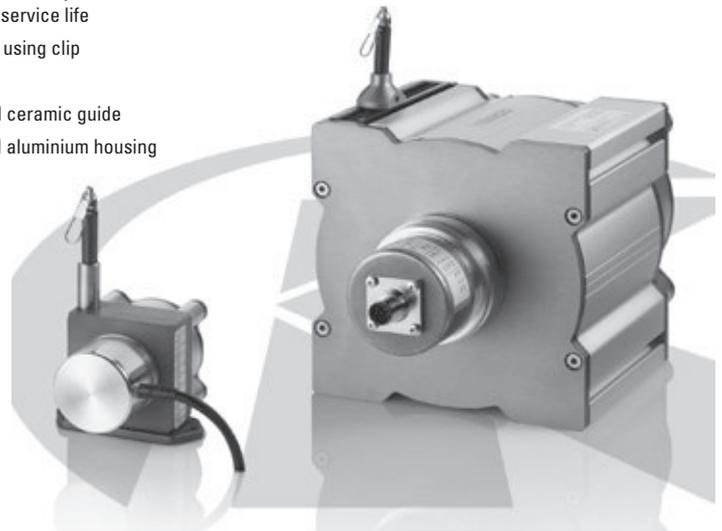
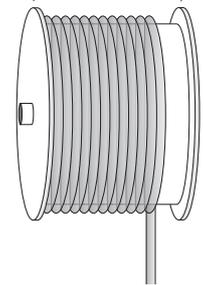
Measuring length up to 40 m,
Resolution up to 0.1 mm



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



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

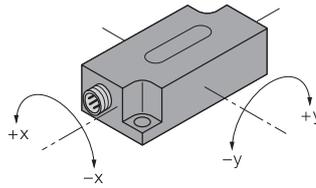
Inclinometers

The 1 and 2-dimensional inclinometers are used for measuring inclinations in the ranges of $\pm 10^\circ$, $\pm 45^\circ$, $\pm 60^\circ$ 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



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



Product overview Basics

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

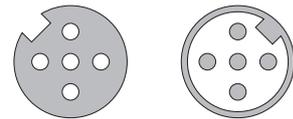
Coding of the M12 x 1 connectors

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.

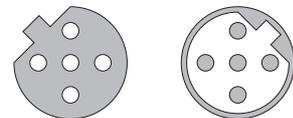
A-coding

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



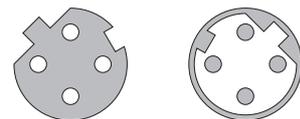
B-coding

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

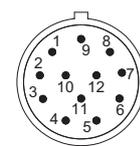
Counting direction cw/ccw

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	
<p>Description</p>	<p>The system is made up of an optical fibre transmitter and an optical fibre receiver.</p> <p>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.</p> <p>The receiver module converts the optical signals back into electrical signals.</p> <p>The modules are available in various level and power supply voltage variants.</p>	<p>Main advantages of an optical fibre transmission:</p> <ul style="list-style-type: none"> • 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
<p>Mounting of optical fibre modules</p>	<p>The optical fibre modules can be mounted directly on a TS35 DIN rail (top-hat rail) according to EN 50022.</p> <p>The installation width for every module is only 19 mm.</p>	
<p>Laying and connection of glass fibre cables</p>	<p>Laying the cable is generally easy.</p> <p>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.</p>	<p>When connecting the cable, make sure that the bayonet catch is locked and remove the dust protection caps only just before connecting the cable.</p>
<p>Glass fibre cables</p>	<p>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.</p>	<p>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.</p>

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	++

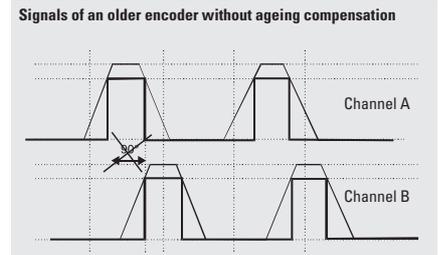
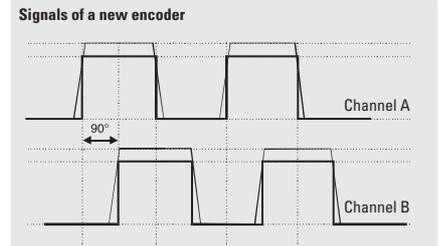
Encoders Technologies

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.



Product overview Basics

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



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	<p><i>Working temperature:</i></p> <p>Is defined as the environmental temperature, in which the encoder will produce the signals defined in the data sheets.</p>	<p><i>Operating temperature:</i></p> <p>Is defined as the environmental temperature, in which the encoder can be operated without incurring damage.</p>
--------------------	--	---

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.

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

These two tables summarise the most used IP ratings.

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



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 	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
	 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
	 Stainless steel Sendix 5006 / 5026 (shaft / hollow shaft)	Push-Pull / RS422	103
	Large hollow shaft 5821 (hollow shaft)	Push-Pull / RS422	107
	 ATEX/IECEX Sendix 7000 (shaft)	Push-Pull / RS422	110
	 ATEX/IECEX, SIL2 / PLd Sendix SIL 7014FS2 (shaft)	SinCos	113
	 ATEX/IECEX, SIL3 / PLe Sendix SIL 7014FS3 (shaft)	SinCos	116
 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

Incremental encoders

Miniature optical

2400 / 2420 (shaft / hollow shaft)

Push-Pull



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

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



High rotational speed



Temperature range
-20°...+85°C



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 . **XXXX** . **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.



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.

Incremental encoders

Miniature optical	2400 / 2420 (shaft / hollow shaft)	Push-Pull
--------------------------	---	------------------

Order code Hollow shaft	05.2420 Type	1 X X X X a b c d e	XXXX e	If for each parameter of an encoder the <u>underlined preferred option</u> 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.	
a Flange <u>1 = ø 24 mm [0.94"]</u>	b Blind hollow shaft insertion depth max. 14 mm [0.55"] <u>1 = ø 4 mm [0.16"]</u> 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 <u>4 = Push-Pull (with inverted signal) / 8 ... 30 V DC</u>	d Type of connection <u>1 = axial cable, 2 m [6.56'] PVC</u> 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, <u>100</u> , 120, 125, 180, 200, 250, 300, <u>360</u> , 400, 500, <u>512</u> , <u>1000</u> , <u>1024</u> (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

Incremental encoders

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 LOW max. 0.5 V	min. +V - 3.0 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.

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.

Incremental encoders

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	\bar{A}	B	\bar{B}	0	$\bar{0}$
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD

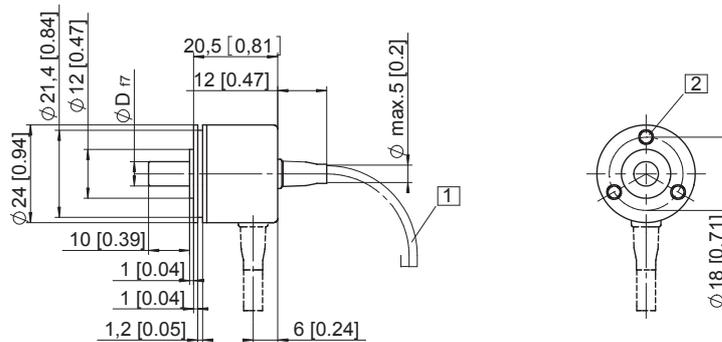
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal

Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

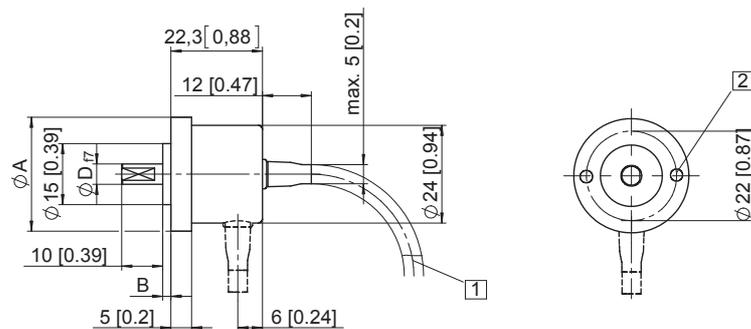
- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep



Flange type 2, \varnothing 30 [1.18]

Flange type 3, \varnothing 28 [1.10]

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



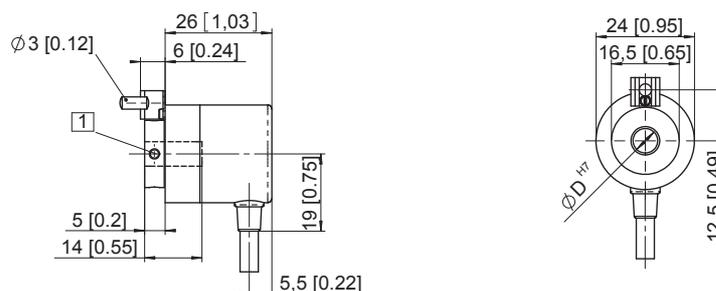
Flange type	A	B
2	\varnothing 30 [1.18]	3 [0.12]
3	\varnothing 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5



Incremental encoders

Incremental encoders

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	8.2430	. X X 6 X . XXXX	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.				
Shaft version	Type	<table border="0"> <tr> <td style="border: 1px solid black; padding: 2px;">a</td> <td style="border: 1px solid black; padding: 2px;">b</td> <td style="border: 1px solid black; padding: 2px;">c</td> <td style="border: 1px solid black; padding: 2px;">d</td> <td style="border: 1px solid black; padding: 2px;">e</td> </tr> </table>			a	b	c
a	b	c	d	e			

- | | | |
|--|---|---|
| <p>a Flange
 <u>1 = ø 24 mm [0.94"]</u>
 3 = ø 28 mm [1.10"]
 2 = ø 30 mm [1.18"]</p> <p>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
 <u>2 = ø 6 x 10 mm [0.24 x 0.39"]</u></p> <p>c Output circuit / power supply
 <u>6 = RS422 (with inverted signal) / 5 V DC</u></p> | <p>d Type of connection
 1 = axial cable, 2 m [5.56'] PVC
 A = axial cable, special length PVC *)
 <u>2 = radial cable, 2 m [5.56'] PVC</u>
 B = radial cable, special length PVC *)</p> <p>*) 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)</p> | <p>e Pulse rate
 1 ... 128 (factory programmable)
 <u>256</u>
 (e.g. 128 pulses => 0128)</p> <p><i>Optional on request</i>
 - other pulse rates</p> |
|--|---|---|

Order code	8.2440	. 1 X 6 X . XXXX	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.				
Hollow shaft	Type	<table border="0"> <tr> <td style="border: 1px solid black; padding: 2px;">a</td> <td style="border: 1px solid black; padding: 2px;">b</td> <td style="border: 1px solid black; padding: 2px;">c</td> <td style="border: 1px solid black; padding: 2px;">d</td> <td style="border: 1px solid black; padding: 2px;">e</td> </tr> </table>			a	b	c
a	b	c	d	e			

- | | | |
|---|---|---|
| <p>a Flange
 <u>1 = ø 24 mm [0.94"]</u></p> <p>b Blind hollow shaft
 <i>(insertion depth max. 14 mm [0.55"])</i>
 1 = ø 4 mm [0.16"]
 <u>2 = ø 6 mm [0.24"]</u></p> <p>c Output circuit / power supply
 <u>6 = RS422 (with inverted signal) / 5 V DC</u></p> | <p>d Type of connection
 1 = axial cable, 2 m [5.56'] PVC
 A = axial cable, special length PVC *)
 <u>2 = radial cable, 2 m [5.56'] PVC</u>
 B = radial cable, special length PVC *)</p> <p>*) 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)</p> | <p>e Pulse rate
 1 ... 128 (factory programmable)
 <u>256</u>
 (e.g. 128 pulses => 0128)</p> <p><i>Optional on request</i>
 - other pulse rates</p> |
|---|---|---|

Incremental encoders

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 outputs²⁾	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	\bar{A}	B	\bar{B}	0	$\bar{0}$	
		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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: 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.

Incremental encoders

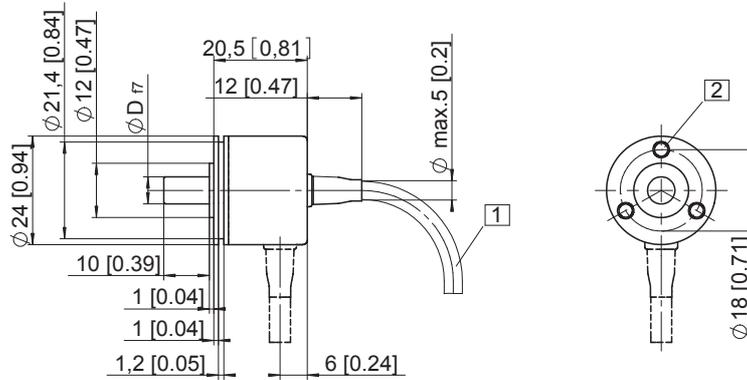
Miniature magnetic	2430 / 2440 (shaft / hollow shaft)	RS422
---------------------------	---	--------------

Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

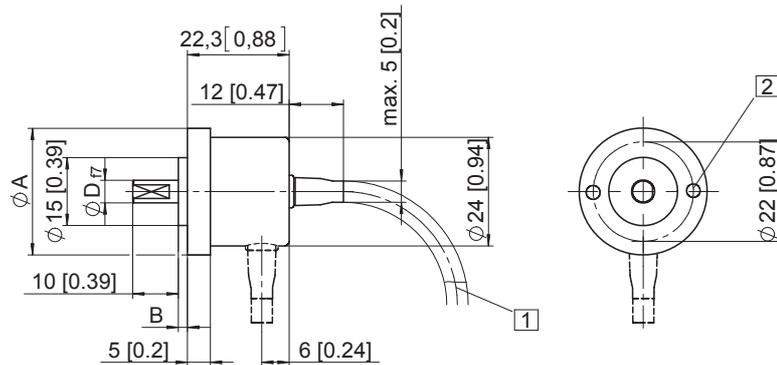
- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep



Flange type 2, \varnothing 30 [1.18]

Flange type 3, \varnothing 28 [1.10]

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



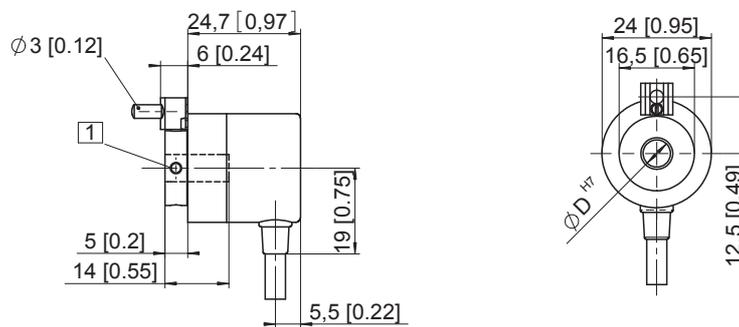
Flange type	A	B
2	\varnothing 30 [1.18]	3 [0.12]
3	\varnothing 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5



Incremental encoders

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		Working temperature range	
Maximum speed	4500 min ⁻¹	-20°C ... +70° [-4°F ... +158°F]	
Mass moment of inertia	approx. 0.2 x 10 ⁻⁶ kgm ²	Materials	
Starting torque – at 20°C [68°F]	< 0.05 Nm	shaft	stainless steel
Shaft load capacity	radial	flange	aluminium
	axial	housing	aluminium
Weight	ca. 0.17 kg [6.00 oz]	cable	PVC
Protection acc. to EN 60529	IP64	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 LOW max. 0.5 V	min. +V - 2.0 V max. 0.5 V	
Rising edge time t_r	max. 200 ns	max. 1 µs	
Falling edge time t_f	max. 200 ns	max. 1 µs	
Short circuit proof outputs 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	\bar{A}	B	\bar{B}	0	$\bar{0}$	
		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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: 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.

Incremental encoders

Compact optical

Sendix Base KIS40 / KIH40 (shaft / hollow shaft)

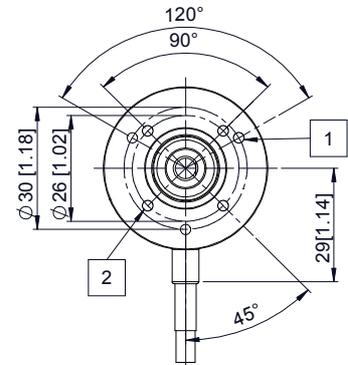
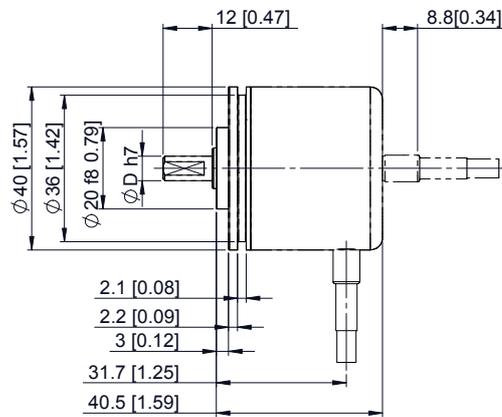
Push-Pull / RS422 / open collector

Dimensions shaft version

Dimensions in mm [inch]

Clamping-synchro flange, $\varnothing 40$ [1.57] Flange type 1

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

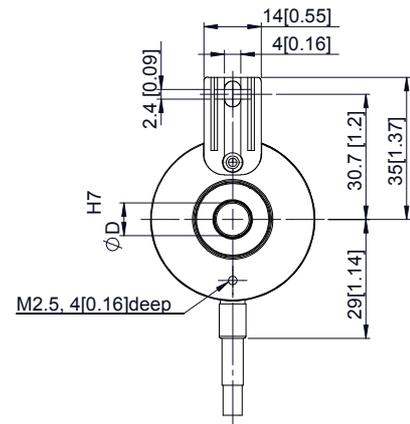
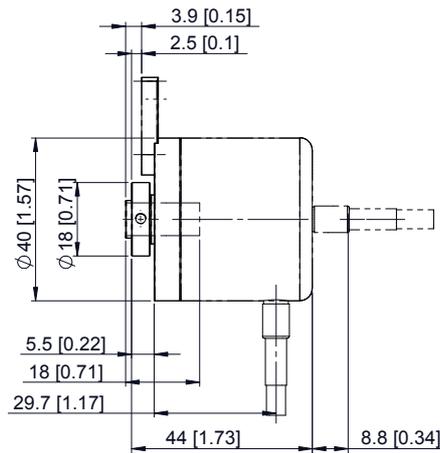


$D = \varnothing 6$ [0.24]
 $\varnothing 1/4''$

Dimensions hollow shaft version

Dimensions in mm [inch]

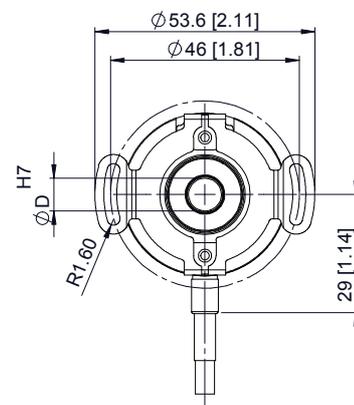
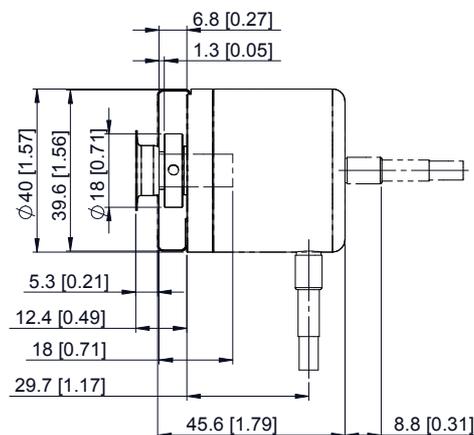
Flange with spring element, long Flange type 2



$D = \varnothing 8$ [0.31]
 $\varnothing 1/4''$

Flange with stator coupling, $\varnothing 46$ [1.81] Flange type 5

Shaft: minimum insertion
depth 1.5 x D



$D = \varnothing 8$ [0.31]
 $\varnothing 1/4''$

Incremental encoders

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	8.3610	.	X	X	X	X	.	XXXX
Shaft version	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.



<p>a Flange</p> <p>2 = synchro flange, \varnothing 36.5 mm [1.44"]</p> <p><u>3 = clamping flange, \varnothing 36.5 mm [1.44"]</u></p>	<p>d Type of connection</p> <p>1 = axial cable, 2 m [5.56'] PVC</p> <p>A = axial cable, special length PVC *)</p> <p><u>2 = radial cable, 2 m [5.56'] PVC</u></p> <p>B = radial cable, special length PVC *)</p> <p>3 = axial M12 connector, 8-pin</p> <p>4 = radial M12 connector, 8-pin</p> <p>*) 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)</p>	<p>e Pulse rate</p> <p>25, 100, <u>200</u>, 360, <u>500</u>, 512, 600, 1000,</p> <p><u>1024</u>, 1500, 2000, <u>2048</u>, <u>2500</u></p> <p>(e.g. 500 pulses => 0500)</p> <p><i>Optional on request</i></p> <p>- other pulse rates</p>
<p>b Shaft ($\varnothing \times L$)</p> <p>1 = \varnothing 4 x 10 mm [0.16 x 0.39"]</p> <p>2 = \varnothing 5 x 10 mm [0.20 x 0.39"]</p> <p><u>3 = \varnothing 6 x 12.5 mm [0.24 x 0.49"], with flat</u></p> <p>5 = \varnothing 1/4" x 12.5 mm [1/4" x 0.49"], with flat</p>	<p>c Output circuit / power supply</p> <p>2 = Push-Pull (with inverted signal) / 5 ... 18 V DC</p> <p><u>4 = Push-Pull (with inverted signal) / 8 ... 30 V DC</u></p> <p>3 = Push-Pull (without inverted signal) / 8 ... 30 V DC</p> <p>6 = RS422 (with inverted signal) / 5 V DC</p> <p>5 = RS422 (with inverted signal) / 8 ... 30 V DC</p>	

Incremental encoders

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

Order code Hollow shaft	8.3620 Type	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">X</td> </tr> <tr> <td style="padding: 2px;">a</td><td style="padding: 2px;">b</td><td style="padding: 2px;">c</td><td style="padding: 2px;">d</td> </tr> </table>	X	X	X	X	a	b	c	d	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">X</td> </tr> <tr> <td style="padding: 2px;">e</td><td colspan="3"></td> </tr> </table>	X	X	X	X	e				<p>If for each parameter of an encoder the <u>underlined preferred option</u> 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.</p> <div style="text-align: right; border: 1px solid black; border-radius: 50%; padding: 2px; width: 40px; float: right;">10 by 10</div>
X	X	X	X																	
a	b	c	d																	
X	X	X	X																	
e																				
a Flange	d Type of connection	e Pulse rate																		
1 = with spring element, short <u>2 = with spring element, long</u> 5 = with stator coupling, ø 46 mm [1.81"]	<u>E = radial cable, 2 m [5.56'] PVC</u> B = radial cable, special length PVC *) 4 = radial M12 connector, 8-pin	25, 100, <u>200</u> , 360, <u>500</u> , 512, 600, 1000, <u>1024</u> , 1500, 2000, <u>2048</u> , <u>2500</u> (e.g. 500 pulses => 0500)																		
b Hollow shaft	*) 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)	<i>Optional on request</i> - other pulse rates																		
<u>2 = ø 6 mm [0.24"]</u> 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 <u>4 = Push-Pull (with inverted signal) / 8 ... 30 V DC</u> 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																				

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⁾	Push-Pull ¹⁾
		(7272 comp.)	(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 LOW	min. 2.5 V max. 0.5 V	min. +V - 2.5 V max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 µs	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.

Incremental encoders

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	\bar{A}	B	\bar{B}	0	$\bar{0}$	
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	
3 without inv. signal	1, 2, E, A, B	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	
		Cable colour:	WH	BN	GN	-	YE	-	GY	-	
2, 4, 5, 6 with inv. signal	3, 4	M12 connector									
		Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	
3 without inv. signal	3, 4	M12 connector									
		Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	
		Pin:	1	2	3	4	5	6	7	8	

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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal

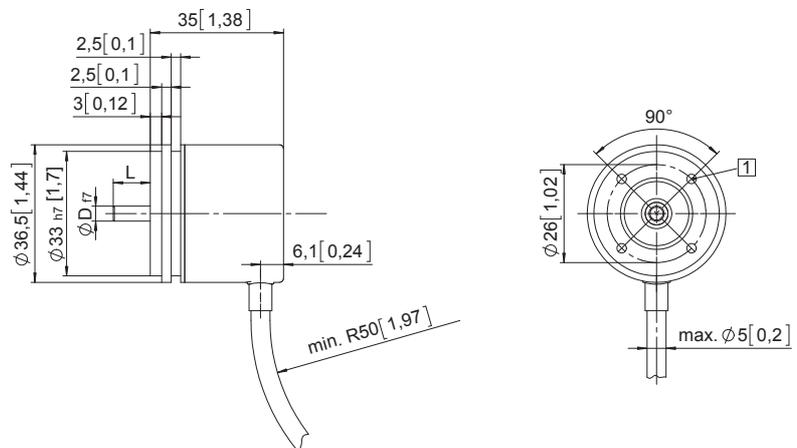
Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, \varnothing 36.5 [1.44]

Flange type 2

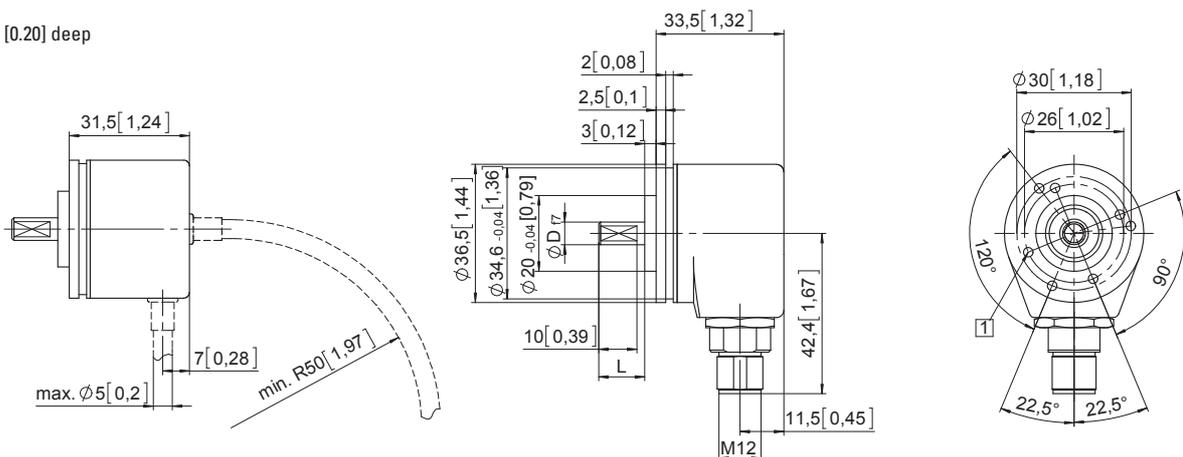
- 1 M3, 5 [0.20] deep



Clamping flange, \varnothing 36.5 [1.44]

Flange type 3

- 1 M3, 5 [0.20] deep



Incremental encoders

Compact optical

3610 / 3620 (shaft / hollow shaft)

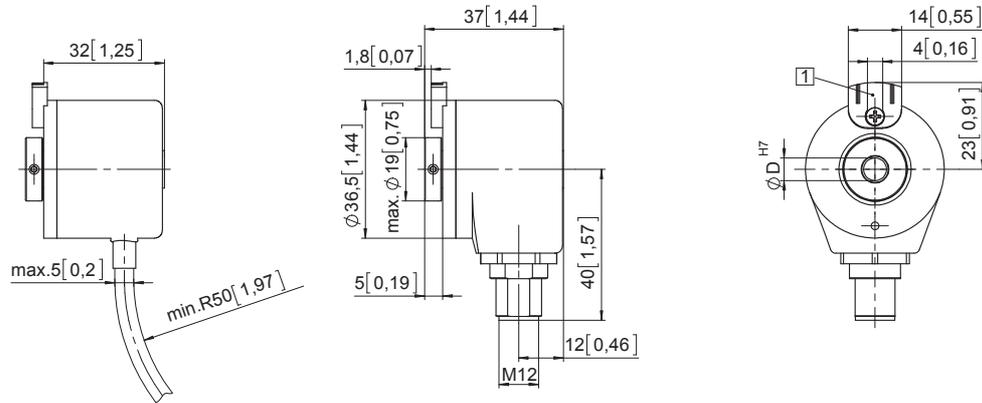
Push-Pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

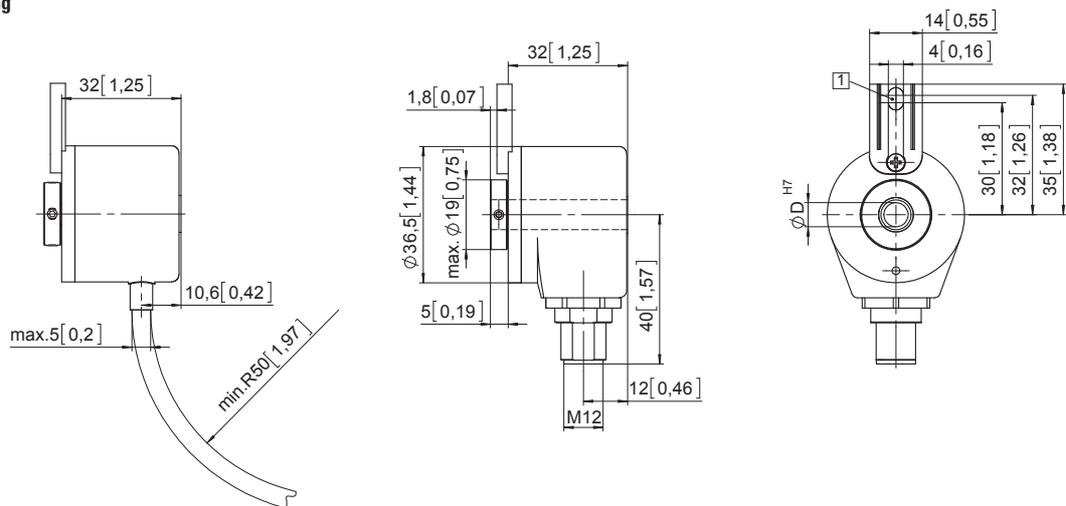
Flange with spring element, short Flange type 1

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]



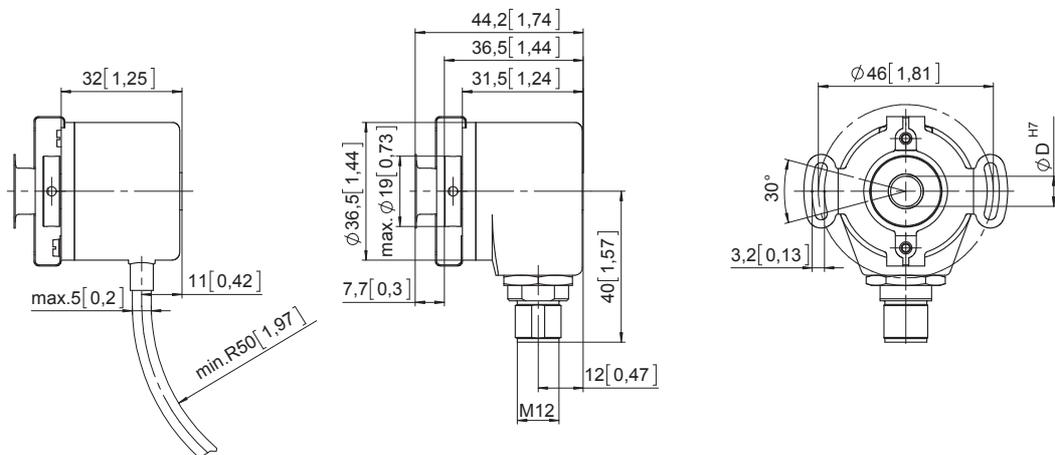
Flange with spring element, long Flange type 2

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]



Flange with stator coupling, $\varnothing 46$ [1.81] Flange type 5

Shaft: minimum insertion depth 1.5 x D



Incremental encoders

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.



Incremental encoders

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	8.3700	.	X	X	X	X	.	XXXX
Shaft version	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.



<p>a Flange</p> <p>1 = clamping-synchro flange, ø 36.8 mm [1.45"] A = flange adapter, mounted, ø 36.8 mm [1.45"]</p> <p>b Shaft (ø x L), with flat</p> <p>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"]</p>	<p>c Output circuit / power supply</p> <p>1 = RS422 / 5 V DC (±5 %)</p> <p>3 = Push-Pull (with inverted signal) / 5 ... 30 V DC 4 = Push-Pull (with inverted signal) / 10 ... 30 V DC</p> <p>d Type of connection ¹⁾</p> <p>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</p>	<p>e Pulse rate</p> <p>10, 25, 50, 60, 100, 200, 250, 300, 360, 400, 500, 512, 600, 1000, 1024 (e.g. 360 pulses => 0360)</p> <p>Stock types</p> <p>8.3700.1332.0360 8.3700.1332.0500 8.3700.1332.1000 8.3700.1332.1024</p> <p><i>Optional on request</i> - other pulse rates</p>
---	--	--

Order code	8.3720	.	X	X	X	X	.	XXXX
Hollow shaft	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.



<p>a Flange</p> <p>1 = with spring element, short 2 = with spring element, long 5 = with stator coupling, ø 46 mm [1.81"]</p> <p>b Hollow shaft</p> <p>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"</p>	<p>c Output circuit / power supply</p> <p>1 = RS422 / 5 V DC (±5 %)</p> <p>3 = Push-Pull (with inverted signal) / 5 ... 30 V DC 4 = Push-Pull (with inverted signal) / 10 ... 30 V DC</p> <p>d Type of connection ¹⁾</p> <p>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</p>	<p>e Pulse rate</p> <p>10, 25, 50, 60, 100, 200, 250, 300, 360, 400, 500, 512, 600, 1000, 1024 (e.g. 360 pulses => 0360)</p> <p>Stock types</p> <p>8.3720.5631.0360 8.3720.5611.1024</p> <p><i>Optional on request</i> - other pulse rates</p>
---	---	--

1) "Tube Tech" cable outlet guarantees 10 x higher strain relief than traditional cabling methods plus higher IP protection.

Incremental encoders

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 min. 2.5 V LOW 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	\bar{A}	B	\bar{B}	0	$\bar{0}$
		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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: 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'].

Incremental encoders

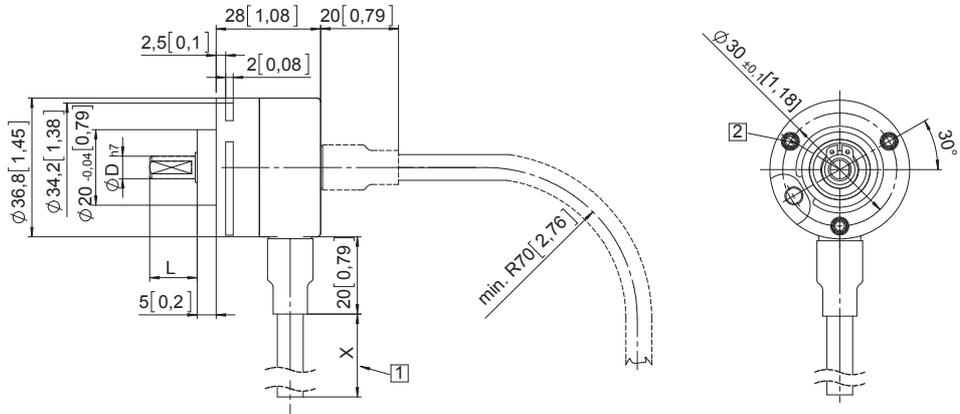
Compact plastic housing, optical	3700 / 3720 (shaft / hollow shaft)	Push-Pull / RS422
---	---	--------------------------

Dimensions shaft version

Dimensions in mm [inch]

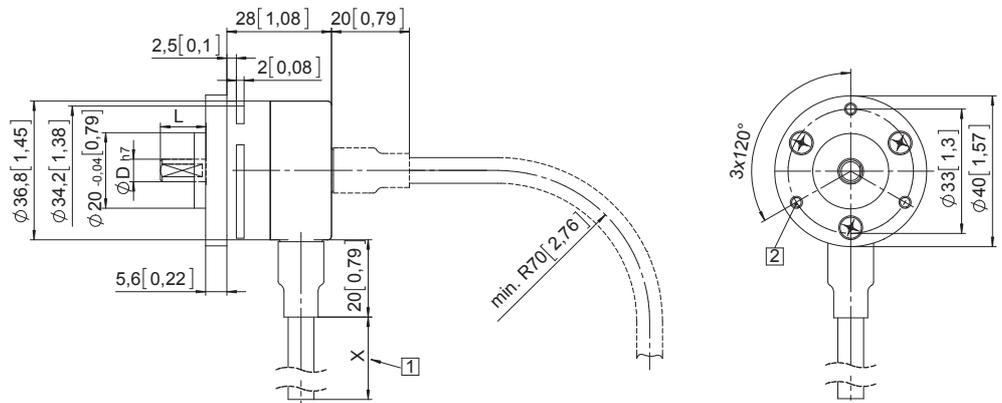
Clamping-synchro flange, ø 36.8 [1.45] Flange type 1

- 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



Incremental encoders

Incremental encoders

Compact plastic housing, optical

3700 / 3720 (shaft / hollow shaft)

Push-Pull / RS422

Dimensions hollow shaft version

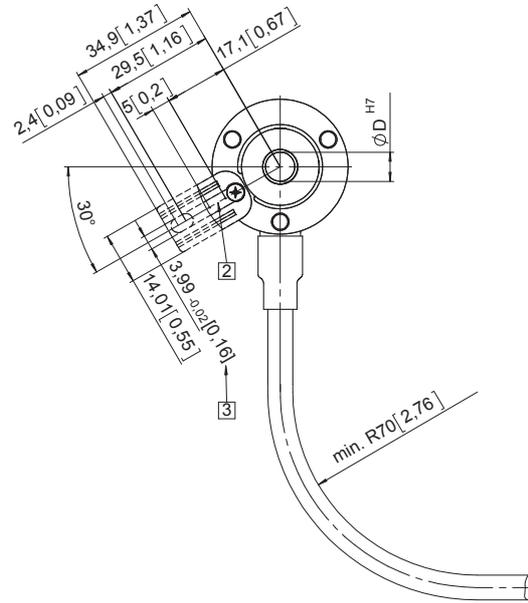
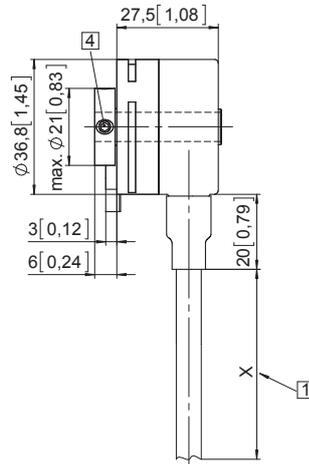
Dimensions in mm [inch]

Flange with spring element, short

(long spring element version is shown dashed)

Flange type 1 (2)

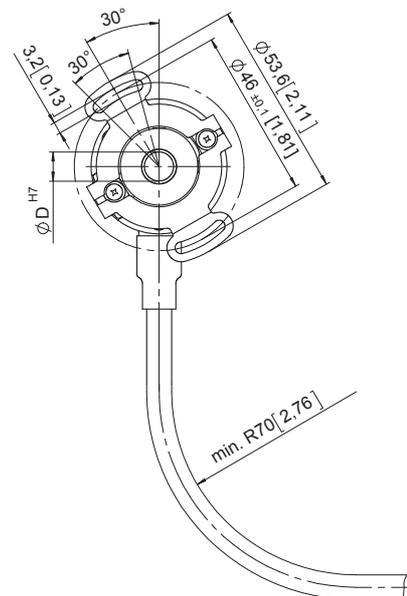
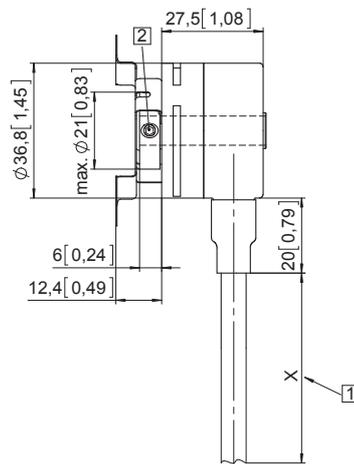
- 1 Cable length 1, 2, 3 or 5 m [3.28', 6.56', 9.84' or 16.40']
- 2 Slot for torque stop, 3 [0.12] deep
- 3 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 4 Recommended torque for the clamping ring 1.0 Nm



Flange with stator coupling, \varnothing 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



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 LOW max. 0.5 V	min. 2.5 V max. 0.5 V	min +V - 1.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V	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. 200 ns	max. 1 μs	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	max. 1 μs
Short circuit proof outputs³⁾	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.

Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

Push-Pull / RS422

Terminal assignment

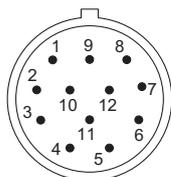
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)												
1, 2, 3, 4, 5, 8	5000: 1, 2, A, B	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
	5020: 1, A, E, F	Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield	
1, 2, 3, 4, 5, 8	5000: 3, 4 5020: 2, H ²⁾	M12 connector, 8-pin												
		Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Pin:	1	2			3	4	5	6	7	8	PH ¹⁾	
1, 2, 3, 4, 5, 8	5000: 7, 8 5020: 4	M23 connector, 12-pin												
		Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾	
1, 2, 3, 4, 5, 8	5000: Y 5020: 7	MIL connector, 10-pin												
		Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Pin:	F	D		E	A	G	B	H	C	I	J	
1, 3, 4, 5, 8	5000: W	MIL connector, 7-pin												
		Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Pin:	F	D		E	A		B		C		G	
1, 3, 4, 5, 8	5000: 9	MIL connector, 6-pin												
		Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Pin:	A	B			E		D		C			

- +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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \perp : Plug connector housing (shield)

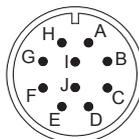
Top view of mating side, male contact base



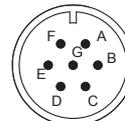
M12 connector, 8-pin



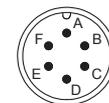
M23 connector, 12-pin



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.

Incremental encoders

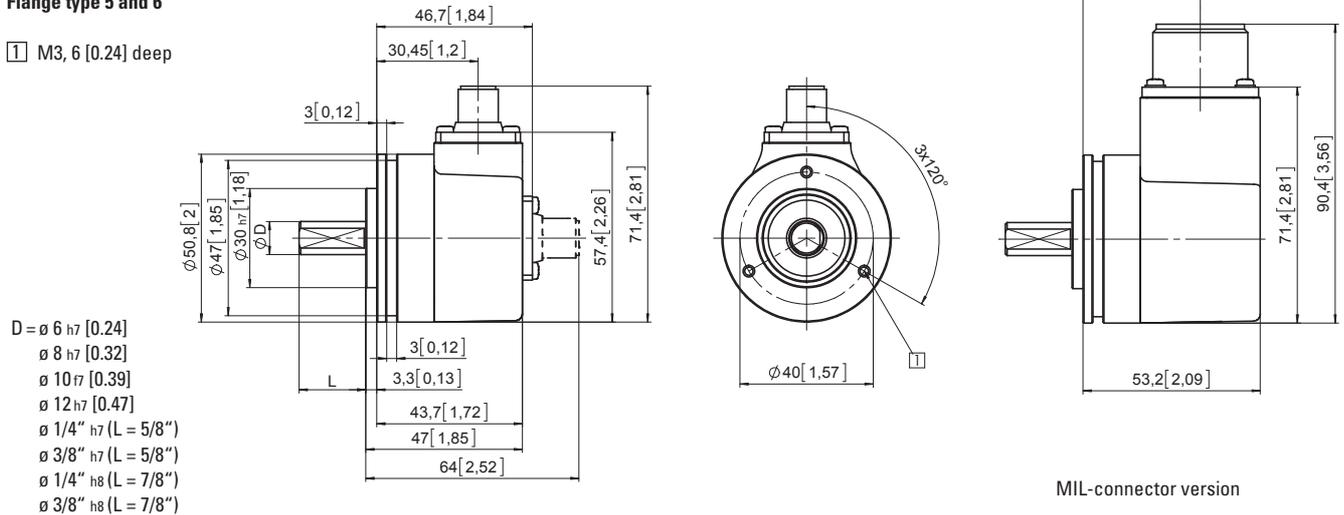
Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-Pull / RS422
-------------------------	--	--------------------------

Dimensions shaft version

Dimensions in mm [inch]

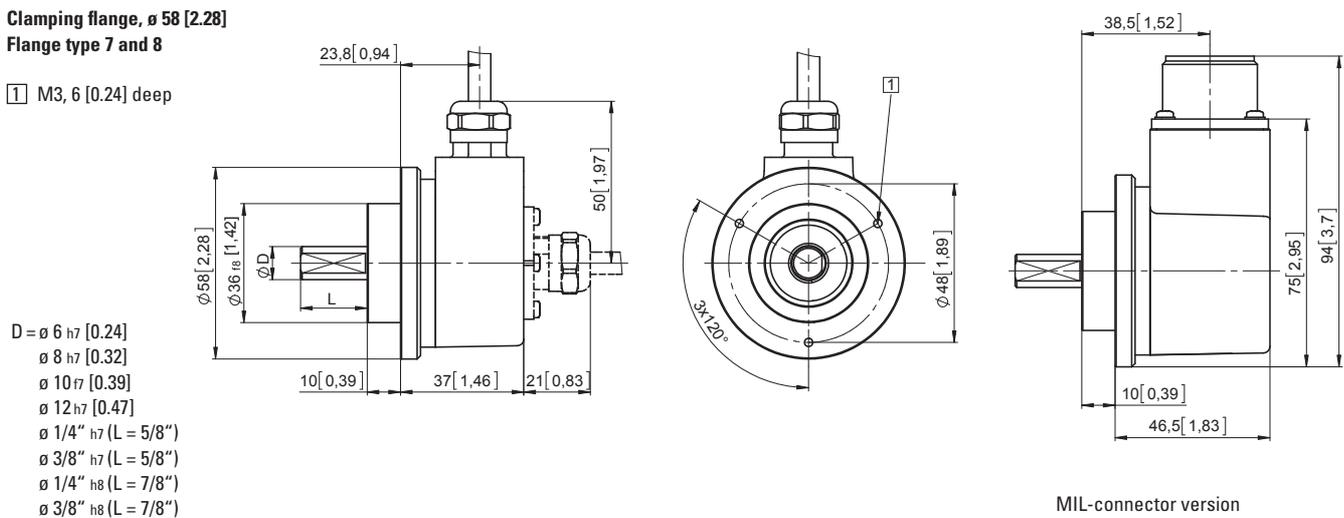
Synchro flange, $\varnothing 50.8$ [2] Flange type 5 and 6

1 M3, 6 [0.24] deep



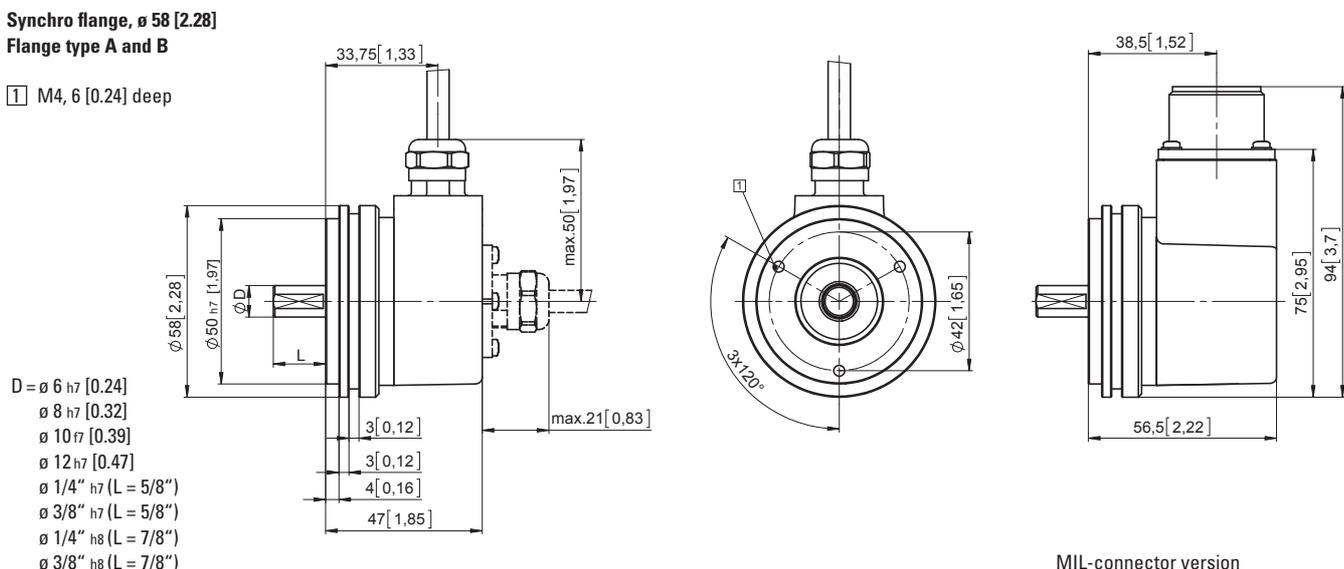
Clamping flange, $\varnothing 58$ [2.28] Flange type 7 and 8

1 M3, 6 [0.24] deep



Synchro flange, $\varnothing 58$ [2.28] Flange type A and B

1 M4, 6 [0.24] deep



Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

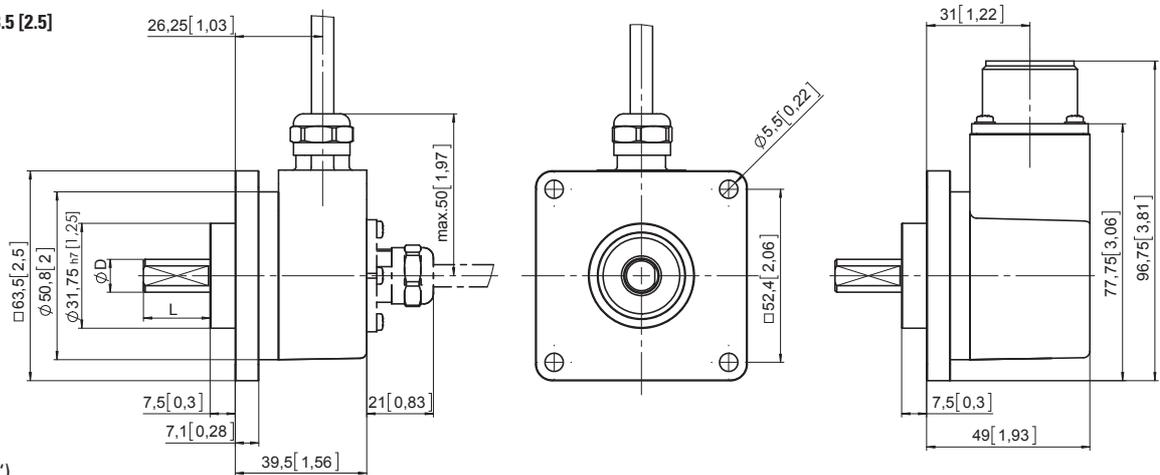
Push-Pull / RS422

Dimensions shaft version

Dimensions in mm [inch]

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

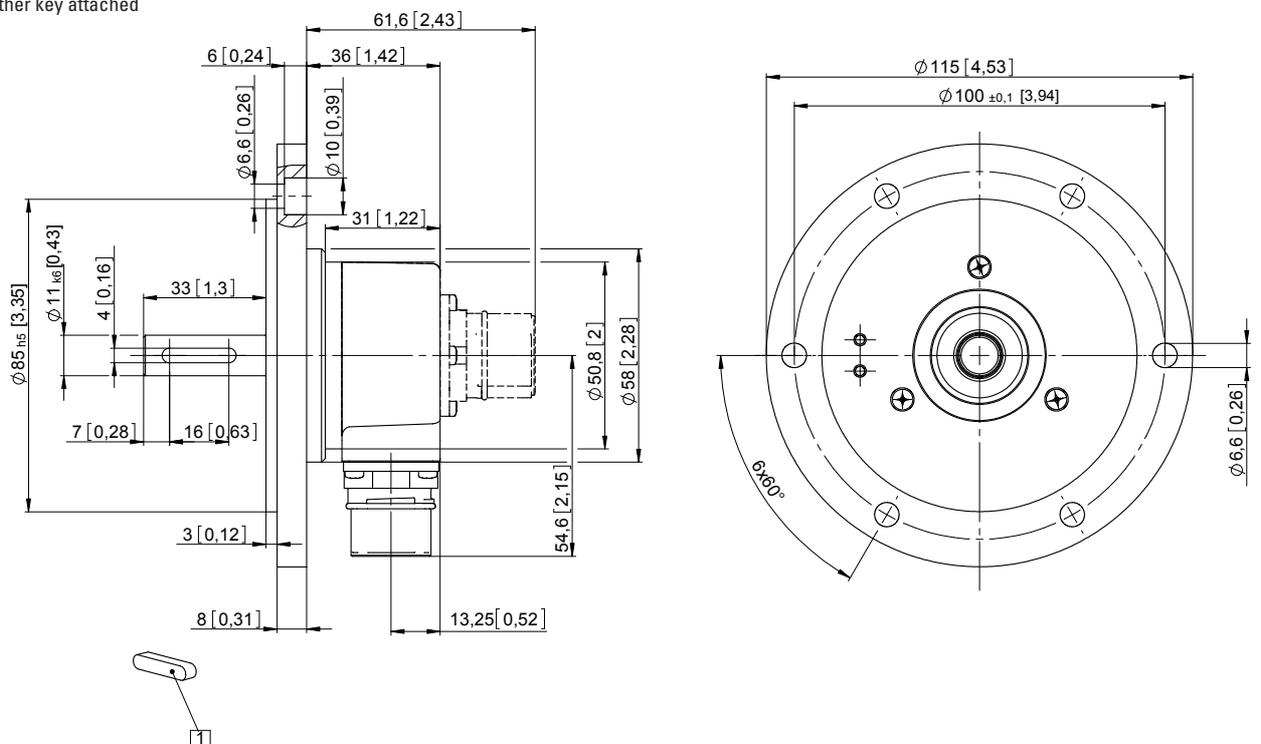
- D = \varnothing 6 h7 [0.24]
- \varnothing 8 h7 [0.32]
- \varnothing 10 h7 [0.39]
- \varnothing 12 h7 [0.47]
- \varnothing 1/4" h7 (L = 5/8")
- \varnothing 3/8" h7 (L = 5/8")
- \varnothing 1/4" h8 (L = 7/8")
- \varnothing 3/8" h8 (L = 7/8")



MIL-connector version

Euro flange, \varnothing 115 [4.53]
Flange type G

1 Feather key attached



Incremental encoders

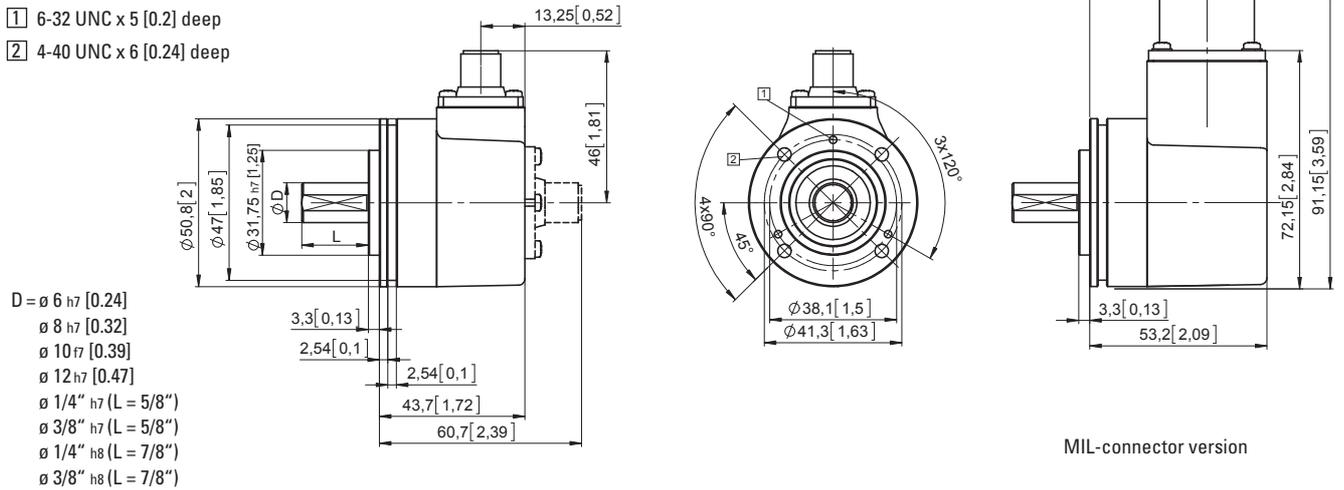
Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-Pull / RS422
-------------------------	--	--------------------------

Dimensions shaft version

Dimensions in mm [inch]

Servo flange, $\varnothing 50.8$ [2] Flange type 1 and 2

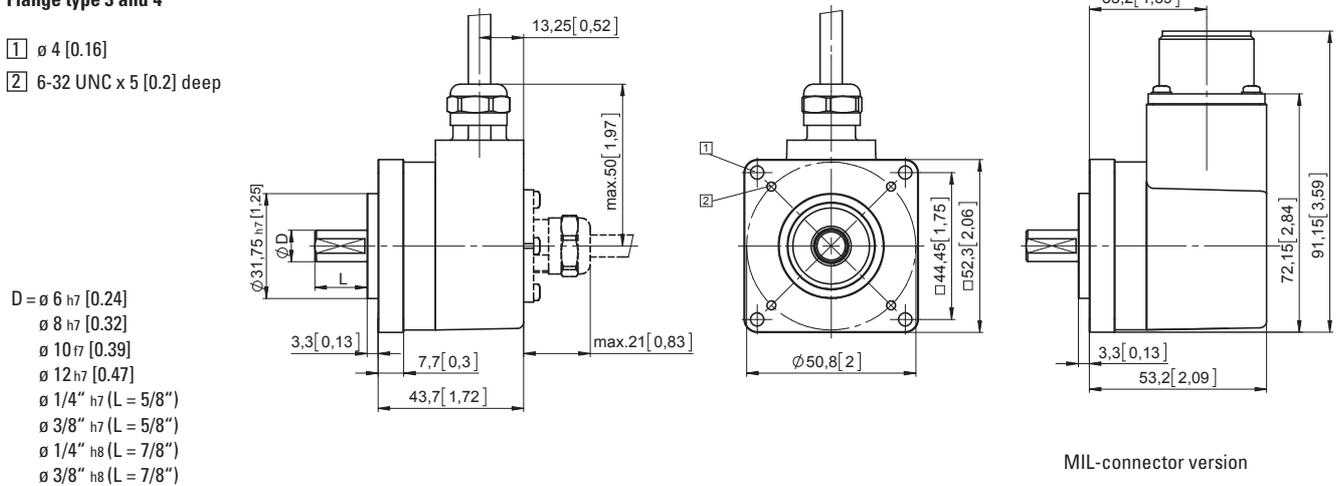
- 1 6-32 UNC x 5 [0.2] deep
- 2 4-40 UNC x 6 [0.24] deep



- D = $\varnothing 6$ h7 [0.24]
- $\varnothing 8$ h7 [0.32]
- $\varnothing 10$ r7 [0.39]
- $\varnothing 12$ h7 [0.47]
- $\varnothing 1/4$ " h7 (L = 5/8")
- $\varnothing 3/8$ " h7 (L = 5/8")
- $\varnothing 1/4$ " h8 (L = 7/8")
- $\varnothing 3/8$ " h8 (L = 7/8")

Square flange, $\square 50.8$ [2] Flange type 3 and 4

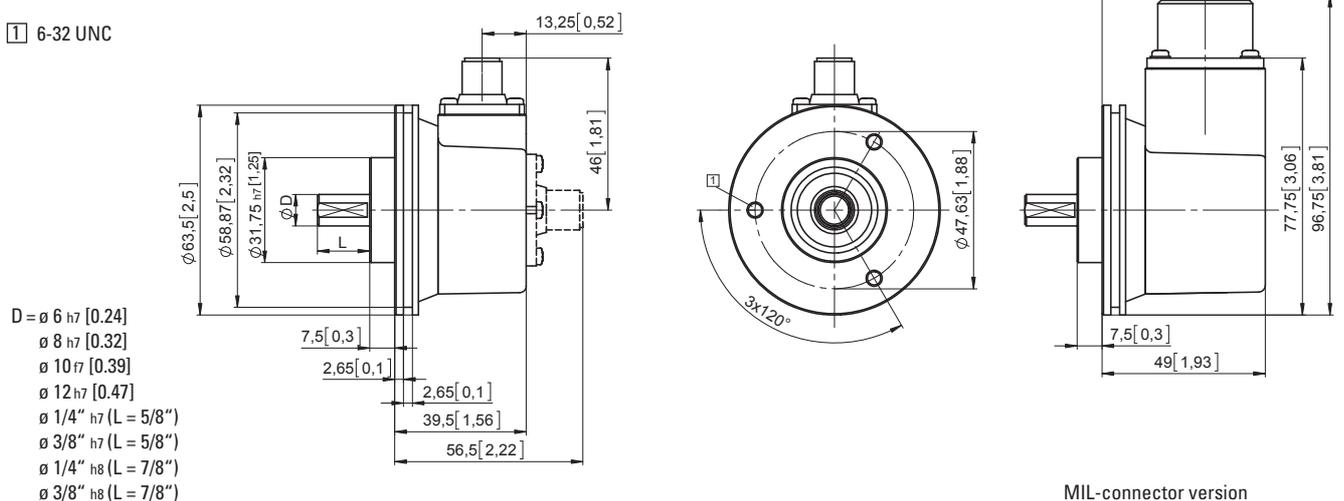
- 1 $\varnothing 4$ [0.16]
- 2 6-32 UNC x 5 [0.2] deep



- D = $\varnothing 6$ h7 [0.24]
- $\varnothing 8$ h7 [0.32]
- $\varnothing 10$ r7 [0.39]
- $\varnothing 12$ h7 [0.47]
- $\varnothing 1/4$ " h7 (L = 5/8")
- $\varnothing 3/8$ " h7 (L = 5/8")
- $\varnothing 1/4$ " h8 (L = 7/8")
- $\varnothing 3/8$ " h8 (L = 7/8")

Servo flange, $\varnothing 63.5$ [2.5] Flange type E and F

- 1 6-32 UNC



- D = $\varnothing 6$ h7 [0.24]
- $\varnothing 8$ h7 [0.32]
- $\varnothing 10$ r7 [0.39]
- $\varnothing 12$ h7 [0.47]
- $\varnothing 1/4$ " h7 (L = 5/8")
- $\varnothing 3/8$ " h7 (L = 5/8")
- $\varnothing 1/4$ " h8 (L = 7/8")
- $\varnothing 3/8$ " h8 (L = 7/8")

Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

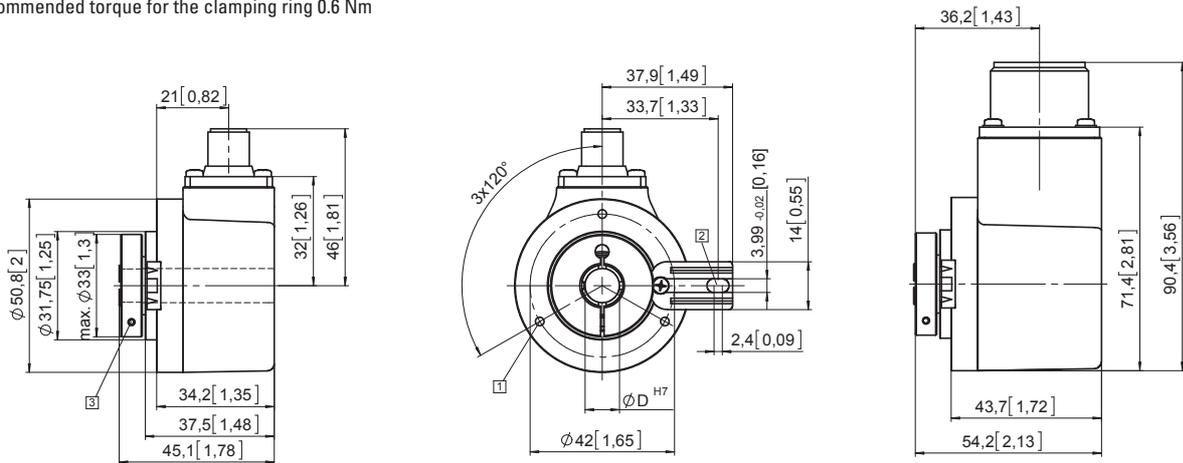
Push-Pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

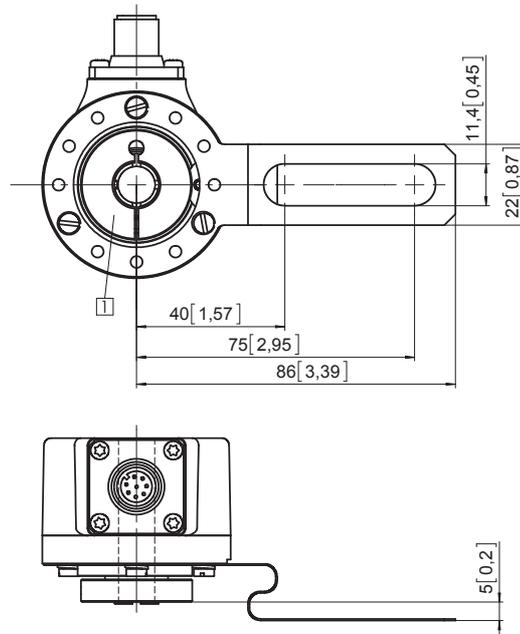
- 1 M3, 6 [0.24] deep
- 2 Torque stop slot, recommendation: cylindrical pin DIN7, 4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm



MIL-connector version

Flange with fastening arm, long Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



Incremental encoders

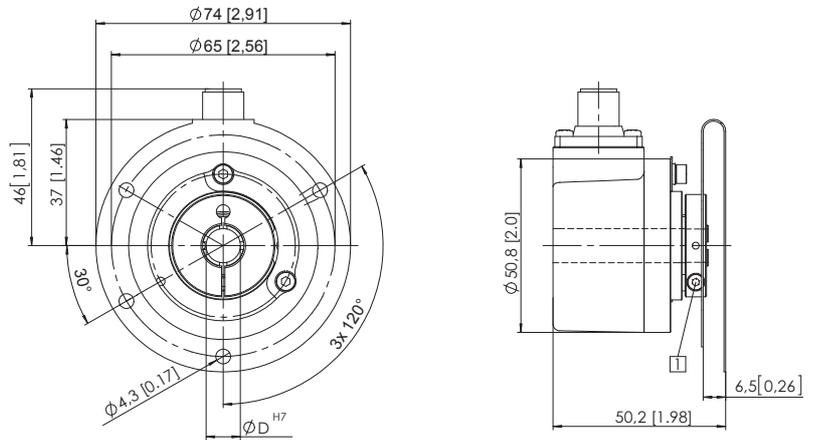
Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-Pull / RS422
-------------------------	--	--------------------------

Dimensions hollow shaft version

Dimensions in mm [inch]

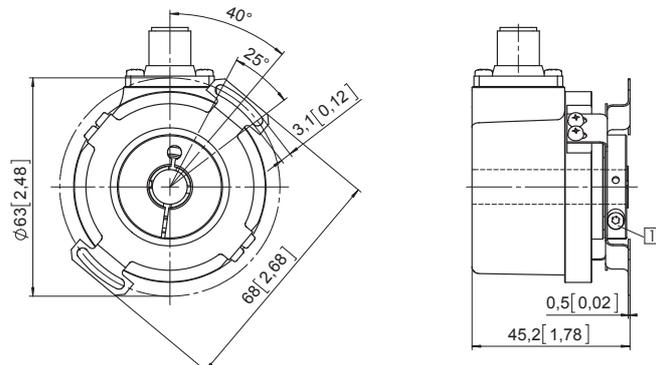
Flange with stator coupling, \varnothing 65 [2.56] Flange type 7 and 8

1 Recommended torque for the clamping ring 0.6 Nm



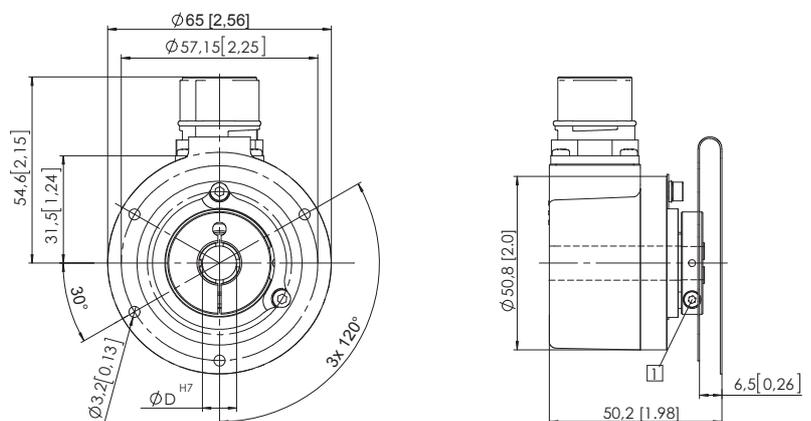
Flange with stator coupling, \varnothing 63 [2.48] Flange type C and D

1 Recommended torque for the clamping ring 0.6 Nm



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

1 Recommended torque for the clamping ring 0.6 Nm



Incremental encoders

Incremental encoders

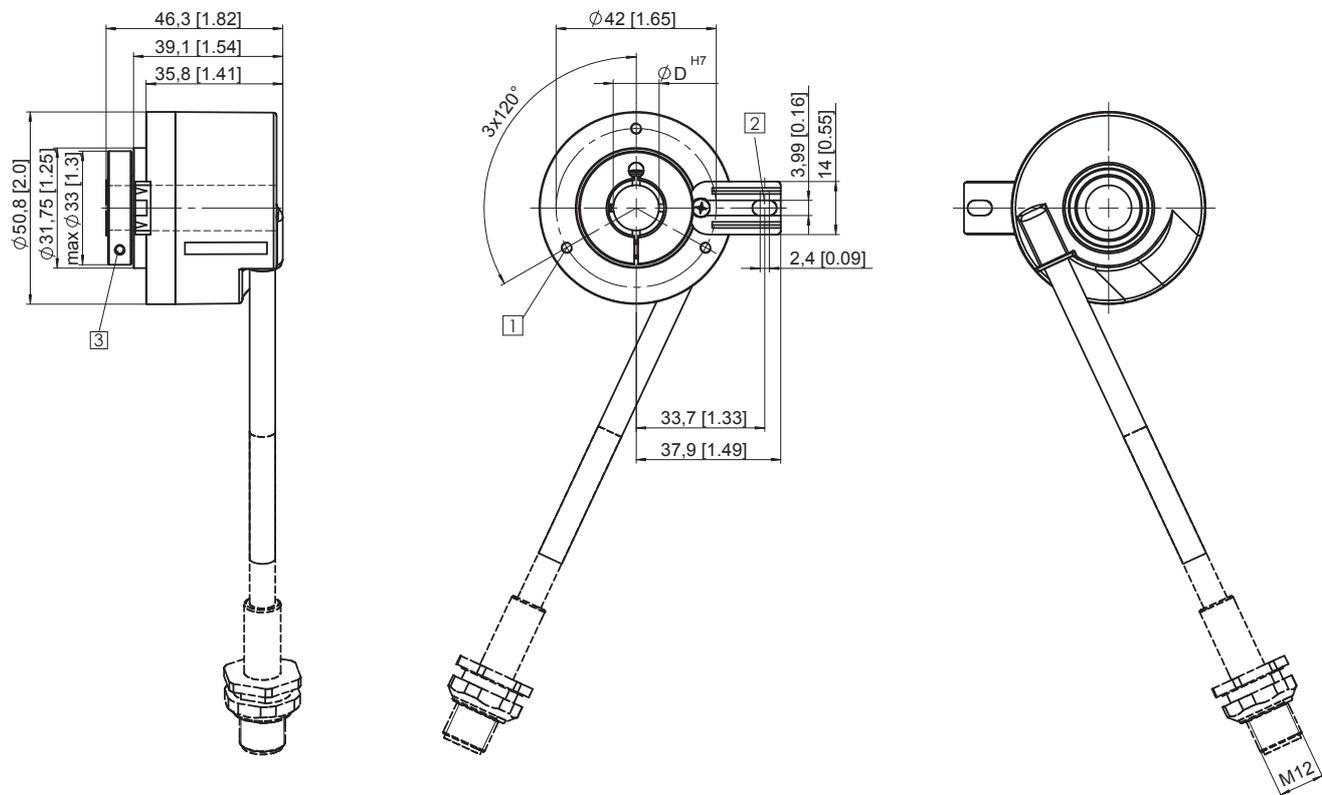
Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-Pull / RS422
-------------------------	--	--------------------------

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



Incremental encoders

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.



Incremental encoders

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	8.5803	. XXXXX .	XXXX
Shaft version	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"]

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

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

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⁾

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

Order code	8.5823	. XXXXX .	XXXX
Hollow shaft	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"]

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

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

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

d Type of connection

1 = radial cable, 1 m [3.28'] TPE

2 = radial M23 connector, 12-pin, without mating connector

1) Only in conjunction with flange M or P.

2) Only with output circuit 7.

3) Insertion depth ≤ 30 mm [1.18"].

Incremental encoders

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
Permissible load / channel	max. +/- 20 mA	max. +/- 30 mA
Pulse frequency	max. 300 kHz	max. 300 kHz
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.5 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.

Incremental encoders

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

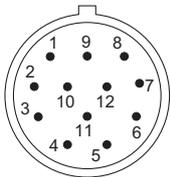
Terminal assignment

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	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5823: 1	Cable colour:	WH 0.5 mm ²	BN 0.5 mm ²	WH	BN	GN	YE	GY	PK	BU	RD	shield
M23 connector, 12-pin													
1, 2, 3, 4, 5, 6, 7	5803: 3, 5	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5823: 2	Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾
MIL connector, 7-pin													
1, 2, 3, 4, 5, 6, 7	5803: W	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5823: –	Pin:	F	D	–	E	A	–	B	–	C	–	G
MIL connector, 10-pin													
1, 2, 3, 4, 5, 6, 7	5803: Y	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5823: –	Pin:	F	D	–	E	A	G	B	H	C	I	J

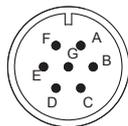
Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

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

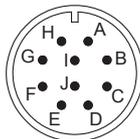
Top view of mating side, male contact base



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.

Incremental encoders

Standard
high temperature, optical

5803 / 5823 (shaft / hollow shaft)

Push-Pull / RS422

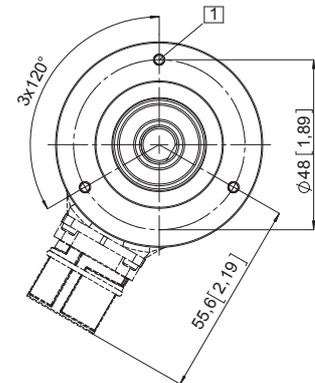
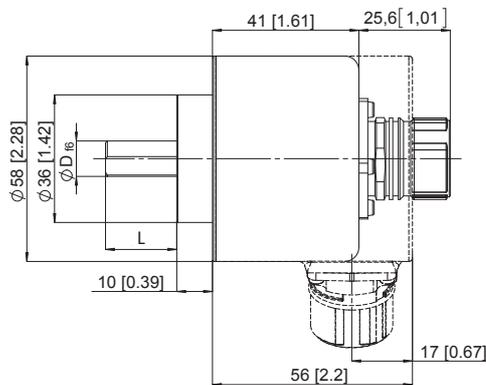
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]

Flange type 1

1 3 x M3, 5 [0.2] deep

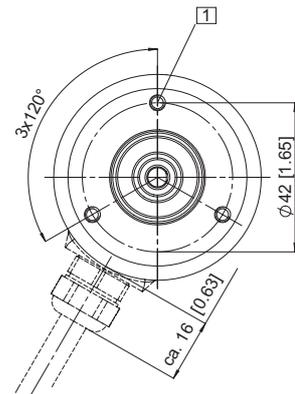
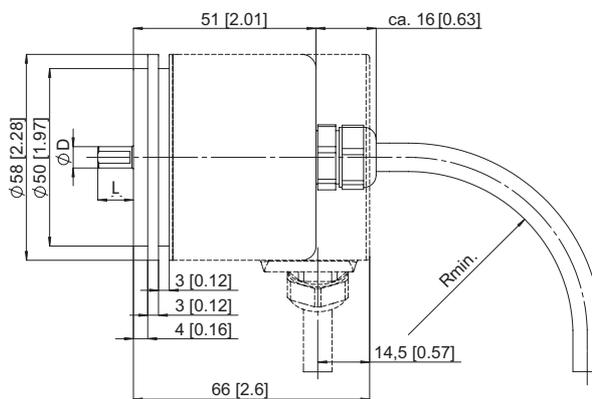


Synchro flange, ø 58 [2.28]

Flange type 2

1 3 x M4, 5 [0.2] deep

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



Incremental encoders

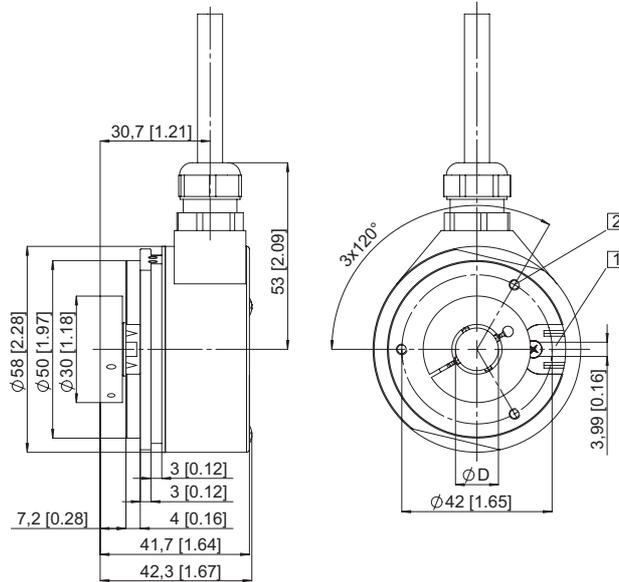
Standard high temperature, optical	5803 / 5823 (shaft / hollow shaft)	Push-Pull / RS422
---	---	--------------------------

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, \varnothing 4 [0.16]
- 2 M3, 5 [0.2] deep
Recommended torque for the clamping ring 0.6 Nm

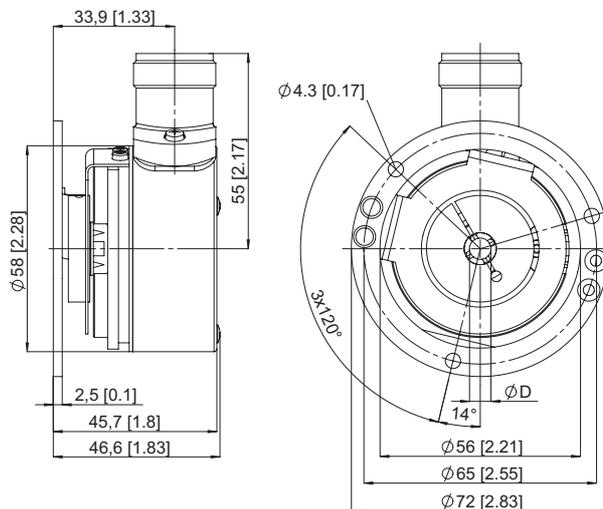


Incremental encoders

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

Recommended torque for the clamping ring 0.6 Nm

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



Incremental encoders

Standard
sine wave output, with zero pulse, optical

5804 / 5824 (shaft / hollow shaft)

SinCos



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

They are ideal for use in drive engineering.

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



High rotational speed



Temperature range
-20°...+85°C



High protection level
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Optical sensor

High performance

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

Adaptable

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

Order code

8.5804 . **XXXXX** . **XXXX**
Type a b c d e

a Flange

- 1 = clamping flange \varnothing 58 mm [2.28"]
- 2 = synchro flange \varnothing 58 mm [2.28"]

b Shaft ($\varnothing \times L$), with flat

- 1 = \varnothing 6 x 10 mm [0.24 x 0.39"]
- 2 = \varnothing 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

8.5824 . **XXXXX** . **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, \varnothing 65 mm [2.56"]
- 4 = with blind hollow shaft ¹⁾ and stator coupling, \varnothing 65 mm [2.56"]

b Hollow shaft

- 1 = \varnothing 6 mm [0.24"], IP40
- 2 = \varnothing 6 mm [0.24"], IP66
- 3 = \varnothing 8 mm [0.32"], IP40
- 4 = \varnothing 8 mm [0.32"], IP66
- 5 = \varnothing 10 mm [0.39"], IP40
- 6 = \varnothing 10 mm [0.39"], IP66
- 7 = \varnothing 12 mm [0.47"], IP40
- 8 = \varnothing 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

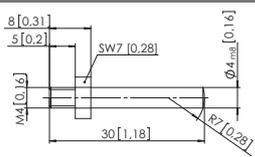
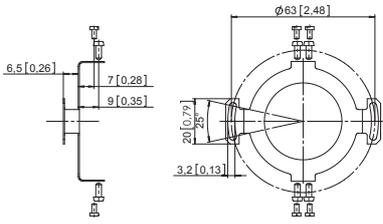
e Pulse rate

- 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 \leq 30 mm [1.18"].

Incremental encoders

Standard sine wave output, with zero pulse, optical		5804 / 5824 (shaft / hollow shaft)	SinCos
Mounting accessory for shaft encoders			Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1102.0606
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]		8.0000.1102.1010
Mounting accessory for hollow shaft encoders			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. 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	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	
Signal level	channels A/B	1 Vpp (±20 %)
	channel 0	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.

Incremental encoders

Standard
sine wave output, with zero pulse, optical

5804 / 5824 (shaft / hollow shaft)

SinCos

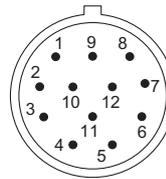
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)
1, 2	5804: 1, 2	Signal: 0 V +V 0Vsens ²⁾ +Vsens ²⁾ A \bar{A} B \bar{B} 0 $\bar{0}$ \perp
	5824: 1	Cable colour: WH 0.5 mm ² BN 0.5 mm ² WH BN GN YE GY PK BU RD shield
1, 2	5804: 3, 5	M23 connector, 12-pin
	5824: 2	Signal: 0 V +V 0Vsens ²⁾ +Vsens ²⁾ A \bar{A} B \bar{B} 0 $\bar{0}$ \perp 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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- 0, $\bar{0}$: Reference signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

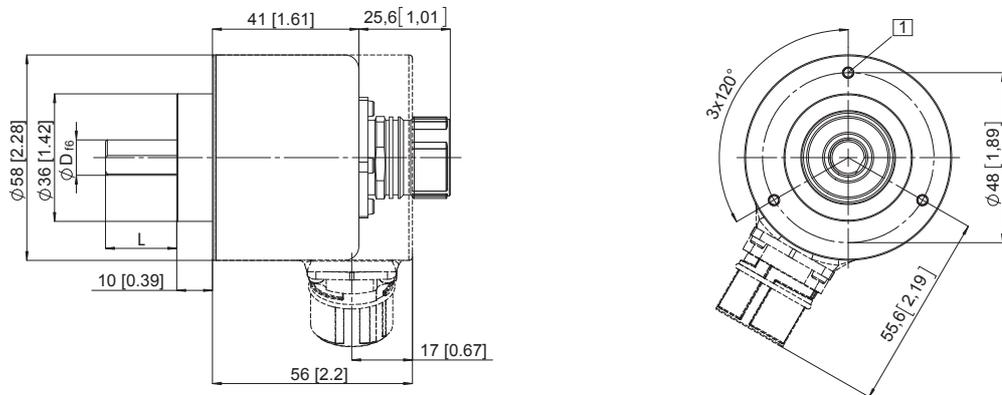
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1

- 1 3 x M3, 5 [0.2] deep

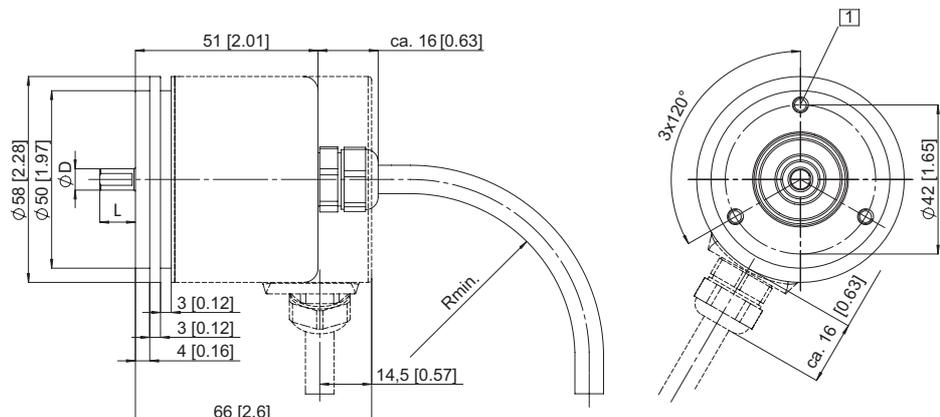


Synchro flange, \varnothing 58 [2.28]

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.

Incremental encoders

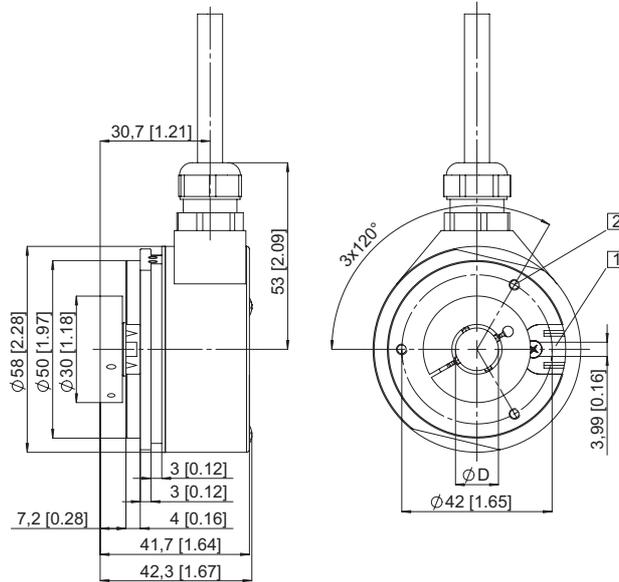
Standard sine wave output, with zero pulse, optical	5804 / 5824 (shaft / hollow shaft)	SinCos
--	---	---------------

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, $\varnothing 4$ [0.16]
- 2 M3, 5 [0.2] deep
Recommended torque for the clamping ring 0.6 Nm

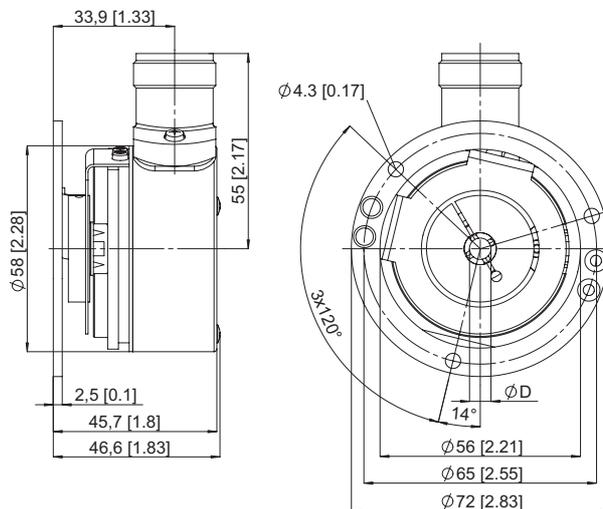


Incremental encoders

Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

Recommended torque for the clamping ring 0.6 Nm

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

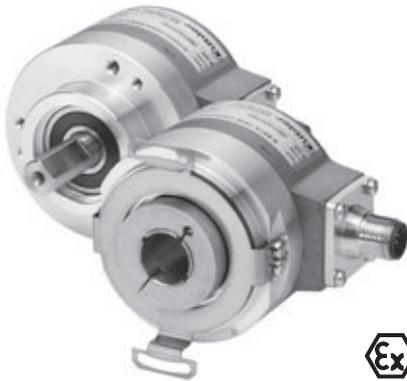


Incremental encoders

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.



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 **8.5814** . **1** **2** **X** **X** . **X** **X** **X** **X**
Shaft version 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.



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 **8.5834** . **X** **X** **X** **X** . **X** **X** **X** **X**
Hollow shaft 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.



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

Incremental encoders

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	\bar{A}	B	\bar{B}	\perp	
		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	\bar{A}	B	\bar{B}	\perp	
		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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- PH \perp : 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.

Incremental encoders

Standard
sine wave output, highly interpolable, optical

Sendix 5814 / 5834 (shaft / hollow shaft)

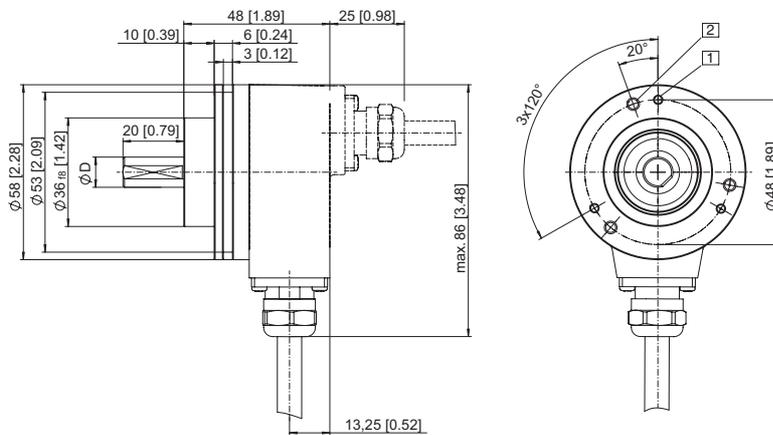
SinCos

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 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 = 10¹⁷ [0.39]

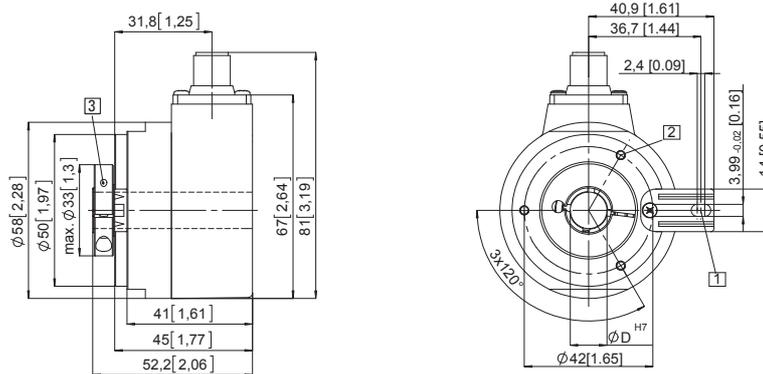


Dimensions hollow shaft version

Dimensions in mm [inch]

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

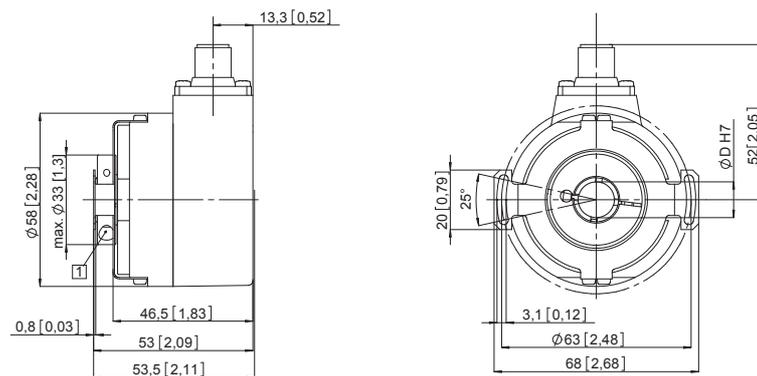
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



Flange with stator coupling, \varnothing 63 [2.48]
and hollow shaft

Flange type 5
(drawing with M12 connector)

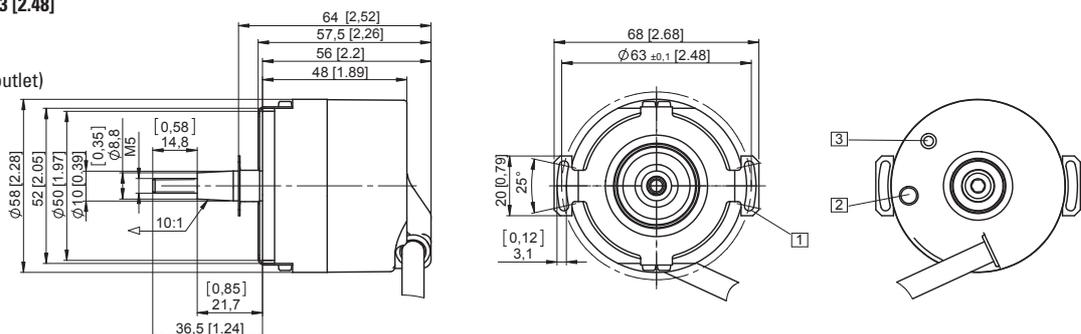
- 1 Recommended torque for the clamping ring 0.6 Nm



Flange with stator coupling, \varnothing 63 [2.48]
and tapered shaft

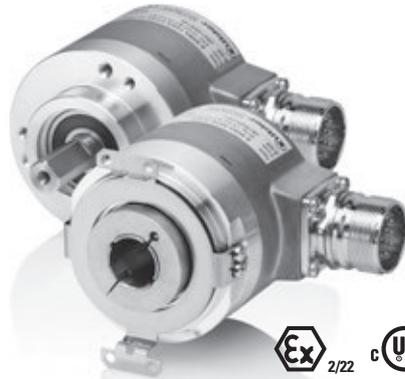
Flange type 5
(drawing with tangential cable outlet)

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



Incremental encoders

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.



Incremental encoders

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

Functional Safety

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

Flexible

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

Order code Shaft version	8.5814FS2 Type	. 1 X X X . XXXX 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 <u>1 = clamping flange, IP65, ø 58 mm [2.28"]</u>	b Shaft (ø x L) <u>2 = 10 x 20 mm [0.39 x 0.79"], with flat</u> A = 10 x 20 mm [0.39 x 0.79"], with feather key	c Output circuit / power supply 1 = SinCos / 5 V DC <u>2 = SinCos / 10 ... 30 V DC</u>	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 <u>4 = radial M23 connector, 12 pin</u> 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, <u>2048</u> <i>Optional on request</i> - Ex 2/22

Order code Hollow shaft	8.5834FS2 Type	. X X X X . XXXX 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 <u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u>	b Hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] K = ø 10 mm [0.39"], tapered shaft	c Output circuit / power supply 1 = SinCos / 5 V DC <u>2 = SinCos / 10 ... 30 V DC</u>	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 *) <u>4 = radial M23 connector, 12 pin</u> 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, <u>2048</u> <i>Optional on request</i> - 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 inertia	shaft version	4.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft	hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] ³⁾
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.

Incremental encoders

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 V _{pp} (±10 %)
Short circuit proof	yes ¹⁾
Pulse rate	1024 / 2048 ppr

Terminal assignment

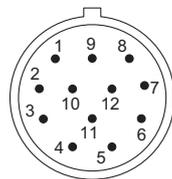
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
1, 2	1, 2, A, B, E, F	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp	
		Cable colour:	WH	BN	GN	YE	GY	PK	shield	
Output circuit	Type of connection	M23 connector, 12-pin								
1, 2	3, 4	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp	
		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	\bar{A}	B	\bar{B}	\perp	
		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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- PH \perp : 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.

Incremental encoders

Standard
sine wave output, SIL2/PLd, optical

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

SinCos

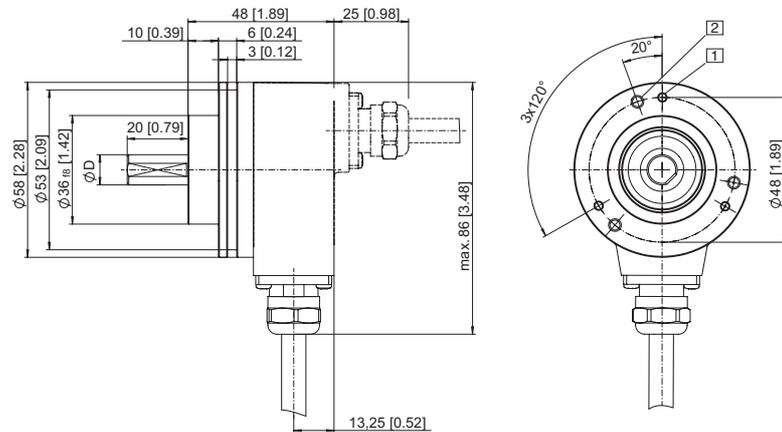
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 with shaft type 2
(drawing with cable)

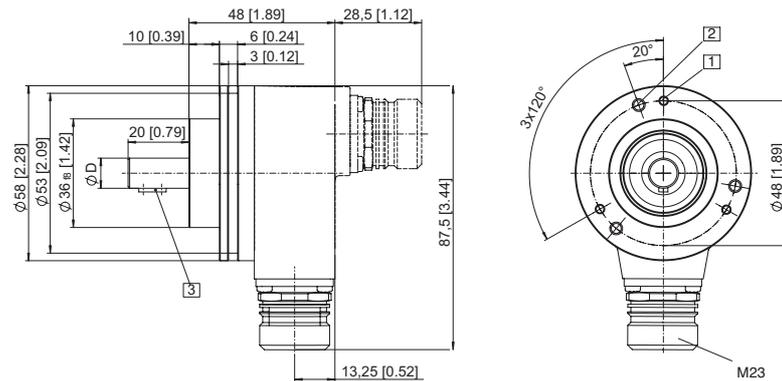
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- D = 10^{h7} [0.39]



Clamping flange, \varnothing 58 [2.28]

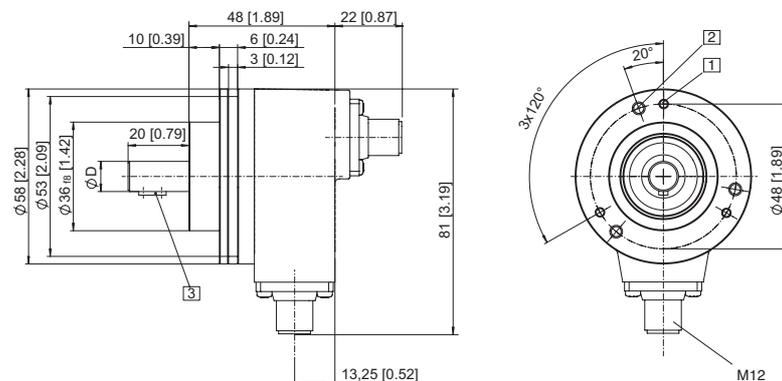
Flange type 1 with shaft type A
(drawing with M23 connector)

- 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]



Incremental encoders

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, $\varnothing 63$ [2.48] and hollow shaft

Flange type B

(drawing with M23 connector)

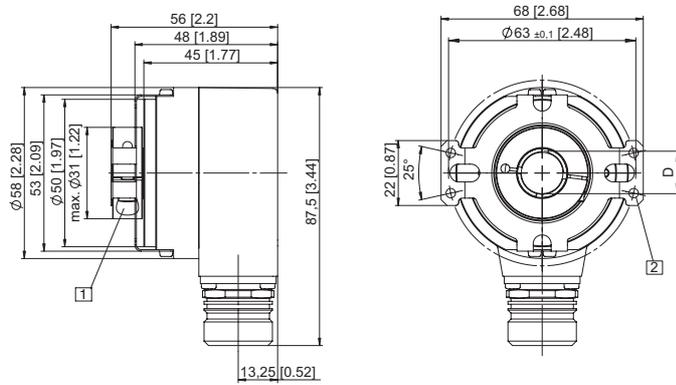
- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw

$D = \varnothing 10^{H7}$ [0.39]

$\varnothing 12^{H7}$ [0.47]

$\varnothing 14^{H7}$ [0.55]



Flange with stator coupling, $\varnothing 63$ [2.48] and tapered shaft

Flange type B

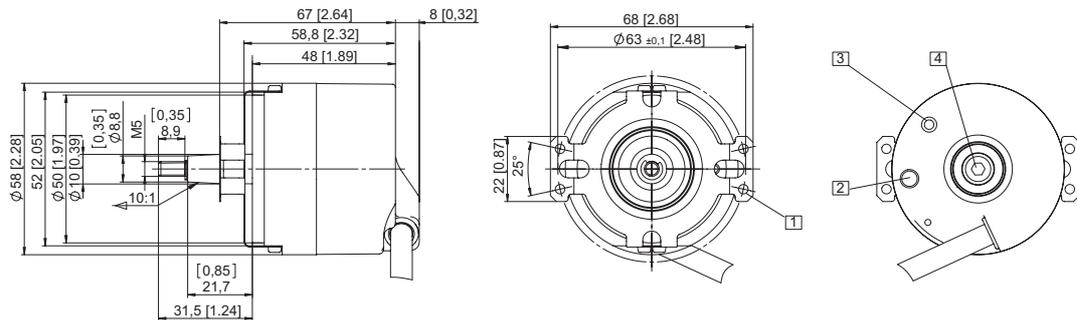
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

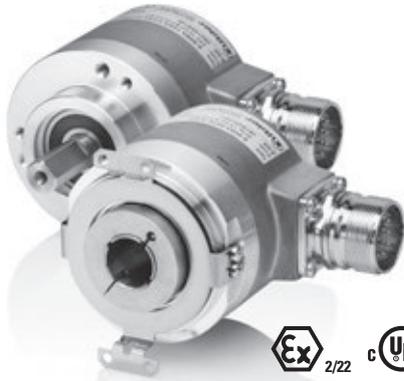
- 3 SET button

- 4 SW 4



Incremental encoders

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.



Incremental encoders

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 Type	. 1 <u>X</u> <u>X</u> <u>X</u> . <u>XXXX</u>
		(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.



- 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 Type	. <u>X</u> <u>X</u> <u>X</u> <u>X</u> . <u>XXXX</u>
		(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.



- 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)

Incremental encoders

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 inertia	shaft version	4.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft	hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] ³⁾
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.

Incremental encoders

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 V _{pp} (±10 %)
Short circuit proof	yes ¹⁾
Pulse rate	1024 / 2048 ppr

Terminal assignment

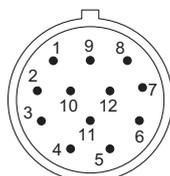
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)								
1, 2	1, 2, A, B, E, F	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp	
		Cable colour:	WH	BN	GN	YE	GY	PK	shield	
Output circuit	Type of connection	M23 connector, 12-pin								
1, 2	3, 4	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp	
		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	\bar{A}	B	\bar{B}	\perp	
		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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- PH \perp : 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.

Incremental encoders

Standard
sine wave output, SIL3/PLe, optical

Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)

SinCos

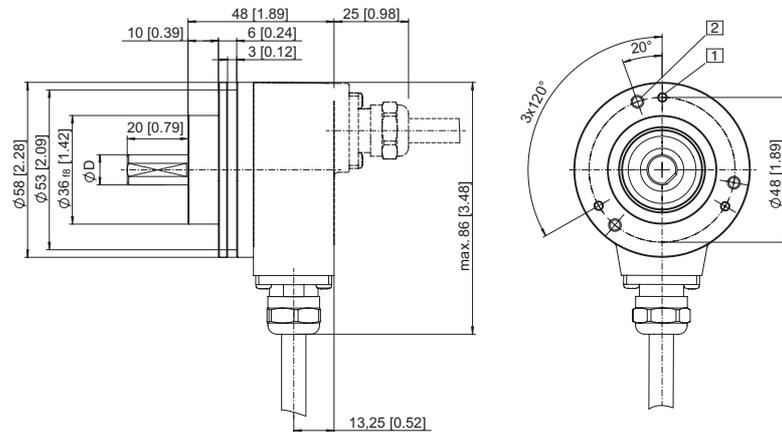
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, $\varnothing 58$ [2.28]

Flange type 1 with shaft type 2
(drawing with cable)

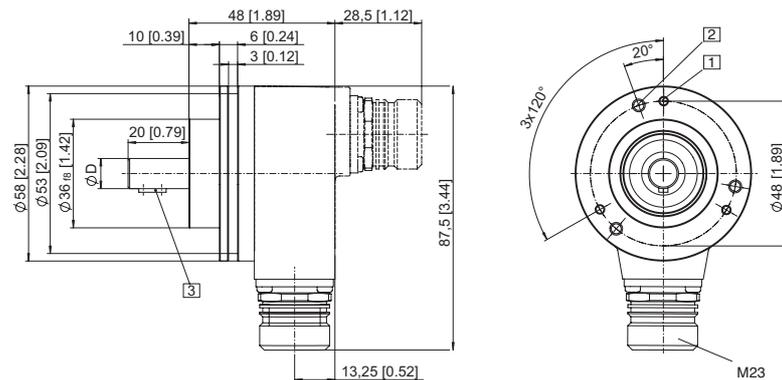
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- D = 10^{h7} [0.39]



Clamping flange, $\varnothing 58$ [2.28]

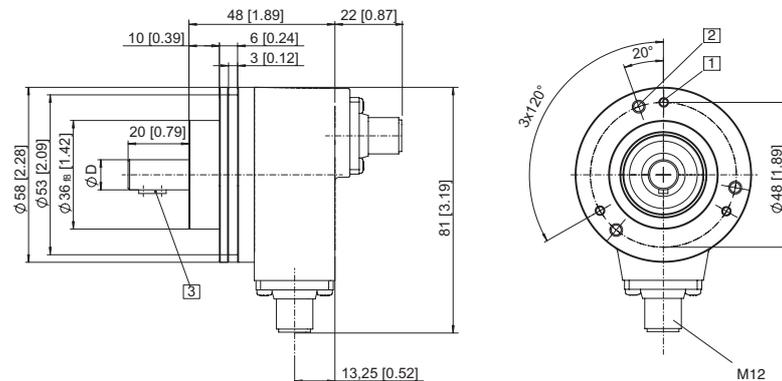
Flange type 1 with shaft type A
(drawing with M23 connector)

- 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]



Incremental encoders

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

Dimensions hollow shaft version

Dimensions in mm [inch]

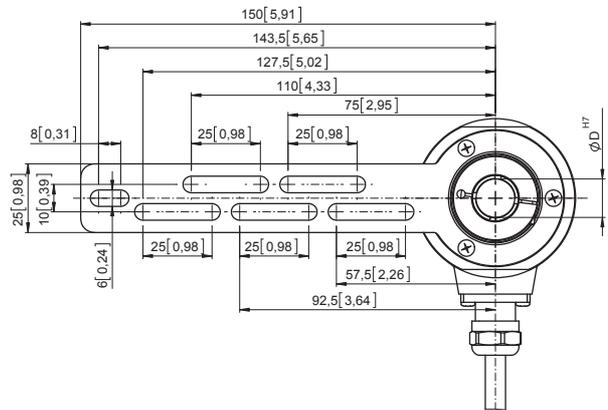
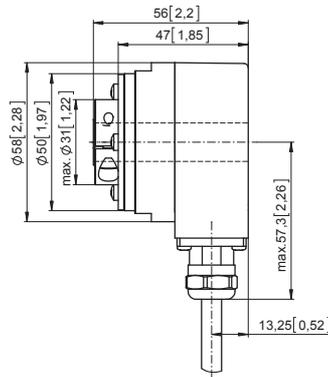
Flange with torque stop set, rigid

Flange type A

(drawing with cable)

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

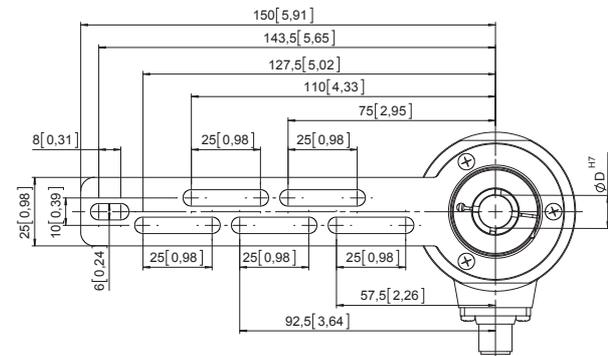
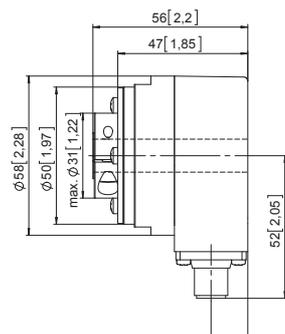
D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



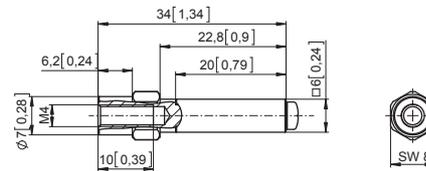
(drawing with M12 connector)

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

D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



Torque pin with rectangular sleeve with M4 thread



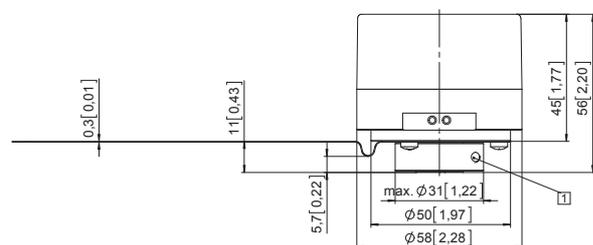
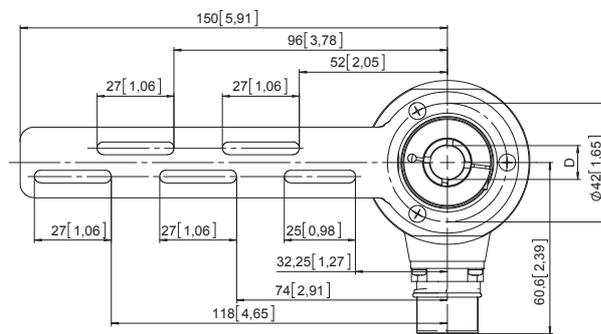
Flange with torque stop, flexible

Flange type 9

(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm

D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



Incremental encoders

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, $\varnothing 63$ [2.48] and hollow shaft Flange type B

(drawing with M23 connector)

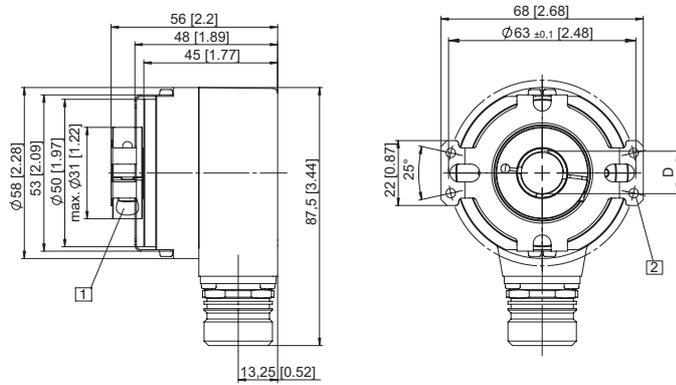
1 SW 3,
recommended torque for the
clamping ring 2.5 Nm

2 For (4x) M3 screw

$D = \varnothing 10^{H7}$ [0.39]

$\varnothing 12^{H7}$ [0.47]

$\varnothing 14^{H7}$ [0.55]



Flange with stator coupling, $\varnothing 63$ [2.48] and tapered shaft

Flange type B

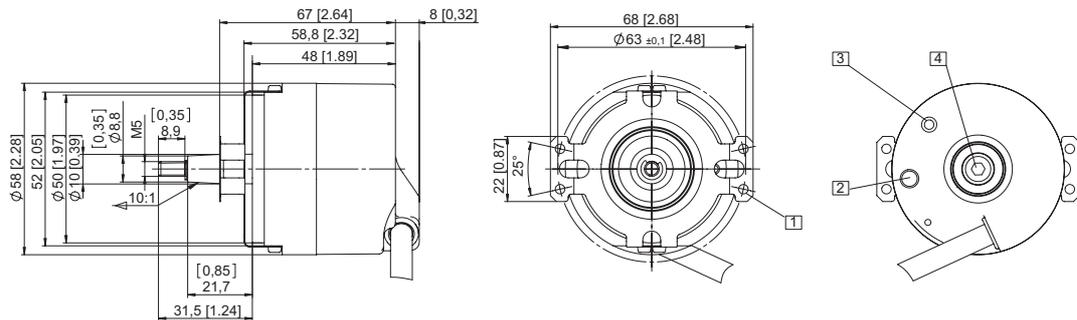
(drawing with tangential cable outlet)

1 For (4x) M3 screw

2 Status LED

3 SET button

4 SW 4



Incremental encoders

**Standard
high resolution, optical**

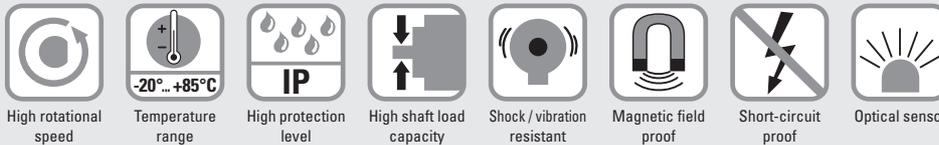
5805 / 5825 (shaft / hollow shaft)

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 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 . **XXXXX** . **XXXXX**
Type a b c d e

a Flange

- 1 = clamping flange \varnothing 58 mm [2.28"]
- 2 = synchro flange \varnothing 58 mm [2.28"]

b Shaft ($\varnothing \times L$), with flat

- 1 = \varnothing 6 x 10 mm [0.24 x 0.39"]
- 2 = \varnothing 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 . **XXXXX** . **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, \varnothing 65 mm [2.56"]
- 4 = with blind hollow shaft ¹⁾ and stator coupling, \varnothing 65 mm [2.56"]

b Hollow shaft

- 1 = \varnothing 6 mm [0.24"], IP40
- 2 = \varnothing 6 mm [0.24"], IP66
- 3 = \varnothing 8 mm [0.32"], IP40
- 4 = \varnothing 8 mm [0.32"], IP66
- 5 = \varnothing 10 mm [0.39"], IP40
- 6 = \varnothing 10 mm [0.39"], IP66
- 7 = \varnothing 12 mm [0.47"], IP40
- 8 = \varnothing 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 \leq 30 mm [1.18"].

Incremental encoders

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

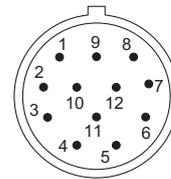
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2, 3, 4, 5, 6, 7	5805: 1, 2	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5825: 1	Cable colour:	WH 0.5 mm ²	BN 0.5 mm ²	WH	BN	GN	YE	GY	PK	BU	RD	shield
Output circuit	Type of connection	M23 connector, 12-pin											
1, 2, 3, 4, 5, 6, 7	5805: 3, 5	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	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.

Top view of mating side, male contact base

- +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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \perp : Plug connector housing (shield)



M23 connector, 12-pin

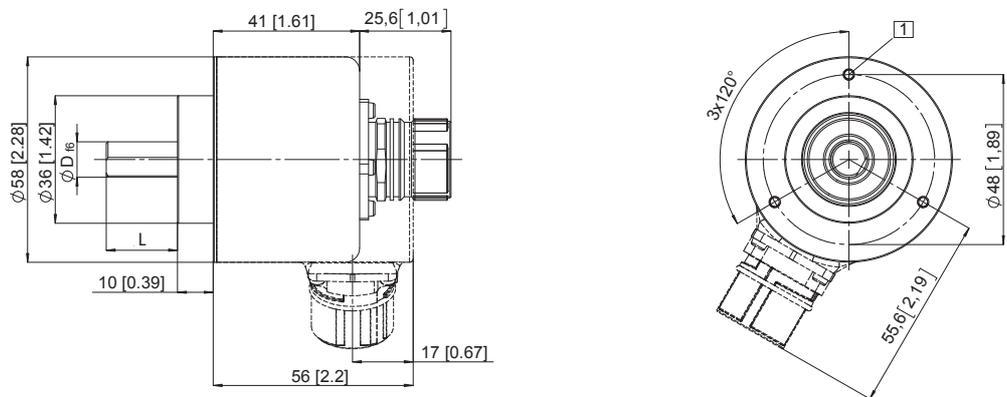
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1

- 1) 3 x M3, 5 [0.2] deep

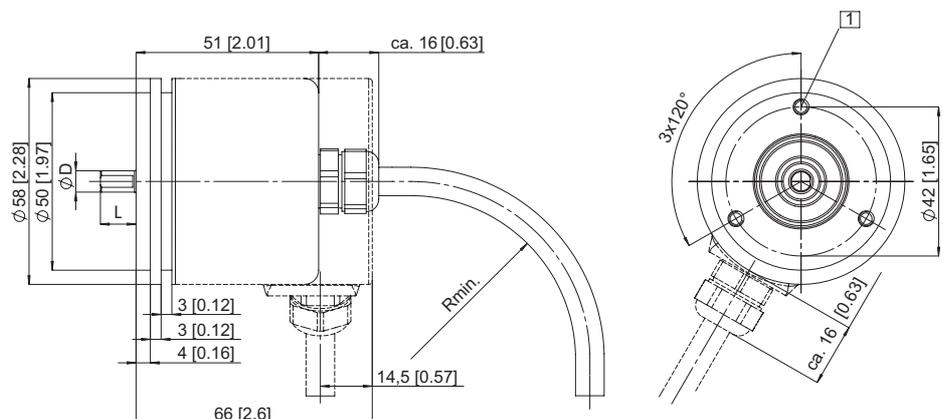


Synchro flange, \varnothing 58 [2.28]

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.

Incremental encoders

**Standard
high resolution, optical**

5805 / 5825 (shaft / hollow shaft)

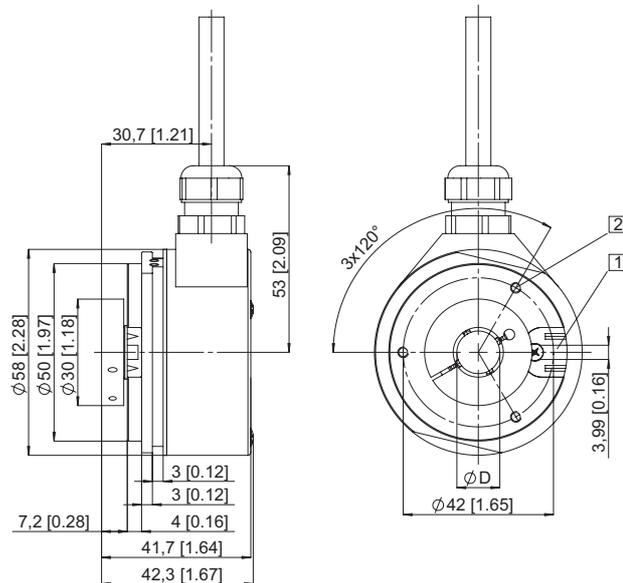
Push-Pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1 and 2

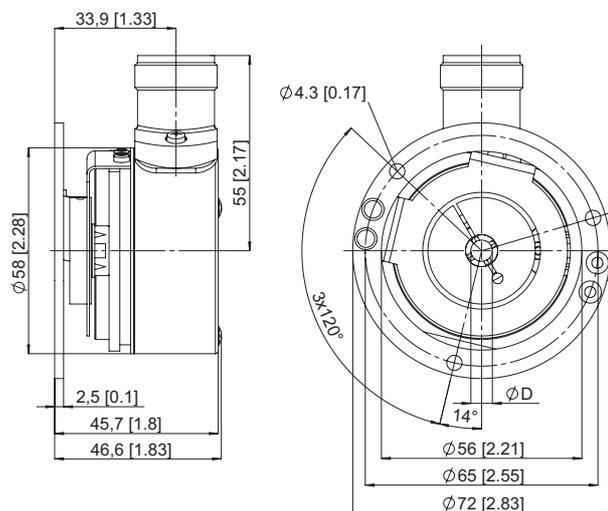
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 2 M3, 5 [0.2] deep
Recommended torque for the clamping ring 0.6 Nm



Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

Recommended torque for the clamping ring 0.6 Nm

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



Incremental encoders

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.



Incremental encoders

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

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	8.5006	. XXXX 4 . XXXX
Shaft version	Type	a b c d e
a Flange	7 = clamping flange \varnothing 58 mm [2.28"] A = synchro flange \varnothing 58 mm [2.28"] C = square flange \square 63.5 mm [2.5"]	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
b Shaft ($\varnothing \times L$), with flat 1 = \varnothing 6 x 10 mm [0.24 x 0.39"] 3 = \varnothing 10 x 20 mm [0.39 x 0.79"] 8 = \varnothing 3/8" x 7/8"	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) <i>Optional on request</i> - other pulse rates - Ex 2/22

Order code	8.5026	. XXXX 2 . XXXX
Hollow shaft	Type	a b c d e
a Flange 1 = with spring element, long C = with stator coupling, \varnothing 63 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	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) <i>Optional on request</i> - other pulse rates - Ex 2/22
b Hollow shaft 3 = \varnothing 10 mm 5 = \varnothing 12 mm 8 = \varnothing 15 mm	d Type of connection 2 = radial M12 connector, 8-pin	

Incremental encoders

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	Isolation insert	Order no.
6 mm [0.24"]		8.0010.4021.0000
8 mm [0.32"]		8.0010.4020.0000
10 mm [0.39"]		8.0010.4023.0000
12 mm [0.47"]		8.0010.4025.0000
1/4"		8.0010.4022.0000
3/8"		8.0010.4024.0000
1/2"		8.0010.4026.0000

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

Technical data

Electrical characteristics				
Output circuit	RS422 (TTL compatible)	Push-Pull	Push-Pull (7272 compatible)	
Power supply	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC	
Current consumption with inverted signal (no load)	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA	
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	
Signal level	HIGH min. 2.5 V LOW 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	Working temperature	-40°C ... +85°C [-40°F ... +185°F]	
Mass moment of inertia	approx. 1.8 x 10 ⁻⁶ kgm ²	Material	housing, flange, shaft	stainless steel, 1.4305 (V2A)
Starting torque – at 20°C [68°F]	< 0.05 Nm		connector	stainless steel
Weight	approx. 0.4 kg [14.11 oz]	Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms	
Load capacity of shaft	radial 80 N axial 40 N	Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz	
Protection acc. to EN 60529	IP66 / IP67			

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.

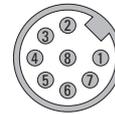
Incremental encoders

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	\bar{A}	B	\bar{B}	0	$\bar{0}$	\pm
	5026: 2	Pin:	1	2	3	4	5	6	7	8	PH ¹⁾

Top view of mating side, male contact base



M12 connector, 8-pin

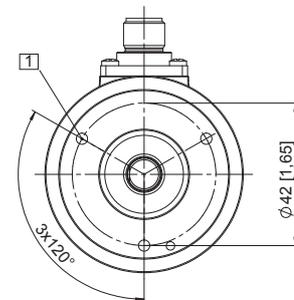
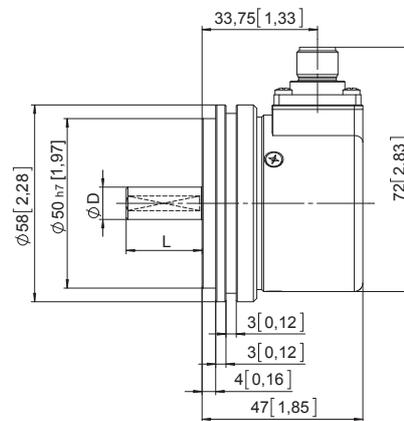
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \pm : Plug connector housing (shield)

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28] Flange type A

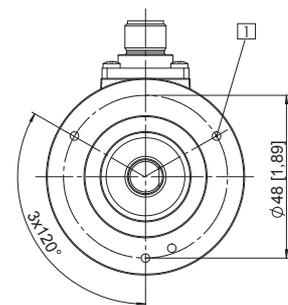
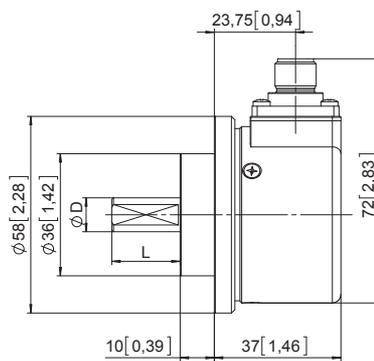
- 1) 3 x M4, 6 [0.24] deep



- D = \varnothing 6 h7 [0.24]
- \varnothing 10 f7 [0.39]
- \varnothing 3/8" h8

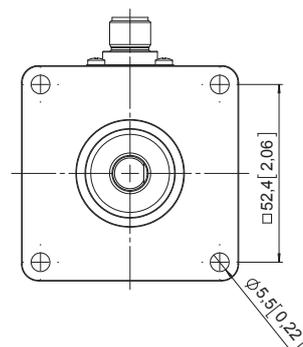
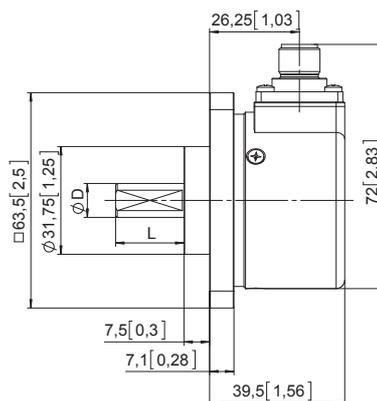
Clamping flange, \varnothing 58 [2.28] Flange type 7

- 1) 3 x M3, 5.5 [0.22] deep



- D = \varnothing 6 h7 [0.24]
- \varnothing 10 f7 [0.39]
- \varnothing 3/8" h8

Square flange, \square 63.5 [2.5] Flange type C



- D = \varnothing 6 h7 [0.24]
- \varnothing 10 f7 [0.39]
- \varnothing 3/8" h8

1) PH = shield is attached to connector housing.

Incremental encoders

**Standard
stainless steel, optical**

Sendix 5006 / 5026 (shaft / hollow shaft)

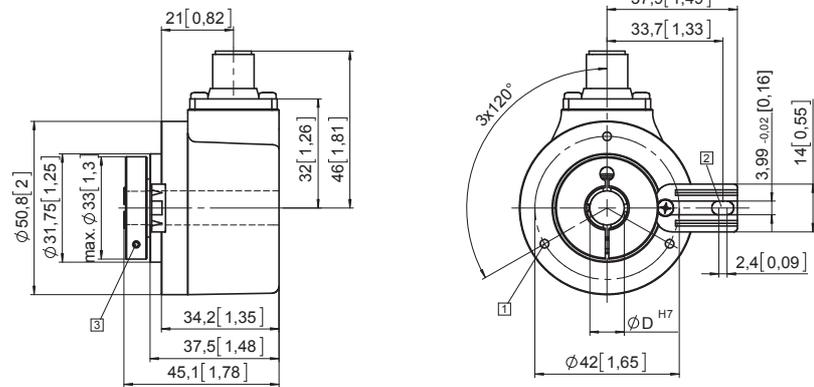
Push-Pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

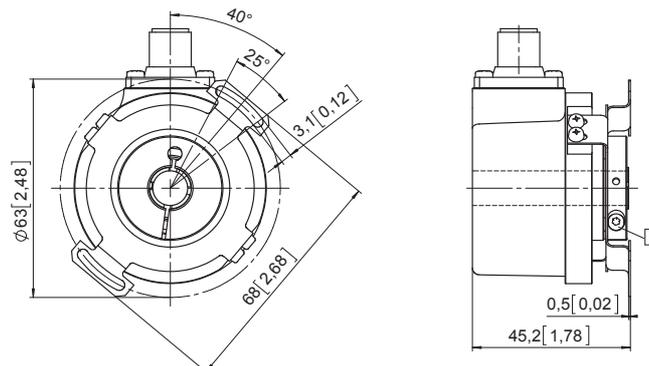
Flange with spring element, long Flange type 1

- 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



Incremental encoders

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.

Incremental encoders

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

- | | | |
|--|--|--|
| <p>a Flange
1 = with spring element, ø 58 mm [2.28"]</p> <p>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"]</p> | <p>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</p> <p>d Type of connection
1 = radial cable, 2 m [6.56'] PVC
E = radial M12 connector, 8-pin</p> | <p>e Pulse rate
50, 60, 100, 125, 250, 400, 500, 512, 960, 1000, 1024, 2000, 2048, 5000 (e.g. 100 pulses => 0100)</p> <p><i>Optional on request</i>
- other pulse rates
- other hollow shaft diameters</p> |
|--|--|--|

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.

Incremental encoders

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

Technical data

Mechanical characteristics	
Maximum speed	2500 min ⁻¹
Mass moment of inertia	approx. 3.5 x 10 ⁻⁶ kgm ²
Starting torque – at 20°C [68°F]	< 0.1 Nm
Weight	approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	IP64
Working temperature range	
at max. speed 2000 min ⁻¹	-20°C ... +70°C [-4°F ... +158°F]
at max. speed 2500 min ⁻¹	-20°C ... +60°C [-4°F ... +140°F]
Material	hollow shaft steel
Shock resistance acc. to EN 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 35 ... 2000 Hz

Electrical characteristics		
Output circuit	RS422	Push-Pull (7272 compatible)
Power supply	5 V DC (±5%) or 8 ... 30 V DC	8 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 100 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 40 mA
Pulse frequency	max. 300 kHz	max. 200 kHz
Signal level	HIGH min. 2.5 V LOW 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	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		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	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \perp : 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.

Incremental encoders

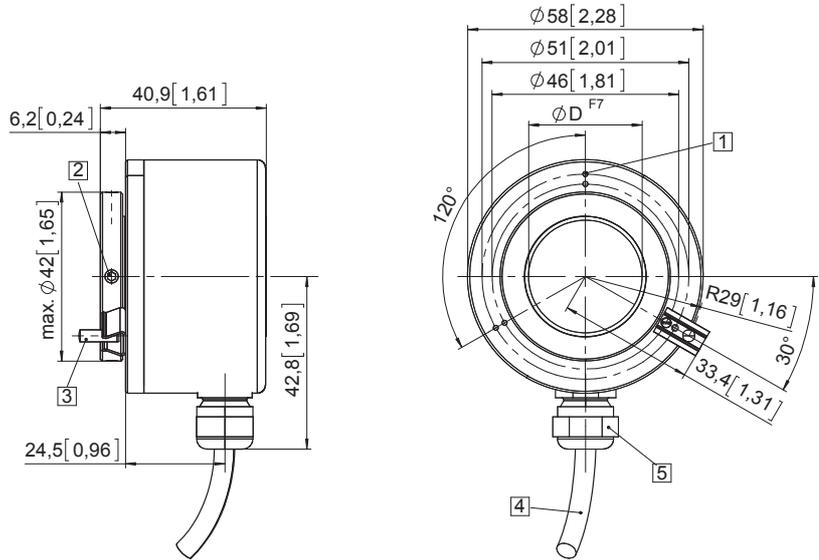
Standard large hollow shaft, optical	5821 (hollow shaft)	Push-Pull / RS422
---	----------------------------	--------------------------

Dimensions

Dimensions in mm [inch]

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

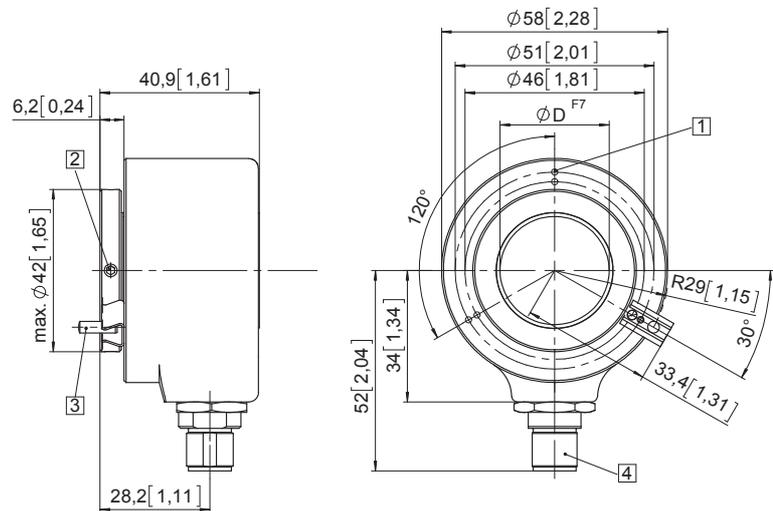
- 1 M1.6 / 5 [0.2] deep
- 2 4 x socket set screw M4x6 DIN 913
- 3 Cylindrical pin 3m6x12 DIN 6325 included
- 4 Cable length 2 m [6.56']
- 5 Cable gland PG7



Incremental encoders

Flange with spring element, \varnothing 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



Incremental encoders

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.



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 8.7000 . 1 X X X . X X X X . X X X X
Shaft version 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.

Incremental encoders

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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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

Incremental encoders

Electrical characteristics

Output circuit	RS422 (TTL compatible)		Push-Pull	Push-Pull (7272 compatible)	
	Ordercode	1	4	5	
Power supply		5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)		typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load / channel		max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA
Pulse frequency		max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz ¹⁾
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. 2.5 V max. 0.5 V	min +V - 1.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Rising edge time t_r		max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs²⁾		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)												
		Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	0 Vsens	+Vsens	⊥	
1, 2, 4, 5	1, 2, A, B	Cable marking:	1	2	3	4	5	6	7	8	9	10	shield	

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

Incremental encoders

Standard
ATEX/IECEX – zone 1/21, optical

Sendix 7000 (shaft)

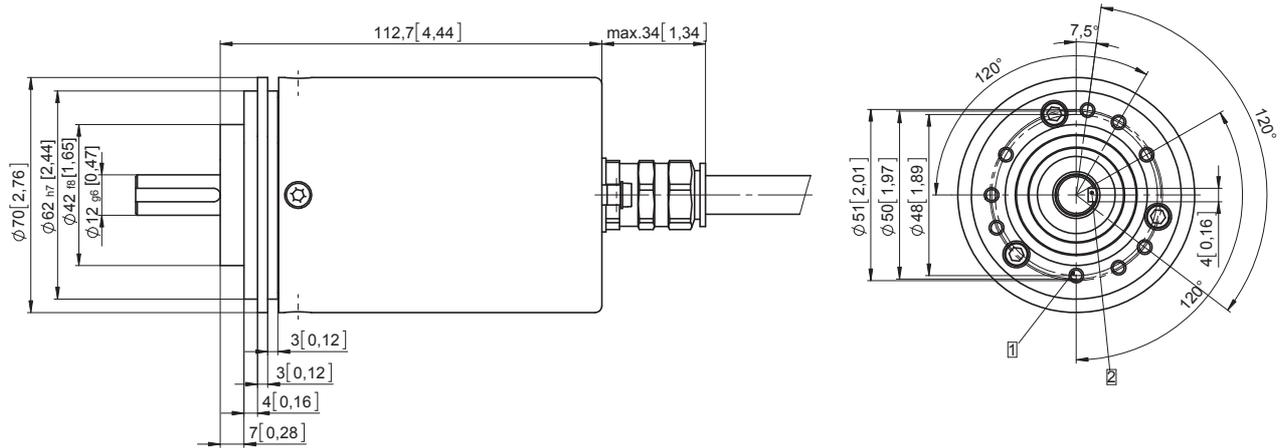
Push-Pull / RS422

Dimensions

Dimensions in mm [inch]

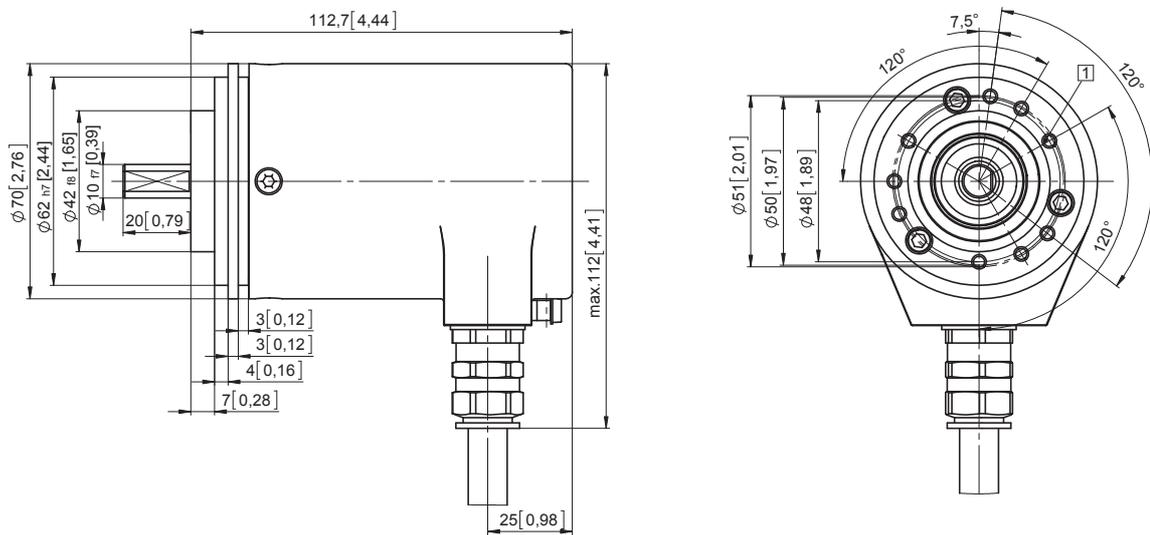
Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

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



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

- 1 9 x M4, 10 [0.39] deep



Incremental encoders

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.



Incremental encoders

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 8.7014 FS2 . 1 XXX . XXXX . XXXX
Shaft version Type a b c d e f

a Flange 1 = clamping / synchronous flange, IP67 ø 70 mm [2.76"]	c Output circuit / power supply 1 = SinCos / 5 V DC 2 = SinCos / 10 ... 30 V DC	e Pulse rate 1024, 2048	<i>Optional on request</i> - special cable length - stainless steel version
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	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']	f Cable length in dm ¹⁾ 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']	

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.

Incremental encoders

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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 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

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	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 V _{pp} (±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	\bar{A}	B	\bar{B}	\perp
		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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : 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.

Incremental encoders

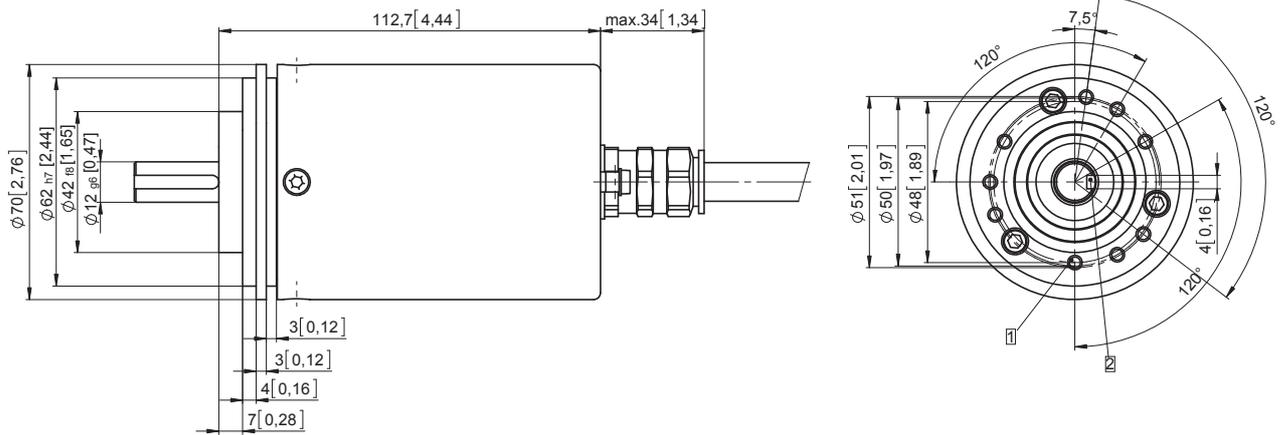
Standard ATEX/IECEX – zone 1/21, SIL2/PLd, optical	Sendix SIL 7014FS2 (shaft)	SinCos
--	-----------------------------------	---------------

Dimensions

Dimensions in mm [inch]

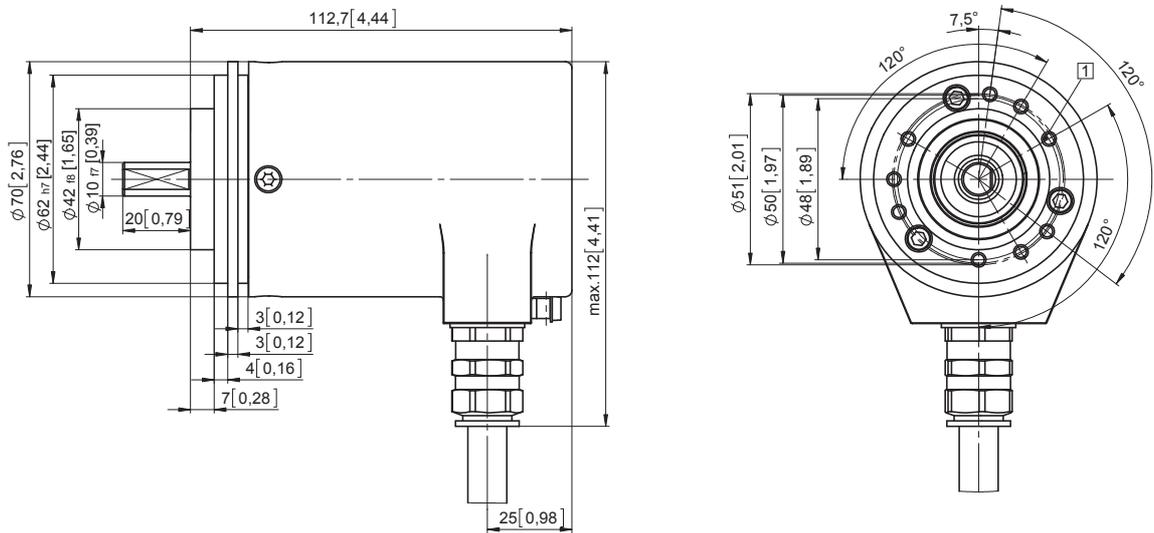
Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

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



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

- 1 9 x M4, 10 [0.39] deep



Incremental encoders

Standard ATEX/IECEX – zone 1/21, SIL3/PLe, optical	Sendix SIL 7014FS3 (shaft)	SinCos
--	-----------------------------------	---------------

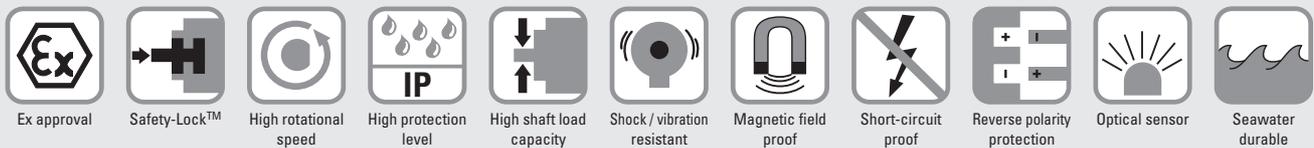


SIL3
Functional Safety
PLe

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.



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 8.7014 FS3 . 1 XXX . XXXX . XXXX
Shaft version Type

a Flange 1 = clamping / synchronous flange, IP67 ø 70 mm [2.76"]	c Output circuit / power supply 1 = SinCos / 5 V DC 2 = SinCos / 10 ... 30 V DC	e Pulse rate 1024, 2048	Optional on request - special cable length - stainless steel version
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	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']	f Cable length in dm ¹⁾ 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']	

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.

Incremental encoders

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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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

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	\bar{A}	B	\bar{B}	\perp
		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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Plug connector housing (shield)

Safety characteristics	
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value ¹⁾	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

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 AISiMgMn (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 V _{pp} (±10 %)
Short circuit proof	yes ²⁾
Pulse rate	1024 / 2048 ppr

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.

Incremental encoders

Standard
ATEX/IECEX – zone 1/21, SIL3/PLe, optical

Sendix SIL 7014FS3 (shaft)

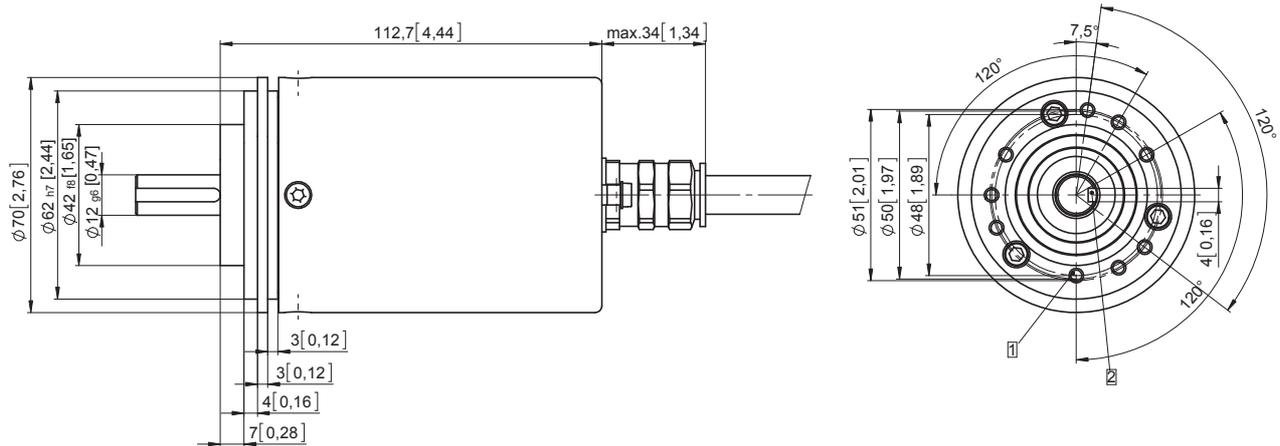
SinCos

Dimensions

Dimensions in mm [inch]

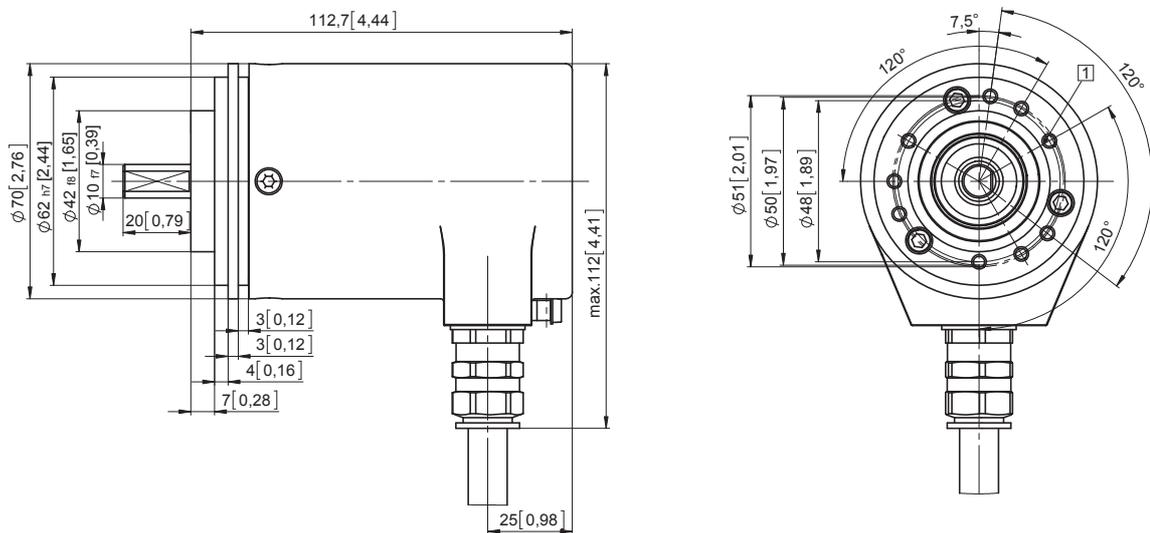
Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

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



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

- 1 9 x M4, 10 [0.39] deep



Incremental encoders

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.



Incremental encoders

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	8.7100	. 2	X	X	X	. XXXX	. XXXX
Shaft version	Type	a	b	c	d	e	f

<p>a Flange 2 = clamping / synchronous flange, IP67 ø 70 mm [2.76"]</p> <p>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</p>	<p>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</p> <p>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']</p>	<p>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</p> <p>f Cable length in dm ¹⁾ 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']</p> <p><i>Optional on request</i> - other pulse rates - special cable length</p>
--	--	---

1) Not applicable with connection types 1 and 2.

Incremental encoders

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	⊕ 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 LOW max. 0.5 V	min. 2.5 V max. 0.5 V	min +V - 1.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 200 ns	max. 1 μs	max. 1 μs
Falling edge time t_f	max. 200 ns	max. 200 ns	max. 1 μs	max. 1 μs
Short circuit proof outputs²⁾	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	\bar{A}	B	\bar{B}	0	$\bar{0}$	0 Vsens	+Vsens	\perp
		Cable marking:	1	2	3	4	5	6	7	8	9	10	shield

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A, \bar{A} : Incremental output channel A / cosine signal
- B, \bar{B} : Incremental output channel B / sine signal
- 0, $\bar{0}$: Reference signal
- \perp : 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.

Incremental encoders

Standard
ATEX/IECEX – mining, optical

Sendix 7100 (shaft)

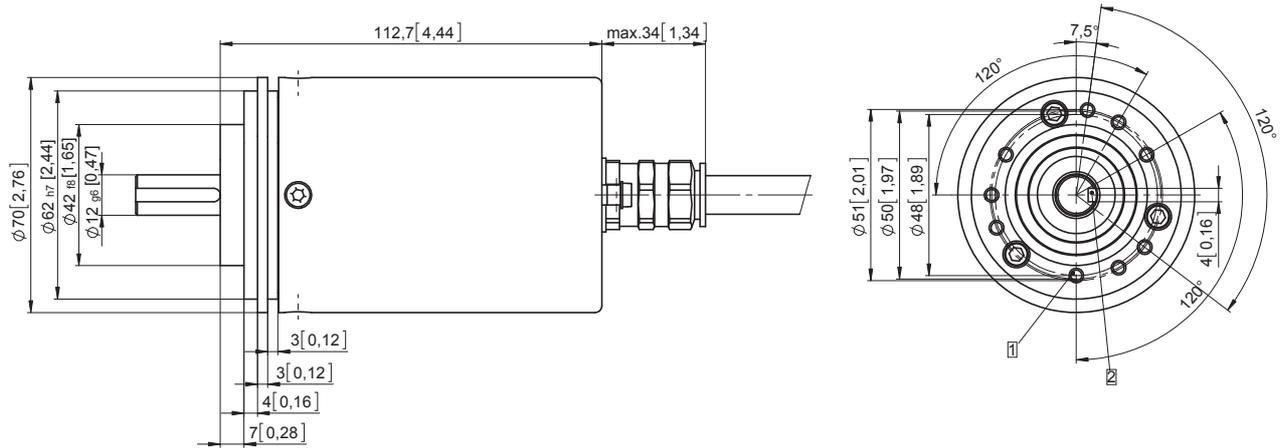
Push-Pull / RS422

Dimensions

Dimensions in mm [inch]

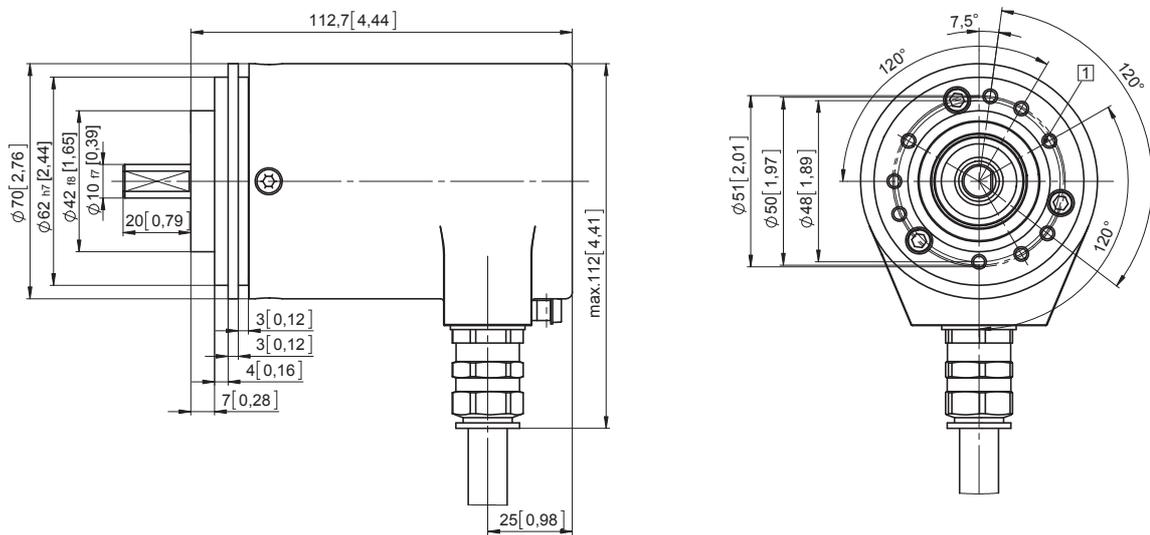
Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

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



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

- 1 9 x M4, 10 [0.39] deep

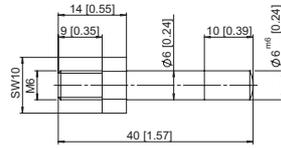


Incremental encoders

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

Mounting accessory for hollow shaft encoders

Cylindrical pin, long for torque stops	with fixing thread	Order no. 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		Electrical characteristics SinCos output		
Maximum speed	3000 min ⁻¹ 1)	Output circuit	SinCos U = 1 Vpp	SinCos U = 1 Vpp
Mass moment of inertia 2)	< 150 x 10 ⁻⁶ kgm ²	Power supply	5 V DC (±5 %)	10 ... 30 V DC
Starting torque with sealing at 20°C [68°F]	< 0.2 Nm	Power consumption with inverted signal (no load)	typ. 65 mA max. 110 mA	typ. 65 mA max. 110 mA
Weight	approx. 0.7 kg [24.69 oz]	-3 dB frequency	≤180 kHz	≤180 kHz
Protection acc. to EN 60529	IP65	Signal level channels A/B channel 0	1 Vpp (±20 %) 0.1 ... 1.2 V	1 Vpp (±20 %) 0.1 ... 1.2 V
Working temperature range	-40°C 3) ... +70°C [-40°F 3) ... +158°F]	Short circuit proof outputs 4)	yes	yes
Material	shaft stainless steel H7	Reverse polarity protection of the power supply	no	yes
Shock resistance acc. to EN 60068-2-27	1000 m/s ² , 6 ms	UL approval	file 224618	
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz	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	–	typ. 55 mA/max. 125 mA	–	
with inverted signal	typ. 40 mA/max. 90 mA	typ. 80 mA/max. 150 mA	typ. 50 mA/max. 100 mA	
Permissible load / channel	max. +/- 20 mA	max. +/- 30 mA	max. +/- 20 mA	
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	
Signal level	HIGH min. 2.5 V LOW 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.

Incremental encoders

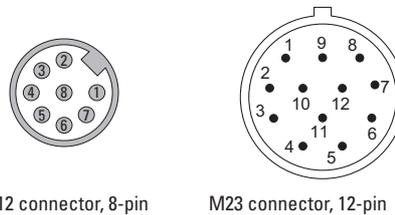
Large hollow shaft optical	A020 (hollow shaft)	Push-Pull / RS422 / SinCos
-----------------------------------	----------------------------	-----------------------------------

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	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield
		M23 connector, 12 pin											
1 ... A	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾
		M12 connector, 8 pin											
1 ... A	E	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		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 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



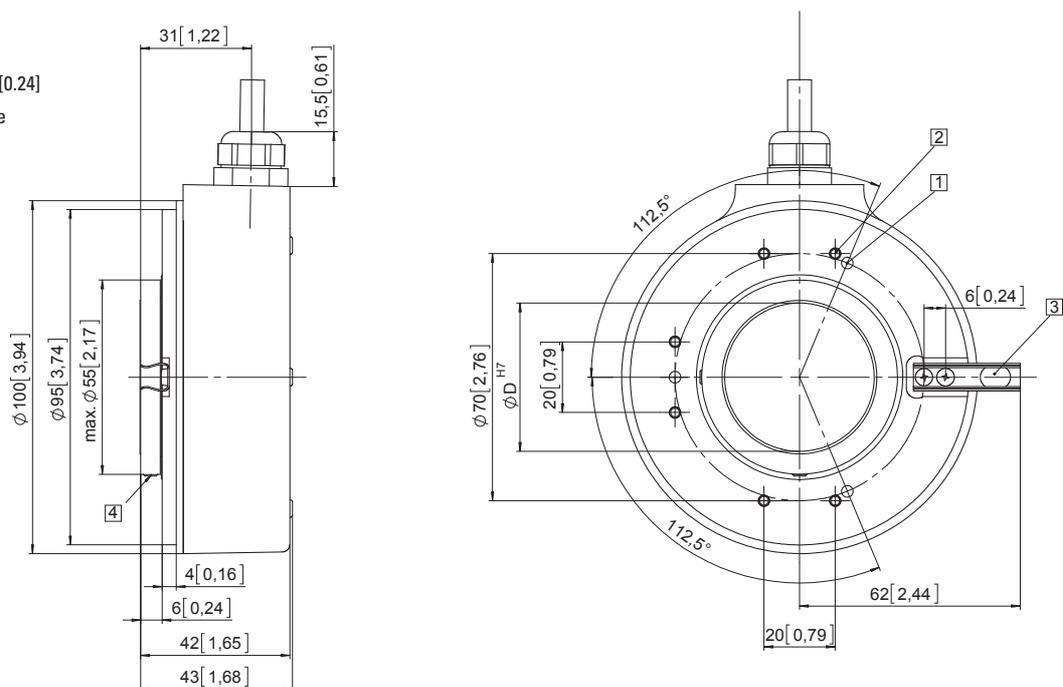
Dimensions hollow shaft version

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, \varnothing 6 [0.24]
- 4) Recommended torque for the clamping ring 1.0 Nm

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



1) PH = shield is attached to connector housing.

Incremental encoders

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

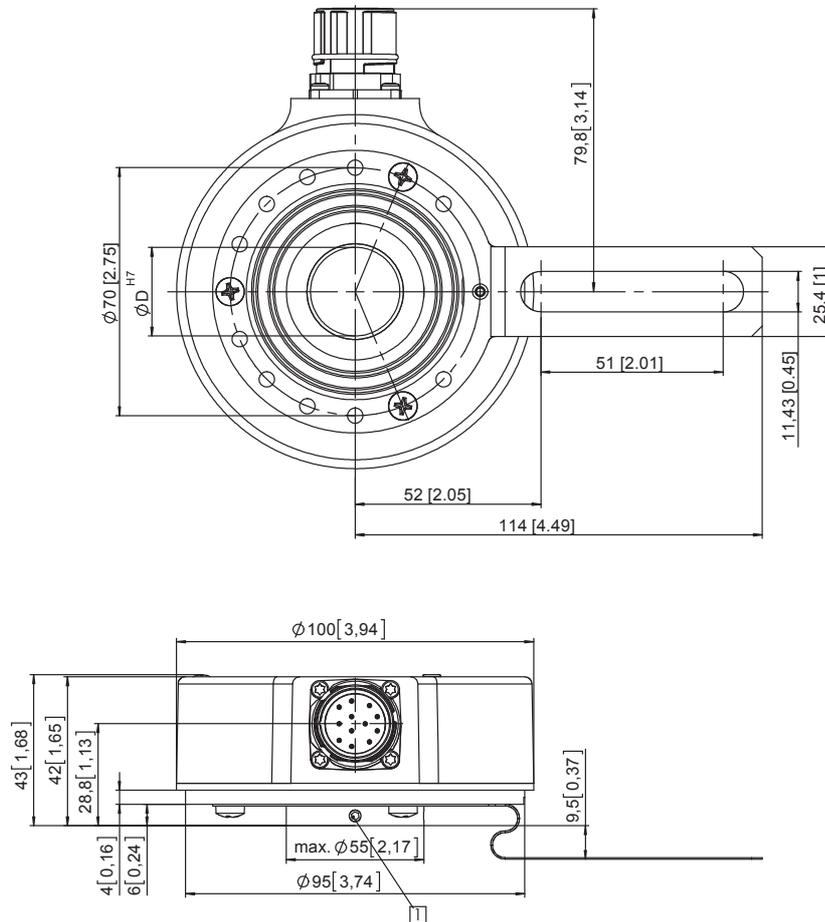
Dimensions hollow shaft version

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
 $1.5 \times D_{\text{hollow shaft}}$



Incremental encoders

Incremental encoders

**Large hollow shaft
robust, optical**

A02H (hollow shaft)

Push-Pull / RS422 / SinCos



The Heavy Duty incremental encoder type A02H boasts a high degree of ruggedness in a very compact design.

Its special construction makes it perfect for all applications in very harsh environments.



High rotational speed



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Optical sensor

Heavy Duty - robust

- Special shaft connection with interlocked bearings.
- Balanced stainless steel clamping ring.
- Optional isolation inserts available to protect against shaft currents.

Compact and versatile

- Only 49 mm installation depth.
- With cable connections, M12, M23 or MIL connectors.
- With Push-Pull, RS422 or SinCos interface.

Order code Hollow shaft

8.A02H.XXXX.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

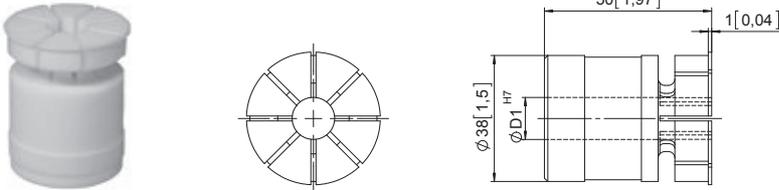
- 50, 360, 512, 600, 1000, 1024, 1500,
2000, 2048, 2500, 4096, 5000
(e.g. 360 pulses => 0360)

SinCos version only available
with pulses ≥ 1024

Optional on request

- other pulse rates on request
- Ex 2/22

Incremental encoders

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 <ul style="list-style-type: none"> Improved reliability Extension of the service life of the encoder Scope of delivery: <ul style="list-style-type: none"> 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, \varnothing 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: <ul style="list-style-type: none"> 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, \varnothing 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 motor 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)	\varnothing D1: 12 mm [0.47"] 14 mm [0.55"] 15 mm [0.59"] 16 mm [0.63"] 18 mm [0.71"] 20 mm [0.79"] 25 mm [0.98"] 30 mm [1.18"] 32 mm [1.26"] 1/2" 5/8" 3/4" 1" 1 1/4"	8.0010.4091.0000 8.0010.4027.0000 8.0010.4038.0000 8.0010.4019.0000 8.0010.4080.0000 8.0010.4011.0000 8.0010.4012.0000 8.0010.4016.0000 8.0010.4015.0000 8.0010.4013.0000 8.0010.4070.0000 8.0010.4090.0000 8.0010.4050.0000 8.0010.4060.0000
Isolation insert for hollow shaft, \varnothing 42 mm [1.65"]	external diameter 42 mm [1.65"] / internal diameter 38 mm [1.50"] external diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]		8.0010.4017.0000 8.0010.4029.0000
Connection technology			Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut M23 female connector with coupling nut		05.CMB 8181-0 8.0000.5012.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable M23 female connector with coupling nut, 2 m [6.56'] PVC cable		05.00.6041.8211.002M 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.

Incremental encoders

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

Technical data

Mechanical characteristics		
Maximum speed		6000 min ⁻¹ 1)
	at 60°C [140°F]	2500 min ⁻¹ 1)
Mass moment of inertia		< 220 x 10 ⁻⁶ kgm ² 2)
Starting torque with sealing at 20°C [68°F]		< 0.2 Nm
Load capacity of shaft	radial	200 N
	axial	100 N
Weight		approx. 0.8 kg [28.22 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C 3) ... +80°C [-40°F 3) ... +176°F]
Materials	shaft	stainless steel, bore tolerance H7
Shock resistance acc. to EN 60068-2-27		2000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz

Electrical characteristics SinCos output		
Output circuit		SinCos U = 1 Vpp SinCos U = 1 Vpp
Power supply		5 V DC (±5 %) 10 ... 30 V DC
Power consumption with inverted signal (no load)		typ. 65 mA typ. 65 mA
		max. 110 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

Incremental encoders

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. 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. +V - 3 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	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'].

Incremental encoders

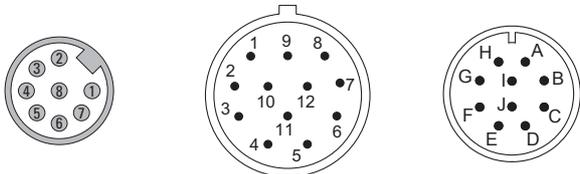
Large hollow shaft robust, optical	A02H (hollow shaft)	Push-Pull / RS422 / SinCos
---	----------------------------	-----------------------------------

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	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield
M23 connector, 12-pin													
1 ... D	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾
M12 connector, 8-pin													
1 ... D	E	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Pin:	1	2			3	4	5	6	7	8	PH ¹⁾
MIL connector, 10-pin													
1 ... D	D	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		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 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \perp : 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.

Incremental encoders

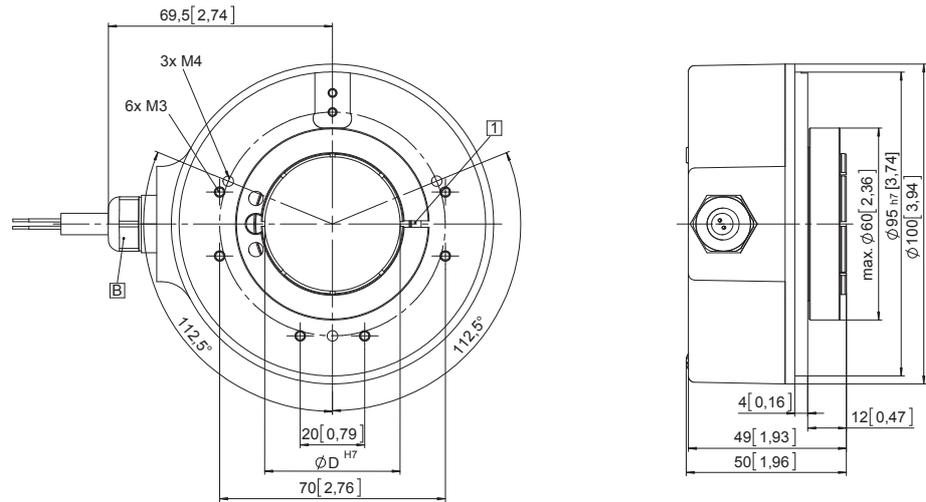
Large hollow shaft robust, optical	A02H (hollow shaft)	Push-Pull / RS422 / SinCos
---	----------------------------	-----------------------------------

Dimensions hollow shaft version

Dimensions in mm [inch]

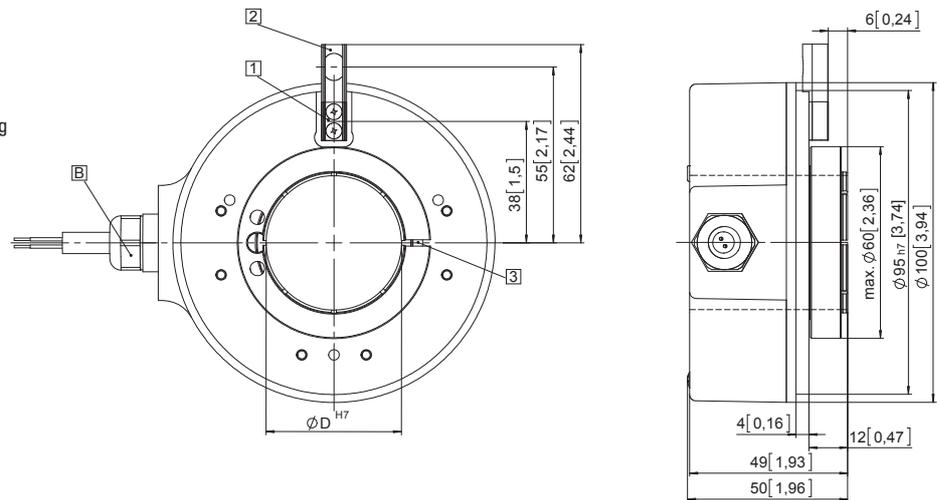
Flange without mounting aid Flange type 1

- 1 Recommended torque for the clamping ring 1.0 Nm
- B Cable version



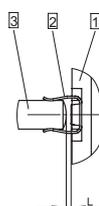
Flange with spring element Flange type 2 and 3

- 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

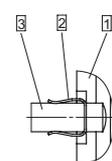
When mounting the encoder, ensure that dimension L is larger than the maximum axial play of the drive in the direction of the arrow.
Danger of mechanical seizure!



- 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

Incremental encoders

**Large hollow shaft
robust, optical**

A02H (hollow shaft)

Push-Pull / RS422 / SinCos

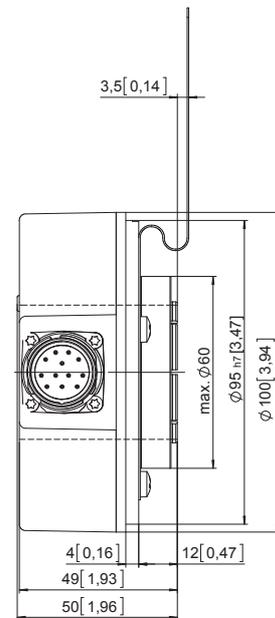
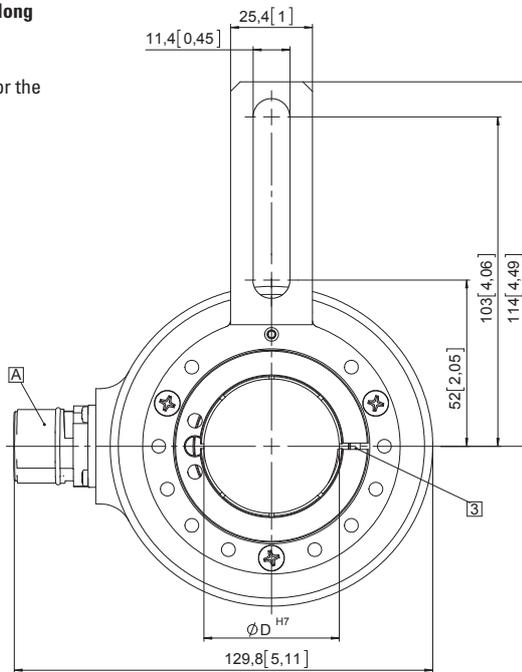
Dimensions hollow shaft version

Dimensions in mm [inch]

**Flange with fastening arm, long
Flange type 5**

③ Recommended torque for the clamping ring 2.0 Nm

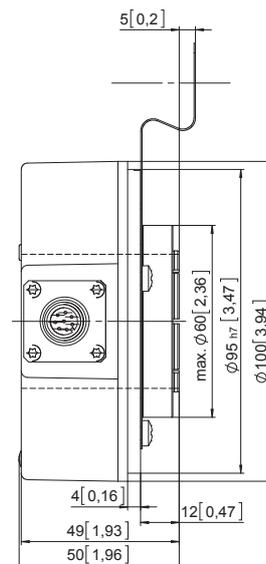
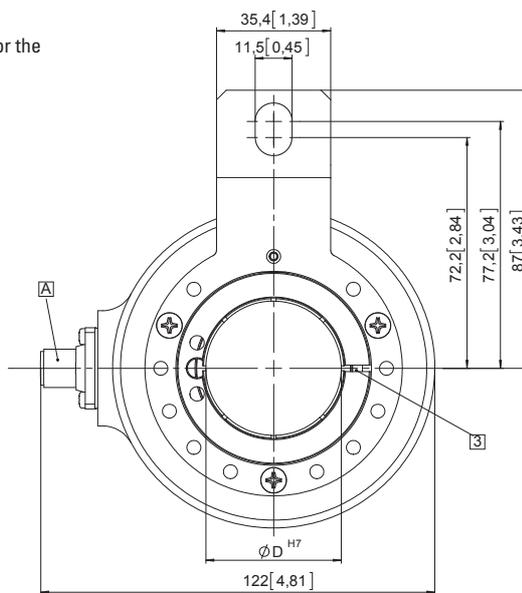
Ⓐ Plug version



**Flange with fastening arm, short 4.5"
Flange type 6**

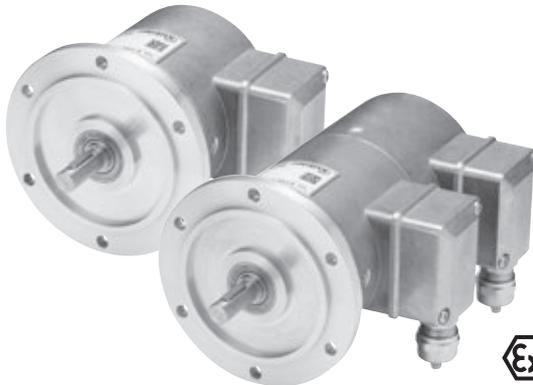
③ Recommended torque for the clamping ring 2.0 Nm

Ⓐ Plug version



Incremental encoders

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



The Sendix Heavy Duty encoder H100 is an extremely rugged incremental encoder available in 3 versions: encoder with or without speed switch and double encoder.

Thanks to the special HD-Safety-Lock™ construction it is ideally suited for applications in heavy industry, such as steel works and cranes. Resistant materials, wide temperature ranges and a high protection level ensure it remains unaffected by the harshest environmental conditions. Its innovative connection technology enables simple quick installation.



HD-Safety-Lock™	High rotational speed	Temperature range	High protection level	Shock/vibration resistant	Magnetic field proof	Plug-in cage-clamp connectors	Spring terminal connectors	Reverse polarity protection	Optical sensor	Seawater durable

Suitable for your Heavy Duty application

- HD-Safety-Lock™ bearing construction for an extremely high bearing load capacity of up to 300 N axial and 400 N radial.
- With a temperature range from -40°C up to +100°C, IP66 protection and seawater durable material the encoder is resistant to harsh environmental conditions.
- Feather key shaft slot ensures positive fitting to the application.
- Safe overspeed protection by means of mechanical speed switch.

Simple quick installation

- Innovative plug-in spring terminal connectors in the terminal box greatly simplify the cable connection and offer a very high level of safety.
- Various connection possibilities thanks to terminal box being rotatable through 180°.
- Large number of resolution and switching speed options available as standard.

Order code without speed switch

8.H100 . 1 1 1 X . XXXX
Type a b c d e

a Flange
1 = Euro RE0444

b Shaft (ø x L), with feather key shaft slot
1 = ø 11 x 30 mm [0.43 x 1.18"]

c Version
1 = incremental encoder

d Output circuit / power supply
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC

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

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

Order code with speed switch

8.H100 . 1 1 2 X . XXXX . XXXX . 1
Type a b c d e f g

a Flange
1 = Euro RE0444

b Shaft (ø x L), with feather key shaft slot
1 = ø 11 x 30 mm [0.43 x 1.18"]

c Version
2 = incremental encoder with mech. speed switch

d Output circuit / power supply
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC

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

f Switching speed
750, 1000, 2000, 3000, 4000

g Switching accuracy
1 = standard (±4 % at 100 rad/s²)

Optional on request
- other pulse rates
- other switching speeds
- other switching accuracies
- Ex 2/22

Incremental encoders

Heavy Duty shaft, optical	Sendix Heavy Duty H100 (shaft)	Push-Pull / RS422 / speed switch										
Order code double encoder	<table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25%;">8.H100 Type</td> <td style="width: 10%;">.</td> <td style="width: 10%;">1 <small>a</small></td> <td style="width: 10%;">1 <small>b</small></td> <td style="width: 10%;">3 <small>c</small></td> <td style="width: 10%;">X <small>d</small></td> <td style="width: 10%;">.</td> <td style="width: 10%;">XXXX <small>e</small></td> <td style="width: 10%;">.</td> <td style="width: 10%;">XXXX <small>f</small></td> </tr> </table>		8.H100 Type	.	1 <small>a</small>	1 <small>b</small>	3 <small>c</small>	X <small>d</small>	.	XXXX <small>e</small>	.	XXXX <small>f</small>
8.H100 Type	.	1 <small>a</small>	1 <small>b</small>	3 <small>c</small>	X <small>d</small>	.	XXXX <small>e</small>	.	XXXX <small>f</small>			
<p>a Flange 1 = Euro RE0444</p> <p>b Shaft ($\varnothing \times L$), with feather key shaft slot 1 = $\varnothing 11 \times 30$ mm [0.43 x 1.18"]</p> <p>c Version 3 = 2 x incremental encoder</p>	<p>d Output circuit / power supply 1 = RS422 (with inverted signal) / 5 ... 30 V DC 2 = Push-pull (with inverted signal) / 10 ... 30 V DC</p> <p>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)</p>	<p>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)</p> <p><i>Optional on request</i> - other pulse rates - Ex 2/22</p>										

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 mm ² [AWG 23] + 2 x 1 mm ² [AWG 17], twisted pair	8.0000.6400.XXXX ¹⁾
Speed switch cable	TPE-trailing cable, shielded, halogen free, black – 5 x 0.75 mm ² [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/s ² (1 ms)		
Vibration resistance acc. to EN 60068-2-27	without speed switch	100 m/s ² , 10 ... 2000 Hz	
	with speed switch, switching speed > 1000	100 m/s ² , 10 ... 400 Hz	
	with speed switch, switching speed < 1000	50 m/s ² , 10 ... 400 Hz	
Electrical characteristics			
Output circuit	RS422 (TTL compatible)	Push-Pull (HTL) up to 150 m [492.13'] cable length	
Power supply	5 ... 30 V DC		10 ... 30 V DC
Power consumption (no load) with inverted signal	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	
Permissible load per channel	DC peak	max. +/- 20 mA max. +/- 30 mA	max. +/- 30 mA max. +/- 70 mA
Pulse frequency	max. 300 kHz		max. 300 kHz
Pulse frequency with 150 m [492.13'] cable length	max. 300 kHz		max. 80 kHz
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.5 V max. 0.5 V
Rising edge time t_r	max. 200 ns		max. 1 µs
Falling edge time t_f	max. 200 ns		max. 1 µs
Short circuit proof outputs ²⁾	yes ³⁾		yes
Reverse polarity protection of the power supply	yes		yes
CE-compliant acc. to	EMC guideline 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.

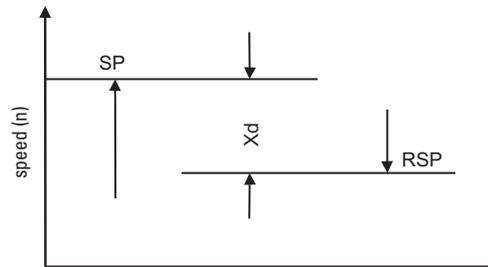
Incremental encoders

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 $\alpha = 100 \text{ rad/s}^2$ (corresponds $\Delta n = 955 \text{ min}^{-1}/\text{s}$)	$\pm 4 \%$ of ns
Switching difference cw/ccw rotation	$\sim 3 \%$
Switching hysteresis (Xd)	$\sim 40 \%$ 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)

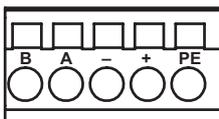


SP = switching point (for switching speed ns)
RSP = reset point
Xd = switching difference (hysteresis)

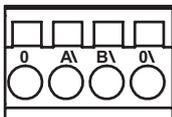
Incremental encoders

Terminal assignment terminal connections

Incremental encoders

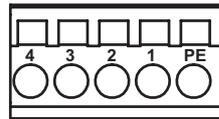


B incremental track B
A incremental track A
- 0 V
+ +V
PE shield



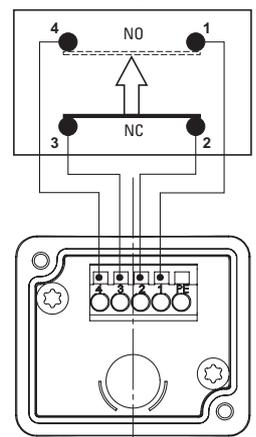
0 incremental track 0
 \bar{A} incremental track \bar{A}
 \bar{B} incremental track \bar{B}
 $\bar{0}$ incremental track $\bar{0}$

Speed switch



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

Jumper



Incremental encoders

**Heavy Duty
shaft, optical**

Sendix Heavy Duty H100 (shaft)

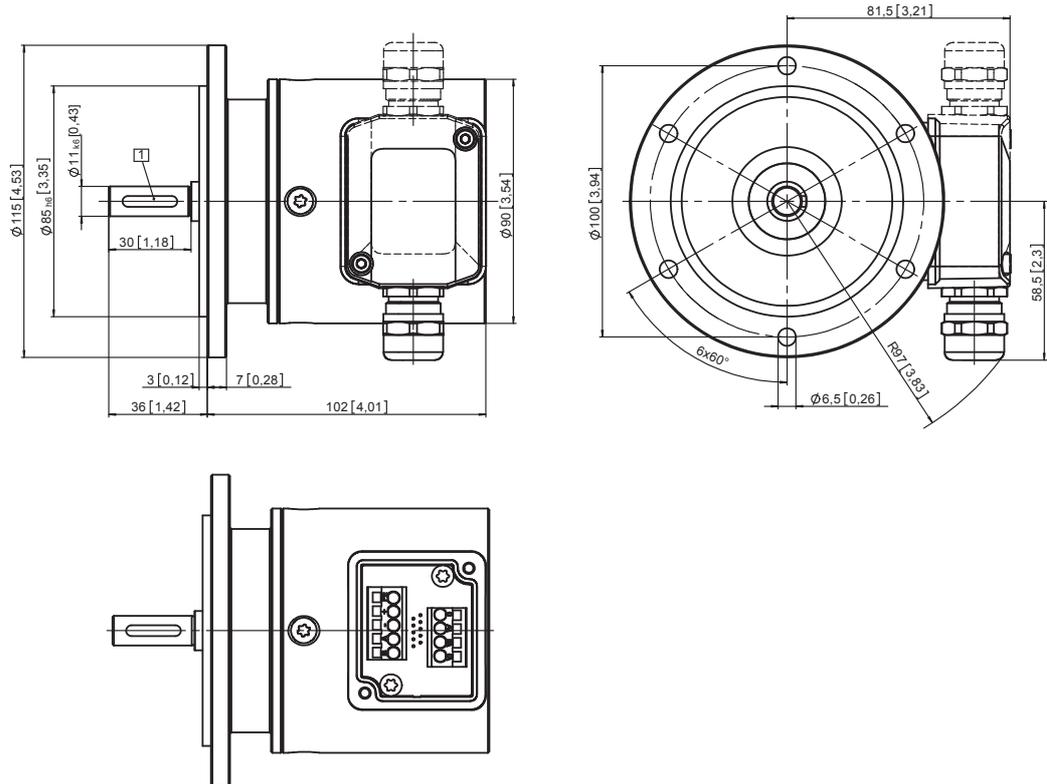
Push-Pull / RS422 / speed switch

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]



Incremental encoders

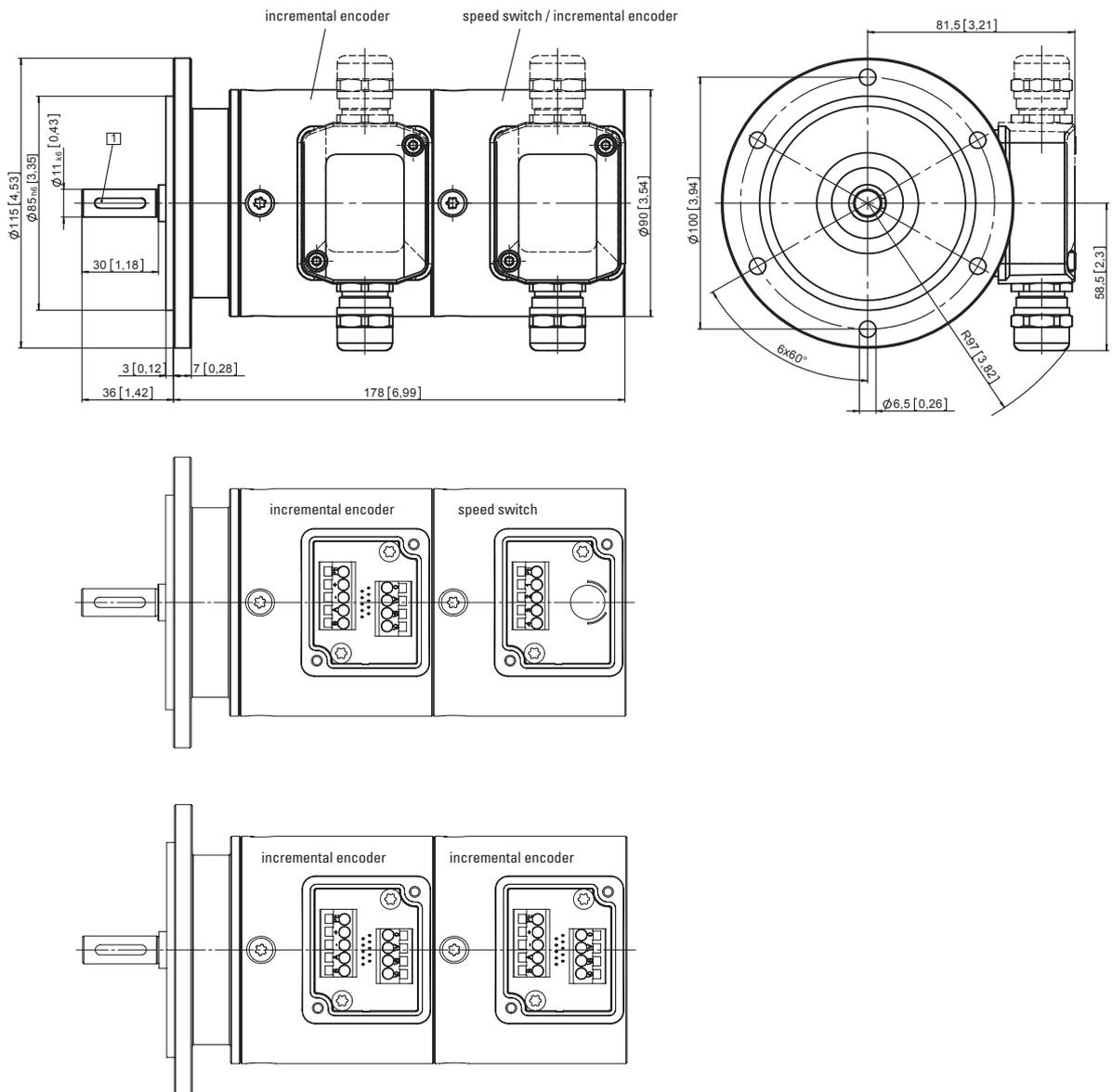
Heavy Duty shaft, optical	Sendix Heavy Duty H100 (shaft)	Push-Pull / RS422 / speed switch
----------------------------------	---------------------------------------	---

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]



Incremental encoders

Incremental encoders

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.



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.XXXX.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 W
 - B = LWL + RS422 (with inverted signal) / 5 V DC²⁾
 - A = LWL + RS422 (with inverted signal) / 10 ... 30 V DC²⁾
 - C = LWL + Push-Pull (with inverted signal) / 10 ... 30 V DC²⁾

- 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, cw³⁾

*) 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.

Incremental encoders

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		Technical data for optical fibre connection	
Maximum speed		Power consumption per module	< 2 W
	at 60°C [140°F]	6000 min ⁻¹	Input level optical fibre transmitter
		Optical wavelength	850 nm
Starting torque – at 20°C [68°F]	0.05 Nm	Optical transmission rate	120 Mbit/s
Load capacity of shaft	radial	Optical fibre synchronisation display	LED on the receiver
	axial		
	400 N	Optical fibre connection	ST connector, ø 9 mm [0.35"]
	300 N	Glass fibre	multimode fibre, 50/125 µm, 62.5/125 µm
Weight	1.6 ... 2.0 kg [56.44 ... 70.55 oz] (depending on version)	Optical fibre transmission distance	max. 1000 m [3280.84']
Protection acc. to EN 60529	IP66 + IP67		
Working temperature range	-40°C ²⁾ ... +100°C ³⁾ [-40°F ³⁾ ... +212°F ³⁾		
Materials	shaft		
	housing, flange	stainless steel, bore tolerance H7 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		

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. +/- 30 mA	max. +/- 150 mA
	peak	max. +/- 30 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. +V - 3.0 V	min. +V - 4.0 V
	LOW	max. 0.5 V	max. 2.5 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	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.

Incremental encoders

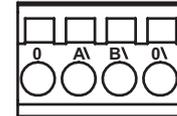
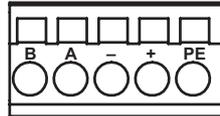
**Heavy Duty
hollow shaft, optical**

Sendix Heavy Duty H120 (hollow shaft)

Push-Pull / RS422 / optical fibre

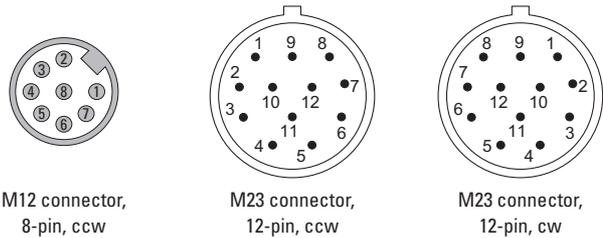
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)																								
1, 4, 5, 6	1	<table border="1"> <tr> <td>Signal:</td> <td>0 V</td> <td>+V</td> <td>0 Vsens</td> <td>+Vsens</td> <td>A</td> <td>\bar{A}</td> <td>B</td> <td>\bar{B}</td> <td>0</td> <td>$\bar{0}$</td> <td>\perp</td> </tr> <tr> <td>Cable colour:</td> <td>WH</td> <td>BN</td> <td>GY PK</td> <td>RD BU</td> <td>GN</td> <td>YE</td> <td>GY</td> <td>PK</td> <td>BU</td> <td>RD</td> <td>Shield</td> </tr> </table>	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	Shield
Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp															
Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	Shield															
1, 4, 5, 6	2	<table border="1"> <tr> <td>Signal:</td> <td>0 V</td> <td>+V</td> <td>0 Vsens</td> <td>+Vsens</td> <td>A</td> <td>\bar{A}</td> <td>B</td> <td>\bar{B}</td> <td>0</td> <td>$\bar{0}$</td> <td>\perp</td> </tr> <tr> <td>Pin:</td> <td>1</td> <td>2</td> <td>-</td> <td>-</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>PH²⁾</td> </tr> </table>	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	Pin:	1	2	-	-	3	4	5	6	7	8	PH ²⁾
Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp															
Pin:	1	2	-	-	3	4	5	6	7	8	PH ²⁾															
1, 4, 5, 6, A, B, C	4, D, L	<table border="1"> <tr> <td>Signal:</td> <td>0 V</td> <td>+V</td> <td>0 Vsens</td> <td>+Vsens</td> <td>A</td> <td>\bar{A}</td> <td>B</td> <td>\bar{B}</td> <td>0</td> <td>$\bar{0}$</td> <td>\perp</td> </tr> <tr> <td>Pin:</td> <td>10</td> <td>12</td> <td>11</td> <td>2</td> <td>5</td> <td>6</td> <td>8</td> <td>1</td> <td>3</td> <td>4</td> <td>PH²⁾</td> </tr> </table>	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	Pin:	10	12	11	2	5	6	8	1	3	4	PH ²⁾
Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp															
Pin:	10	12	11	2	5	6	8	1	3	4	PH ²⁾															
1, 4, 5, 6	K	<table border="1"> <tr> <td>Signal:</td> <td>B</td> <td>A</td> <td>0 V</td> <td>+V</td> <td>\perp</td> <td>0</td> <td>\bar{A}</td> <td>\bar{B}</td> <td>$\bar{0}$</td> </tr> <tr> <td>Pin:</td> <td>B</td> <td>A</td> <td>-</td> <td>+</td> <td>PE</td> <td>0</td> <td>\bar{A}</td> <td>\bar{B}</td> <td>$\bar{0}$</td> </tr> </table>	Signal:	B	A	0 V	+V	\perp	0	\bar{A}	\bar{B}	$\bar{0}$	Pin:	B	A	-	+	PE	0	\bar{A}	\bar{B}	$\bar{0}$				
Signal:	B	A	0 V	+V	\perp	0	\bar{A}	\bar{B}	$\bar{0}$																	
Pin:	B	A	-	+	PE	0	\bar{A}	\bar{B}	$\bar{0}$																	



- +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, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



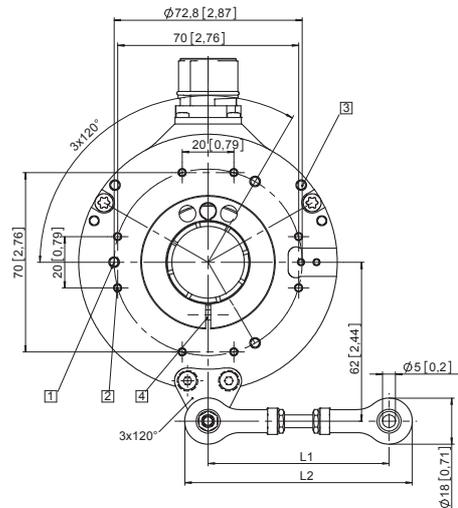
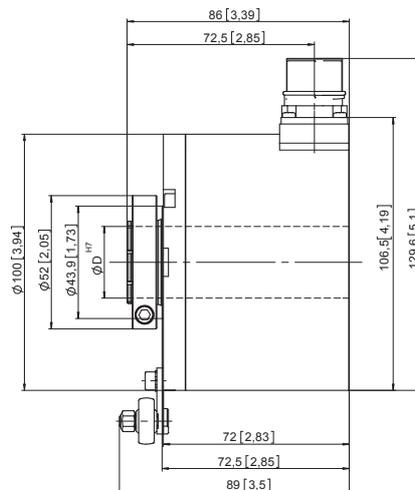
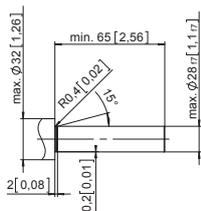
Dimensions

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.

Incremental encoders

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

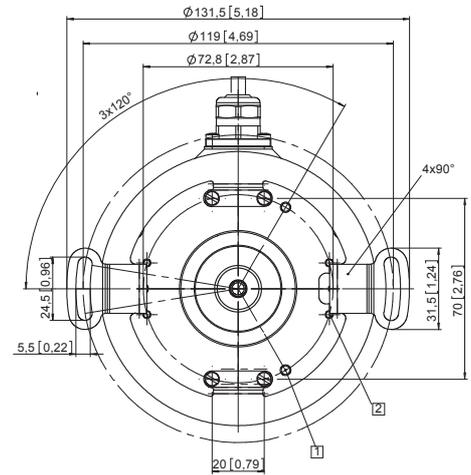
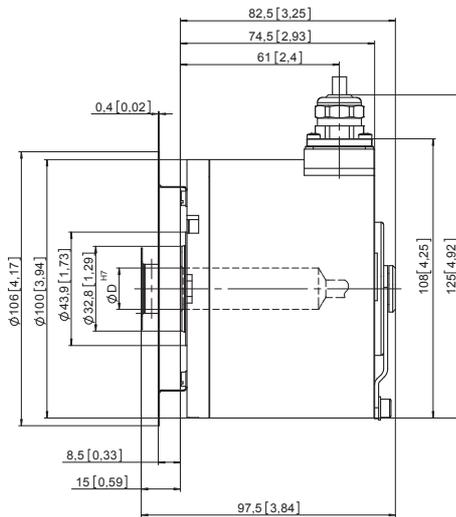
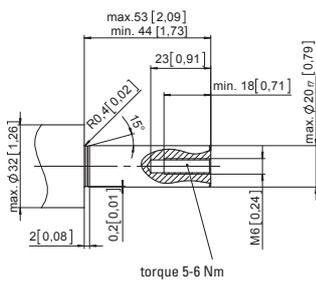
Dimensions

Dimensions in mm [inch]

Flange with stator coupling, \varnothing 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

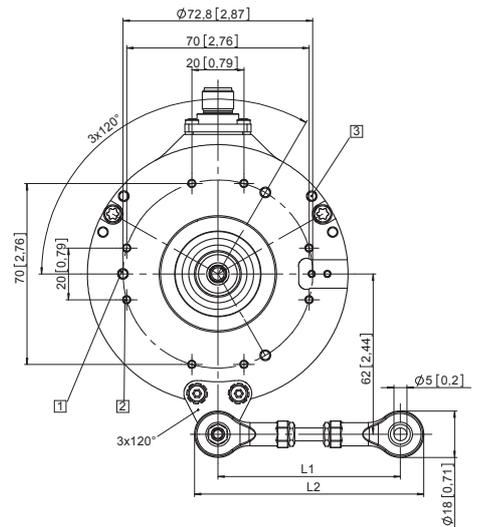
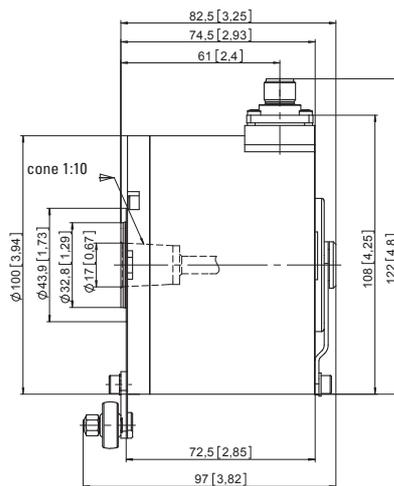
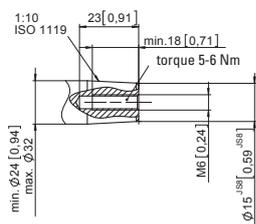


Incremental encoders

Flange with fastening arm
Blind hollow shaft with central fastening, cone, \varnothing 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.

Incremental encoders

Heavy Duty hollow shaft, optical

Sendix Heavy Duty H120 (hollow shaft)

Push-Pull / RS422 / optical fibre

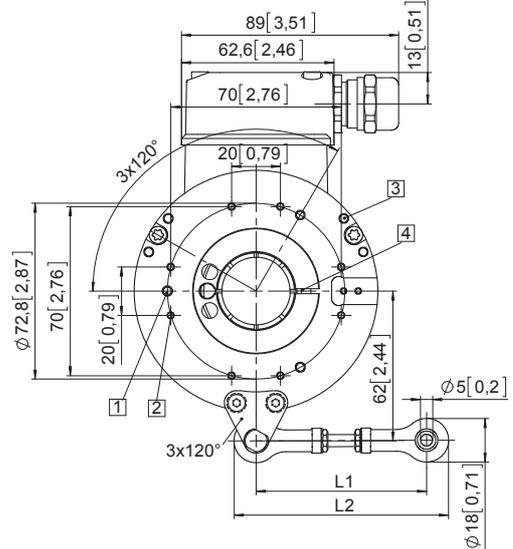
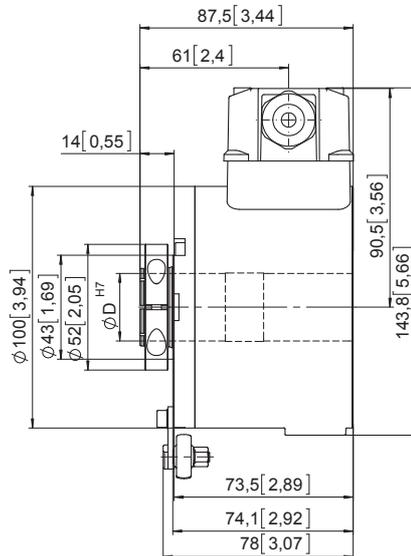
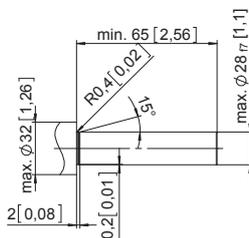
Dimensions

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

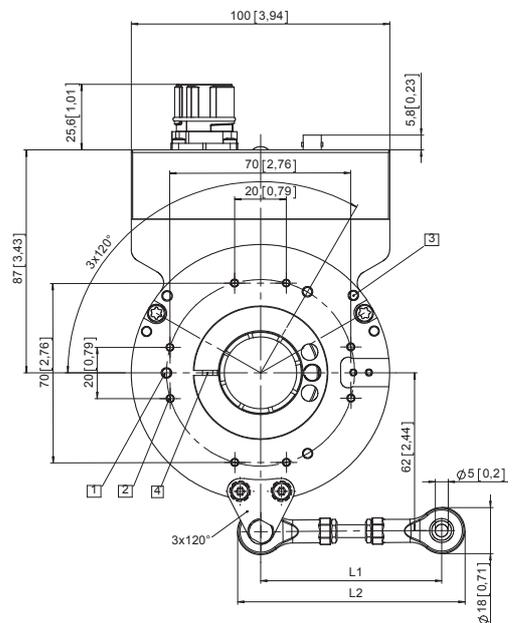
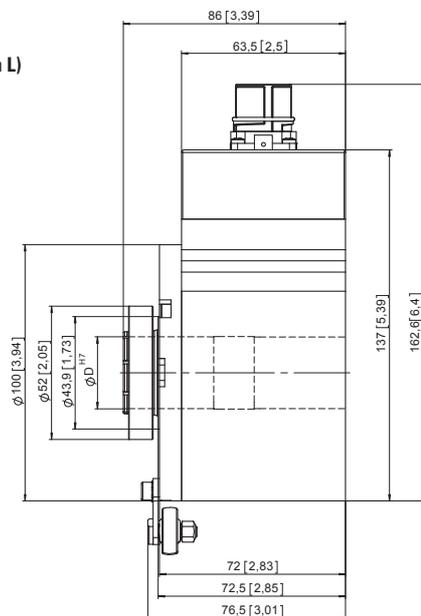
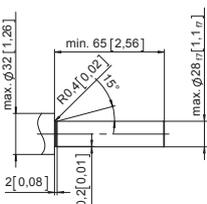


Fastening arm	L1	L2
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

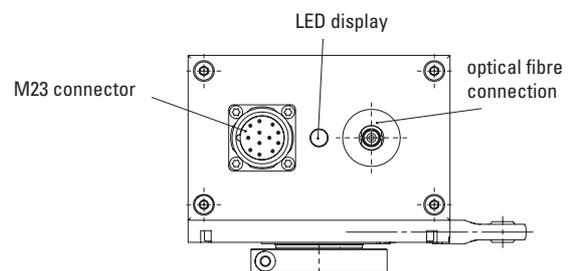
Flange with fastening arm Through hollow shaft and optical fibre connection (type of connection L)

- 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.

Incremental encoders

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.



Incremental encoders

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 <small>Type a b</small>	Min. order quantity for non-stock types: 10 pieces
a Outer diameter 031 = 31 mm [1.22"] 041 = 41.2 mm [1.62"] 045 = 45 mm [1.77"]	b Bore diameter 0800 = 8 mm [0.32"] 1800 = 18 mm [0.71"] 0952 = 3/8" 1000 = 10 mm [0.39"] 2000 = 20 mm [0.79"] 1587 = 5/8" 1200 = 12 mm [0.47"] 2500 = 25 mm [0.98"] ³⁾ 2540 = 1" ³⁾ 1500 = 15 mm [0.59"] 3000 = 30 mm [1.18"] 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.

Incremental encoders

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

Order code Sensor head Limes LI20	<table border="1" style="font-family: monospace; font-size: 1.2em;"> <tr> <td style="padding: 2px;">8</td> <td style="padding: 2px;">.</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">.</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> </tr> <tr> <td colspan="11" style="text-align: center; font-size: 0.8em;">Type</td> </tr> <tr> <td style="padding: 2px; font-size: 0.8em;">a</td> <td colspan="2" style="padding: 2px; font-size: 0.8em;">b</td> <td colspan="2" style="padding: 2px; font-size: 0.8em;">c</td> <td colspan="2" style="padding: 2px; font-size: 0.8em;">d</td> <td colspan="4" style="padding: 2px; font-size: 0.8em;">e</td> </tr> </table>	8	.	X	1	X	X	.	2	X	X	X	Type											a	b		c		d		e			
8	.	X	1	X	X	.	2	X	X	X																								
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		
Output circuit	RS422	Push-Pull
Power supply	4.8 ... 26 VDC	4.8 ... 30 VDC
Power consumption (no load)	typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA
Permissible load / channel	120 Ohm	+/- 20 mA
Min. pulse edge interval	1 µs	
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Reference signal	index periodical	
System accuracy	typ. 0.3° with shaft tolerance g6	

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	Ā	B	B̄	0	0̄	⊥
		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, Ā: Incremental output channel A / cosine signal
- B, B̄: Incremental output channel B / sine signal
- 0, 0̄: Reference signal
- ⊥: Plug connector housing (shield)

¹⁾ Shield is attached to connector housing.

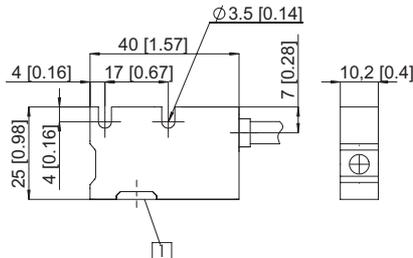
Incremental encoders

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

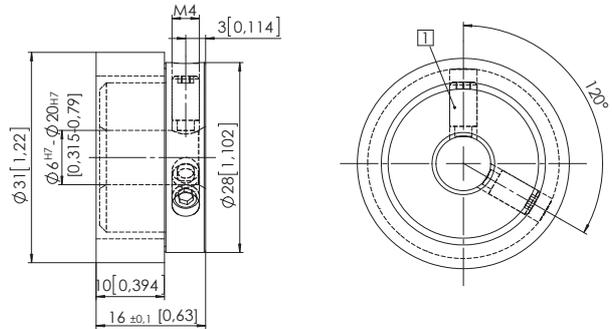
Dimensions

Dimensions in mm [inch]

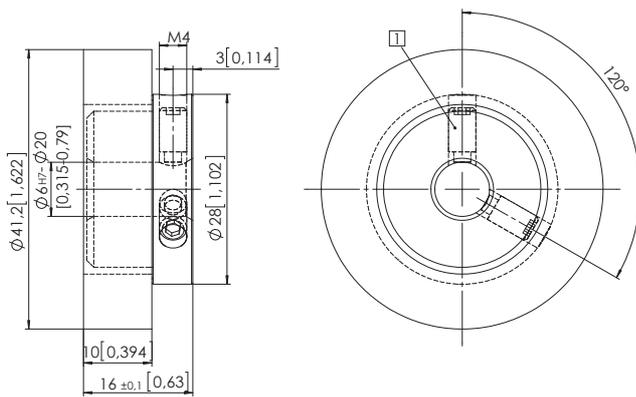
Sensor head Limes LI20



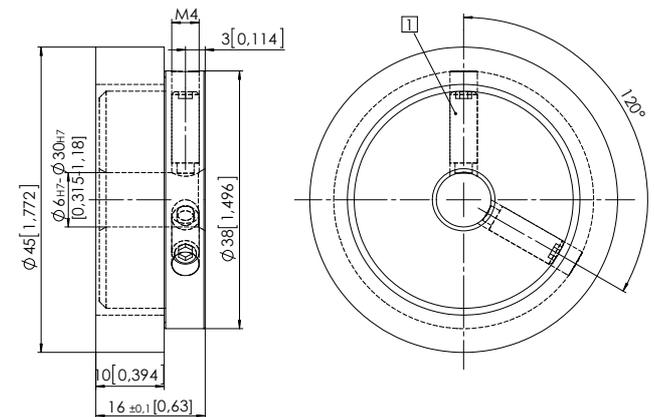
Magnetic ring, \varnothing 31 [1.22], 8.RI20.031.XXXX.111



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



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

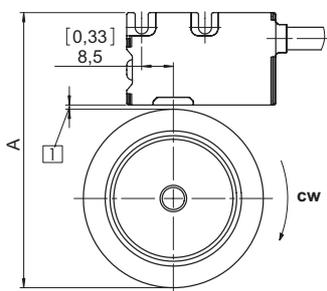


1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

Mounting orientation and permissible mounting tolerances

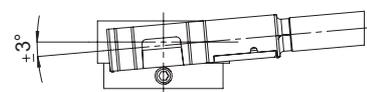
Distances



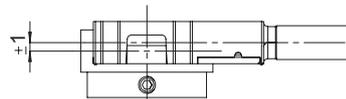
1 Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

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]

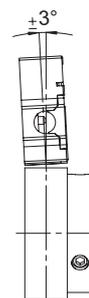
Torsion



Offset



Tilting



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

Incremental encoders

**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 a b

Min. order quantity for non-stock types: 10 pieces

a Outer diameter
031 = 31 mm [1.22"]
048 = 48.3 mm [1.90"]
055 = 54.7 mm [2.15"]

b Bore diameter
0600 = 6 mm [0.24"] 1500 = 15 mm [0.59"] 3500 = 35 mm [1.34"] ⁴⁾
0800 = 8 mm [0.32"] 2000 = 20 mm [0.79"]
1000 = 10 mm [0.39"] 2500 = 25 mm [0.98"] ³⁾ 1587 = 5/8"
1200 = 12 mm [0.47"] 3000 = 30 mm [1.18"] ³⁾ 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	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">8.LI50</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">X</td> <td style="padding: 2px 5px;">.</td> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">XXX</td> </tr> <tr> <td style="font-size: 8px;">Type</td> <td></td> <td style="font-size: 8px;">a</td> <td></td> <td style="font-size: 8px;">b</td> <td style="font-size: 8px;">c</td> <td></td> <td style="font-size: 8px;">d</td> <td style="font-size: 8px;">e</td> </tr> </table>	8.LI50	.	X	1	X	X	.	1	XXX	Type		a		b	c		d	e
8.LI50	.	X	1	X	X	.	1	XXX											
Type		a		b	c		d	e											

<p>a Model</p> <p>1 = IP67, standard 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78</p> <p>b Output circuit / Power supply</p> <p>1 = RS422 / 4.8 ... 26 V DC 2 = Push-Pull / 4.8 ... 30 V DC</p>	<p>c Type of connection</p> <p>1 = radial cable, 2 m [6.56'] PUR A = radial cable, special length PUR *)</p> <p>*) 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)</p>	<p>d Reference signal</p> <p>1 = separate index signal (linked with A and B)</p> <p>e Interpolation factor</p> <p>032, 050, 064, 100</p> <p style="text-align: right;">Stock types 8.LI50.1121.1032</p>
--	--	--

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 LOW max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Reference signal	fixed	
System accuracy	typ. 0.3° with shaft tolerance g6	

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	Ā	B	B̄	0	0̄	⊥
		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, Ā: Incremental output channel A / sine signal
- B, B̄: Incremental output channel B / cosine signal
- 0, 0̄: Reference signal
- ⊥: Plug connector housing (shield)

1) Shield is attached to connector housing.

Incremental encoders

**Bearingless
zero pulse, magnetic**

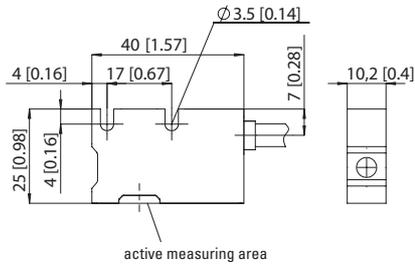
RI50 / Limes LI50 (hollow shaft)

Push-Pull / RS422

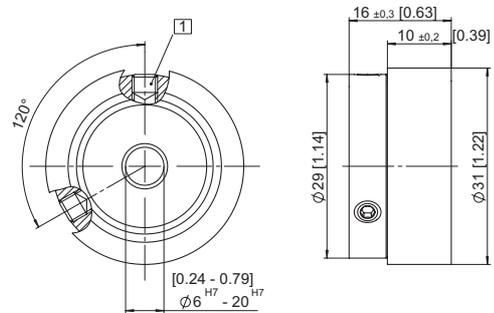
Dimensions

Dimensions in mm [inch]

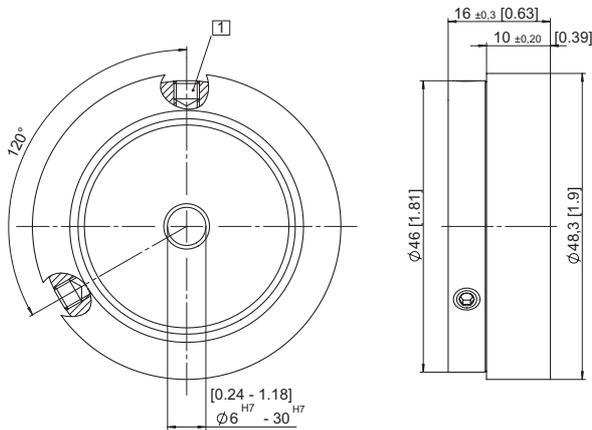
Sensor head Limes LI50



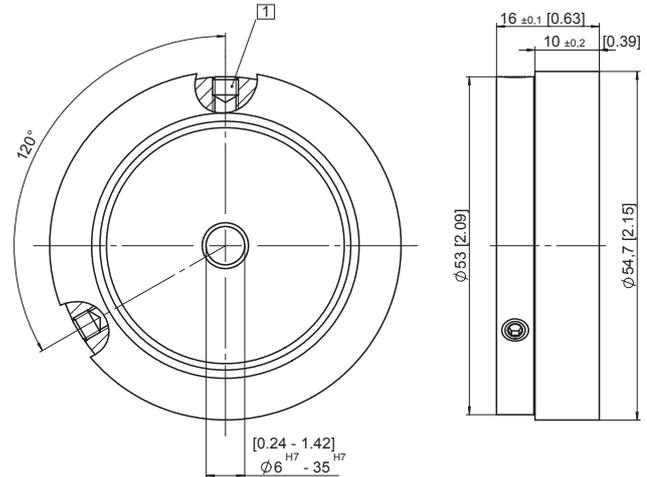
Magnetic ring, ø 31 [1.22], 8.RI50.031.XXXX.112



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



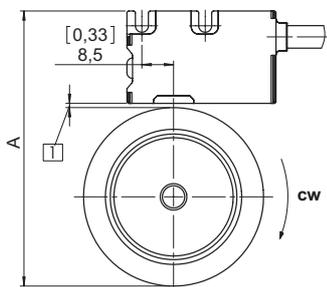
Magnetic ring, ø 54.7 [2.15], 8.RI50.055.XXXX.112



1 M4 Set screw

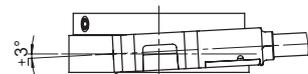
Mounting orientation and permissible mounting tolerances

Distances



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

Torsion



Offset



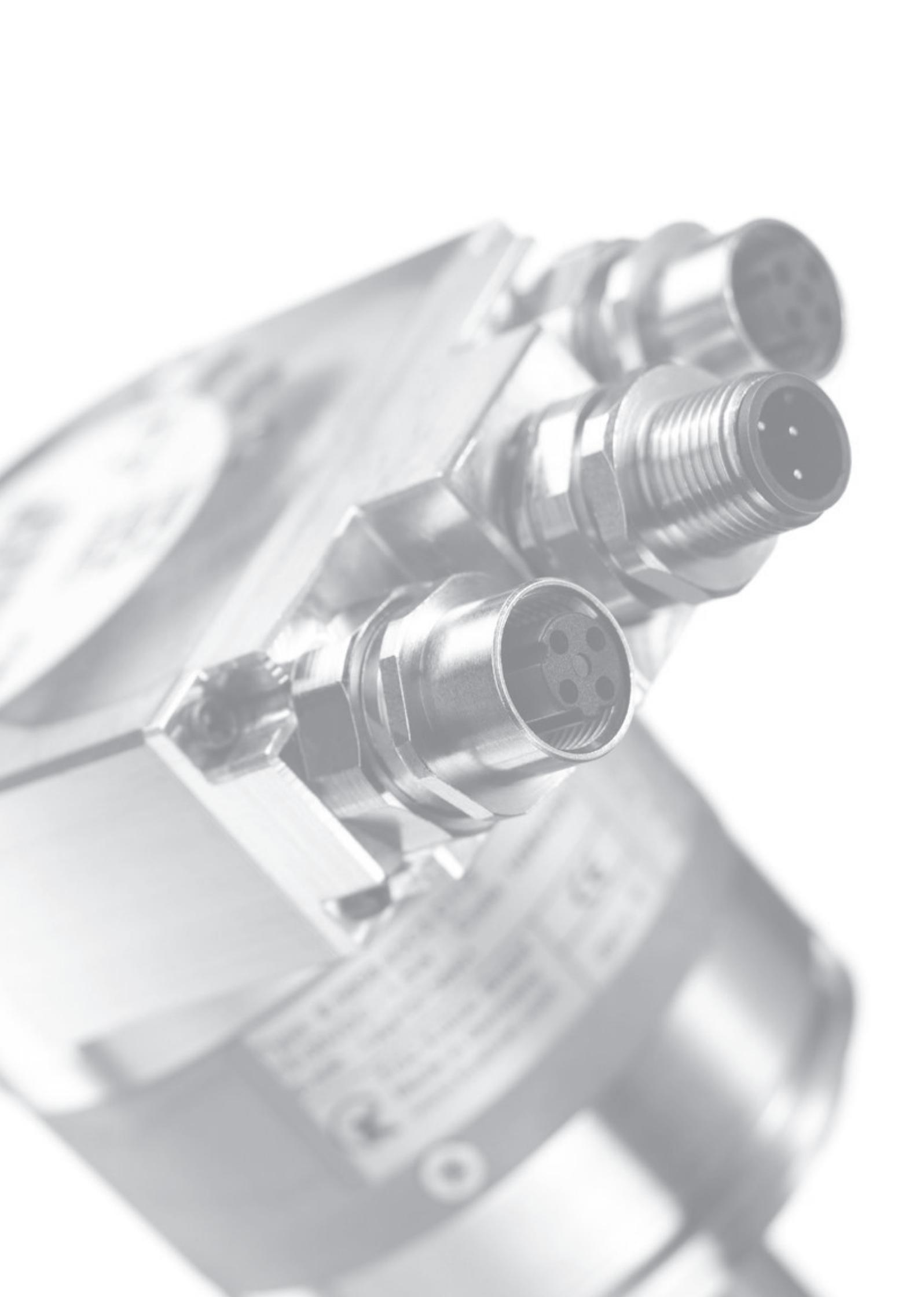
Tilting



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]

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

Incremental encoders



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 (patented technology)	Sendix F3653 / F3673 (shaft / hollow shaft)	SSI / BiSS	168	
	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
	 ATEX/IECEX, SIL2/PLd	Sendix SIL 7053FS2 (shaft)	SSI / BiSS + SinCos	235
	 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
	 ATEX/IECEX, minig	Sendix 7153 (shaft)	SSI / BiSS	249
	 ATEX/IECEX, minig	Sendix 7158 (shaft)	PROFIBUS DP	252
 ATEX/IECEX, minig	Sendix 7158 (shaft)	CANopen	255	

Absolute encoders - singleturn

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 -20°...+85°C	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	8.2450	. XX1X	. G121
Shaft version	Type	a b c d	e

- | | | | | |
|--|---|---|---|---|
| <p>a Flange
1 = ø 24 mm [0.94"]
3 = ø 28 mm [1.10"]
2 = ø 30 mm [1.18"]</p> | <p>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"]</p> | <p>c Interface / power supply
1 = SSI / 5 V DC</p> | <p>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 *)</p> <p>*) 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)</p> | <p>e Gray-code
12 bit resolution</p> |
|--|---|---|---|---|

Order code	8.2470	. 1X1X	. G121
Hollow shaft	Type	a b c d	e

- | | | | | |
|--|---|---|---|---|
| <p>a Flange
1 = ø 24 mm [0.94"]</p> | <p>b Blind hollow shaft
insertion depth max. 14 mm [0.55"]
1 = ø 4 mm [0.16"]
2 = ø 6 mm [0.24"]</p> | <p>c Interface / power supply
1 = SSI / 5 V DC</p> | <p>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 *)</p> <p>*) 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)</p> | <p>e Gray-code
12 bit resolution</p> |
|--|---|---|---|---|

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.

Absolute encoders - singleturn

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)

 Absolute encoders
singleturn

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)						
		Signal:	0 V	+V	C+	C-	D+	D-
2	1, 2, A, B	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.

Absolute encoders - singleturn

Miniature magnetic

2450 / 2470 (shaft / hollow shaft)

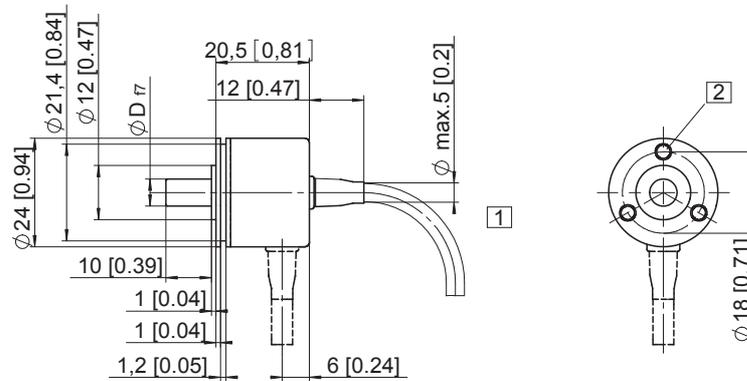
SSI

Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

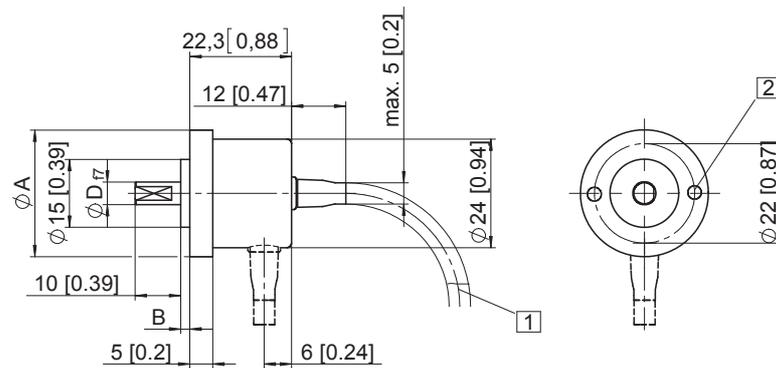
- 1 min. R50 [1.97]
- 2 3 x M3, 4 [0.16] deep



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



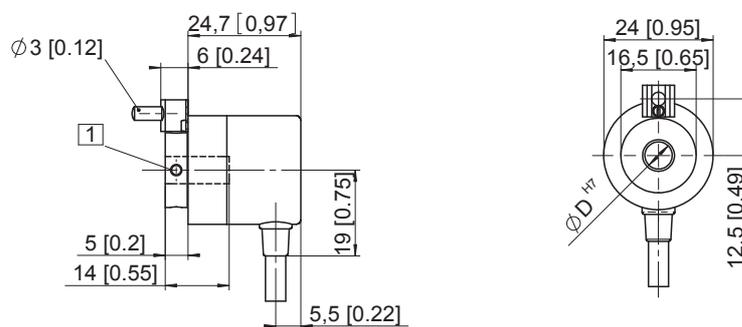
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

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.



Absolute encoders singleturn

Safety-Lock™	High rotational speed	Temperature range -40°... +85°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Short-circuit proof	Reverse polarity protection	Magnetic sensor	Surface protection salt spray-tested optional

Safe operation

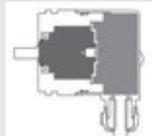
- Non-contact measuring system for long-life non-wear applications.
- Rugged die-cast-housing and protection up to IP69k for an exceptional tightness.
- High shock and vibration resistance for an exceptional robustness.

Compact and powerful

- Outer diameter of only 36 mm.
- The hollow shaft version is fitted with a blind hole with a diameter of up to 10 mm. It can be mounted as required with either a torque stop pin or a stator coupling.
- 360° with 12 bit resolution (4096 positions).
- For use in 12 V or 24 V vehicle electrical systems.

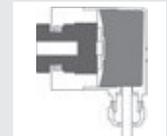
Safety-Lockplus™

IP69k protection on the flange side, robust bearing assemblies with interlocking bearings, mechanically protected shaft seal.



Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly.



Order code	Shaft version	8.3651	. 2XXXX . XXXX	Type	a b c d e f g h	If for each parameter of an encoder the <u>underlined preferred option</u> 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.	
a Flange	b Shaft (ø x L), with flat	c Output circuit ¹⁾	d Type of connection	e Measuring range	f Interface / power supply	g Option 1	h Option 2
<u>2</u> = synchro flange, ø 36 mm [1.42"]	<u>3</u> = 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"]	<u>3</u> = current output <u>4</u> = voltage output	1 = axial cable, 1 m [3.28"] PUR A = axial cable, special length PUR *) <u>2</u> = 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)	<u>1</u> = 1 x 360° 2 = 1 x 180° 3 = 1 x 90° 4 = 1 x 45°	<u>3</u> = 4 ... 20 mA / 10 ... 30 V DC <u>4</u> = 0 ... 10 V / 15 ... 30 V DC 5 = 0 ... 5 V / 10 ... 30 V DC	<u>1</u> = count direction cw ²⁾ 2 = count direction ccw ³⁾	<u>1</u> = 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.

Absolute encoders - singleturn

Compact magnetic	Sendix 3651 / 3671 (shaft / hollow shaft)	Analogue
-------------------------	--	-----------------

Order code Hollow shaft	8.3671 Type	<table border="1" style="font-size: 0.8em; border-collapse: collapse;"> <tr> <td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td> <td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">a</td><td style="text-align: center;">b</td><td style="text-align: center;">c</td><td style="text-align: center;">d</td> <td style="text-align: center;">e</td><td style="text-align: center;">f</td><td style="text-align: center;">g</td><td style="text-align: center;">h</td> </tr> </table>	X	X	X	X	X	X	X	X	a	b	c	d	e	f	g	h	<p>If for each parameter of an encoder the <u>underlined preferred option</u> 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.</p> <div style="text-align: right; border: 1px solid black; border-radius: 50%; padding: 2px 5px; font-weight: bold;">10 by 10</div>
X	X	X	X	X	X	X	X												
a	b	c	d	e	f	g	h												
a Flange 2 = with spring element, long <u>5 = with stator coupling, ø 46 mm [1.81"]</u>	b Hollow shaft <u>2 = ø 6 mm [0.24"]</u> 4 = ø 8 mm [0.32"] 6 = ø 10 mm [0.39"] 3 = ø 1/4"	c Output circuit ¹⁾ <u>3 = current output</u> <u>4 = voltage output</u>	d Type of connection 1 = axial cable, 1 m [3.28'] PUR A = axial cable, special length PUR *) <u>2 = radial cable, 1 m [3.28'] PUR</u> 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 <u>1 = 1 x 360°</u> 2 = 1 x 180° 3 = 1 x 90° 4 = 1 x 45°	f Interface / power supply <u>3 = 4 ... 20 mA / 10 ... 30 V DC</u> <u>4 = 0 ... 10 V / 15 ... 30 V DC</u> 5 = 0 ... 5 V / 10 ... 30 V DC	g Option 1 <u>1 = count direction cw ²⁾</u> 2 = count direction ccw ³⁾	h Option 2 <u>1 = IP67</u> 2 = IP69k <i>Optional on request</i> - 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	<p style="font-size: 0.8em;">with fixing thread</p>	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
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
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

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.

Absolute encoders - singleturn

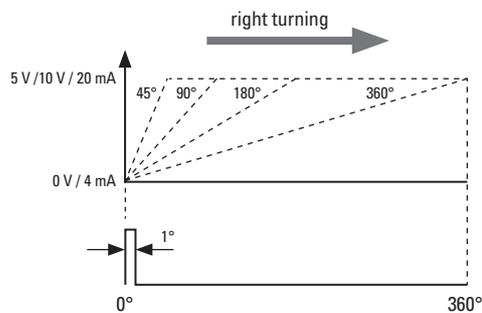
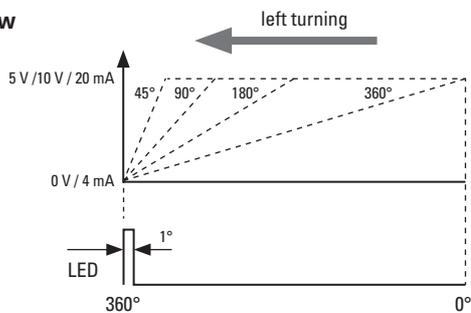
Compact magnetic		Sendix 3651 / 3671 (shaft / hollow shaft)	Analogue
Electrical characteristics current interface 4 ... 20 mA			
Sensor			
Power supply	10 ... 30 V DC		
Current consumption (no load)	max. 38 mA		
Reverse polarity protection of the power supply	yes		
Measuring range	45°, 90°, 180° or 360°		
Resolution	12 bit		
Absolute accuracy, 25°C [77°F]	±1°		
Repeat accuracy, 25°C [77°F]	±0.2°		
Status LED	red	break in current loop, input load too high.	
	green	reference point display turns ON	
		at cw: betw. 0° and 1°	
		at ccw: betw. 0° and -1°	
Current loop Output load			
	max. 200 Ohm at 10 V DC		
	max. 900 Ohm at 24 V DC		
Setting time			
	< 1 ms		
	$R_{load} = 400 \text{ Ohm}, 25^\circ\text{C} [77^\circ\text{F}]$		
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		
	$R_{load} \geq 1 \text{ KOhm}, 25^\circ\text{C} [77^\circ\text{F}]$		
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°	

Absolute encoders singleturn

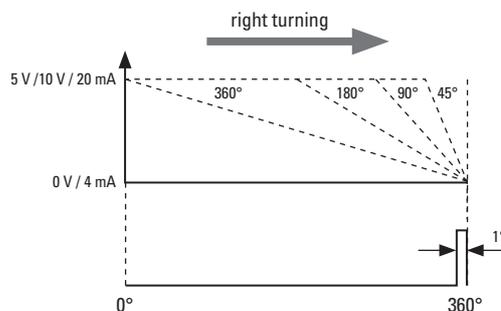
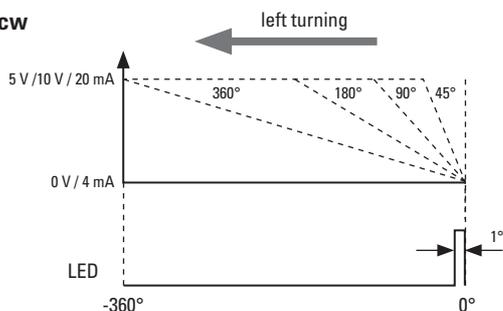
Example (output signal profile)

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

Version cw



Version ccw



Absolute encoders - singleturn

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

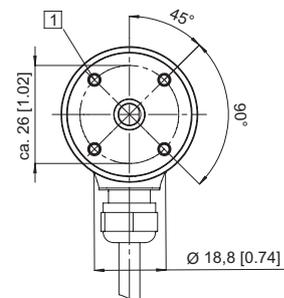
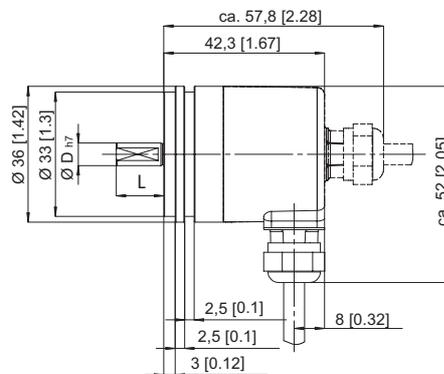
Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]

Flange type 2

(drawing with cable)

1 M3, 6 [0.24] deep



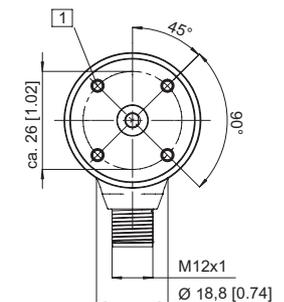
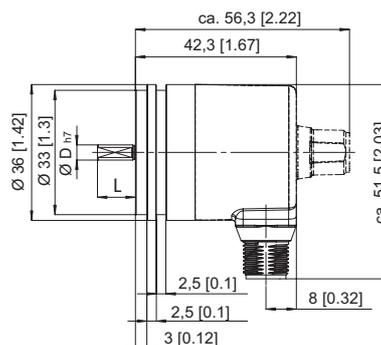
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	12.5 [0.49]	h7
1/4"	12.5 [0.49]	h7

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

Absolute encoders - singleturn

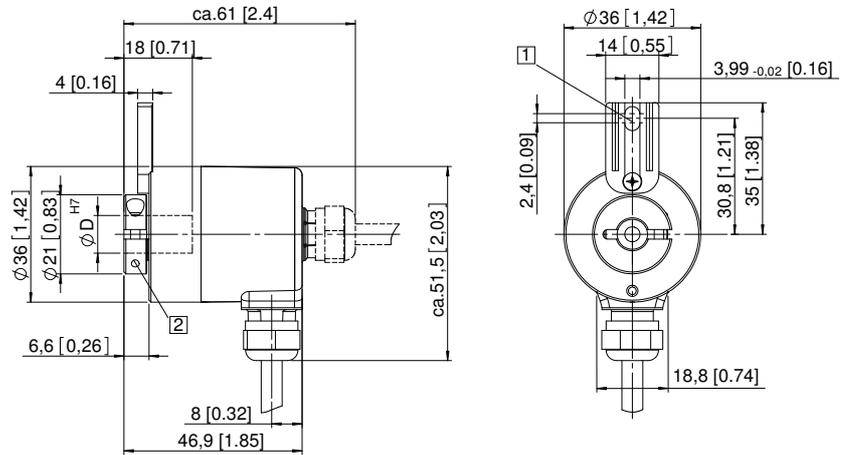
Compact magnetic	Sendix 3651 / 3671 (shaft / hollow shaft)	Analogue
-------------------------	--	-----------------

Dimensions hollow shaft version

Dimensions in mm [inch]

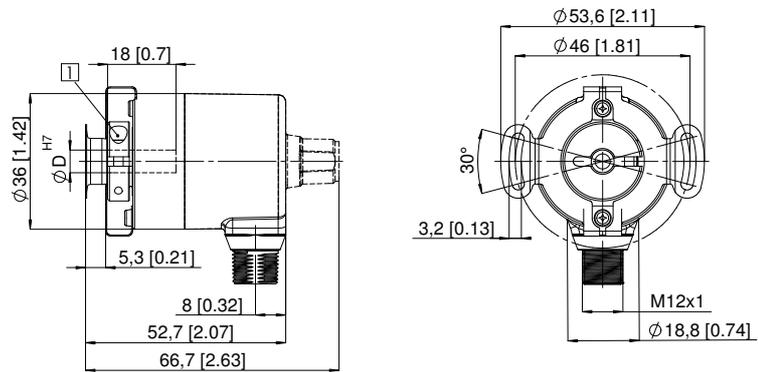
Flange with spring element, long Flange type 2

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



Flange with stator coupling, \varnothing 46 [1.81] Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm



Absolute encoders - singleturn

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.



CANopen



Safety-Lock™



High rotational speed



Temperature range
-40°...+85°C



High protection level



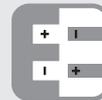
High shaft load capacity



Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic sensor



Surface protection salt spray-tested optional

Safe technology

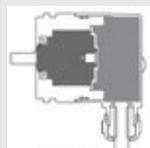
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety-Lock™ design.
- Resistant die-cast-housing and protection up to IP69k.

Versatile applications

- CANopen encoder profile DS406 V3.2.
- Fast determination of the operating status via two-colour LED.
- With M12 connector or cable connection.

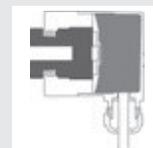
Safety-Lockplus™

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 . **2XCX** . **21 1X**
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.



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

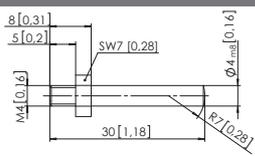
Optional on request

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

Absolute encoders - singleturn

Compact magnetic	Sendix M3658 / M3678 (shaft / hollow shaft)	CANopen
-------------------------	--	----------------

Order code hollow shaft	8.M3678 <small>Type</small>	.XXCX <small>a b c d</small>	.211X <small>e f</small>	If for each parameter of an encoder the <u>underlined preferred option</u> 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.
a Flange 2 = with spring element, long <u>5 = with stator coupling, ø 46 mm [1.81"]</u>		d Type of connection 2 = radial cable, 1 m [3.28] PUR B = radial cable, special length PUR *) <u>4 = radial M12 connector, 5-pin</u>		
b Hollow shaft <u>2 = ø 6 mm [0.24"]</u> <u>4 = ø 8 mm [0.32"]</u> 6 = ø 10 mm [0.39"] 3 = ø 1/4"		e Fieldbus profile <u>21 = CANopen encoder profil DS406 V3.2</u>		
c Interface / power supply <u>C = CANopen DS301 V4.02 / 8 ... 30 V DC</u>		f Protection <u>1 = IP67</u> 2 = IP69k <i>Optional on request</i> - 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 <div style="display: flex; align-items: center; margin-top: 5px;">  <div style="margin-left: 10px;">with fixing thread</div> </div>	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		Electrical characteristics	
Maximum speed	6000 min ⁻¹	Power supply	8 ... 30 V DC
Starting torque at 20°C [68°F]	< 0.06 Nm	Current consumption (no load)	max. 25 mA
Shaft load capacity	radial 40 N axial 20 N	Reverse polarity protection of the power supply	yes
Weight	approx. 0.2 kg [7.06 oz]	Measuring range	360°
Protection acc. to EN 60529/DIN 40050-9	IP67 / IP69k	Absolute accuracy, 25°C [77°F]	±1°
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]	Repeat accuracy, 25°C [77°F]	±0.2°
Materials	shaft / hollow shaft stainless steel flange aluminium housing zinc die-cast cable PUR	Data refresh rate	400 µs
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 6 ms	CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz	Diagnostic LED (two-colour, red/green)	
Permanent shock resistance acc. to EN 60068-2-27	1000 m/s ² , 2 ms	LED ON or blinking	red error display green status display
Vibration (broad-band random) acc. to EN 60068-2-64	5 ... 2500 Hz, 100 m/s ² - rms		

Absolute encoders singleturn

Absolute encoders - singleturn

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 L_u .

$L_u < 5 \text{ m [16.40']}$ cable length for 125 Kbit.

$L_u < 2 \text{ m [6.56']}$ cable length for 250 Kbit.

$L_u < 1 \text{ m [3.28']}$ 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

Absolute encoders - singleturn

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

Dimensions shaft version

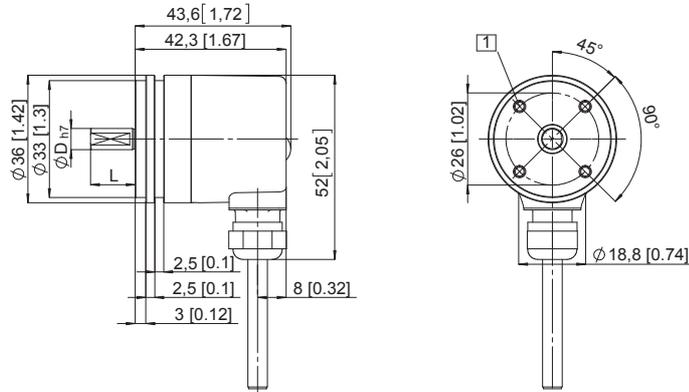
Dimensions in mm [inch]

Synchro flange, \varnothing 36 [1.42]

Flange type 2

(drawing with cable)

- 1 4 x M3, 6 [0.24] deep

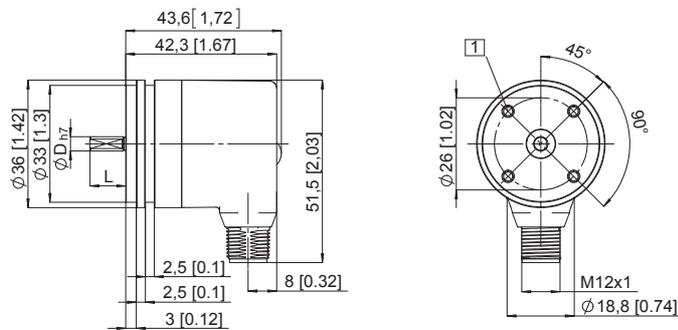


Synchro flange, \varnothing 36 [1.42]

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

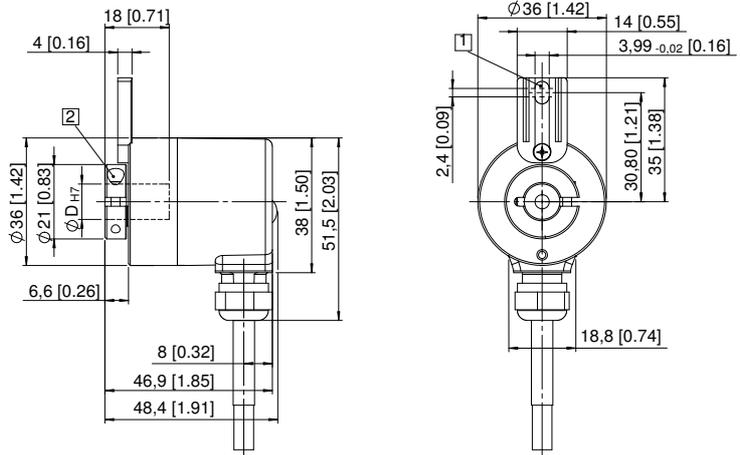
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long

Flange type 2

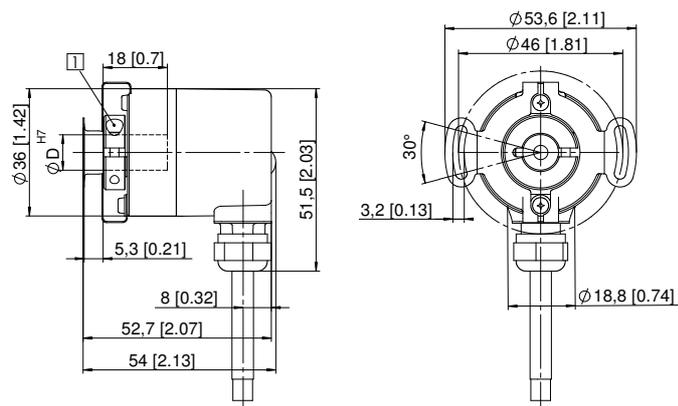
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm



Flange with stator coupling, \varnothing 46 [1.81]

Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm



Absolute encoders - singleturn

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).



SAE J1939



Safety-Lock™ (shaft)



High rotational speed



Temperature range



High protection level



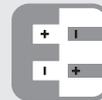
High shaft load capacity



Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic sensor



Surface protection salt spray-tested optional

Safe technology

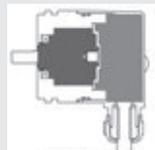
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety Lock™ Design.
- Resistant die cast housing and protection up to IP69k.

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).

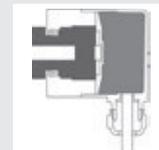
Safety-Lockplus™

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 . **2XCX** . **321X**
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.



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

Absolute encoders - singleturn

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

Order code	8.M3678	.XXCX	.321X	If for each parameter of an encoder the <u>underlined preferred option</u> 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.	
Hollow shaft	Type	a b c d	e f		
a Flange 2 = with spring element, long <u>5 = with stator coupling, ø 46 mm [1.81"]</u>		c Interface / Power supply <u>C = CAN Highspeed / 8 ... 30 V DC</u>		e Fieldbus profile <u>32 = J1939</u>	
b Hollow shaft <u>2 = ø 6 mm [0.24"]</u> <u>4 = ø 8 mm [0.32"]</u> 6 = ø 10 mm [0.39"] 3 = ø 1/4"		d Type of connection 2 = radial cable, 1 m [3.28] PUR B = radial cable, special length PUR *) <u>4 = radial M12 connector, 5-pin</u>		f Protection <u>1 = IP67</u> 2 = IP69k	
		*) 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)		<i>Optional on request</i> - 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	with fixing thread	8.0010.4700.0000
for torque stops		

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 axial	40 N 20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP67 / IP69k
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft flange housing cable	stainless steel aluminium zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		5000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s ² , 10 ... 2000 Hz
Permanent shock resistance acc. to EN 60068-2-27		1000 m/s ² , 2 ms
Vibration (broad-band random) acc. to EN 60068-2-64		5 ... 2500 Hz, 100 m/s ² - rms

Electrical characteristics	
Power supply	8 ... 30 V DC
Current consumption (no load)	max. 25 mA
Reverse polarity protection of the power supply	yes
Measuring range	360°
Absolute accuracy, 25°C [77°F]	±1°
Repeat accuracy, 25°C [77°F]	±0.2°
Data refresh rate	400 µs
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU

Diagnostic LED (two-colour, red/green)	
LED ON or blinking	red error display green status display

Absolute encoders - singleturn

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

Interface characteristics CANopen	
Resolution	1 ... 16384 (14 bit), scalable default: 16384 (14 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	SAE J1939
Node address	1 ... 255 via address claiming
Baud rate	250 kbit/s
Termination	software configurable

General information concerning SAE J1939

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

This protocol is a multimaster system with 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

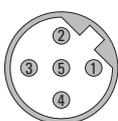
- PGNs that are adaptable to the customer's application.
- Resolution of address conflicts -> Address Claiming (ACL).
- Continuous checking whether control addresses have been assigned twice within a network.
- Change of control device addresses during run-time.
- Unique identification of a control device 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)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
C	2, B	Cable colour:	BN	WH	GY	GN	YE
		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

Absolute encoders - singleturn

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

Dimensions shaft version

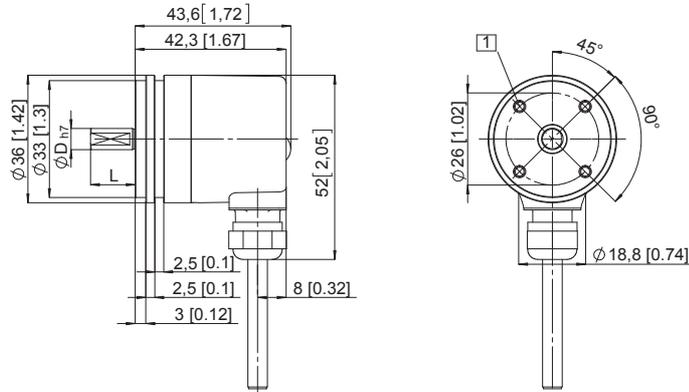
Dimensions in mm [inch]

Synchro flange, \varnothing 36 [1.42]

Flange type 2

(drawing with cable)

- 1 4 x M3, 6 [0.24] deep

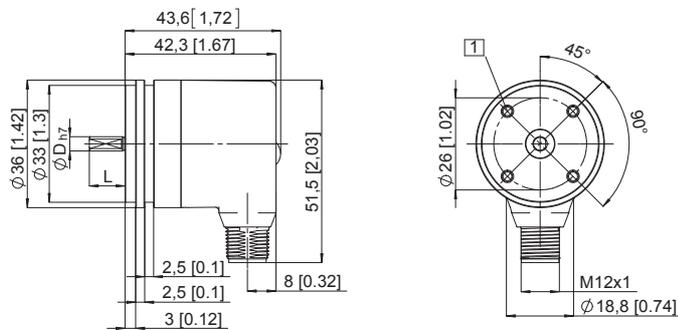


Synchro flange, \varnothing 36 [1.42]

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

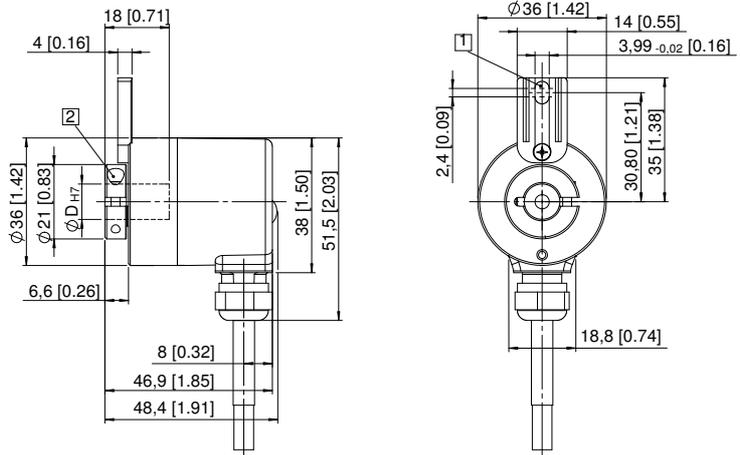
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long

Flange type 2

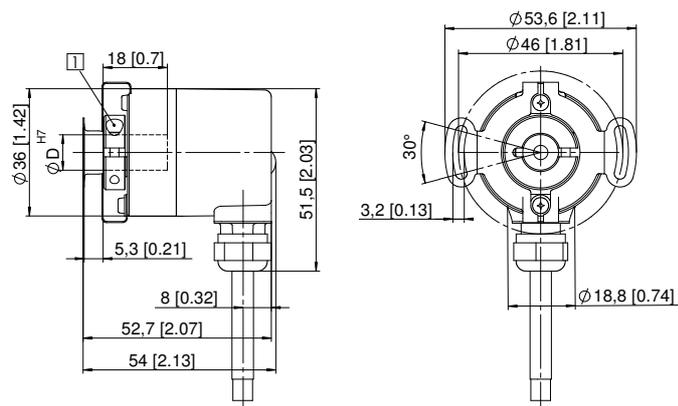
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm



Flange with stator coupling, \varnothing 46 [1.81]

Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm



Absolute encoders - singleturn

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



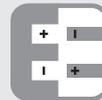
Shock / vibration resistant



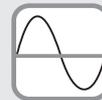
Magnetic field proof



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 . **XXXX** . **XX** **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.



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.

Absolute encoders - singleturn

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

Order code	Hollow shaft	8.F3673 Type	.XXXXX.XX12	If for each parameter of an encoder the <u>underlined preferred option</u> 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.	
a Flange	b Hollow shaft	c Interface / power supply	d Type of connection	e Code	f Resolution
1 = with spring element, short, IP65 3 = with spring element, long, IP65 <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u>	1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"], blind hollow shaft</u> 2 = ø 1/4"	1 = SSI, BiSS / 5 V DC <u>2 = SSI, BiSS / 10 ... 30 V DC</u> 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	1 = <u>tangential cable, 1 m [3.28] PUR</u> 3 = tangential cable, 5 m [16.40] PUR F = tangential cable, special length PUR *) 8 = axial M12 connector, 8-pin ¹⁾	B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u>	A = 10 bit 2 = 12 bit <u>3 = 13 bit</u> 4 = 14 bit 7 = 17 bit
				Optional on request - surface protection salt spray tested - other resolutions	
*) 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)					

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	8.0010.4700.0000
	with fixing thread
Connection technology	Order no.
Connector, self-assembly (straight)	05.CMB 8181-0
Cordset, pre-assembled	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	
Protection	housing side IP67
acc. to EN 60529	shaft side IP65 (solid shaft version opt. IP67)
Working temperature range	
Working temperature range	-40°C ... +90°C [-40°F ... +194°F]
Materials	
Materials	shaft / hollow shaft stainless steel
	flange aluminium
	housing zinc die-cast
	cable PUR
Shock resistance	
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance	
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"].

Absolute encoders - singleturn

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

Electrical characteristics	
Power supply	5 V DC ($\pm 5\%$) 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 $I_{Load} = 20\text{ mA}$ typ. 1.3 V
Resolution	10 ... 17 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Monoflop time	$\leq 15\ \mu\text{s}$
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 $\leq 1\ \mu\text{s}$ resolution ≥ 15 bit $4\ \mu\text{s}$

BiSS interface	
Resolution	10 ... 17 bit
Code	binary
BiSS clock rate	50 kHz ... 10 MHz
Max. update rate	$< 10\ \mu\text{s}$, depends on the clock rate and the data length
Data refresh rate	$\leq 1\ \mu\text{s}$
Note:	<ul style="list-style-type: none"> - 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 V _{pp} ($\pm 20\%$)	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 (+V = power supply)	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V
Input current	$< 0,5\text{ mA}$
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 k Ω m
Permissible load	max. 20 mA
Signal level	HIGH +V LOW $< 1\text{ V}$
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 k Ω m).

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.

Absolute encoders - singleturn

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			
1, 2	8	SET, DIR	M12 connector, 8-pin													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥				
			Pin:	1	2	3	4	5	6	7	8	PH				
3, 4	1, 3, F	SET, DIR, 2048 SinCos	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	⊥
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
5	1, 3, F	SET, DIR, Sensor output	Cable (isolate unused wires individually before initial start-up)													
			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		
6	1, 3, F	2048 SinCos, Sensor output	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	0 V _{sens}	+V _{sens}	A	\bar{A}	B	\bar{B}	⊥
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
7, 8	1, 3, F	2048 incr. RS422	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{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, \bar{A} : Incremental output channel A (cosine)
- B, \bar{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

Absolute encoders - singleturn

Compact optical

Sendix F3653 / F3673 (shaft / hollow shaft)

SSI / BiSS

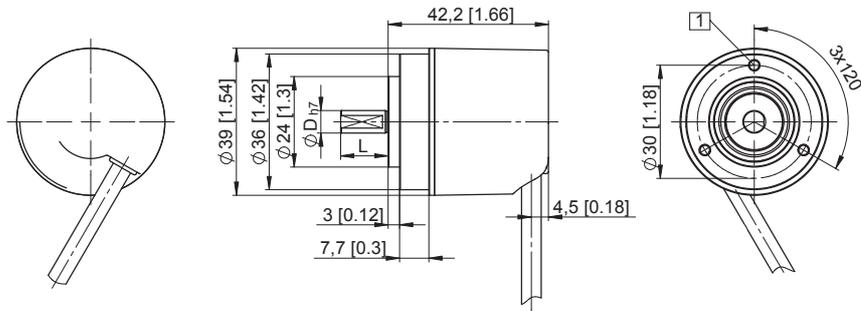
Dimensions shaft version

Dimensions in mm [inch]

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

1 3 x M3, 6 [0.24] deep

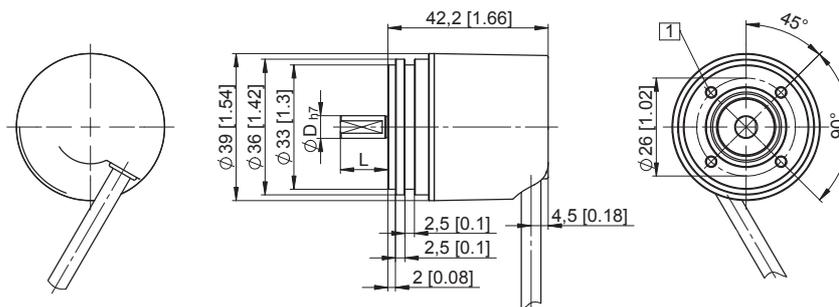
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7



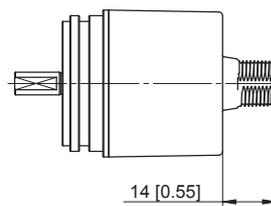
Synchro flange, \varnothing 36 [1.42]

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

Absolute encoders - singleturn

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

Dimensions hollow shaft version

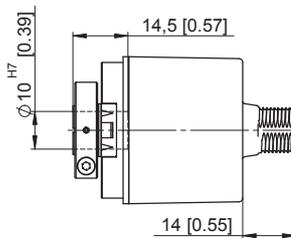
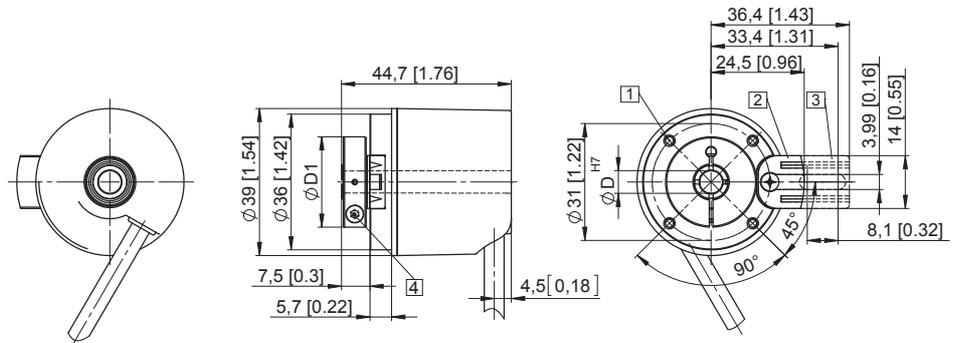
Dimensions in mm [inch]

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, \varnothing 4 [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 4 Recommended torque for the clamping ring 0.7 Nm



Drawing with M12 connector
Type of connection 8

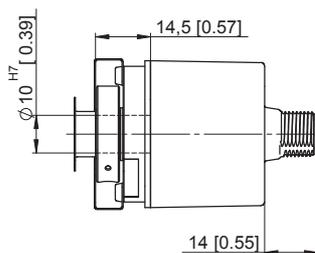
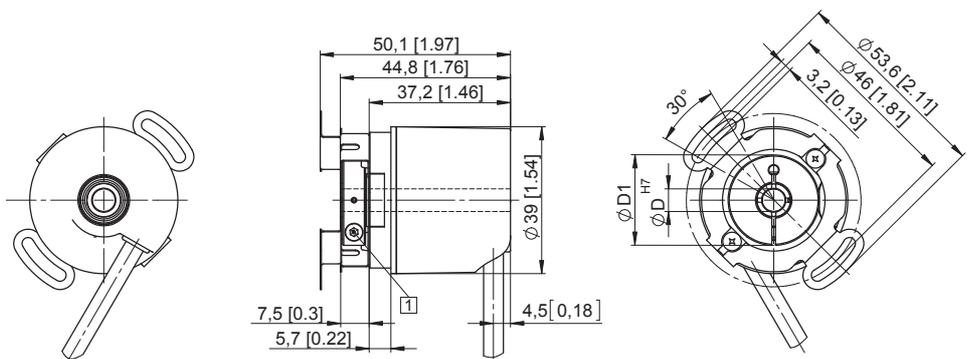
D	D1
6 [0.24]	24 [0.94]
8 [0.32]	25.5 [1.00]
10 [0.39]	25.5 [1.00]
1/4"	24 [0.94]

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, \varnothing 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]

Absolute encoders - singleturn

Compact optical

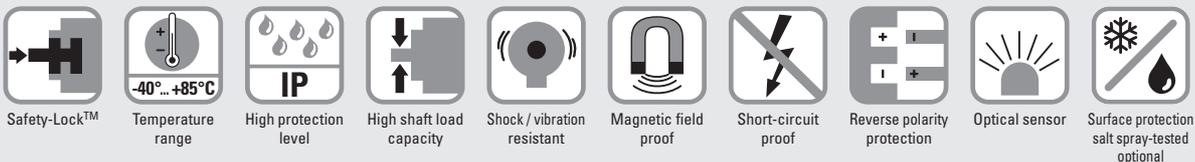
Sendix F3658 / F3678 (shaft / hollow shaft)

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 . XX 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.



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 . XX 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.



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 \varnothing 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		< 0.007 Nm
with shaft seal (IP67)		< 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 error display green status display

Absolute encoders - singleturn

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)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	1, 3, F	Cable colour:	BN	WH	GY	GN	YE

Absolute encoders - singleturn

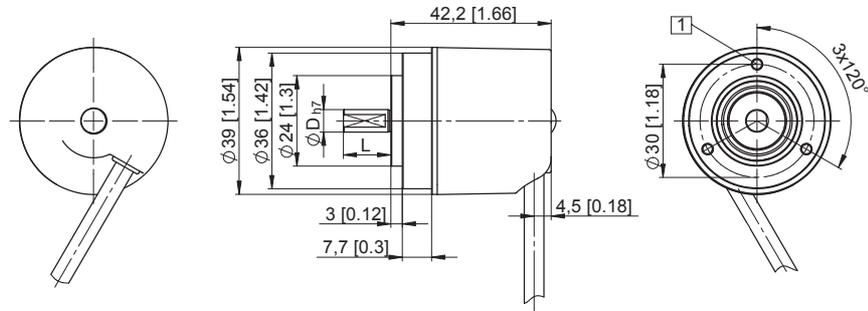
Compact optical **Sendix F3658 / F3678 (shaft / hollow shaft)** **CANopen**

Dimensions shaft version

Dimensions in mm [inch]

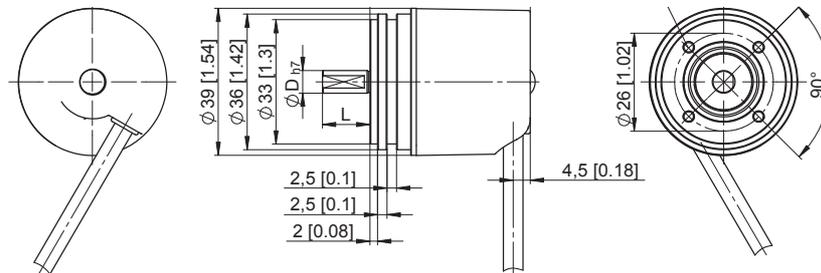
Clamping flange, $\varnothing 36$ [1.42] Flange type 1 and 3

- 1 M3, 6 [0.24] deep



Synchro flange, $\varnothing 36$ [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

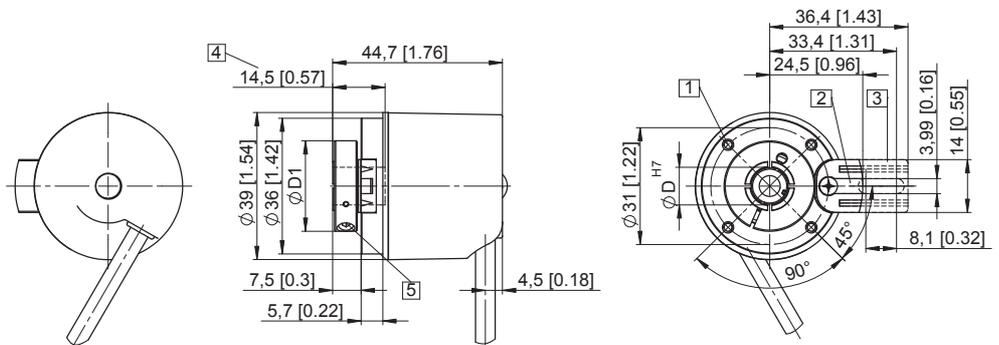
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element Flange type 1 and 3

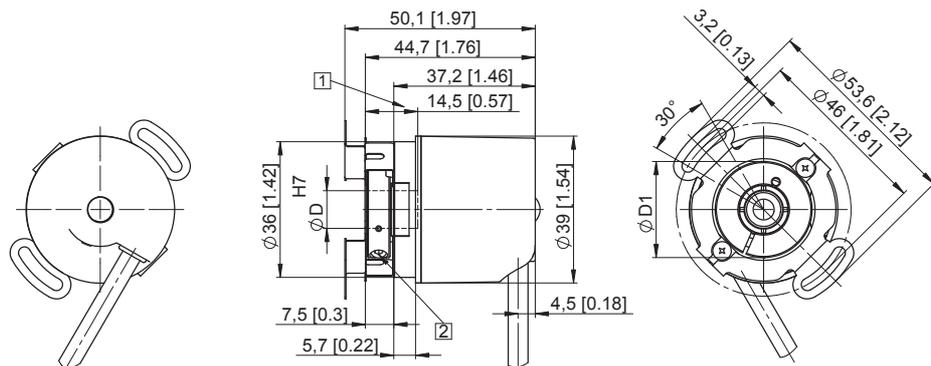
(drawing with spring element short, spring element long is shown dashed)

- 1 M2.5, 5 [0.2] deep
- 2 Spring element, short recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 4 Insertion depth for blind hollow shaft
- 5 Recommended torque for the clamping ring 0.7 Nm



Flange with stator coupling, $\varnothing 46$ [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]

Absolute encoders - singleturn

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.



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

Adaptable

- Power supply 5 V DC or 10 ... 30 V DC.
- Cable or connector.
- Gray code, binary code or BCD code.

Robust

- High shock resistance.
- Temperature range from -20°C up to +85°C.
- Protection rating up to max. IP66.

Order code Shaft version

8.5850	.	X	X	X	X	.	X	X	X	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	.	X	X	X	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 \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606
	bellows coupling \varnothing 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	<p>with fixing thread</p>	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.

Absolute encoders - singleturn

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
	LOW (I _{Load} = 10 mA)	max. 1.5 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 (U _s = 10 V), 1 kOhm (U _s = 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)																		
		Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	⊥
3, 4 (parallel)	5850: 1, 2																			
	5870: 1	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY	RD	WH	BN	WH	YE	WH	

14 bit, max. 2 options

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)																			
		Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	14	⊥
3, 4 (parallel)	5850: 1, 2																				
	5870: 1	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY	RD	WH	BN	WH	YE	WH	GY	BN

max. 13 bit, max. 2 options

Interface	Type of connection	M23 connector, 17-pin																		
		Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	⊥
3, 4 (parallel)	5850: 3, 5																			
	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																		
		Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	14
3, 4 (parallel)	5850: 3, 5																			
	5870: 2	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	

13 bit

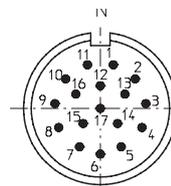
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)																		
		Signal	0 V	+V	-	-	+I	-I	ST	VR										
7, 8 (4 ... 20 mA)	5850: 1, 2																			
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY	RD						

13 bit

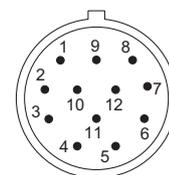
Interface	Type of connection	M23 connector, 12-pin													
		Signal	0 V	+V	-	-	+I	-I	ST	VR					⊥
7, 8 (4 ... 20 mA)	5850: 3, 5														
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

- +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)

Absolute encoders - singleturn

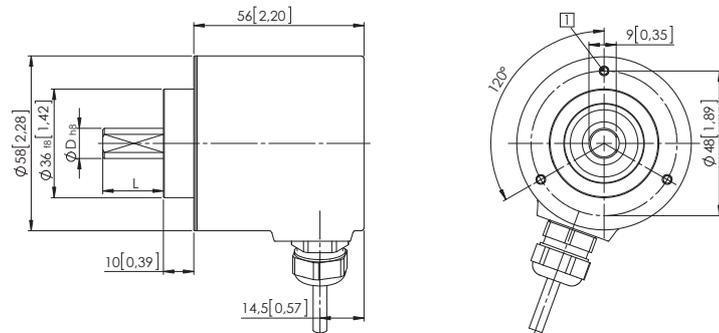
Standard optical	5850 / 5870 (shaft / hollow shaft)	Parallel / analogue
-------------------------	---	----------------------------

Dimensions shaft version

Dimensions in mm [inch]

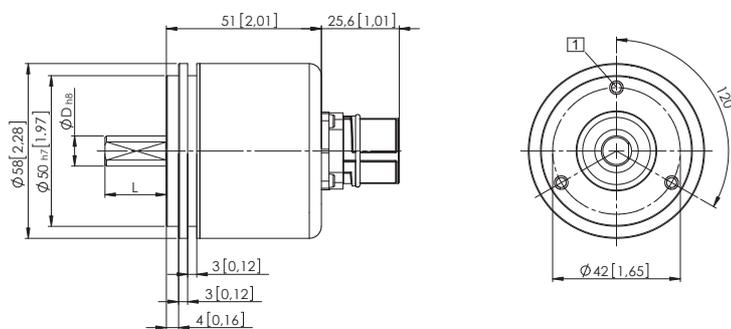
Clamping flange, \varnothing 58 [2.28]
with shaft, \varnothing 10 [0.39]
Flange type 1

- 1 3 x M3, 5 [0.20] deep



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

- 1 3 x M3, 5 [0.20] deep



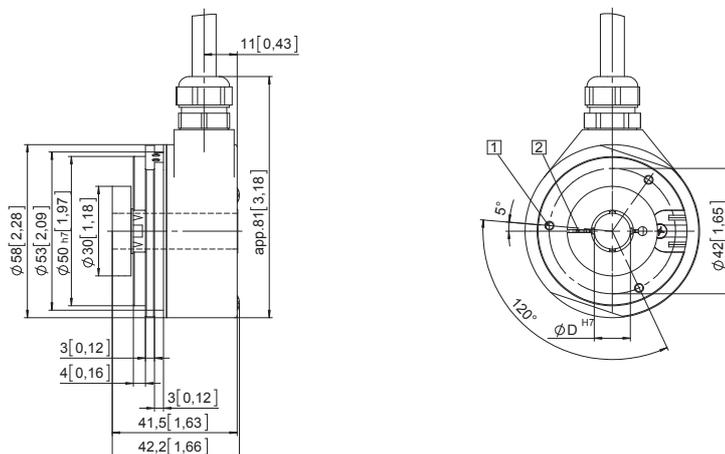
D	L	Fit
6 [0.24]	10 [0.39]	h8
10 [0.39]	20 [0.79]	h8

Dimensions hollow shaft version

Dimensions in mm [inch]

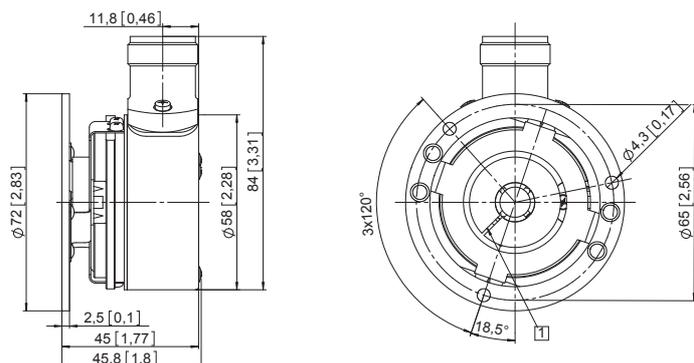
Flange with spring element, short
Flange type 1 and 2

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



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

- 1 Recommended torque for the clamping ring 0.6 Nm



Absolute encoders - singleturn

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



The singleturn encoders 5852 and 5872 with parallel interface and optical technology achieve a very high refresh rate of the position data of 40 kHz with a resolution of max. 14 bits.


 Absolute encoders
singleturn

High rotational speed	Temperature range	High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Optical sensor

Adaptable <ul style="list-style-type: none"> Power supply 5 V DC or 10 ... 30 V DC. Cable or connector M23. 	Fast <ul style="list-style-type: none"> Refresh rate of the position data 40 kHz.
--	---

Order code	8.5852	. XX XX . XXX 1					
Shaft version	Type	<table border="1"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> </tr> </table>	a	b	c	d	
a	b	c	d				
<table border="0"> <tr> <td style="vertical-align: top;"> 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"] </td> <td style="vertical-align: top;"> b Interface / power supply 1 = parallel (CMOS-TTL) / 5 V DC 3 = parallel / 10 ... 30 V DC </td> <td style="vertical-align: top;"> 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 </td> <td style="vertical-align: top;"> 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 </td> <td style="vertical-align: top;"> Optional on request - other code types - other divisions </td> </tr> </table>			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
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	8.5872	. XXX XX . XXX 1								
Hollow shaft	Type	<table border="1"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> <td style="text-align: center;">e</td> </tr> </table>	a	b	c	d	e			
a	b	c	d	e						
<table border="0"> <tr> <td style="vertical-align: top;"> a Flange 1 = with spring element, short 3 = with stator coupling, ø 65 mm [2.56"] </td> <td style="vertical-align: top;"> b Hollow shaft 6 = ø 10 mm [0.39"] 8 = ø 12 mm [0.47"] </td> <td style="vertical-align: top;"> c Interface / power supply 1 = parallel (CMOS-TTL) / 5 V DC 3 = parallel / 10 ... 30 V DC </td> <td style="vertical-align: top;"> d Type of connection 1 = radial cable, 1 m [3.28'] PVC 2 = radial M23 connector, 17-pin, without mating connector </td> <td style="vertical-align: top;"> 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 </td> <td style="vertical-align: top;"> Optional on request - other code types - other divisions </td> </tr> </table>					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
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.

Absolute encoders - singleturn

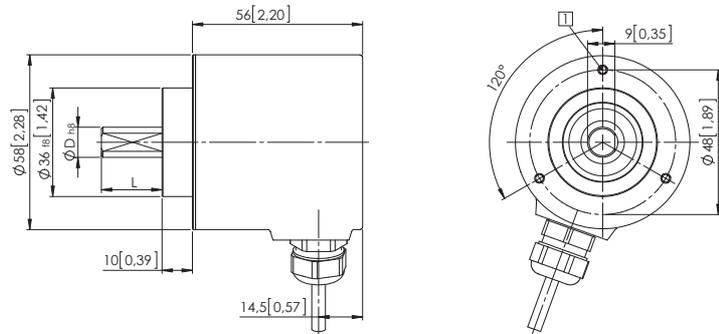
Standard optical	5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed
-------------------------	---	----------------------------

Dimensions shaft version

Dimensions in mm [inch]

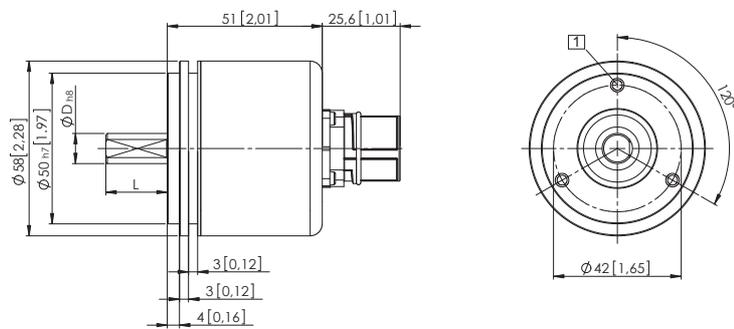
**Clamping flange, \varnothing 58 [2.28]
with shaft, \varnothing 10 [0.39]
Flange type 12**

- 1 3 x M3, 5 [0.20] deep



**Synchro flange, \varnothing 58 [2.28]
with shaft, \varnothing 6 [0.24]
Flange type 21**

- 1 3 x M3, 5 [0.20] deep



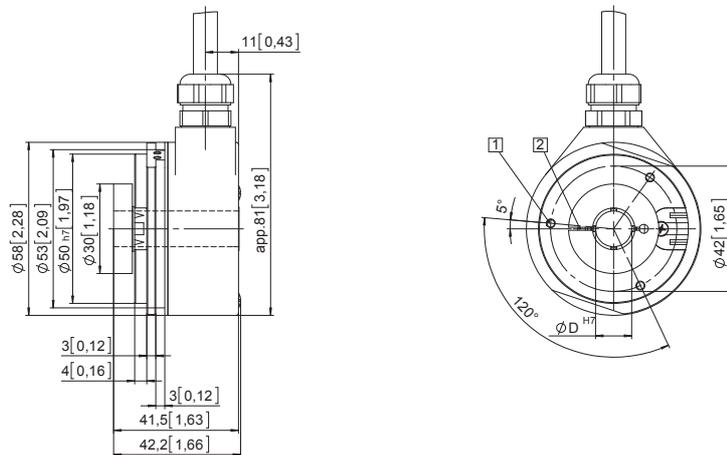
D	L	Fit
6 [0.24]	10 [0.39]	h8
10 [0.39]	20 [0.79]	h8

Dimensions hollow shaft version

Dimensions in mm [inch]

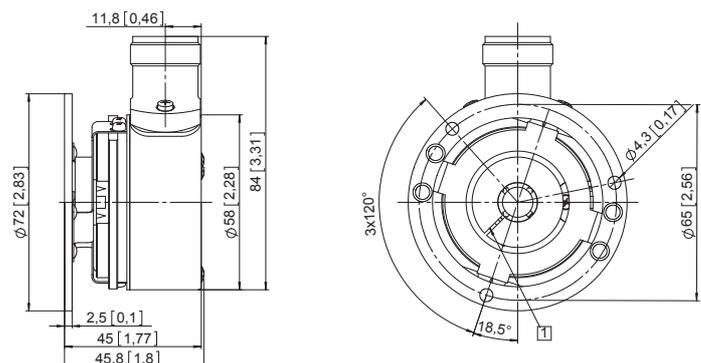
**Flange with spring element, short
Flange type 1**

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



**Flange with stator coupling, \varnothing 65 [2.56]
Flange type 3**

- 1 Recommended torque for the clamping ring 0.6 Nm

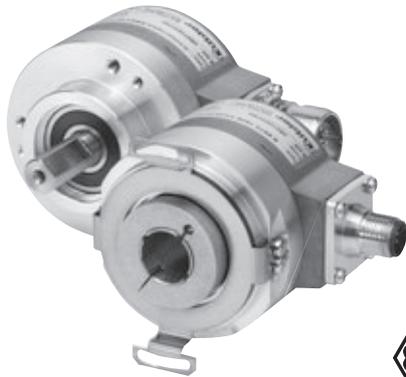


Absolute encoders - singleturn

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.



Safety-Lock™



Temperature range
-40°...+90°C



High protection level
IP67



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 $\leq 1\mu\text{s}$.
- 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
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 \varnothing 58 mm [2.28"]
 3 = clamping flange, IP67 \varnothing 58 mm [2.28"]
2 = synchro flange, IP65 \varnothing 58 mm [2.28"]
 4 = synchro flange, IP67 \varnothing 58 mm [2.28"]
 5 = square flange, IP65 \square 63.5 mm [2.5"]
 7 = square flange, IP67 \square 63.5 mm [2.5"]

b Shaft ($\varnothing \times L$), 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-pin³⁾
 6 = radial M12 connector, 8-pin³⁾

*) 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 Resolution⁴⁾

- A = 10 bit
 1 = 11 bit
 2 = 12 bit
3 = 13 bit
 4 = 14 bit
 7 = 17 bit
 C = 21 bit⁵⁾

g Inputs / outputs⁴⁾

- 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	8.5873	. XXXX . XX2X	If for each parameter of an encoder the <u>underlined preferred option</u> 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.
Hollow shaft	Type	a b c d e f g h 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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 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⁾	c Interface / power supply 1 = SSI, BiSS / 5 V DC <u>2 = SSI, BiSS / 10 ... 30 V DC</u> 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	
b Hollow shaft	3 = ø 10 mm [0.39"] K = ø 10 mm [0.39"], with tapered shaft <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	d Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) <u>E = tangential cable, 1 m [3.28'] PVC</u> F = tangential cable, special length PVC *) <u>4 = radial M23 connector, 12-pin</u> 6 = radial M12 connector, 8-pin ²⁾	e Code B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u>
		f Resolution ³⁾ A = 10 bit 1 = 11 bit 2 = 12 bit <u>3 = 13 bit</u> 4 = 14 bit 7 = 17 bit C = 21 bit ⁴⁾	g Inputs / outputs ³⁾ <u>2 = SET, DIR input</u> additional status output
			h Options (service) 1 = no option 2 = status LED <u>3 = SET button and status LED</u> <i>Optional on request</i> - Ex 2/22 (not with type of connection E or F) - surface protection salt spray tested - other resolutions

Absolute encoders singleturn

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.

Absolute encoders - singleturn

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:	<ul style="list-style-type: none"> - 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
<p>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).</p> <p>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.</p>	

Option incremental outputs (A/B), 2048 ppr		
	SinCos	RS422 TTL compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 V _{pp} (±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
<p>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).</p> <p>An active status output (LOW) displays:</p> <ul style="list-style-type: none"> - Sensor error, singleturn or multiturn (soiling, glass breakage etc.) - LED fault (failure or ageing) - over- or under-temperature <p>In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.</p>	

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

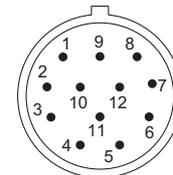
Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - - - shield
Interface	Type of connection	Features	M23 connector
1, 2	3, 4	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			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 0Vsens +Vsens \perp
			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 0Vsens +Vsens \perp
			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 \bar{A} B \bar{B} \perp
			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 \bar{A} B \bar{B} \perp
			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 \bar{A} B \bar{B} 0Vsens +Vsens \perp
			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 \bar{A} B \bar{B} 0Vsens +Vsens \perp
			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 \perp
			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, \bar{A} : Incremental output channel A (cosine)
- B, \bar{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 \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

Absolute encoders
singleturn

Absolute encoders - singleturn

Standard optical

Sendix 5853 / 5873 (shaft / hollow shaft)

SSI / BiSS

Dimensions shaft version

Dimensions in mm [inch]

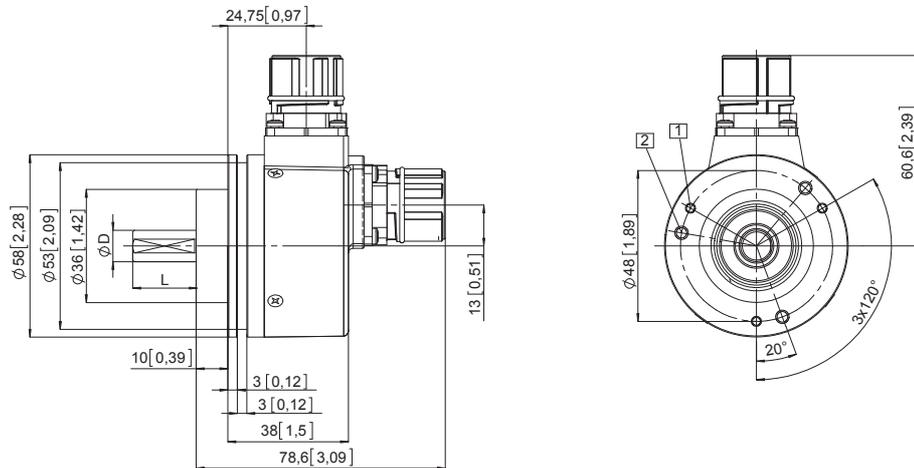
Clamping flange, $\varnothing 58$ [2.28]

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



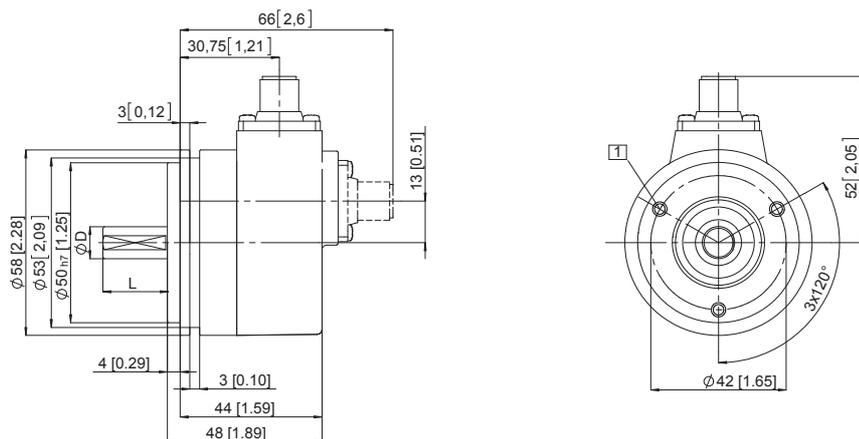
Synchro flange, $\varnothing 58$ [2.28]

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

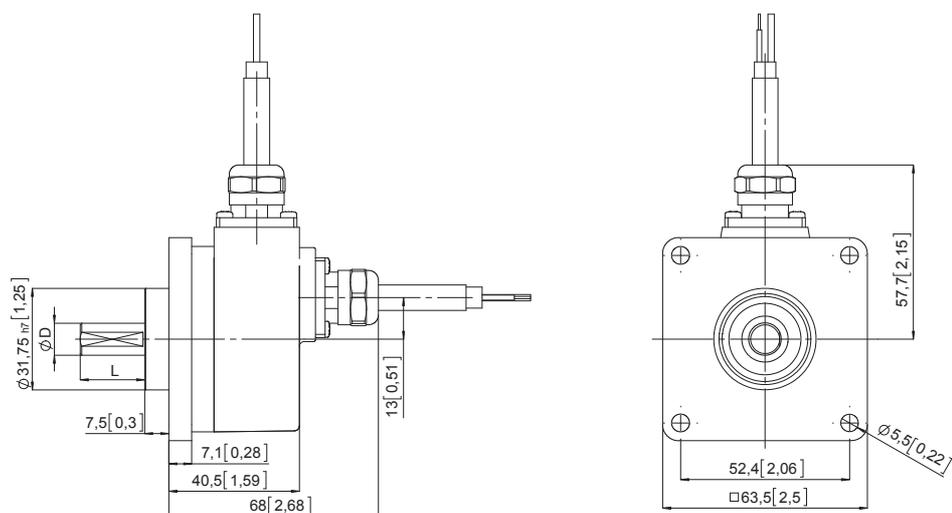


Square flange, $\square 63.5$ [2.5]

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



Absolute encoders - singleturn

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

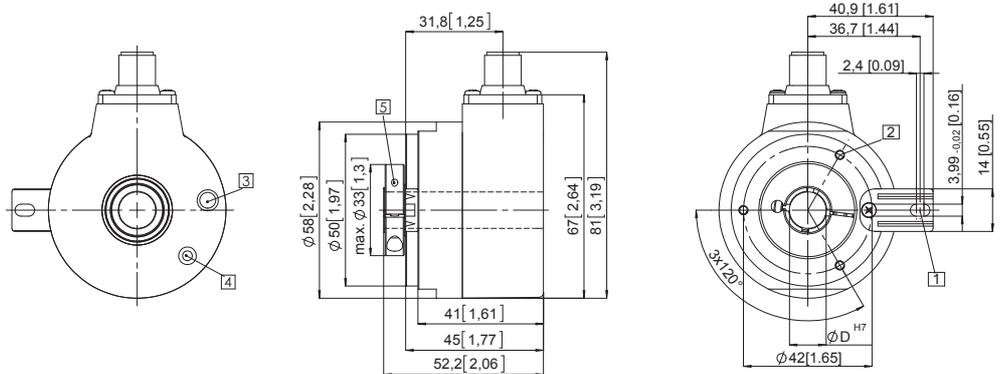
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

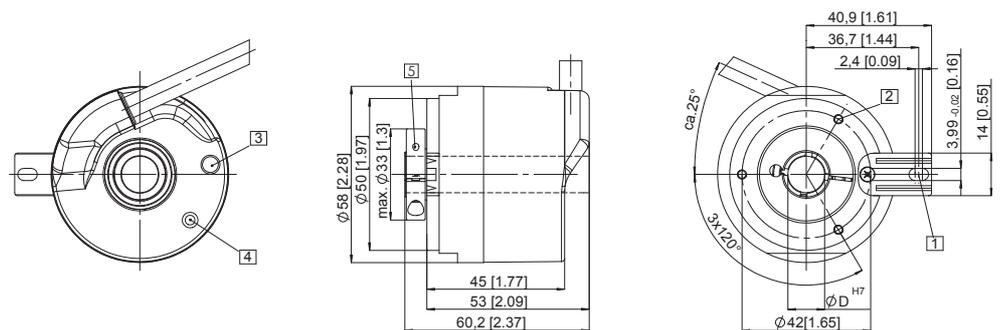
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5.5 [0.21] deep
- 3 Status-LED
- 4 SET button
- 5 Recommended torque for the clamping ring 0.6 Nm



Flange with spring element, long Flange type 1 and 2

(drawing with tangential cable)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 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



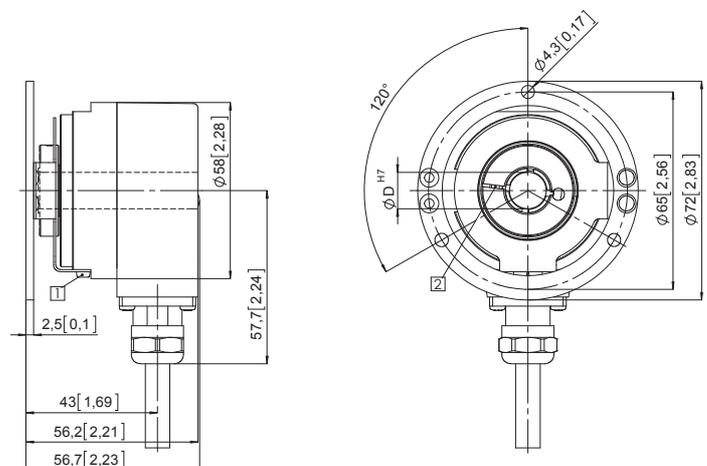
Flange with stator coupling, \varnothing 65 [2.56]

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



Absolute encoders - singleturn

Standard optical

Sendix 5853 / 5873 (shaft / hollow shaft)

SSI / BiSS

Dimensions hollow shaft version

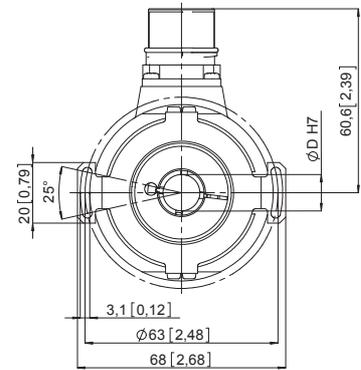
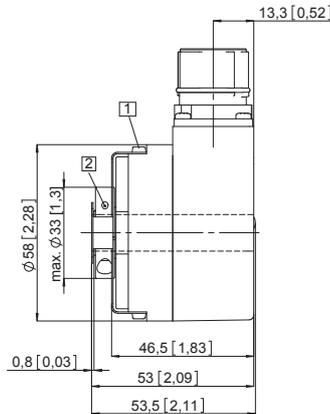
Dimensions in mm [inch]

Flange with stator coupling, $\varnothing 63$ [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

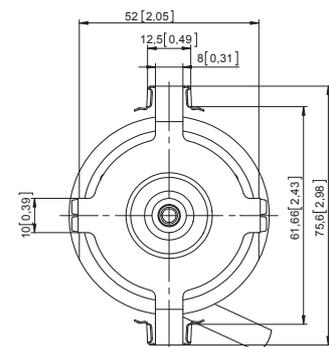
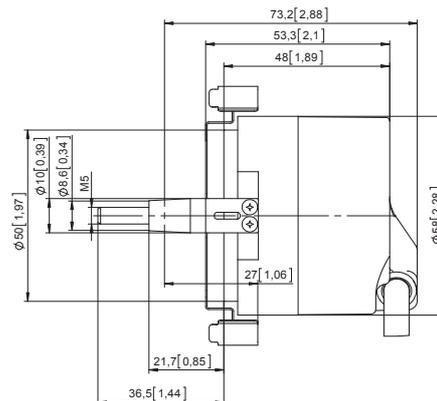
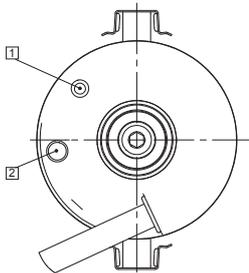


Flange with stator coupling, mounting without screws

Flange type E and F

(with tapered shaft K and tangential cable)

- 1 Status LED
- 2 SET button

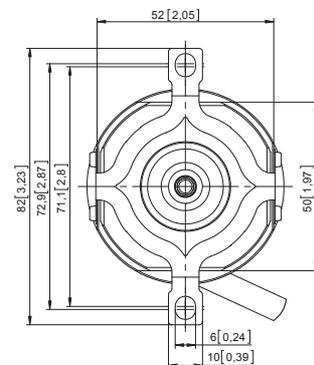
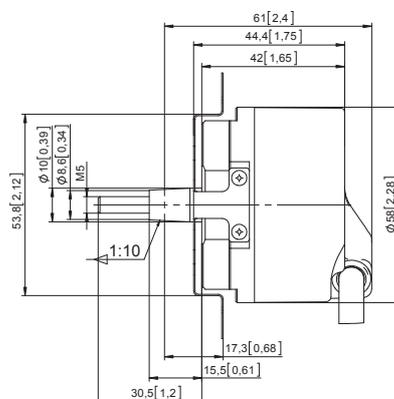
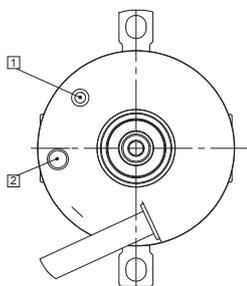


Flange with stator coupling, $\varnothing 72$ [2.83]

Flange type G

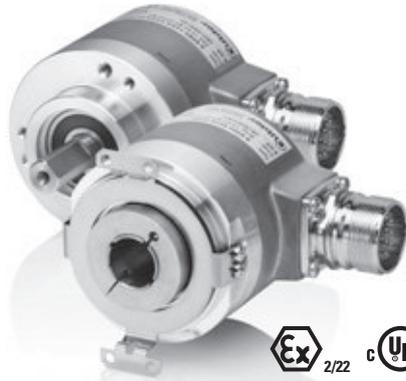
(with tapered shaft K and tangential cable)

- 1 Status LED
- 2 SET Button



Absolute encoders - singleturn

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



The absolute singleturn encoders 5853FS2 and 5873FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

The extra strong Safety-Lock™ design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP65.



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

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Flexible

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

Order code **8.5853FS2** . 1 X X X . X X 2 X
Shaft version 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.



- 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 Type	. XXXXX . XX2X a b c d e f g h	If for each parameter of an encoder the <u>underlined preferred option</u> 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.			
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)	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 <i>Optional on request</i> - 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 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.

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		
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 V _{pp} (±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.

Absolute encoders - singleturn

**Standard
SIL2/PLd, optical**

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

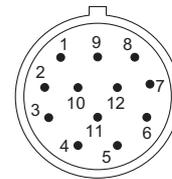
SSI/BiSS + SinCos

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	\bar{A}	B	\bar{B}	\perp
		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	\bar{A}	B	\bar{B}	\perp
		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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

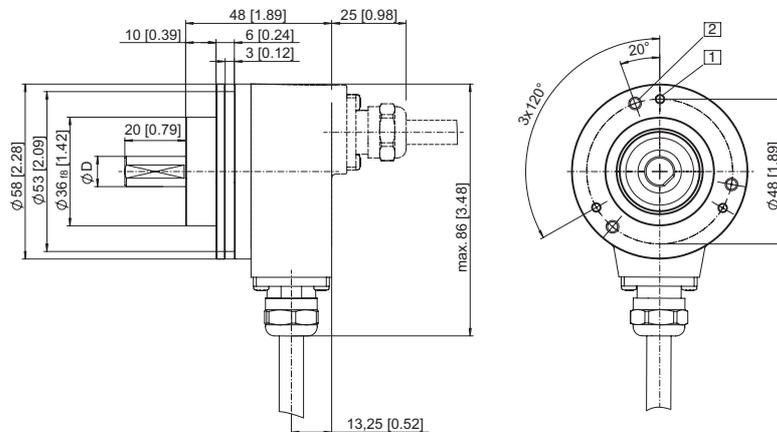
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 with shaft type 2
(drawing with cable)

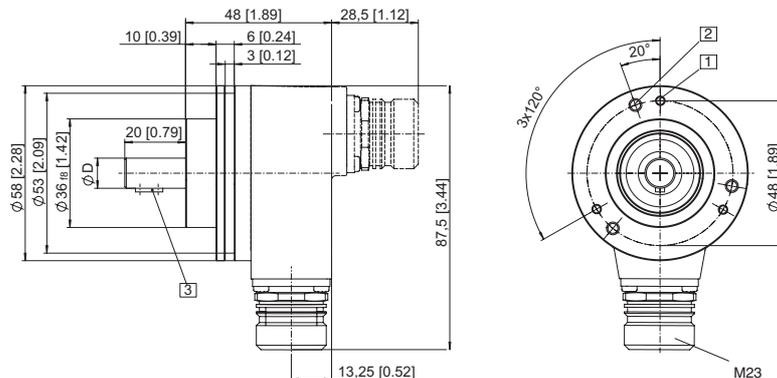
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- D = 10^{H7} [0.39]



Clamping flange, \varnothing 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]



Absolute encoders - singleturn

**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, $\varnothing 63$ [2.48]

and hollow shaft

Flange type B

(drawing with M23 connector)

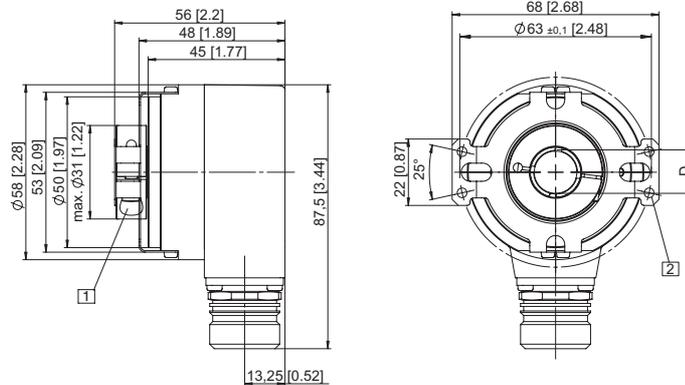
- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw

$D = \varnothing 10^{H7}$ [0.39]

$\varnothing 12^{H7}$ [0.47]

$\varnothing 14^{H7}$ [0.55]



Flange with stator coupling, $\varnothing 63$ [2.48]

and tapered shaft

Flange type B

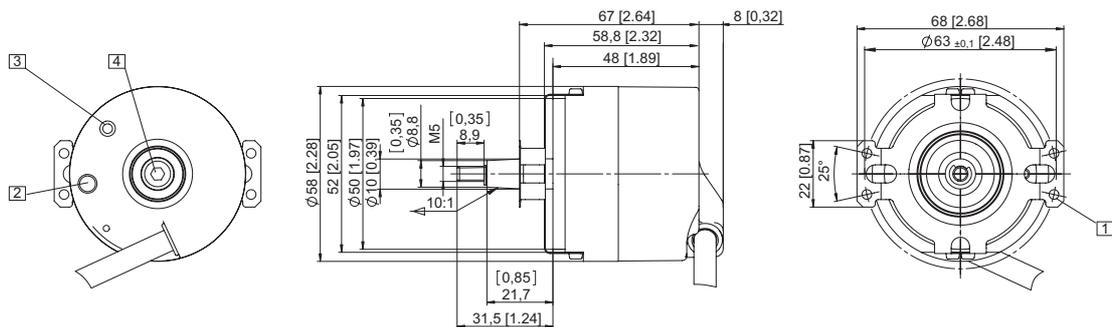
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

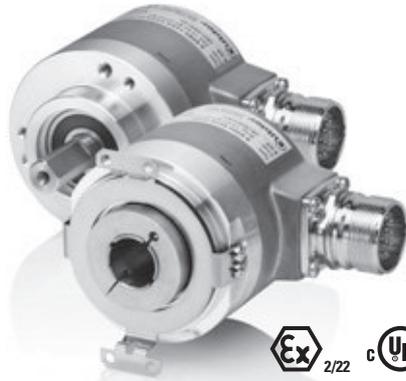
- 3 SET button

- 4 SW 4



Absolute encoders - singleturn

Standard SIL3/PE, 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 -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.
- 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 8.5853FS3 . 1 X X X . X X 2 X
Shaft version 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.



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 Type	<table border="1" style="font-size: 8px; border-collapse: collapse;"> <tr> <td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">X</td> <td style="text-align: center;">X</td><td style="text-align: center;">X</td><td style="text-align: center;">2</td><td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">a</td><td style="text-align: center;">b</td><td style="text-align: center;">c</td><td style="text-align: center;">d</td> <td style="text-align: center;">e</td><td style="text-align: center;">f</td><td style="text-align: center;">g</td><td style="text-align: center;">h</td> </tr> </table>	X	X	X	X	X	X	2	X	a	b	c	d	e	f	g	h	<p>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.</p>	
X	X	X	X	X	X	2	X													
a	b	c	d	e	f	g	h													
a Flange	d Type of connection	f Resolution ¹⁾																		
9 = with torque stop, flexible, IP65 A = with torque stop set, rigid, IP65 B = with stator coupling, IP65, ø 63 mm [2.48"]	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	A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit																		
b Hollow shaft	*) 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)	g Input/output ¹⁾																		
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	e Code	2 = SET, DIR input																		
c Interface / power supply	B = SSI, binary C = BiSS, binary G = SSI, gray	h Options (service)																		
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC		1 = no option 2 = status LED 3 = SET button and status LED																		
<i>Optional on request</i> - 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 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.

Absolute encoders - singleturn

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		
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 V _{pp} (±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.

Absolute encoders - singleturn

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

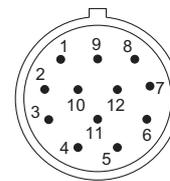
Terminal assignment

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	\bar{A}	B	\bar{B}	\perp
		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	\bar{A}	B	\bar{B}	\perp
		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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

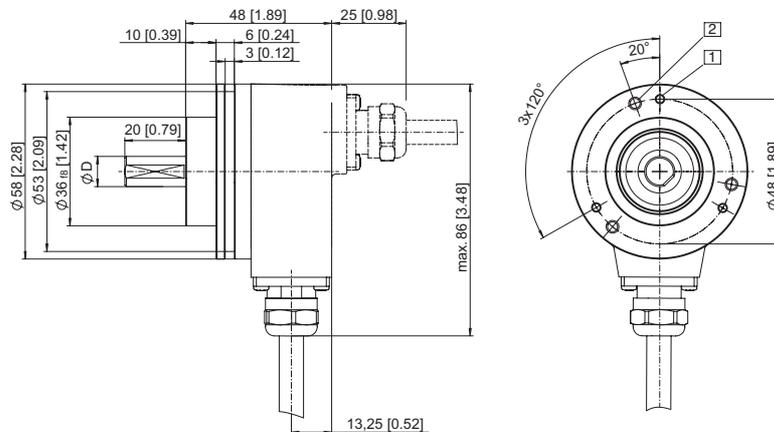
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 with shaft type 2
(drawing with cable)

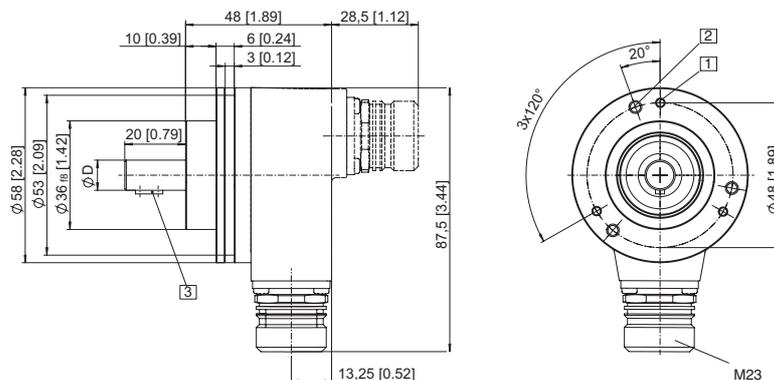
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- D = 10^{H7} [0.39]



Clamping flange, \varnothing 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]



Absolute encoders - singleturn

**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, $\varnothing 63$ [2.48]

and hollow shaft

Flange type B

(drawing with M23 connector)

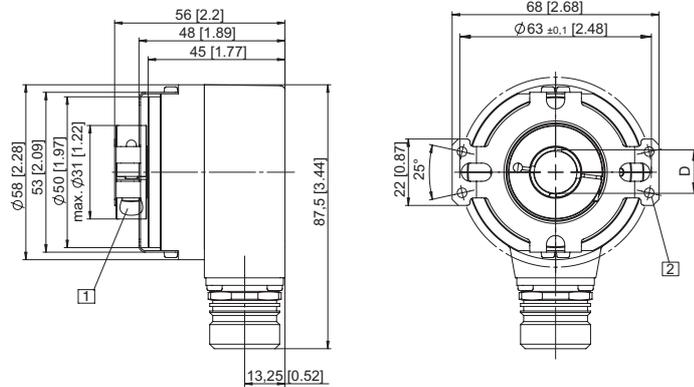
- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw

$D = \varnothing 10^{H7}$ [0.39]

$\varnothing 12^{H7}$ [0.47]

$\varnothing 14^{H7}$ [0.55]



Flange with stator coupling, $\varnothing 63$ [2.48]

and tapered shaft

Flange type B

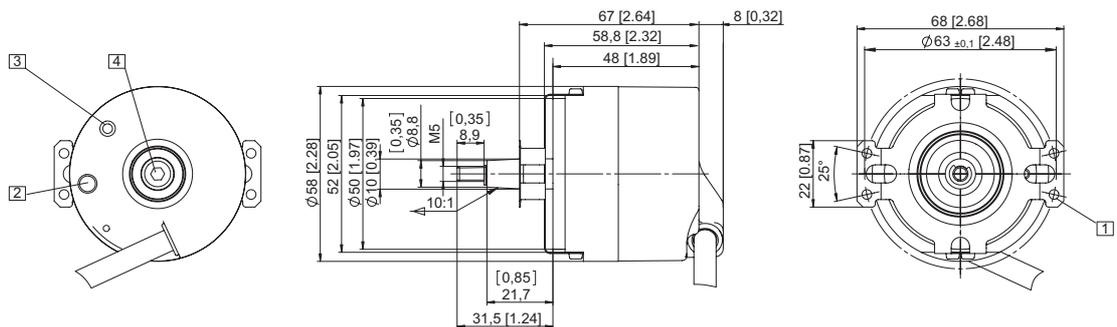
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



Absolute encoders - singleturn

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



The singleturn encoders 5858 and 5878 with Profibus interface and optical sensor technology are the ideal solution for all Profibus applications.

They offer a maximum resolution of 16 bits, divided over 360°. These encoders are available with blind hollow shaft up to 15 mm.



Absolute encoders singleturn

Safety-Lock™	High rotational speed	Temperature range -40°.. +80°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

- 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 Type	. X X 3 X . 31 1 X a b c d e f	<p>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.</p>	
a Flange	b Shaft (ø x L), with flat	d Type of connection <i>removable bus terminal cover</i>	f Options (Service)	
1 = <u>clamping flange, IP65 ø 58 mm [2.28"]</u> 3 = clamping flange, IP67 ø 58 mm [2.28"] 2 = <u>synchro flange, IP65 ø 58 mm [2.28"]</u> 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"]	1 = <u>6 x 10 mm [0.24 x 0.39"]</u> ¹⁾ 2 = <u>10 x 20 mm [0.39 x 0.79"]</u> ²⁾ 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"	1 = with radial cable gland fitting 2 = <u>with 3 x radial M12 connectors</u>	2 = no option 3 = <u>SET button</u>	
	c Interface / power supply	e Fieldbus profile	Optional on request	
	3 = <u>PROFIBUS DP V0</u> encoder profile V 1.1, 10 ... 30 V DC	31 = <u>PROFIBUS DP V0</u> encoder profile class 2	- Ex 2/22 - surface protection salt spray tested	

Order code Hollow shaft	8.5878 Type	. X X 3 X . 31 1 X a b c d e f	<p>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.</p>	
a Flange	b Blind hollow shaft	d Type of connection <i>removable bus terminal cover</i>	f Options (Service)	
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 = <u>with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	3 = ø 10 mm [0.39"] 4 = <u>ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	1 = with radial cable gland fitting 2 = <u>with 3 x radial M12 connectors</u>	2 = no option 3 = <u>SET button</u>	
	c Interface / power supply	e Fieldbus profile	Optional on request	
	3 = <u>PROFIBUS DP V0</u> encoder profile V 1.1, 10 ... 30 V DC	31 = <u>PROFIBUS DP V0</u> encoder profile class 2	- 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)	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.

Absolute encoders singleturn

Terminal assignment terminal box

Interface	Type of connection	Signal:	BUS IN				BUS OUT				The shield of the connection cable must be connected over a large area via the cable gland.
			B	A	0 V	+ V	0 V	+ V	B	A	
3	1 (terminal box)	Terminal:	1	2	3	4	5	6	7	8	

Interface	Type of connection	Function	Signal / Pin							Diagram
			Signal:	Pin:						
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.

Absolute encoders - singleturn

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

Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

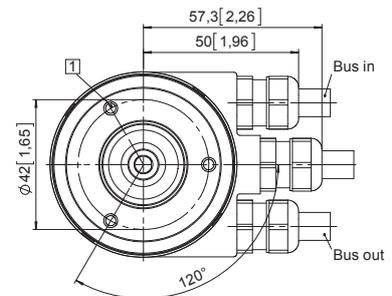
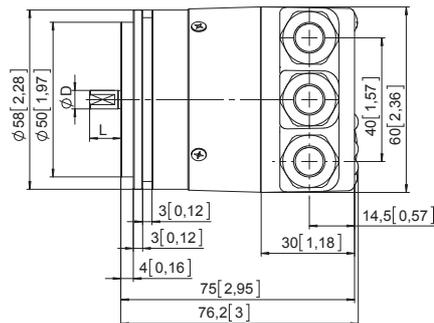
Synchro flange, \varnothing 58 [2.28]

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



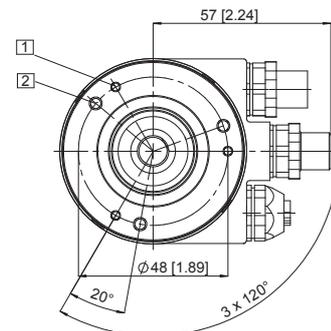
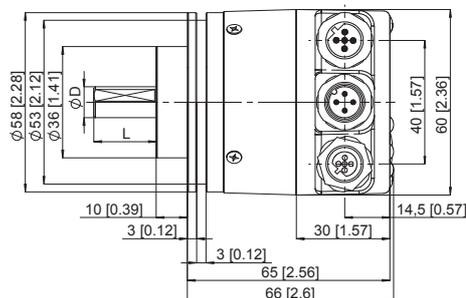
Clamping flange, \varnothing 58 [2.28]

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

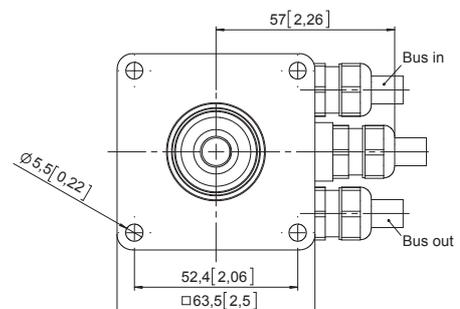
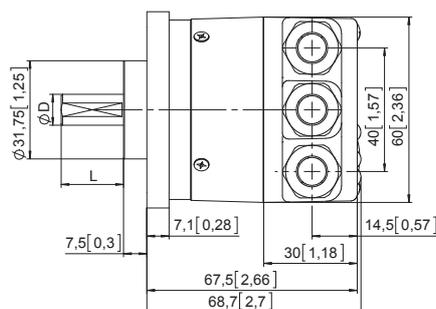


Square flange, \square 63.5 [2.5]

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



Absolute encoders - singleturn

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]

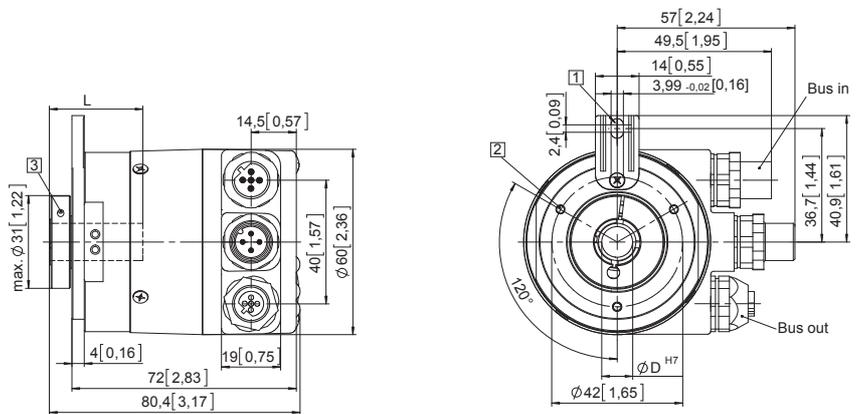
Flange with spring element, long

Flange type 1 and 2

(drawing with 3 x M12 connector)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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, $\varnothing 63$ [2.48]

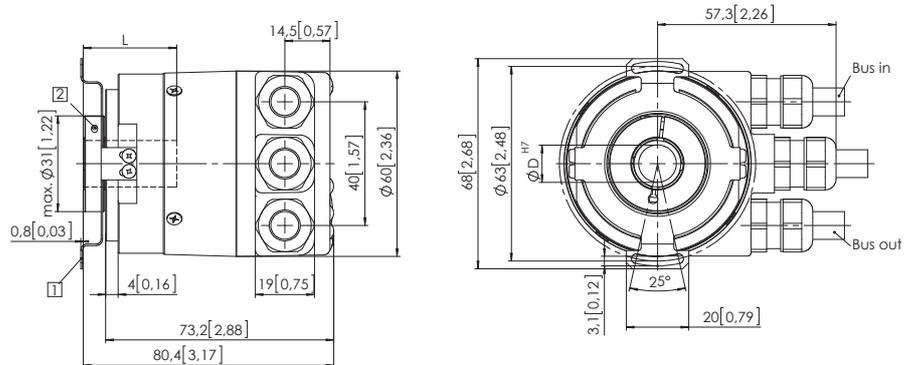
Flange type 5 and 6

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, $\varnothing 65$ [2.56]

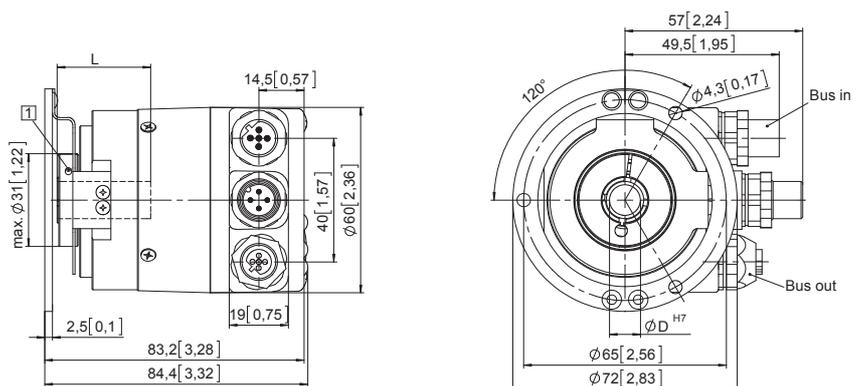
Flange type 3 and 4

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]



Absolute encoders - singleturn

Standard optical

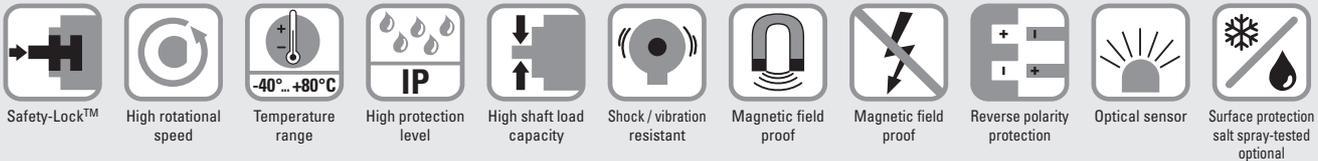
Sendix 5858 / 5878 (shaft / hollow shaft)

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.



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 . XX2X . 211X
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.



- 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 profile³⁾
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 Type	X a	X b	2 c	X d	. e	21 f	1 g	X h	If for each parameter of an encoder the <u>underlined preferred option</u> 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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Blind hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	c Interface / power supply <u>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</u>	d Type of connection removable bus terminal cover 1 = radial cable gland <u>2 = 2 x M12 connector</u> 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⁾ <u>21 = CANopen encoder profile DS406 V3.2</u>	f Options (service) 2 = no options <u>3 = SET button</u> 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"] bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.0606 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 connector M12 for Bus out	8.0000.5116.0000 8.0000.5111.0000
Cordset, pre-assembled	M12, for Bus in, 6 m [19.68'] PVC cable M12, for Bus out, 6 m [19.68'] PVC cable	05.00.6091.A211.006M 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].

Absolute encoders - singleturn

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.

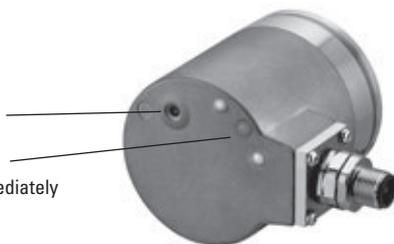
When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

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.

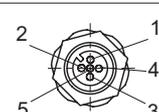
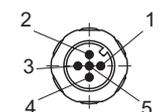
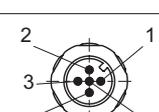
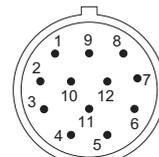
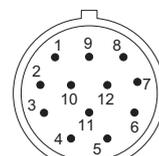
All profiles stated here: key-features

The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen
-------------------------	--	----------------

Terminal assignment

Interface	Type of connection	Cable gland (bus terminal cover with terminal box)										
2	1	Bus OUT					Bus IN					
		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)										
2	A, B	Bus IN										
		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										
2	2, F	Bus OUT										
		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										
2	E	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	2 x M23 connector										
2	J	Bus OUT										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		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										
2	I	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	10	12	2	7						3

 Absolute encoders
singleturn

Absolute encoders - singleturn

Standard optical

Sendix 5858 / 5878 (shaft / hollow shaft)

CANopen

Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

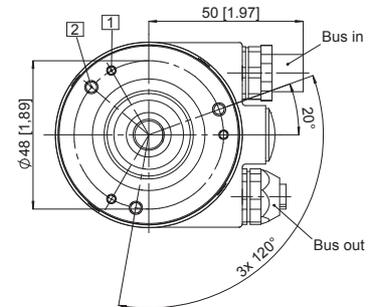
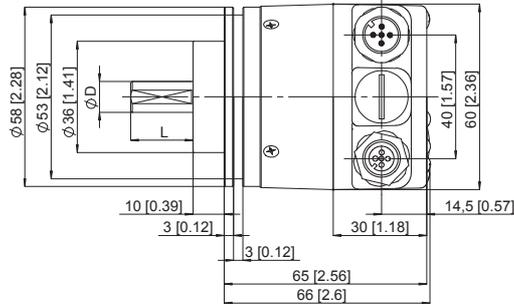
Clamping flange, \varnothing 58 [2.28]

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



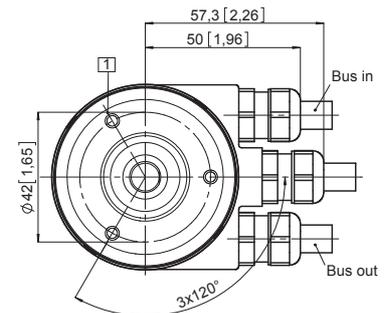
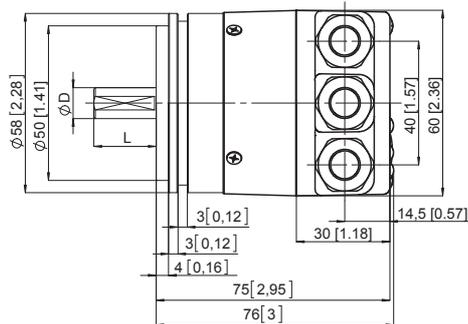
Synchro flange, \varnothing 58 [2.28]

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

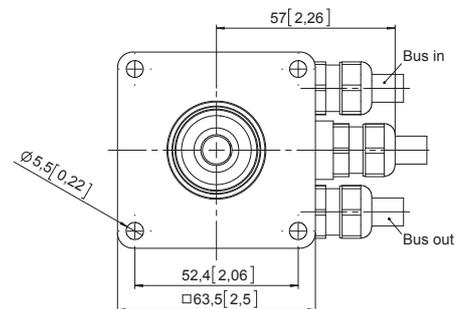
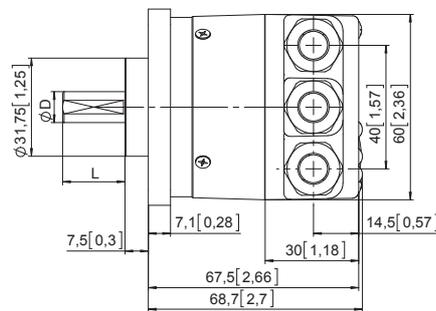


Square flange, \square 63.5 [2.5]

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



Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen
-------------------------	--	----------------

Dimensions shaft version, with fixed connection

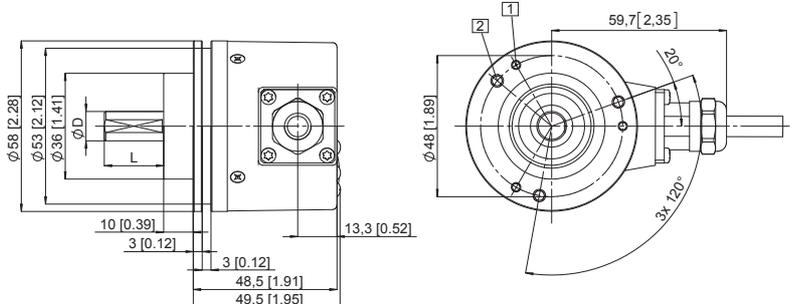
Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

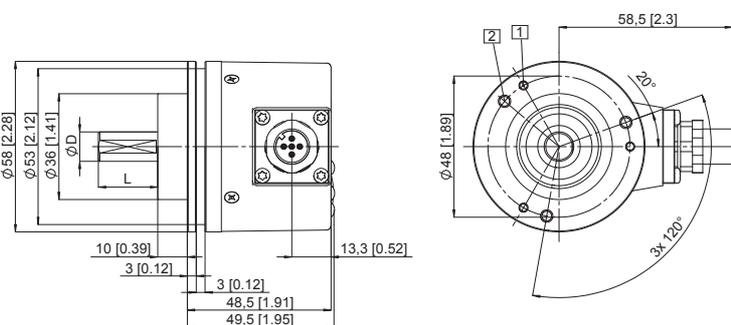
(drawing with cable)

- 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



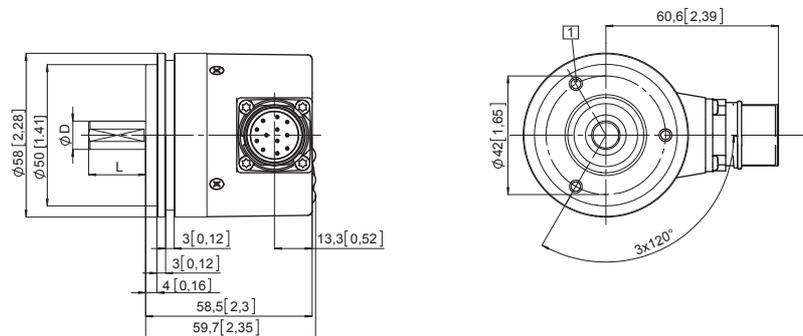
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

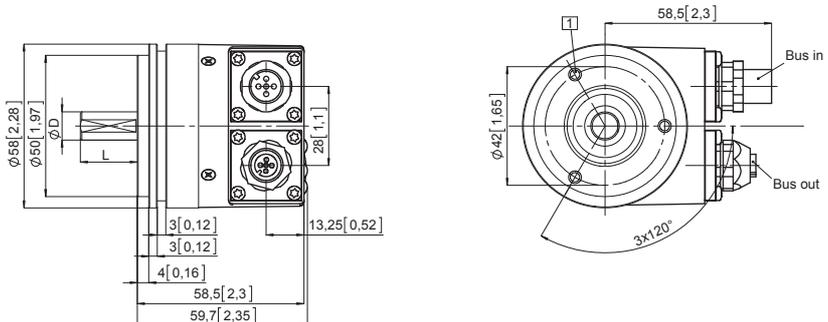
(drawing with M23 connector)

- 1 3 x M4, 6 [0.24] deep



(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep



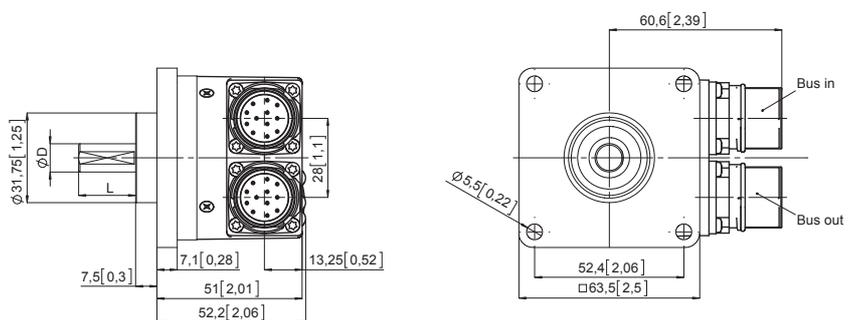
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, \square 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



Absolute encoders - singleturn

**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]

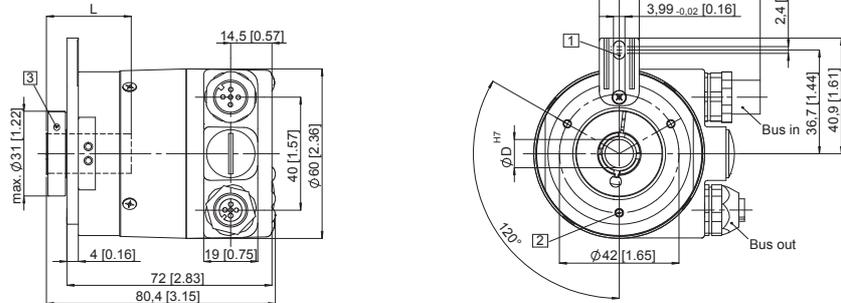
Flange with spring element, long

Flange type 1 and 2

(drawing with 2 x M12 connector)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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, $\varnothing 63$ [2.48]

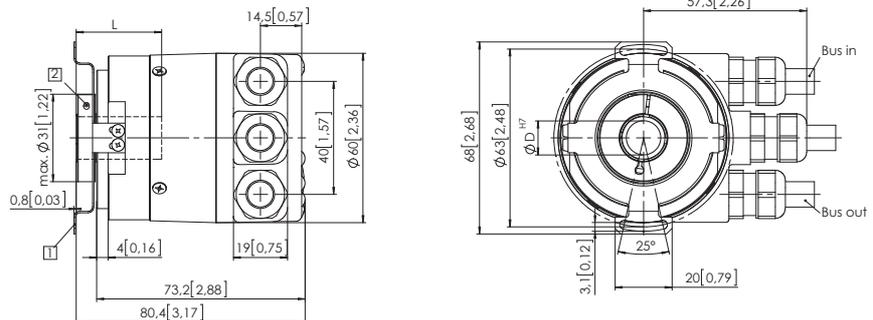
Flange type 5 and 6

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, $\varnothing 65$ [2.56]

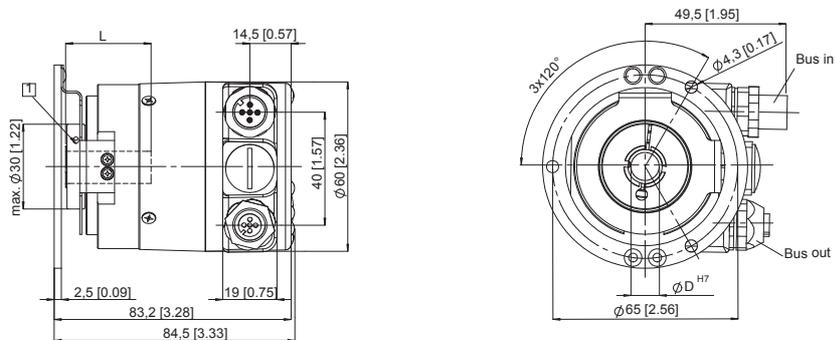
Flange type 3 and 4

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]



Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen
-------------------------	--	----------------

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

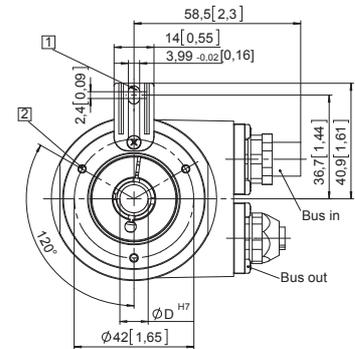
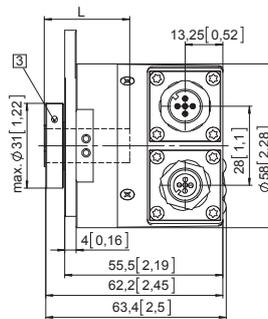
Dimensions in mm [inch]

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, \varnothing 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, \varnothing 65 [2.56]

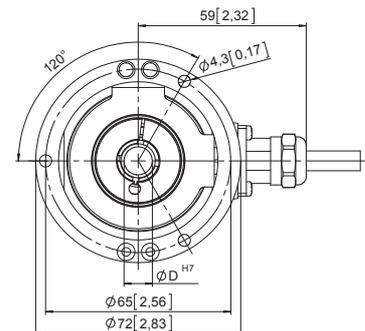
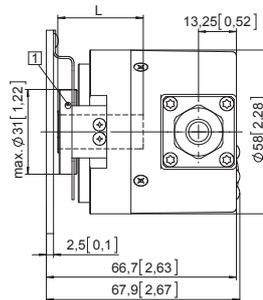
Flange type 3 and 4

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]



Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT
-------------------------	--	-----------------

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606
	bellows coupling \varnothing 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 connector M12 for power supply	05.WASCSY4S 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.

Absolute encoders
singleturn

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

Absolute encoders - singleturn

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.

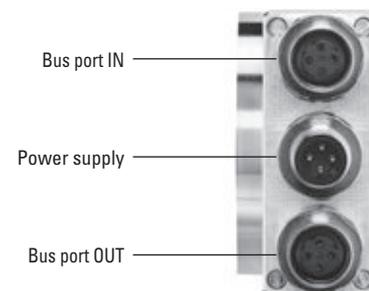
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

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					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
B	2 (3 x M12 connector)	Bus port IN	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			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 -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT
-------------------------	--	-----------------

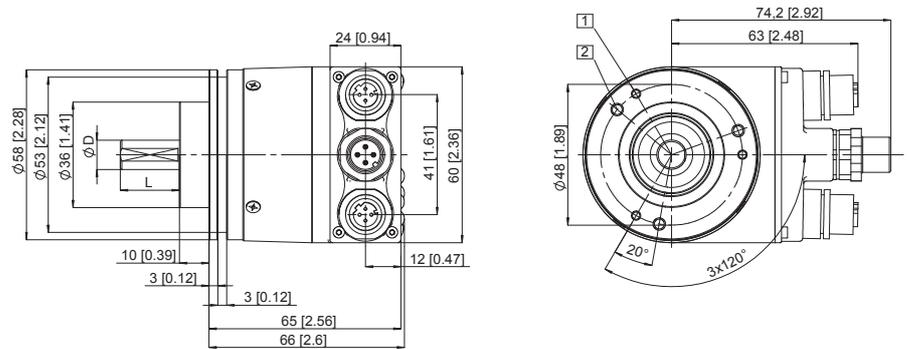
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28] Flange type 1 and 3

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

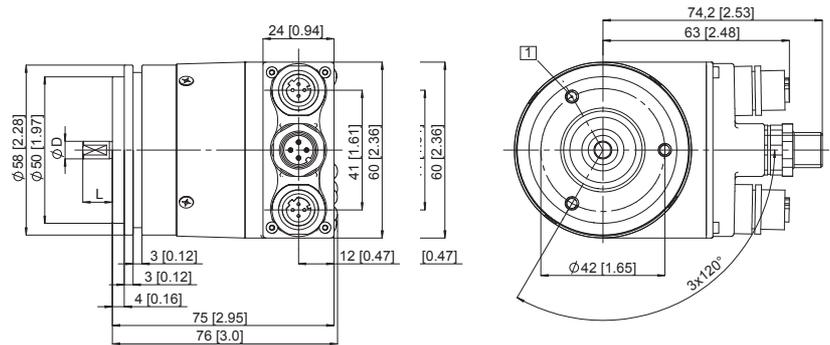
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



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

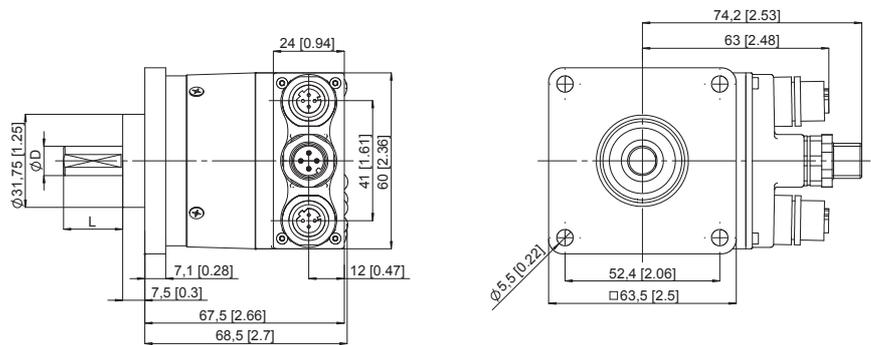
- 1 3 x M4, 6 [0.24] deep

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, \square 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



Absolute encoders - singleturn

**Standard
optical**

Sendix 5858 / 5878 (shaft / hollow shaft)

EtherCAT

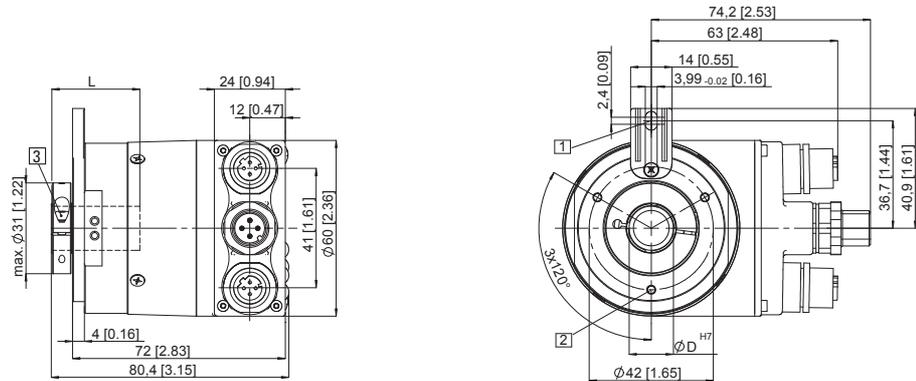
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 2 3 x M3, 5.5 [0.21] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

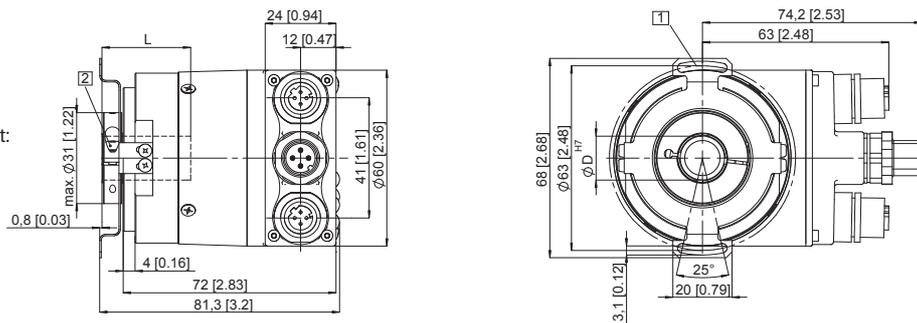
L: Insertion depth for blind hollow shaft:
30 [1.18]



Flange with stator coupling, $\varnothing 63$ [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

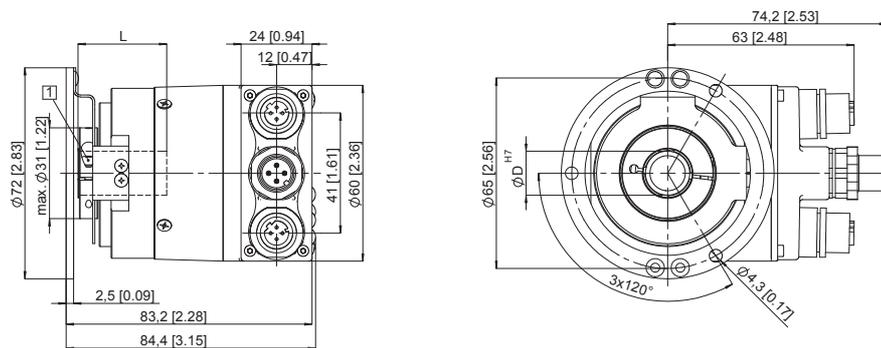
L: Insertion depth for blind hollow shaft:
30 [1.18]



Flange with stator coupling, $\varnothing 65$ [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]



Absolute encoders - singleturn

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.



Absolute encoders singleturn

Safety-Lock™	High rotational speed	Temperature range -40...+85°C	High protection level IP67	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	8.5858	. X X C 2 . C 2 12	<p>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.</p>					
Shaft version	Type	<table border="1"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> <td style="text-align: center;">e</td> </tr> </table>	a	b	c	d	e	
a	b	c	d	e				
<p>a Flange</p> <p><u>1 = clamping flange, IP65 ø 58 mm [2.28"]</u> 3 = clamping flange, IP67 ø 58 mm [2.28"] <u>2 = synchro flange, IP65 ø 58 mm [2.28"]</u> 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"]</p>	<p>b Shaft (ø x L), with flat</p> <p><u>1 = 6 x 10 mm [0.24 x 0.39"]</u>¹⁾ <u>2 = 10 x 20 mm [0.39 x 0.79"]</u>²⁾ 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"</p>	<p>c Interface / power supply</p> <p><u>C = PROFINET IO / 10 ... 30 V DC</u></p>	<p>d Type of connection</p> <p>removable bus terminal cover</p> <p><u>2 = 3 x M12 connector</u></p>	<p>e Field bus profile</p> <p><u>C2 = PROFINET IO</u></p> <p>Optional on request</p> <ul style="list-style-type: none"> - Ex 2/22 - surface protection salt spray tested 				

Order code	8.5878	. X X C 2 . C 2 12	<p>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.</p>					
Hollow shaft	Type	<table border="1"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> <td style="text-align: center;">d</td> <td style="text-align: center;">e</td> </tr> </table>	a	b	c	d	e	
a	b	c	d	e				
<p>a Flange</p> <p>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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]</p>	<p>b Blind hollow shaft</p> <p>3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"</p>	<p>c Interface / power supply</p> <p><u>C = PROFINET IO / 10 ... 30 V DC</u></p>	<p>d Type of connection</p> <p>removable bus terminal cover</p> <p><u>2 = 3 x M12 connector</u></p>	<p>e Field bus profile</p> <p><u>C2 = PROFINET IO</u></p> <p>Optional on request</p> <ul style="list-style-type: none"> - 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)	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		8.0010.4700.0000
		with fixing thread
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	

Interface characteristics PROFINET IO		
Resolution	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)	
Code	binary	
Protocol	PROFINET IO	

Link 1 and 2, LED (green / yellow)		
Two colored	green	active link
	yellow	data transfer

Error LED (red) / PWR LED (green)	
Functionality see manual	

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

Absolute encoders - singleturn

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

General information about PROFINET IO

The PROFINET encoder implements the encoder profile 4.1. (according to the specification Encoder Version 4.1 Dec 2008")

It permits scaling and preset values, as well as many other additional parameters to be programmed via the PROFINET bus.

When switching on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure, or taken over by the controller in the start-up phase.

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

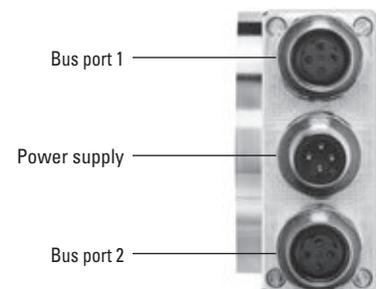
PROFINET IO

The complete encoder profile according to profile encoder version 4.1 as well as the identification & maintenance functionality version 1.16 has been implemented. IM blocks 0, 1, 2, 3 and 4 are supported.

The **M**edia **R**edundancy **P**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					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
C	2 (3 x M12 connector)	Bus port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			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 -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



Absolute encoders - singleturn

Standard optical

Sendix 5858 / 5878 (shaft / hollow shaft)

PROFINET IO

Dimensions shaft version, with removable bus terminal cover

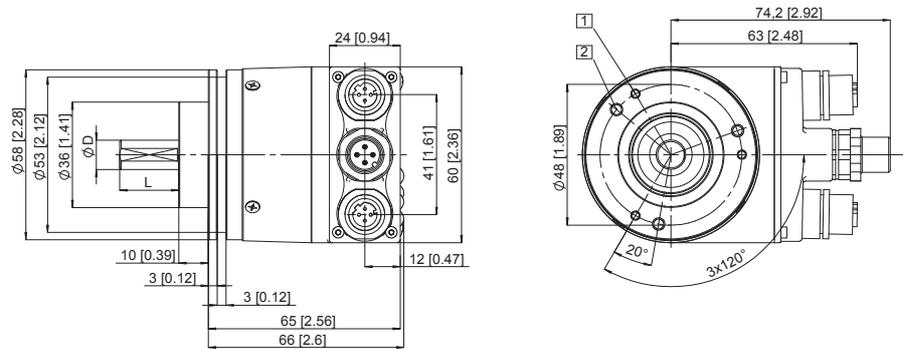
Dimensions in mm [inch]

Clamping flange, \varnothing 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

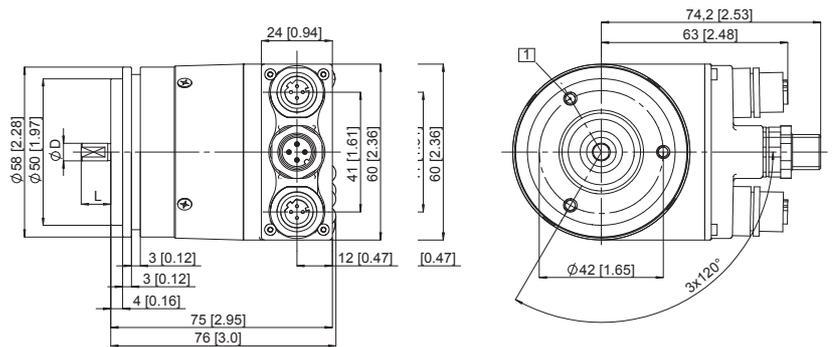


Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

- 1 3 x M4, 6 [0.24] deep

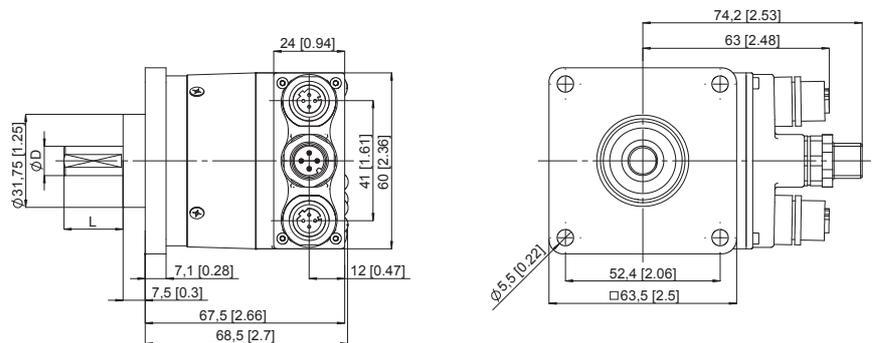
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



Square flange, \square 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



Absolute encoders - singleturn

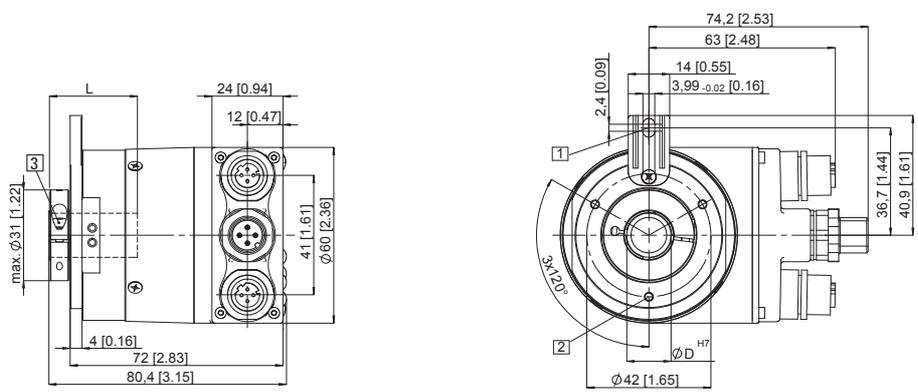
Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	PROFINET IO
-------------------------	--	--------------------

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

Dimensions in mm [inch]

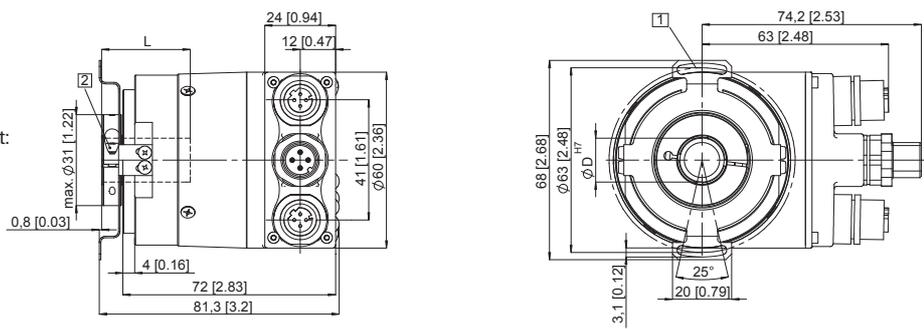
Flange with spring element, long Flange type 1 and 2

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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]



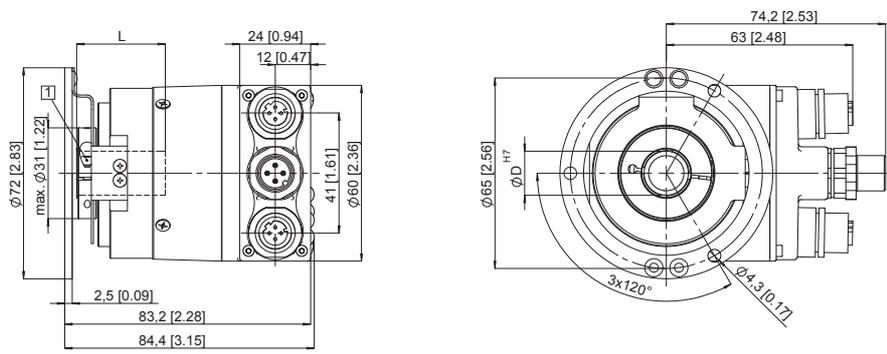
Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

- 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, $\varnothing 65$ [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]



Absolute encoders - singleturn

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



The singleturn encoder 5876 with SSI or parallel interface and optical sensor technology boasts a hollow shaft of up to 12 mm. It offers a maximum resolution of 14 bits, divided over 360°.



Temperature range	Shock / vibration resistant	Short-circuit proof	Reverse polarity protection	Optical sensor

Safe

- A protection level of IP67 as well as the wide temperature range of -20°C to +80°C allow error-free operation even under the toughest working conditions.
- The stainless-steel (1.4305) housing withstands even the most extreme external influences.

Adaptable

- Available with a choice of M12 connector or as cable version.
- Gray, binary or BCD code for parallel interface.
- Wide range of possible applications thanks to numerous input options.

Order code hollow shaft **8.5876 . XXXXX . XXXX**

Type a b c d e f

- | | | |
|--|--|---|
| <p>a Flange</p> <p>1 = with through hollow shaft, ø 58 mm [2.28"]</p> <p>2 = with blind hollow shaft, ø 58 mm [2.28"]</p> | <p>c Interface / power supply</p> <p>1 = SSI / 5 V DC</p> <p>2 = SSI / 10 ... 30 V DC</p> <p>3 = parallel / 5 V DC</p> <p>4 = parallel / 10 ... 30 V DC</p> | <p>e Code type and division</p> <p>see table 1 (at interface 3 and 4, parallel)</p> <p>see table 2 (at interface 1 and 2, SSI)</p> |
| <p>b Hollow shaft</p> <p>6 = ø 10 mm [0.39"]</p> <p>8 = ø 12 mm [0.47"]</p> | <p>d Type of connection</p> <p>1 = radial cable, 1 m [3.28] PVC</p> <p>2 = radial M12 connector, 8-pin, without mating connector ¹⁾</p> | <p>f Options</p> <p>2 = SET and V/R</p> <p>3 = SET and Latch ²⁾</p> <p>4 = V/R and Latch ²⁾</p> <p style="text-align: right; font-size: small;"><i>Optional on request</i></p> <p style="text-align: right; font-size: small;">- Ex 2/22</p> |

Table 1: Code type and divisions for encoders with parallel output

Division	Interface and power supply, version 3 or 4 (parallel)																			
	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
Mass moment of inertia	approx. 6×10^{-6} kgm ²
Starting torque - at 20°C [68°F]	< 0.05 Nm
Weight	approx. 0.6 kg [21.16 oz]
Protection acc. to EN 60529	IP67

Working temperature range	-20°C ... +80°C ²⁾ [-4°F ... +176°F] ²⁾
Material	shaft / housing stainless steel
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz

Electrical characteristics

Interface type	Synchronous serial (SSI)	Synchronous serial (SSI)	Parallel	Parallel
Power supply (+V)	5 V DC (±5 %)	10 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC
Output driver	RS485	RS485	Push-Pull	Push-Pull
Power consumption (no load)	typ. 89 mA max. 138 mA	89 mA 138 mA	109 mA 169 mA	109 mA 169 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 10 mA	max. +/- 10 mA
Update rate	max. 15000/s	max. 15000/s	40000/s	40000/s
SSI clock rate min./max.	100 kHz / 500 kHz	100 kHz / 500 kHz	–	–
Signal level HIGH	typ. 3.8 V	typ. 3.8 V	min. 3.4 V	min. V+ - 2.8 V
Signal level LOW	(I _{Load} = 20 mA) typ. 1.3 V (I _{Load} = 10 mA) – (I _{Load} = 1 mA) –	typ. 1.3 V – –	– max. 1.5 V max. 0.3 V	– max. 1.8 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			

Absolute encoders
singleturn

Control inputs

Switching levels of the control inputs

Power supply	5 V DC	10 ... 30 V DC
Switching level	LOW ≤ 1.7 V HIGH ≥ 3.4 V	≤ 4.5 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.

Absolute encoders - singleturn

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

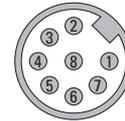
Terminal assignment

SSI interface

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)									
		Signal	0V	+V	C+	C-	D+	D-	ST	VR	
1, 2	1	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	
		Pin:	1	2	3	4	5	6	7	8	

Interface	Type of connection	M12 connector, 8-pin									
		Signal	0V	+V	C+	C-	D+	D-	ST	VR	
1, 2	2	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)																			
		Signal	0V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	ST/VR	VR/LH	14	⊥
3, 4	1	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY	RD	WH	BN	WH	YE	WH	GY	PH
													PK	BU	GN	GN	YE	BN	GY	BN	

- +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

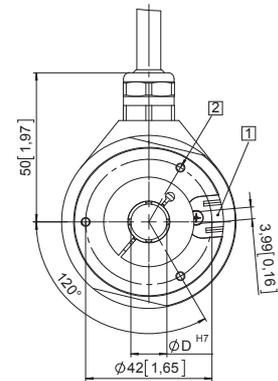
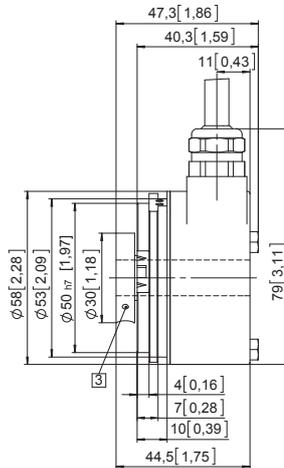
Standard stainless steel, optical	5876 (hollow shaft)	SSI, parallel
--	----------------------------	----------------------

Dimensions

Dimensions in mm [inch]

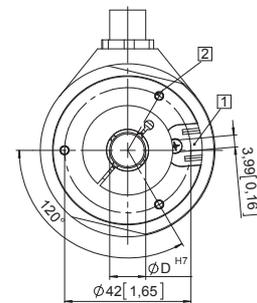
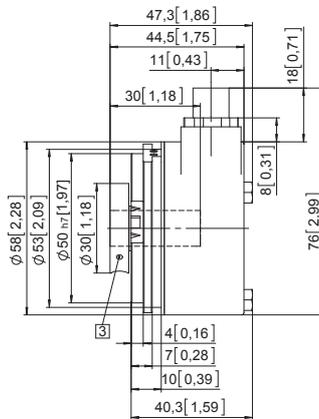
Flange with through hollow shaft, ø 58 [2.28"] Flange type 1

- 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



Absolute encoders singleturn

Absolute encoders - singleturn

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.



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

8.7053 . 1 X 2 X . X X 2 1 . XXXX

Shaft version

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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 AISiMgMn (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.

Absolute encoders - singleturn

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)											
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊕	⊖
2	1, 2, A, B	SET, DIR	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

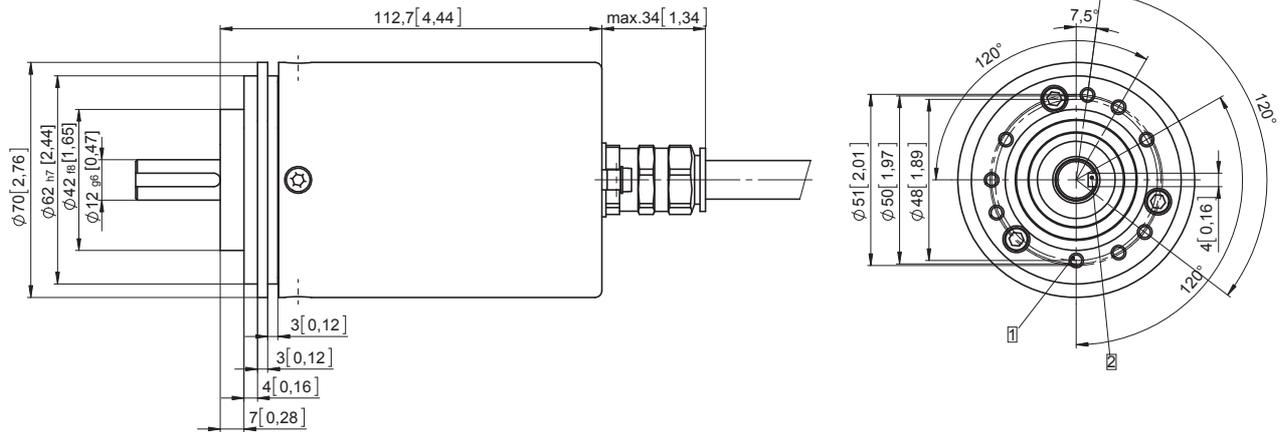
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

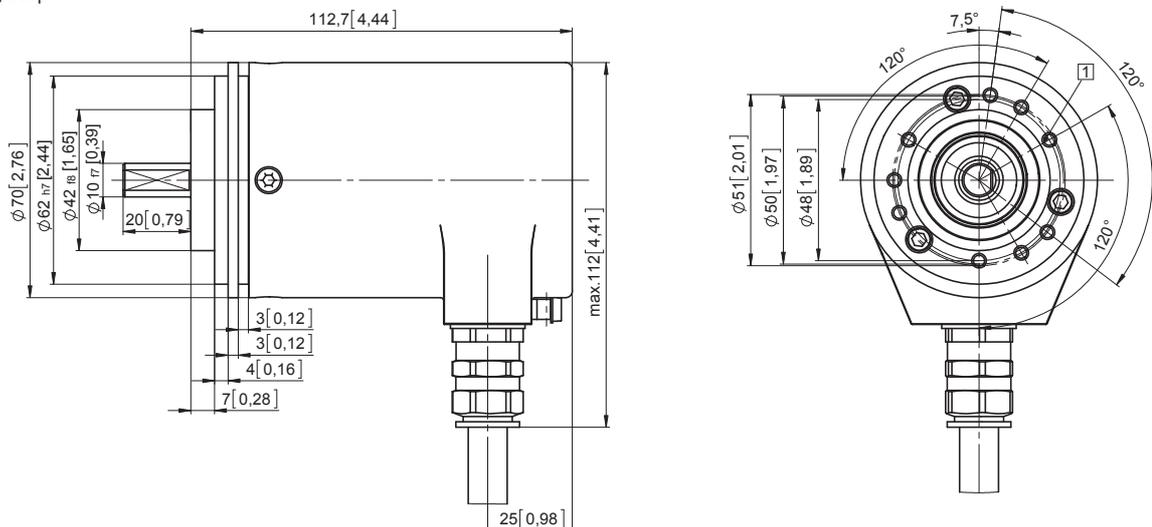
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



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.



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).

Absolute encoders
singleturn

Order code	8.7053FS2	1	X	4	X	X	X	2	1	XXXX
Shaft version	Type	a	b	c	d	e	f	g	h	i ¹⁾

- a** Flange
1 = clamping / synchronous flange, IP67, \varnothing 70 mm [2.76"]
- b** Shaft ($\varnothing \times L$)
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, SIL2/PLd, optical	Sendix SIL 7053FS2 (shaft)	SSI/BiSS + SinCos
Accessory		
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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 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	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 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	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 - singleturn

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:	<ul style="list-style-type: none"> – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±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.	

 Absolute encoders
singleturn

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	A	\bar{A}	B	\bar{B}	\perp	
4	1, 2, A, B	SET	Cable marking:	6	1	2	3	4	5	11	7	8	9	10	shield	

- | | | | |
|---------|---|----------------|------------------|
| +V: | Encoder power supply +V DC | A, \bar{A} : | Cosine signal |
| 0 V: | Encoder power supply ground GND (0 V) | B, \bar{B} : | Sine signal |
| C+, C-: | Clock signal | \perp : | Protective earth |
| D+, D-: | Data signal | | |
| SET: | SET input. The current position becomes defined as position zero. | | |

Absolute encoders - singleturn

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.



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).

Absolute encoders singleturn

Order code	8.7053FS3	. 1 X 4 X . X X 2 1 . XXXX
Shaft version	Type	a b c d e f g h i ¹⁾

- | | | |
|---|--|--|
| <p>a Flange
1 = clamping / synchronous flange, IP67, \varnothing 70 mm [2.76"]</p> <p>b Shaft ($\varnothing \times L$)
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</p> <p>c Interface / power supply
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p> <p>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']</p> | <p>e Code
B = SSI, binary
C = BiSS, binary
G = SSI, gray</p> <p>f Resolution ²⁾
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit</p> | <p>g Inputs / outputs ²⁾
2 = SET input</p> <p>h Options
1 = no option</p> <p>i Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']</p> <p><i>Optional on request</i>
- special cable length
- stainless steel version
- other resolutions</p> |
|---|--|--|

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		
EMC shield terminal	for top-hat rail mounting	Order no. 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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 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	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 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	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.

Absolute encoders - singleturn

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:	<ul style="list-style-type: none"> – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±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.	

 Absolute encoders
singleturn

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	A	\bar{A}	B	\bar{B}	\perp	
4	1, 2, A, B	SET	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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Protective earth

Absolute encoders - singleturn

Standard

ATEX/IECEX – zone 1/21, SIL3/PLe, optical

Sendix SIL 7053FS3 (shaft)

SSI/BiSS + SinCos

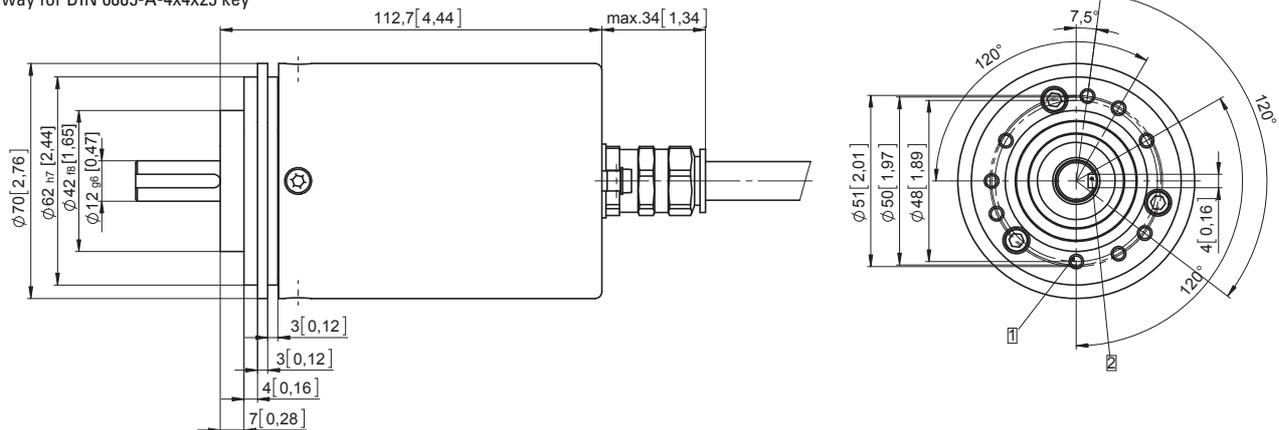
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 1 with axial cable outlet

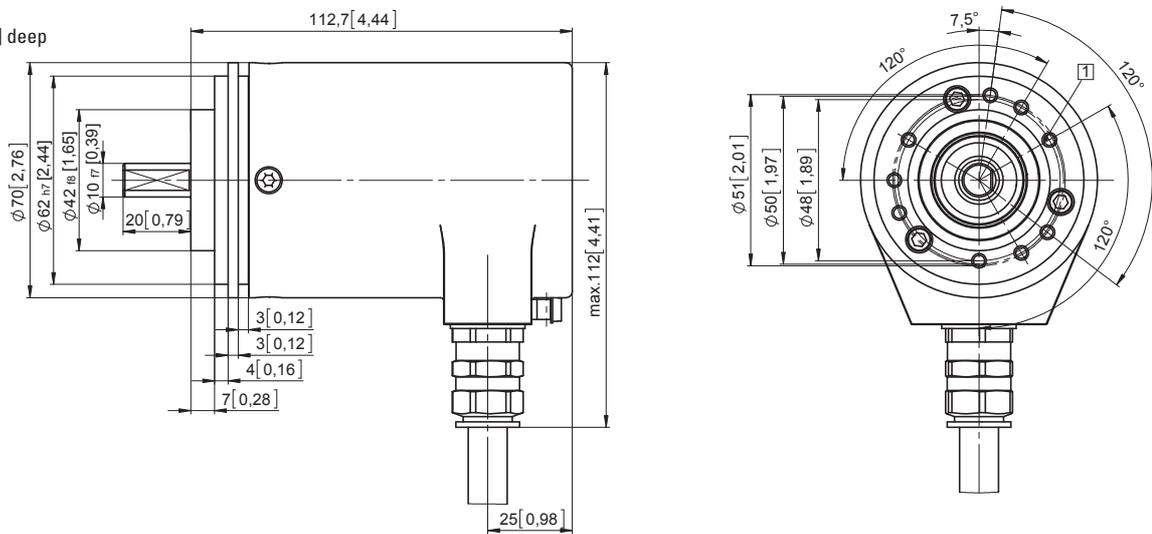
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, \varnothing 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, 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

<h3>Compact and safe</h3> <ul style="list-style-type: none"> • 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). 	<h3>Explosion protection</h3> <ul style="list-style-type: none"> • “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)
<p>a Flange</p> <p>1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p>b Shaft (ø x L)</p> <p>2 = 10 x 20 mm [0.39 x 0.79"], with flat</p> <p>1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p>c Interface / Power supply</p> <p>3 = PROFIBUS DP V0 / 10 ... 30 V DC</p>	<p>d Type of connection</p> <p>1 = axial cable, 2 m [6.56'] PUR</p> <p>2 = radial cable, 2 m [6.56'] PUR</p> <p>A = axial cable, length > 2 m [6.56']</p> <p>B = radial cable, length > 2 m [6.56']</p> <p>preferred length see f, e. g.: 0100 = 10 m [32.81']</p> <p>e Fieldbus profile</p> <p>31 = PROFIBUS DP V0 encoder profile class 2</p>	<p>f Cable length in dm 1)</p> <p>0050 = 5 m [16.40']</p> <p>0100 = 10 m [32.81']</p> <p>0150 = 15 m [49.21']</p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - 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)	PROFIBUS DP
--	----------------------------	--------------------

Technical data

Explosion protection ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 AWW-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

Absolute encoders - singleturn

Standard	ATEX/IECEX – zone 1/21, optical	Sendix 7058 (shaft)	PROFIBUS DP						
-----------------	--	----------------------------	--------------------	--	--	--	--	--	--

Terminal assignment

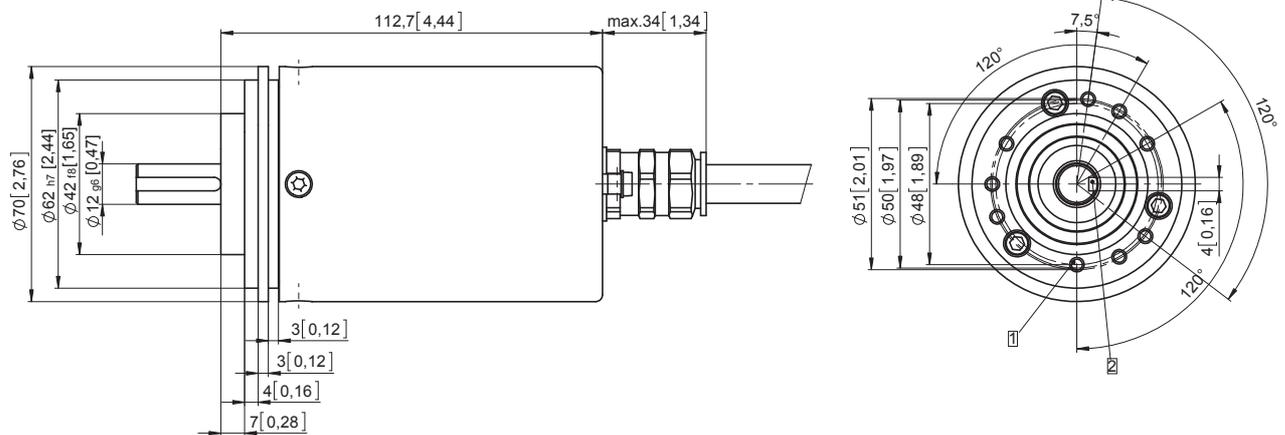
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
		Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_VDC	PB_A OUT	PB_B OUT
3	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

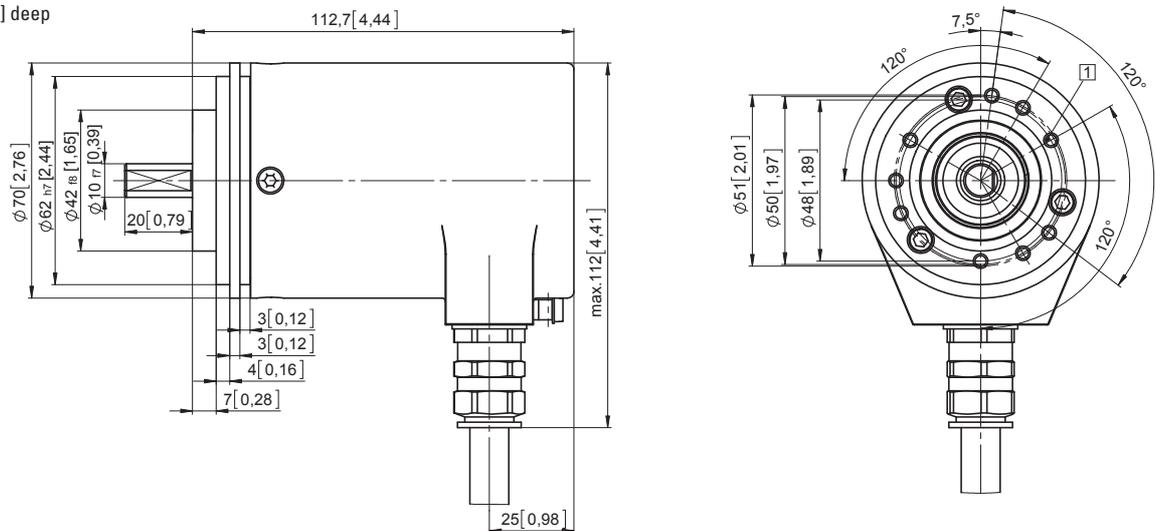
Clamping / synchronous flange, $\varnothing 70$ [2.76] Shaft type 1 with axial cable outlet

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



Clamping / synchronous flange, $\varnothing 70$ [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, 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



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

8.7058 . 1 X 2 X . 21 11 . XXXX

Shaft version

Type **a** **b** **c** **d** **e** **f**¹⁾

a Flange

1 = clamping / synchronous flange, IP67, \varnothing 70 mm [2.76"]

b Shaft ($\varnothing \times L$)

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 dm¹⁾

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 \varnothing 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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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

Absolute encoders
singleturn

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.

Absolute encoders - singleturn

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)								
		Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
2	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

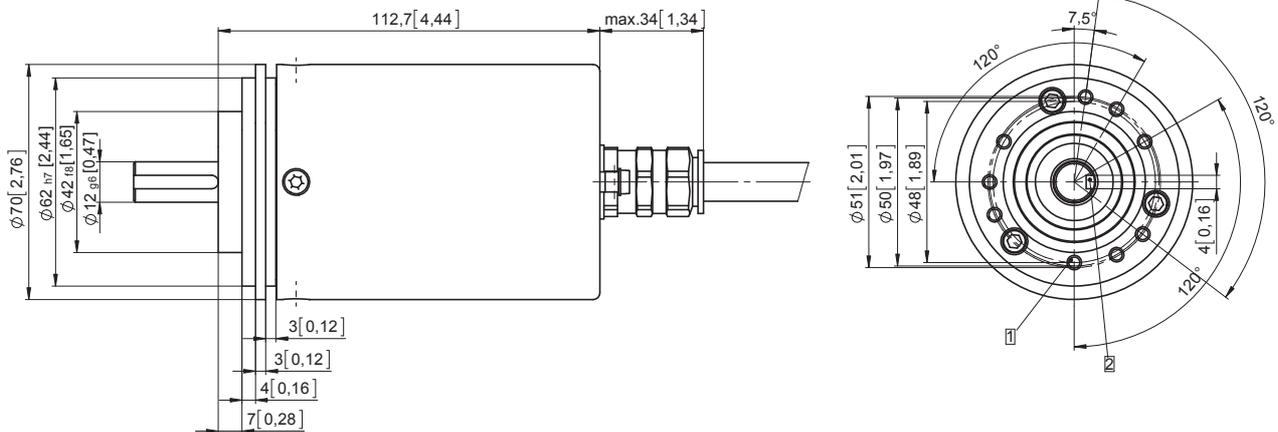
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 1 with axial cable outlet

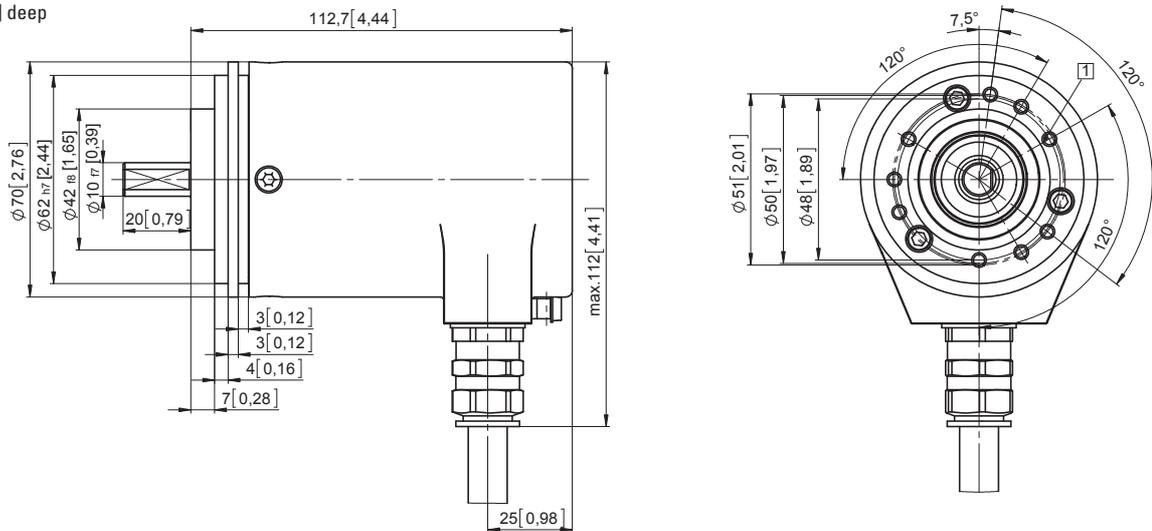
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, \varnothing 70 [2.76]

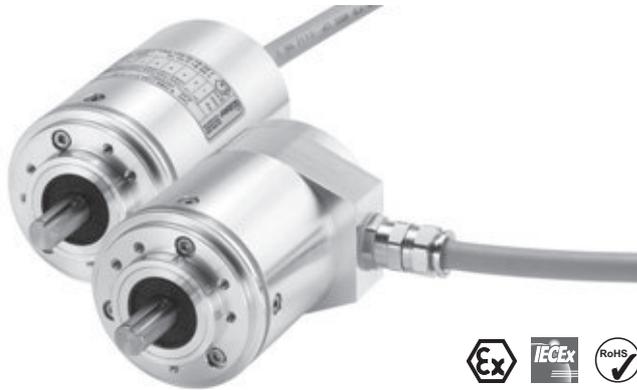
Shaft type 2 with radial cable outlet

- 1 6 x M4, 10 [0.39] deep



Absolute encoders - singleturn

Standard ATEX/IECEX – mining, optical	Sendix 7153 (shaft)	SSI / BiSS
--	----------------------------	-------------------



The Sendix 7153 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with 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.



Absolute encoders
singleturn

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	8.7153	2	X	2	X	X	X	2	1	XXXX
Shaft version	Type	a	b	c	d	e	f	g	h	i ¹⁾

- | | | |
|---|--|---|
| <p>a Flange
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p>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</p> <p>c Interface / power supply
2 = SSI, BiSS / 10 ... 30 V DC</p> <p>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']</p> | <p>e Code
B = SSI, binary
C = BiSS, binary
G = SSI, gray</p> <p>f Resolution ²⁾
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit</p> | <p>g Inputs / outputs ²⁾
2 = SET, DIR input
additional status output</p> <p>h Options
1 = no option</p> <p>i Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']</p> <p style="text-align: right;"><i>Optional on request</i>
- special cable length
- other resolutions</p> |
|---|--|---|

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

Absolute encoders - singleturn

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	⊕ 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. 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: <ul style="list-style-type: none"> - 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.

Absolute encoders - singleturn

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊕	⊖
2	1, 2, A, B	SET, DIR	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

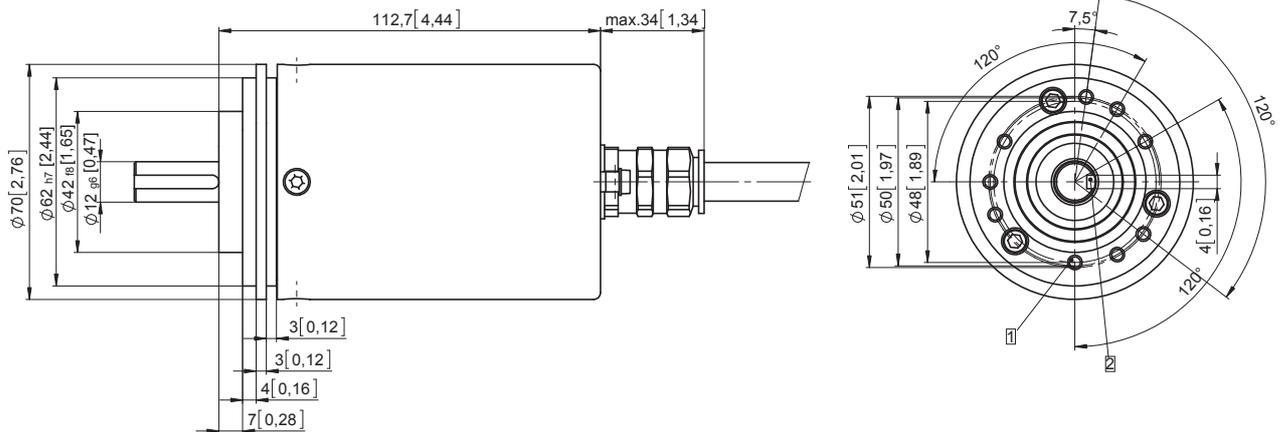
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

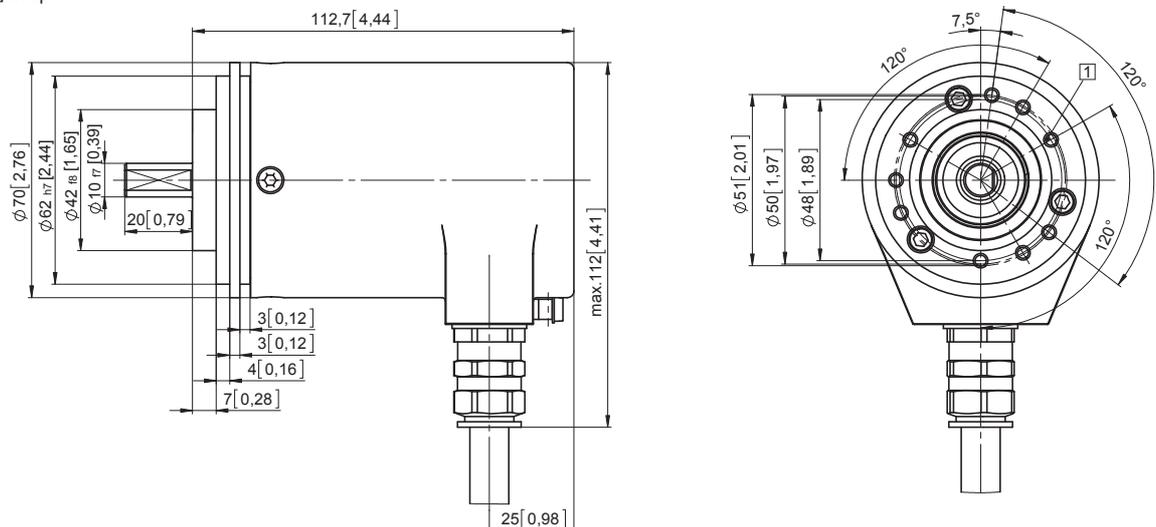
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 6 x M4, 10 [0.39] deep



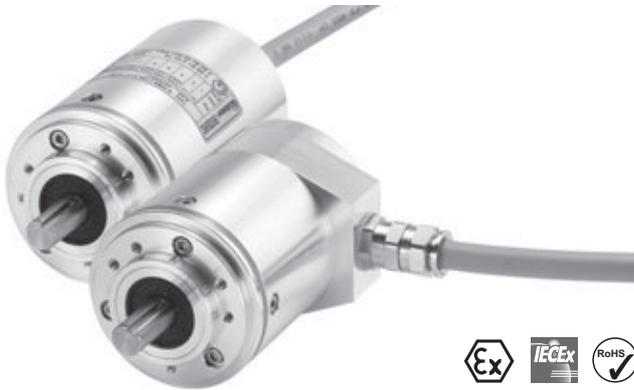
Absolute encoders - singleturn

Standard

ATEX/IECEX – mining, optical

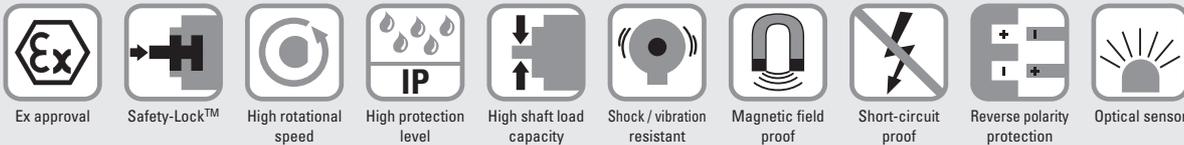
Sendix 7158 (shaft)

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.



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	⊕ 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

Absolute encoders
singleturn

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

Absolute encoders - singleturn

Standard
ATEX/IECEx – mining, optical

Sendix 7158 (shaft)

PROFIBUS DP

Terminal assignment

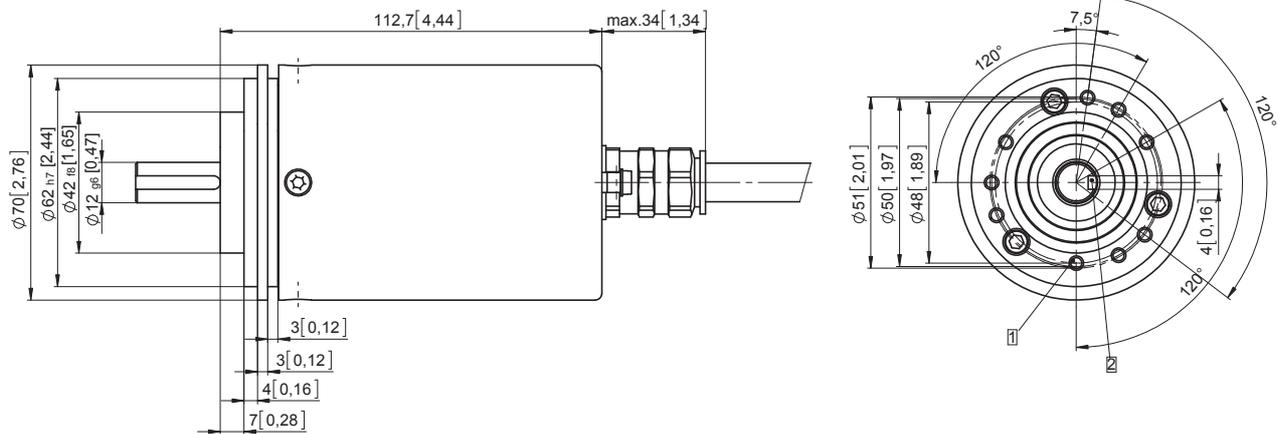
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
		Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_VDC	PB_A OUT	PB_B OUT
3	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

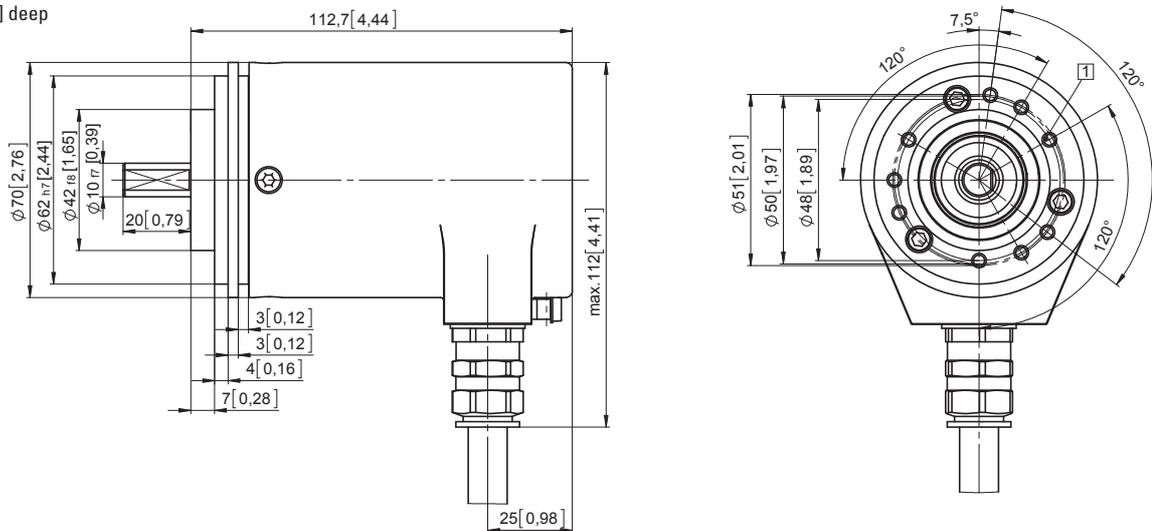
Clamping / synchronous flange, \varnothing 70 [2.76] Shaft type 1 with axial cable outlet

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



Clamping / synchronous flange, \varnothing 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.



Absolute encoders
singleturn

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'] <i>Optional on request - special cable length</i>

1) Not applicable with connection types 1 and 2.

Absolute encoders - singleturn

Standard ATEX/IECEX – mining, optical	Sendix 7158 (shaft)	CANopen
---	----------------------------	----------------

Technical data

Explosion protection ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	⊕ 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.

Absolute encoders - singleturn

Standard	Sendix 7158 (shaft)	CANopen
ATEX/IECEX – mining, optical		

Terminal assignment

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

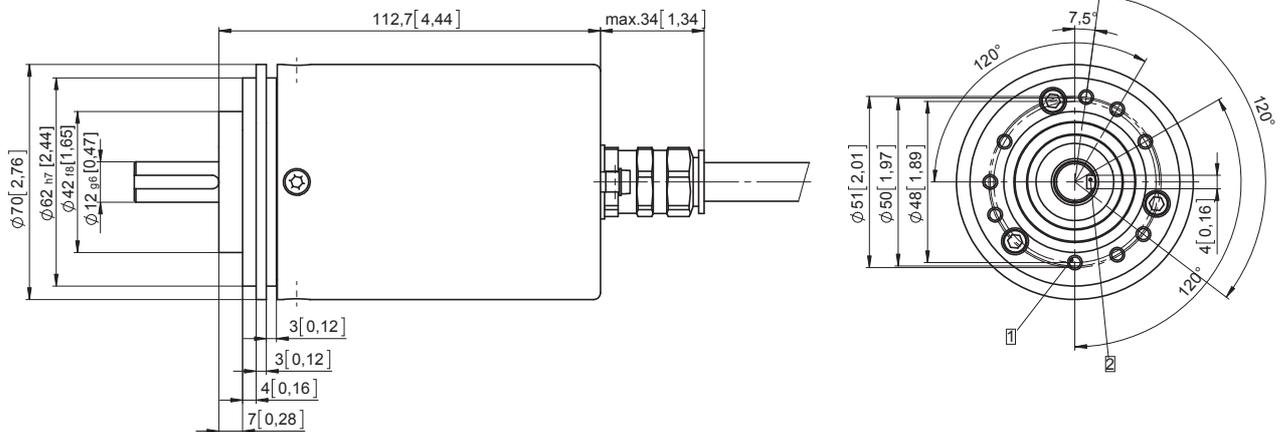
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 1 with axial cable outlet

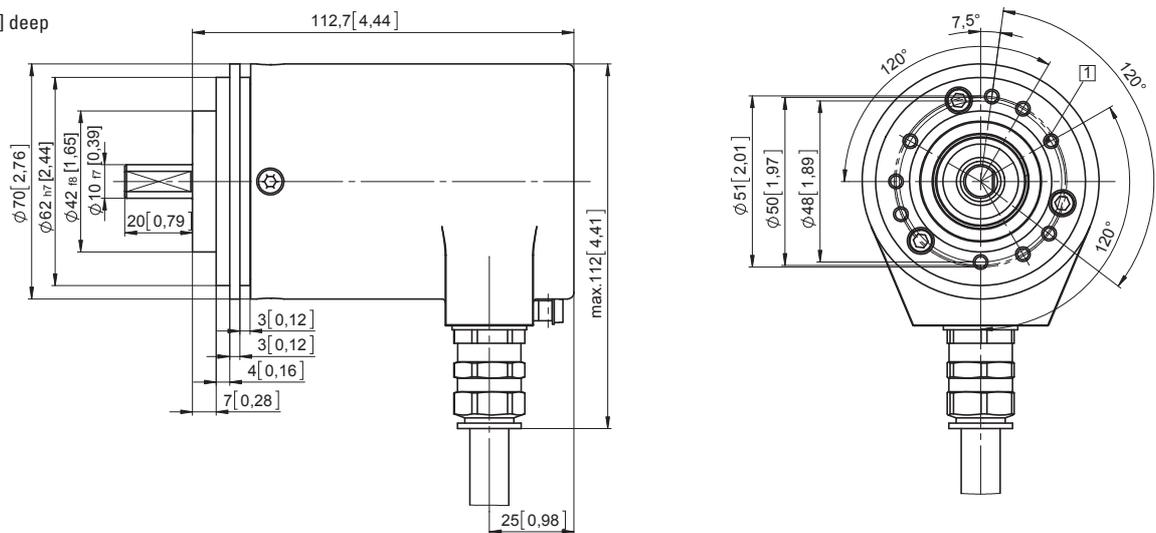
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, \varnothing 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: xxxxxxxxxxx



Kübler

Fritz Kübler GmbH
Made in Germany
www.kuebler.com

GND	+V	AC
WH	BN	GN
DIR	SET	
RD	BU	

Absolute encoders – multiturn

Series	Type	Interface	Page
Compact, magnetic	 Electronic multiturn	Sendix M3661 / M3681 (shaft / hollow shaft)	analogue 260
	 Electronic multiturn	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI 266
	 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
	 Electronic multiturn	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS 306
	 Electronic multiturn	Sendix F5868 / F5888 (shaft / hollow shaft)	CANopen 312
	 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
	 ATEX/IECEX, SIL2/PLd, mech. multiturn	Sendix SIL 7063FS2 (shaft)	SSI / BiSS + SinCos 351
	 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
	 ATEX/IECEX, mech. multiturn, mining	Sendix 7163 (shaft)	SSI / BiSS + SinCos 365
	 ATEX/IECEX, mech. multiturn, mining	Sendix 7168 (shaft)	PROFIBUS DP 368
	 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

Absolute encoders – multiturn

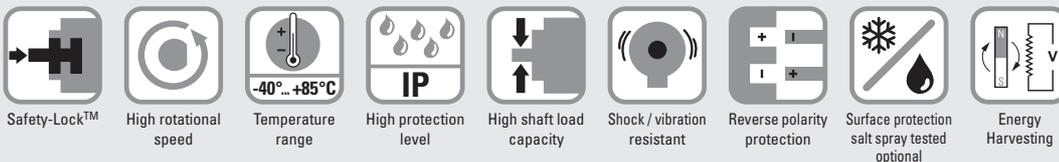
Compact electronic multiturn, magnetic

Sendix M3661 / M3681 (shaft / hollow shaft)

Analogue



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.



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 . **XX****XX** . **XX****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.



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 Type	<table border="1" style="font-size: small; text-align: center;"> <tr> <td style="border: none;">.</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">.</td> <td style="border: none;">X</td> <td style="border: none;">X</td> <td style="border: none;">1</td> <td style="border: none;">2</td> </tr> <tr> <td style="border: none;">a</td> <td style="border: none;">b</td> <td style="border: none;">c</td> <td style="border: none;">d</td> <td style="border: none;">e</td> <td style="border: none;">f</td> <td style="border: none;"></td> <td style="border: none;"></td> <td style="border: none;"></td> <td style="border: none;"></td> </tr> </table>	.	X	X	X	X	.	X	X	1	2	a	b	c	d	e	f					<p>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.</p>
.	X	X	X	X	.	X	X	1	2														
a	b	c	d	e	f																		
<p>a Flange <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u> 3 = with spring element, long, IP65 5 = with stator coupling, IP67, ø 46 mm [1.81"] 6 = with spring element, long, IP67</p> <p>b Blind hollow shaft 1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"]</u> 2 = ø 1/4"</p>		<p>c Output circuit ²⁾ <u>3 = current output</u> <u>4 = voltage output</u></p> <p>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 <u>4 = radial M12 connector</u></p> <p>*) 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)</p>																					
<p>e Interface / resolution / power supply <u>3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC</u> <u>4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC</u> 5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC</p> <p>f Resolution ST + MT / count direction <u>1 = 12 bit + 4 bit / cw</u> 2 = 12 bit + 4 bit / ccw 3 = scalable with limit switch function 4 = scalable without limit switch function</p> <p style="text-align: right; font-size: x-small;"><i>Optional on request</i> - Ex 2/22 (only for connection types 3 and 4) - surface protection salt spray tested</p>																							

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 6000 min ⁻¹ without shaft seal (IP65) 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	
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".

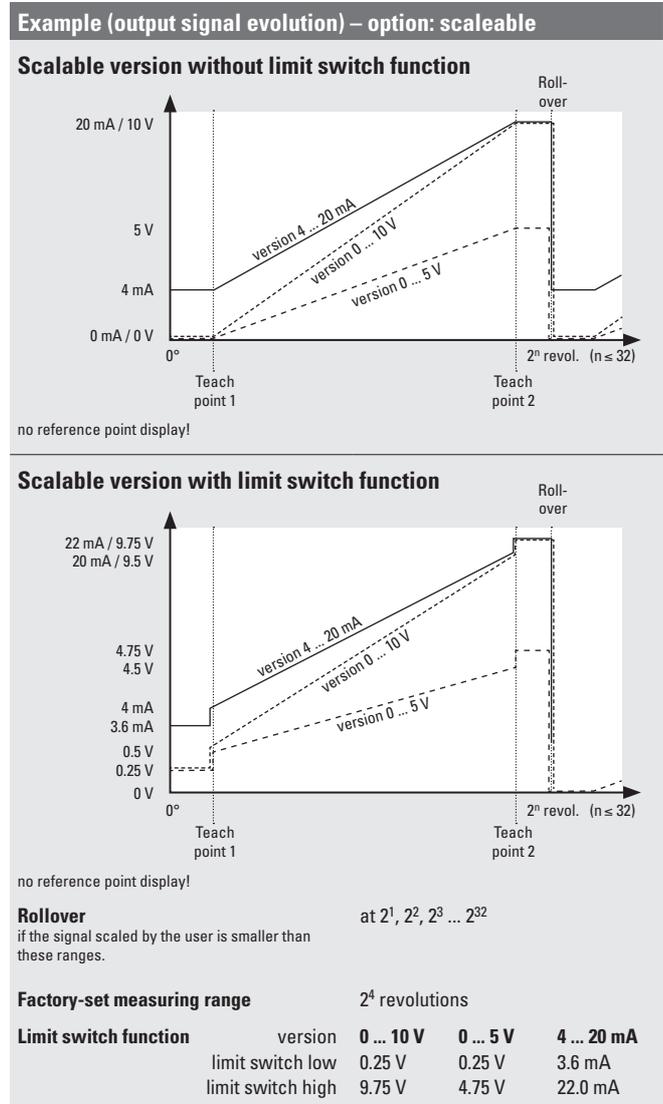
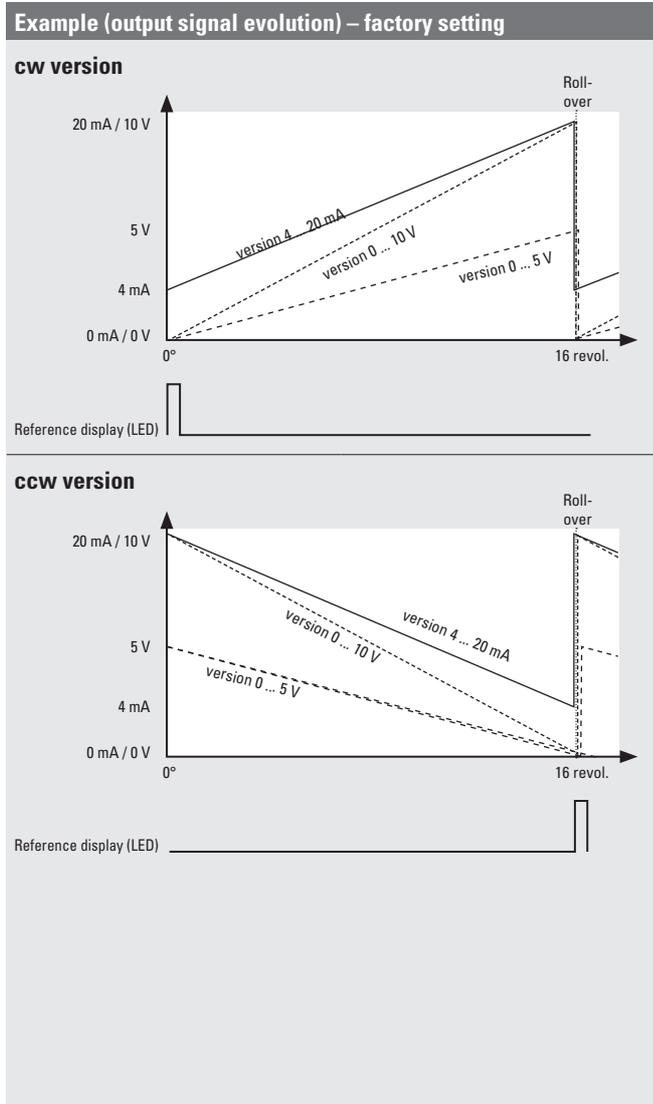
Absolute encoders – multiturn

Compact electronic multiturn, magnetic		Sendix M3661 / M3681 (shaft / hollow shaft)	Analogue
Electrical characteristics current interface 4 ... 20 mA		Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V	
Power supply	10 ... 30 V DC	Power supply	output 0 ... 5 V 10 ... 30 V DC output 0 ... 10 V 15 ... 30 V DC
Current consumption (no load)	max. 30 mA	Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes	Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ¹⁾	Short-circuit proof outputs	yes ¹⁾
Measuring range	factory setting 2 ⁴ revolutions optionally scalable up to 2 ¹⁶ revolutions	Measuring range	factory setting 2 ⁴ revolutions optionally scalable up to 2 ¹⁶ revolutions
Resolution	12 bit	Resolution	0 ... 10 V 12 bit 0 ... 5 V 11 bit
Absolute accuracy ²⁾	±1°	Absolute accuracy ²⁾	±1°
Repeat accuracy	±0.2°	Repeat accuracy	±0.2°
Output load	at 10 V DC max. 200 Ohm at 24 V DC max. 900 Ohm	Current output	max. 10 mA
Setting time	< 1 ms, R _{Last} = 400 Ohm, 25°C [77°F]	Setting time	< 1 ms, R _{Last} = 400 Ohm, 25°C [77°F]
LEDs (green/red)	<ul style="list-style-type: none"> - 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 	LEDs (green/red)	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function 	Options	<ul style="list-style-type: none"> - 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.	Teach inputs	level = +V for 1 s min.
PowerON Time	< 1 s	PowerON Time	< 1 s
Update rate	1 ms	Update rate	1 ms
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)	e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	pending	UL approval	pending
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU	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.

Absolute encoders – multitrurn

Compact electronic multitrurn, magnetic	Sendix M3661 / M3681 (shaft / hollow shaft)	Analogue
--	--	-----------------



Absolute encoders multitrurn

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

Top view of mating side, male contact base



M12 connector, 5-pin

+V : encoder power supply +V DC +U : voltage SET 1 : set input for teachpoint 1
 0 V : encoder power supply ground GND (0 V) +I : current SET 2 : set input for teachpoint 2

1) For scalable version.

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3661 / M3681 (shaft / hollow shaft)	Analogue
---	--	-----------------

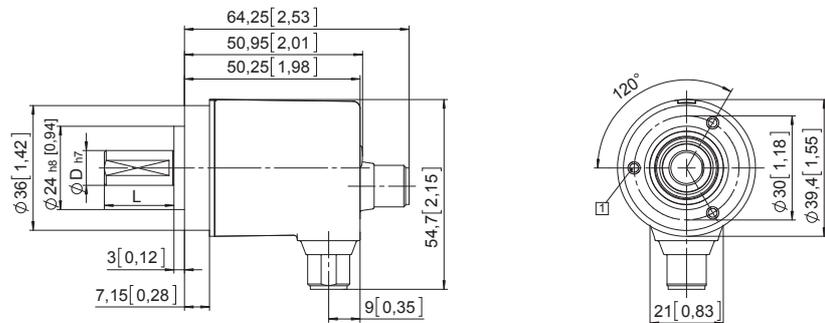
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 36 [1.42]

Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep

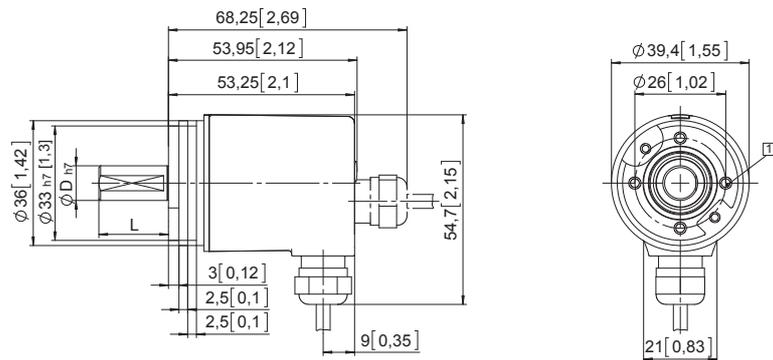


D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7

Synchro flange, \varnothing 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

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3661 / M3681 (shaft / hollow shaft)	Analogue
---	--	-----------------

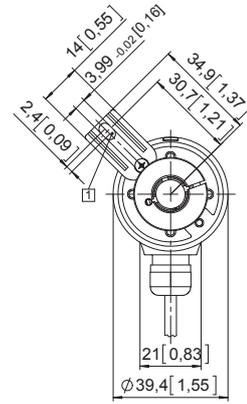
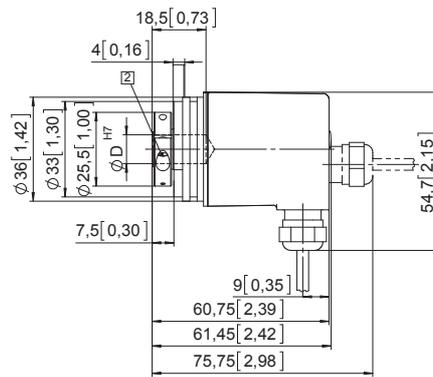
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 3 and 6

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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]

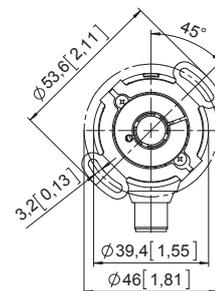
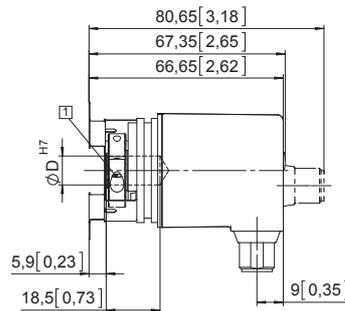


Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, $\varnothing 46$ [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]

Absolute encoders
multiturn

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI
---	--	------------

Order code Hollow shaft ¹⁾	8.M3683 Type	.XX2X.XXX2 a b c d e f g	If for each parameter of an encoder the <u>underlined preferred option</u> 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.
a Flange	d Type of connection	f Resolution (singleturn)	
<u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u> 3 = with spring element, long, IP65 5 = with stator coupling, IP67, ø 46 mm [1.81"] 6 = with spring element, long, IP67	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 <u>4 = radial M12 connector</u>	A = 10 bit ST 2 = 12 bit ST <u>3 = 13 bit ST</u> 4 = 14 bit ST	
b Blind hollow shaft	*) 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)	g Resolution (multiturn)	
1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"]</u> 2 = ø 1/4"		<u>2 = 12 bit MT</u> 6 = 16 bit MT A = 20 bit MT 4 = 24 bit MT	
c Interface / power supply	e Code	<i>Optional on request</i> - Ex 2/22 (only for connection types 3 and 4) - surface protection salt spray tested	
<u>2 = SSI / 10 ... 30 V DC</u>	B = SSI, binary <u>G = SSI, gray</u>		

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 6000 min ⁻¹ without shaft seal (IP65) 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.

Absolute encoders – multiturn

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
Absolute accuracy ²⁾	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 24 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
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)									
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥
2	1, 2, A, B	SET, DIR	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	shield
Interface	Type of connection	Features	M12 connector, 8-pin									
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥
2	3, 4	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.

Absolute encoders – multiturn

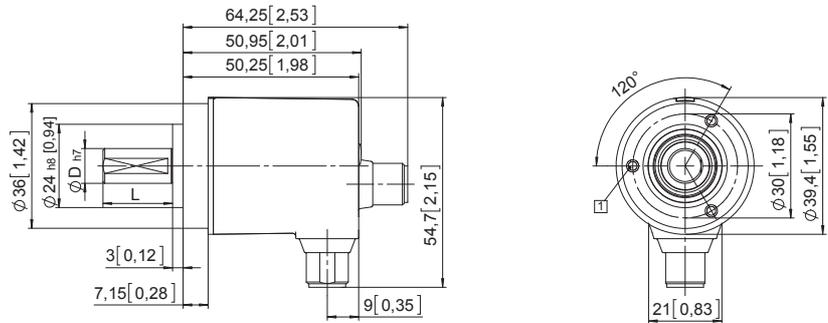
Compact electronic multiturn, magnetic	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI
---	--	------------

Dimensions shaft version

Dimensions in mm [inch]

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

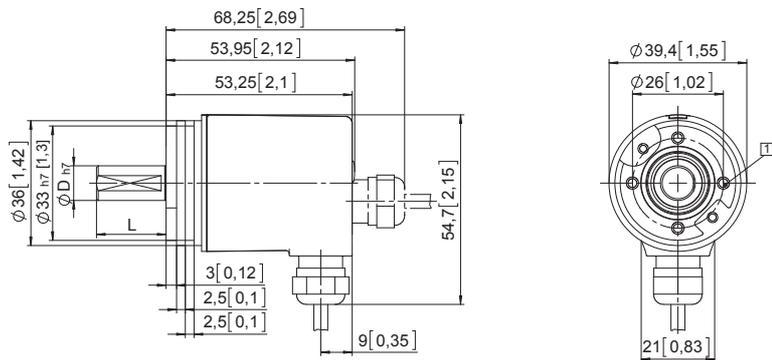
- 1 3 x M3, 6 [0.24] deep



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, \varnothing 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

Absolute encoders
multiturn

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI
---	--	------------

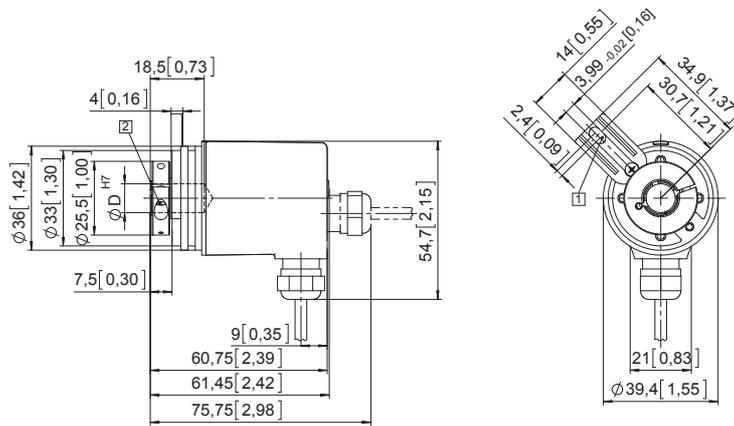
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 3 and 6

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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]

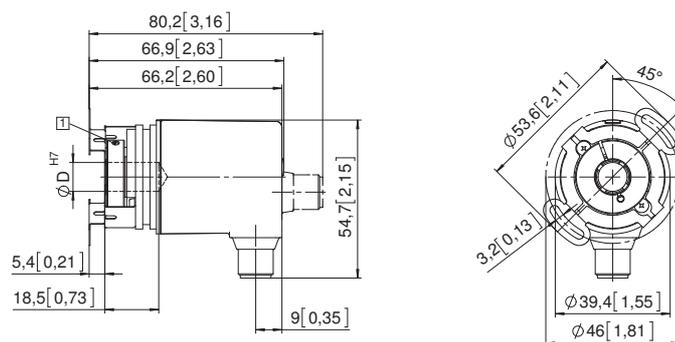


Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, $\varnothing 46$ [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]

Absolute encoders – multiturn

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.



Safety-Lock™	High rotational speed	Temperature range -40°C ... +85°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Reverse polarity protection	Surface protection salt spray-tested optional	Energy Harvesting

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Up-to-the-minute fieldbus performance

- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- Configuration management (bootloader).

Absolute encoders multiturn

Order code	8.M3668	.XX2X.2122	If for each parameter of an encoder the <u>underlined preferred option</u> 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.	
Shaft version ¹⁾	Typ	a b c d e		

- 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.

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3668 / M3688 (shaft / hollow shaft)	CANopen
---	--	----------------

Order code Hollow shaft ¹⁾	8.M3688 Type	.XX2X a b c d e	.2122 e	If for each parameter of an encoder the <u>underlined preferred option</u> 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.	
a Flange <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u> 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"] <u>4 = ø 10 mm [0.39"]</u> 2 = ø 1/4"	c Interface / power supply <u>2 = CANopen DS301 V4.2 / 10 ... 30 V DC</u>	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 <u>4 = radial M12 connector</u>	e Fieldbus profile <u>21 = CANopen encoder profil DS406 V4.0</u>	<i>Optional on request</i> - Ex 2/22 (only for connection types 3 and 4) - surface protection salt spray tested
*) 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)					

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	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 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)
Absolute accuracy ¹⁾	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 16.777.216 (24 bit) scalable only via the total resolution
Total resolution	1 ... 274.877.906.944 (38 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader

Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object
Bootloader	configuration management CIA DS 302-3

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2, DS305 (LSS) and DS302 (Bootloader) are available.

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

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed, acceleration** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-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.

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3668 / M3688 (shaft / hollow shaft)	CANopen
---	--	----------------

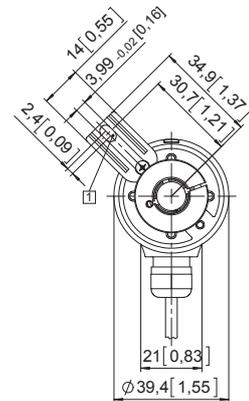
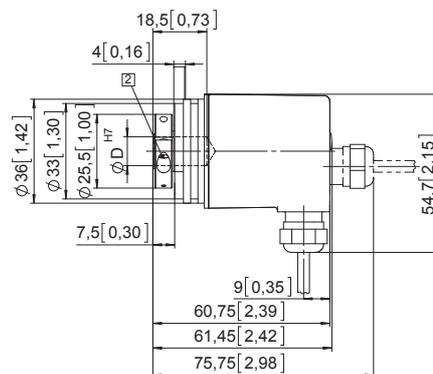
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 3 and 6

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 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]

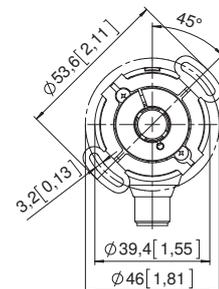
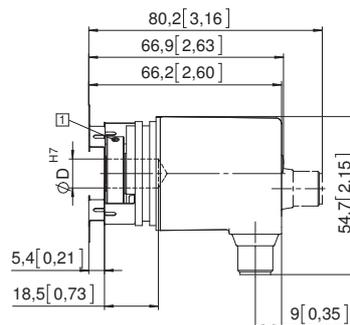


Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, \varnothing 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]

Absolute encoders
multiturn

Absolute encoders – multiturn

Compact electronic multiturn, optical	Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS
--	--	-------------------

Order code	8.F3683	.XXXX.XXX2	If for each parameter of an encoder the <u>underlined preferred option</u> 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.
Hollow shaft	Type	a b c d e f g a b c d e f g	
a Flange	1 = with spring element, short, IP65 3 = with spring element, long, IP65 <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u>	c Interface / power supply	1 = SSI, BiSS / 5 V DC <u>2 = SSI, BiSS / 10 ... 30 V DC</u> 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
b Hollow shaft	1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"], blind hollow shaft</u> 2 = ø 1/4"	d Type of connection	1 = <u>tangential cable, 1 m [3.28'] PUR</u> 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 <u>G = SSI, gray</u>
		f Resolution (singleturn)	A = 10 bit ST 2 = 12 bit ST <u>3 = 13 bit ST</u> 4 = 14 bit ST 7 = 17 bit ST
		g Resolution (multiturn)	<u>2 = 12 bit MT</u> 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) or hollow shaft version	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 ... +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.

Absolute encoders multiturn

Absolute encoders – multiturn

Compact electronic multiturn, optical	Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS
--	--	-------------------

Electrical characteristics	
Power supply	5 V DC ($\pm 5\%$) 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 $I_{Load} = 20\text{ mA}$ 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	$\leq 15\ \mu\text{s}$
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 $\leq 14\text{ bit}$ $\leq 1\ \mu\text{s}$ ST resolution $\geq 15\text{ bit}$ $4\ \mu\text{s}$

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	$< 10\ \mu\text{s}$, depends on the clock rate and the data length
Data refresh rate	$\leq 1\ \mu\text{s}$
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 V _{pp} ($\pm 20\%$)	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	$< 0.5\text{ mA}$
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 $< 1\text{ V}$
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.

Absolute encoders – multiturn

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			
1, 2	5	SET, DIR	M12 connector, 8-pin													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥				
			Pin:	1	2	3	4	5	6	7	8	PH				
3, 4	1, 3, U	SET, DIR, 2048 SinCos	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	⊥
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
5	1, 3, U	SET, DIR, Sensor output	Cable (isolate unused wires individually before initial start-up)													
			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		
6	1, 3, U	2048 SinCos, Sensor output	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	0 V _{sens}	+V _{sens}	A	\bar{A}	B	\bar{B}	⊥
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
7, 8	1, 3, U	2048 incr. RS422	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{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, \bar{A} : Incremental output channel A (cosine)
- B, \bar{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

Absolute encoders – multiturn

**Compact
electronic multiturn, optical**

Sendix F3663 / F3683 (shaft / hollow shaft)

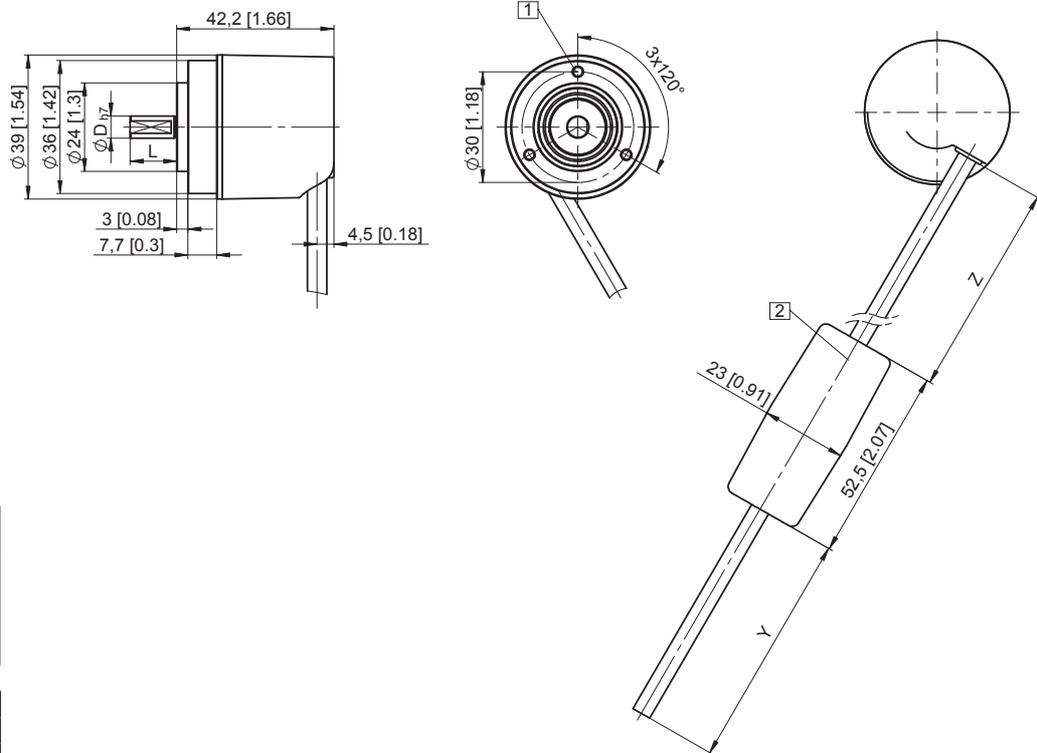
SSI / BiSS

Dimensions shaft version

Dimensions in mm [inch]

**Clamping flange, \varnothing 36 [1.42]
Flange type 1 and 3**

- 1 M3, 6 [0.24] deep
- 2 Battery (in the cable)



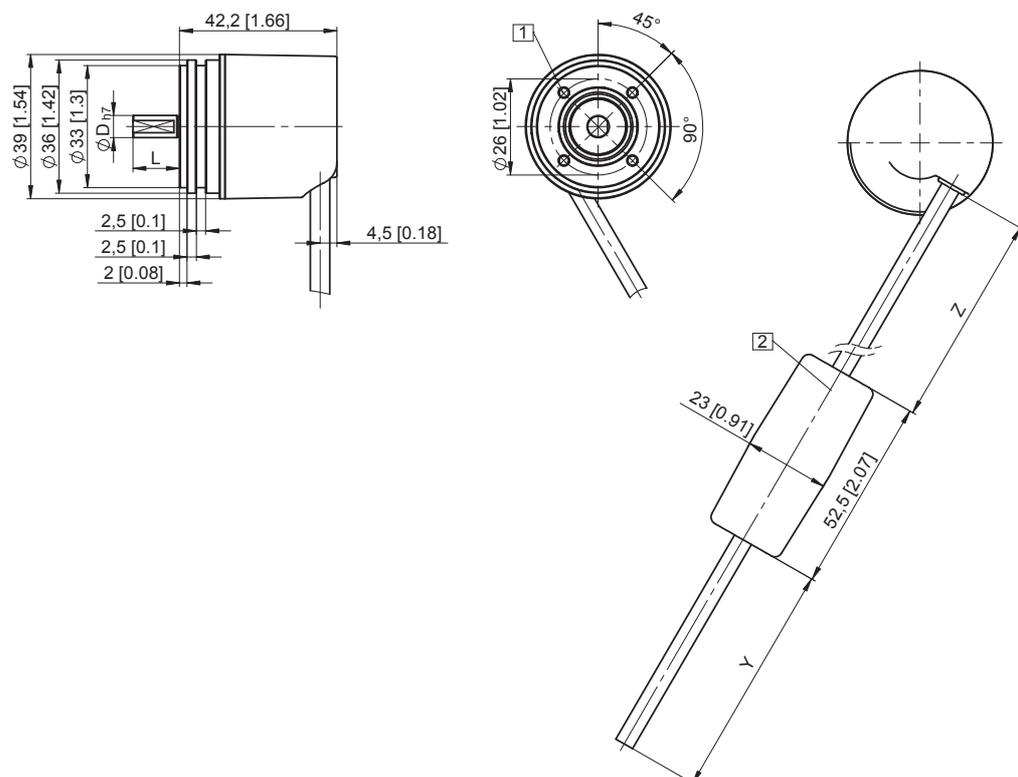
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Synchro flange, \varnothing 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']

Absolute encoders – multiturn

Compact electronic multiturn, optical	Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS
--	--	-------------------

Dimensions hollow shaft version

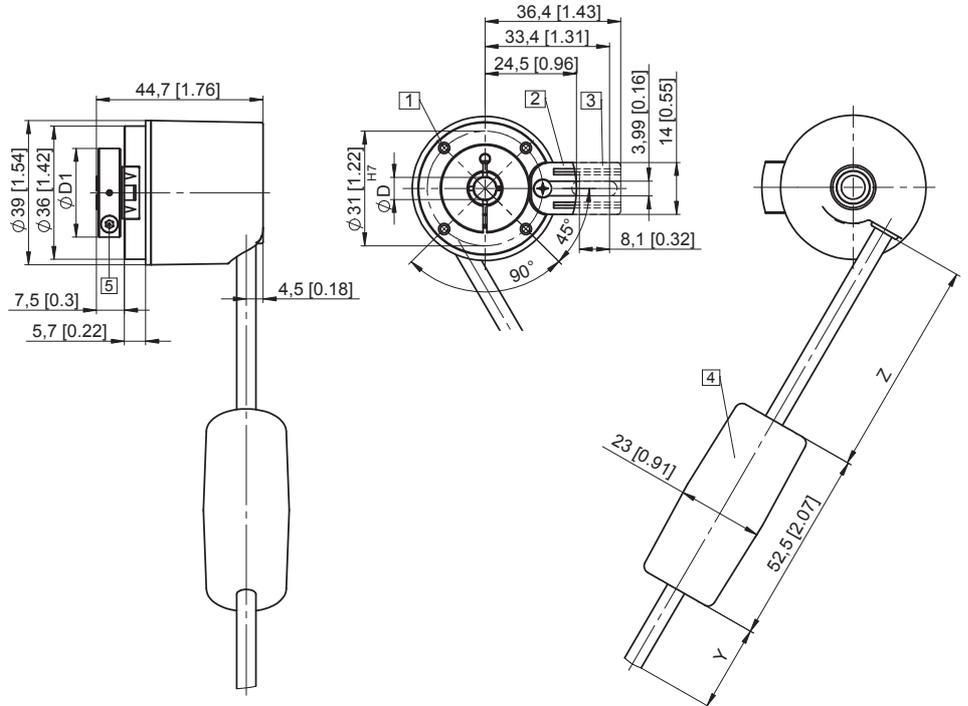
Dimensions in mm [inch]

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, \varnothing 4 [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7, \varnothing 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]

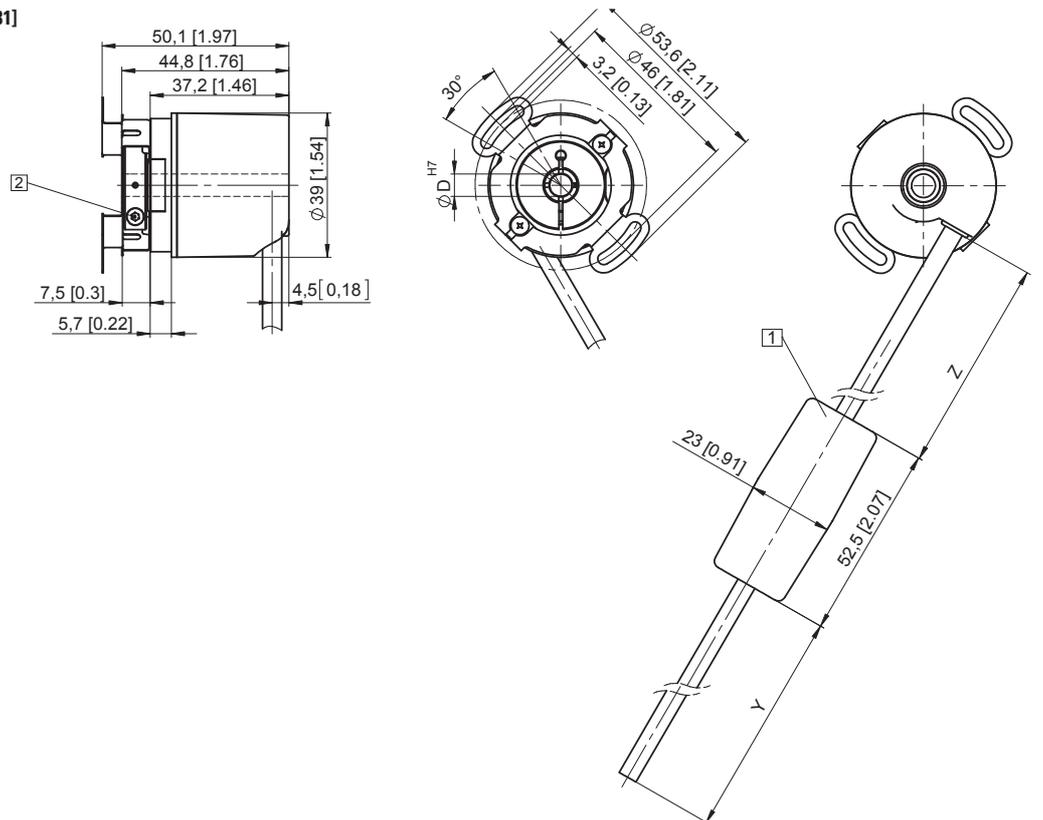
Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, \varnothing 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]

Absolute encoders multiturn

Absolute encoders – multiturn

**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.



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 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.

Order code 8.F3668 . XX2X . 21 22
Shaft version 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.



a Flange

- 1 = clamping flange, IP67, \varnothing 36 mm [1.42"]
- 3 = clamping flange, IP65, \varnothing 36 mm [1.42"]
- 2 = synchro flange, IP67, \varnothing 36 mm [1.42"]
- 4 = synchro flange, IP65, \varnothing 36 mm [1.42"]

b Shaft ($\varnothing \times L$), with flat

- 1 = \varnothing 6 x 12.5 mm [0.24 x 0.49"]
- 3 = \varnothing 8 x 15 mm [0.32 x 0.49"]
- 5 = \varnothing 10 x 20 mm [0.39 x 0.79"]
- 2 = \varnothing 1/4" x 12.5 mm [0.49"]
- 4 = \varnothing 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 8.F3688 . XX2X . 21 22
Hollow shaft 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.



a Flange

- 1 = with spring element, short, IP65
- 3 = with spring element, long, IP65
- 2 = with stator coupling, IP65, \varnothing 46 mm [1.81"]

b Blind hollow shaft

- 5 = \varnothing 6 mm [0.24"]
- 7 = \varnothing 8 mm [0.32"]
- 4 = \varnothing 10 mm [0.39"]
- 6 = \varnothing 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

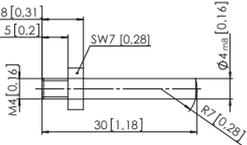
e Fieldbus profile

- 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 \varnothing 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) 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	< 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

Absolute encoders
multiturn

Absolute encoders – multiturn

**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 L_u .

$L_u < 5 \text{ m}$ [16.40'] cable length for 125 Kbit

$L_u < 2 \text{ m}$ [6.56'] cable length for 250 Kbit

$L_u < 1 \text{ m}$ [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)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	1, 3, U	Cable colour:	BN	WH	GY	GN	YE

Absolute encoders – multiturn

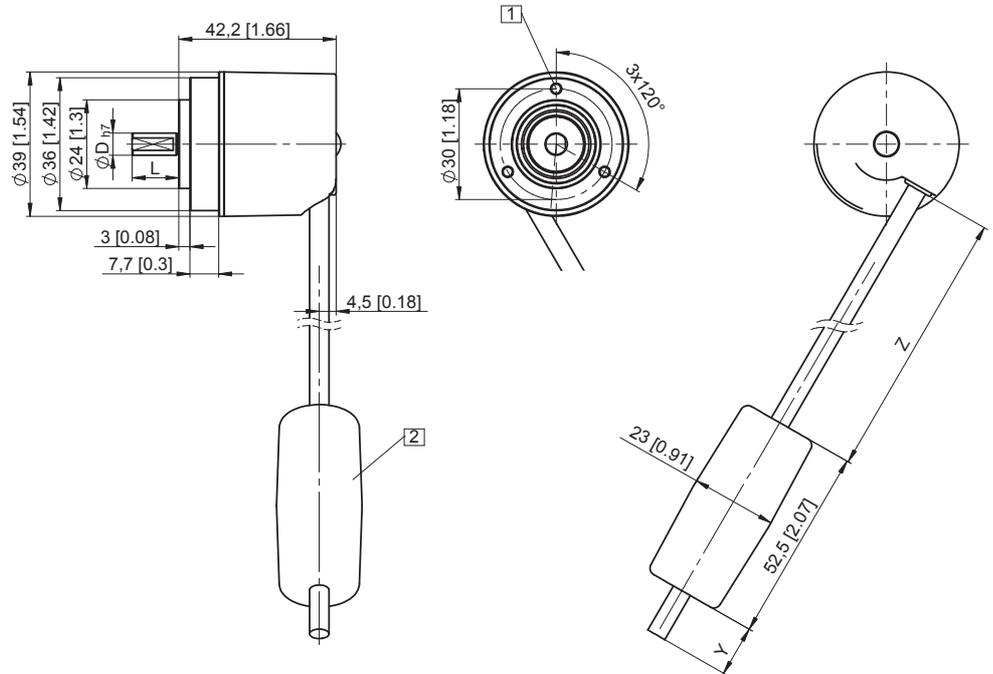
Compact electronic multiturn, optical	Sendix F3668 / F3688 (shaft / hollow shaft)	CANopen
--	--	----------------

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, $\varnothing 36$ [1.42] Flange type 1 and 3

- 1 M3, 6 [0.24] deep
- 2 Battery (in the cable)



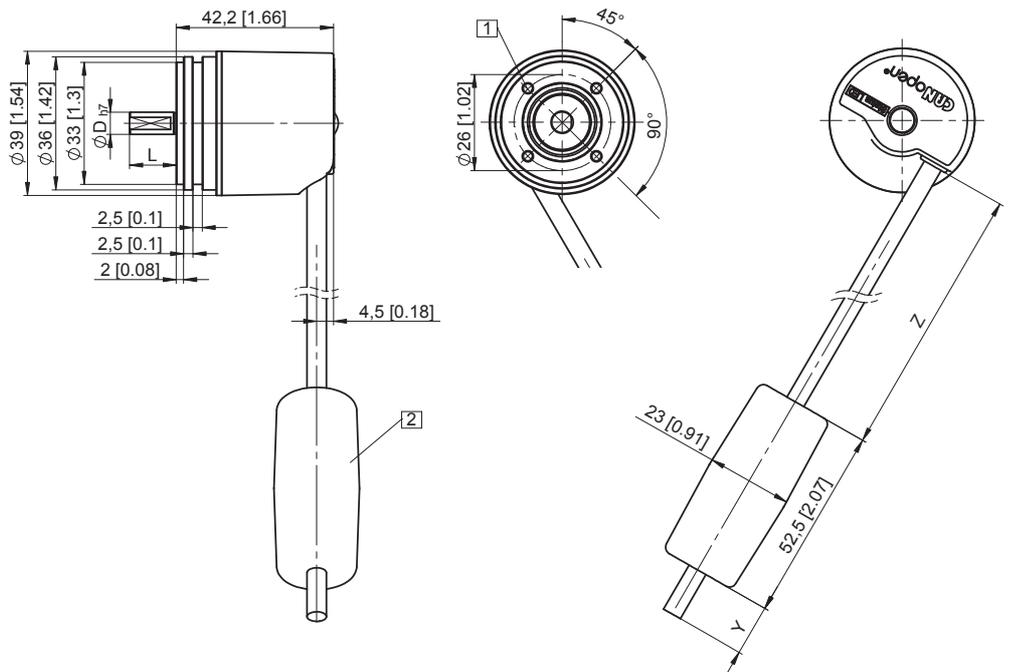
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Synchro flange, $\varnothing 36$ [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']

Absolute encoders
multiturn

Absolute encoders – multiturn

Compact electronic multiturn, optical

Sendix F3668 / F3688 (shaft / hollow shaft)

CANopen

Dimensions hollow shaft version

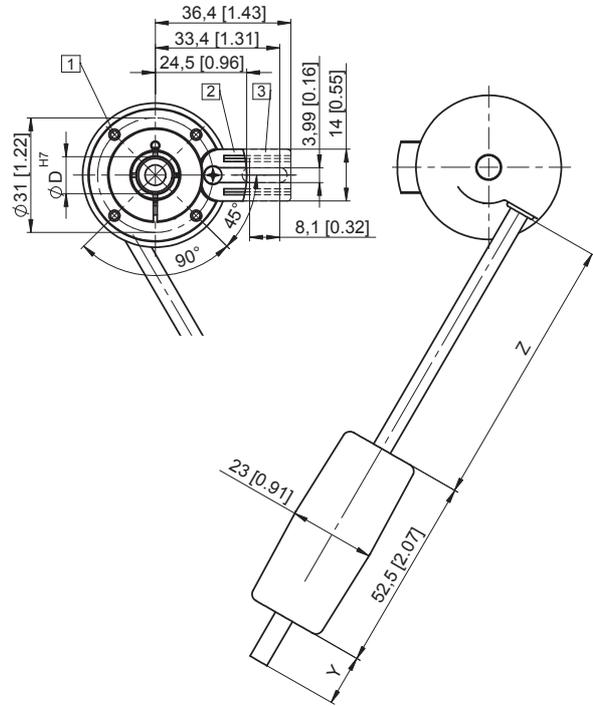
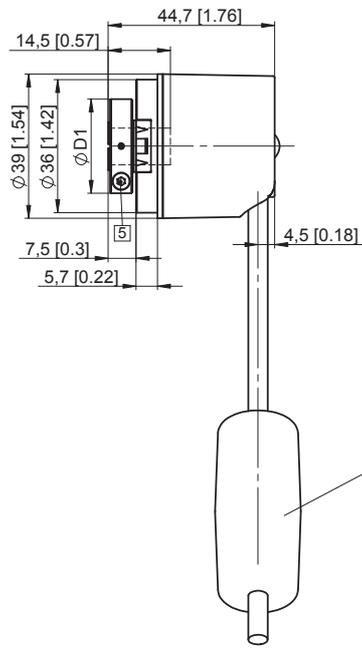
Dimensions in mm [inch]

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, \varnothing 4 [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7, \varnothing 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]

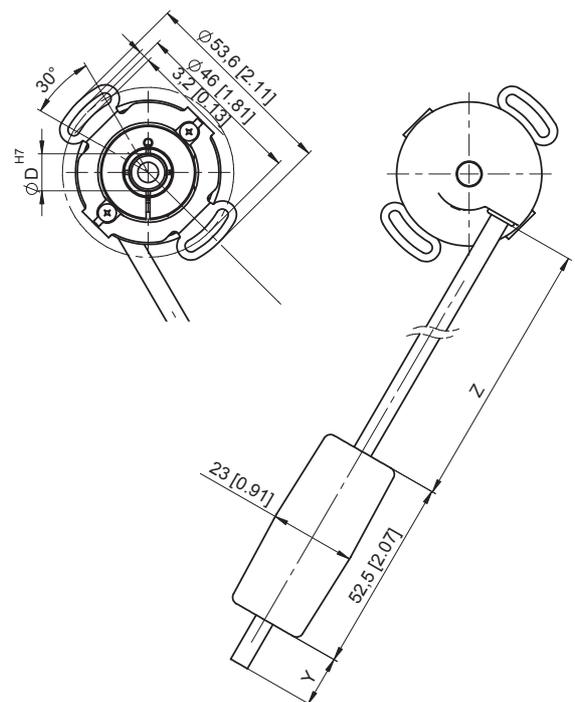
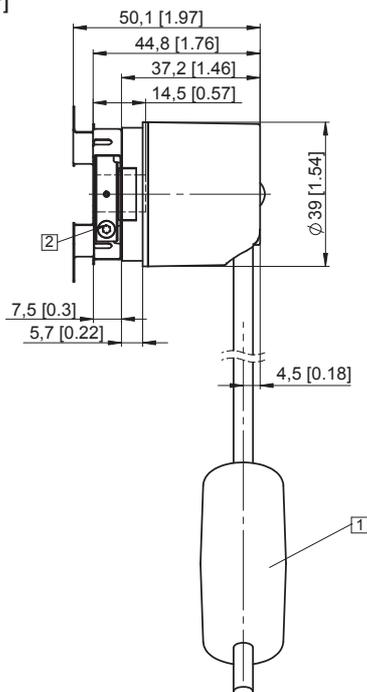
Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, \varnothing 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]

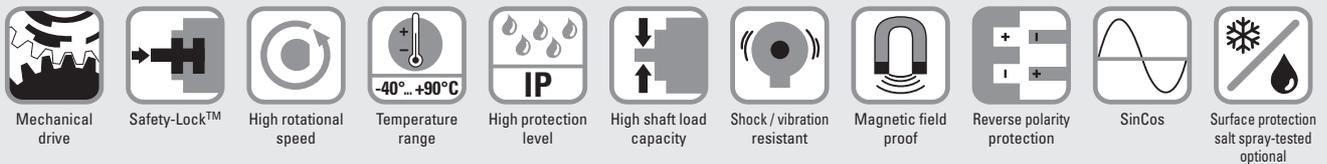
Absolute encoders – multiturn

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.



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.

Absolute encoders multiturn

Order code Shaft version

8.5863	.	<u>X</u> <u>X</u> <u>X</u> <u>X</u>	.	<u>X</u> <u>X</u> <u>2</u> <u>X</u>
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.



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-pin⁴⁾
- 6 = radial M12 connector, 8-pin⁴⁾

*) 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 Resolution⁵⁾

- 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 / outputs⁵⁾

- 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.

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS
---	--	-------------------

Order code Hollow shaft	8.5883 Type	.XXXXX.XX2X a b c d e f g h	If for each parameter of an encoder the <u>underlined preferred option</u> 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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 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 <u>2 = SSI, BiSS / 10 ... 30 V DC</u> 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 *) <u>E = tangential cable, 1 m [3.28'] PVC</u> F = tangential cable, special length PVC *) <u>4 = radial M23 connector, 12-pin</u> 6 = radial M12 connector, 8-pin ²⁾	e Code B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u>	f Resolution ¹⁾ A = 10 bit ST + 12 bit MT 1 = 11 bit ST + 12 bit MT 2 = 12 bit ST + 12 bit MT <u>3 = 13 bit ST + 12 bit MT</u> 4 = 14 bit ST + 12 bit MT 7 = 17 bit ST + 12 bit MT	g Inputs / outputs ¹⁾ <u>2 = SET, DIR input</u> additional status output	h Options (service) 1 = no option 2 = status LED <u>3 = SET button and status LED</u>
*) 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)							
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		8.0010.4700.0000
with fixing thread		
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.

Absolute encoders – multiturn

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 V _{pp} (± 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes	yes

Absolute encoders multiturn

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.

Absolute encoders – multiturn

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: <ul style="list-style-type: none"> – 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 \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - - - shield
1, 2	3, 4	SET, DIR, Status	M23 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
5	1, 2, A, B, E, F	SET, DIR, Status sensor output	Cable (isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
5	3, 4	SET, DIR, Status sensor output	M23 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
3, 4, 7, 8	1, 2, A, B, E, F	SET, DIR, SinCos or incr. RS422	Cable (isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
3, 4, 7, 8	3, 4	SET, DIR, SinCos or incr. RS422	M23 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
6, 9	1, 2, A, B, E, F	SinCos o. incr. RS422 sensor output	Cable (isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
6, 9	3, 4	SinCos o. incr. RS422 sensor output	M23 connector
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
1, 2	5, 6	SET, DIR	M12 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR \perp

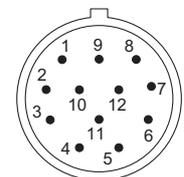
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A, \bar{A} : Incremental output channel A (cosine)
- B, \bar{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 \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5863 / 5883 (shaft / hollow shaft)

SSI / BiSS

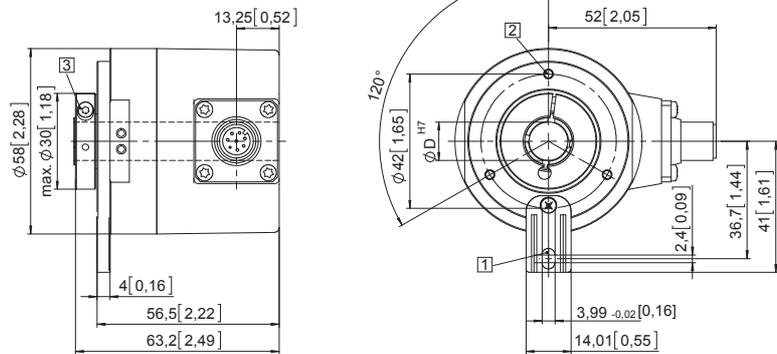
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

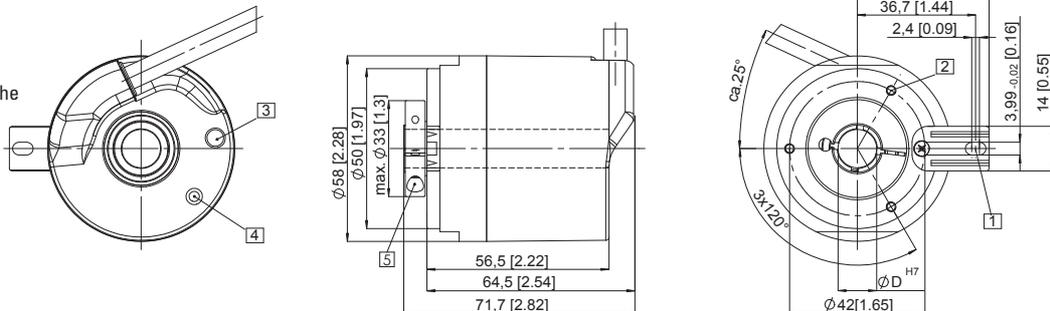
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



Flange with spring element, long Flange type 1 and 2

(drawing with tangential cable)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 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



Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS
---	--	-------------------

Dimensions hollow shaft version

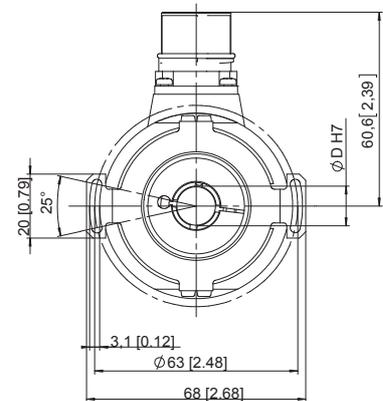
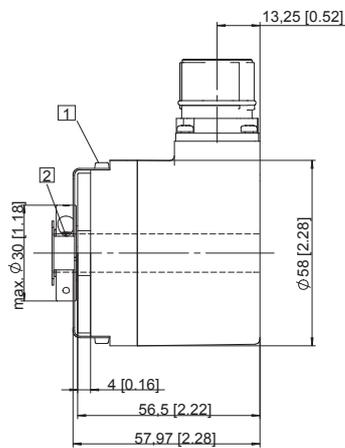
Dimensions in mm [inch]

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

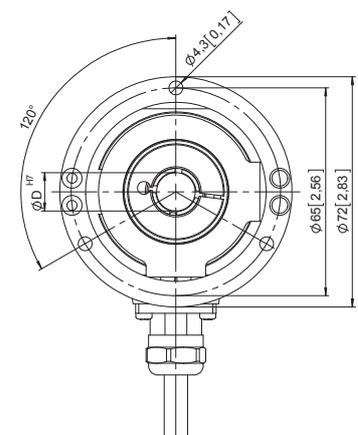
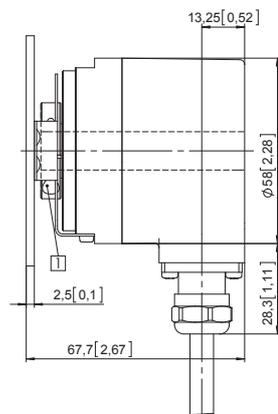


Flange with stator coupling, ø 65 [2.56]

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

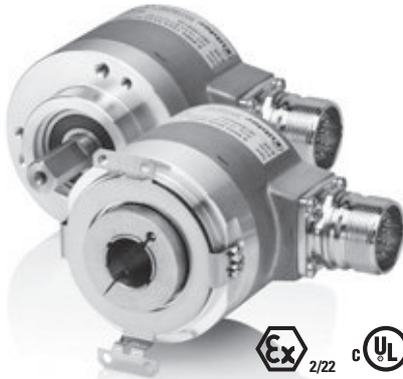


Absolute encoders
multiturn

Absolute encoders – multiturn

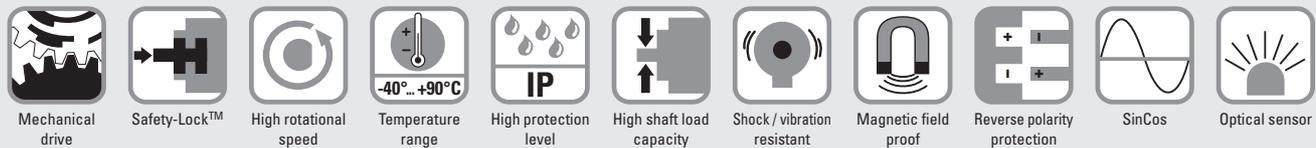
Standard
SIL2/PLd, mech. multiturn, optical

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.



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

8.5863FS2
Type

1 **X** **X** **X** . **X** **X** **2** **X**
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.



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 Type	.XXXXX.XX2X a b c d e f g h	If for each parameter of an encoder the <u>underlined preferred option</u> 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 <u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u>	b Hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 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 <u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u>	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 *) <u>4 = radial M23 connector, 12 pin</u> *) 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 <u>G = SSI, gray</u>	f Resolution ¹⁾ A = 10 bit ST + 12 bit MT 1 = 11 bit ST + 12 bit MT 2 = 12 bit ST + 12 bit MT <u>3 = 13 bit ST + 12 bit MT</u> 4 = 14 bit ST + 12 bit MT 7 = 17 bit ST + 12 bit MT	g Input / output ¹⁾ <u>2 = SET, DIR input</u>	h Options (service) 1 = no option <u>2 = status LED</u> 3 = SET button and status LED	<i>Optional on request</i> - 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.

Absolute encoders – multiturn

Standard SIL2/PLd, mech. multiturn, optical	Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)	SSI/BiSS + SinCos
--	--	--------------------------

Mechanical characteristics		
Maximum speed shaft version	up to 70°C [158°F] up to T _{max}	12000 min ⁻¹ , 10000 min ⁻¹ (continuous) 8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed hollow shaft version	up to 70°C [158°F] up to T _{max}	9000 min ⁻¹ , 6000 min ⁻¹ (continuous) 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 10 ... 30 V DC	max. 80 mA 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: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification 	

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±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.

Absolute encoders – multiturn

Standard SIL2/PLd, mech. multiturn, optical	Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)	SSI/BiSS + SinCos
--	--	--------------------------

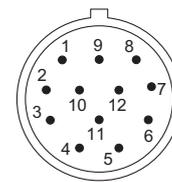
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	1, 2, A, B, E, F	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													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	3, 4	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, \bar{A} : cosine signal
- B, \bar{B} : sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



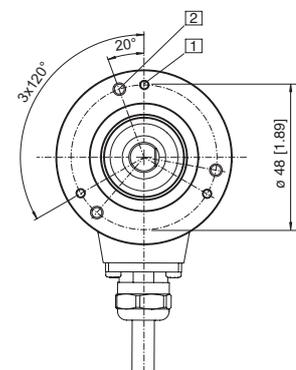
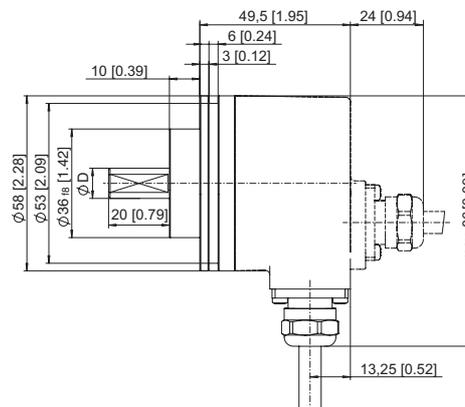
M23 connector, 12-pin

Dimensions shaft version

Dimensions in mm [inch]

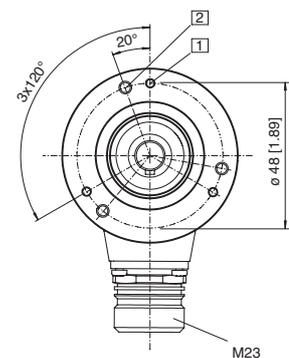
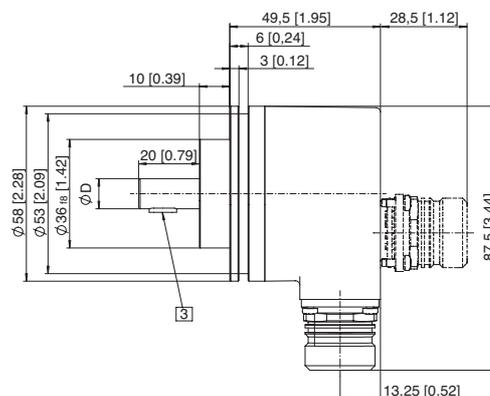
Clamping flange, \varnothing 58 [2.28]
Flange type 1 with shaft type 2
 (drawing with cable)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- D = 10^{h7} [0.39]



Clamping flange, \varnothing 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]



Absolute encoders – multiturn

Standard SIL2/PLd, mech. multiturn, optical	Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)	SSI/BiSS + SinCos
--	--	--------------------------

Dimensions hollow shaft version

Dimensions in mm [inch]

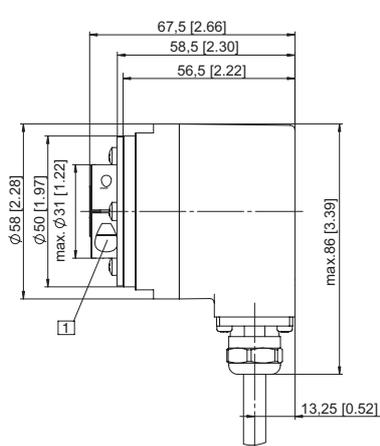
Flange with torque stop set, rigid

Flange type A

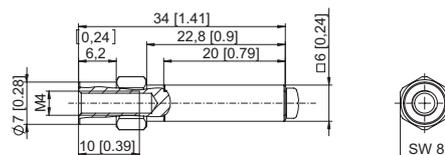
(drawing with cable)

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

D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



Torque pin with rectangular sleeve with M4 thread



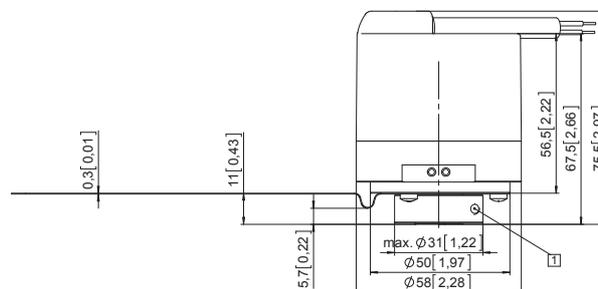
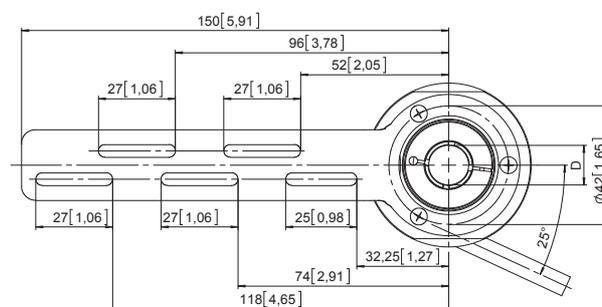
Flange with torque stop, flexible

Flange type 9

(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm

D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



Absolute encoders – multiturn

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, $\varnothing 63$ [2.48]

and hollow shaft

Flange type B

(drawing with M23 connector)

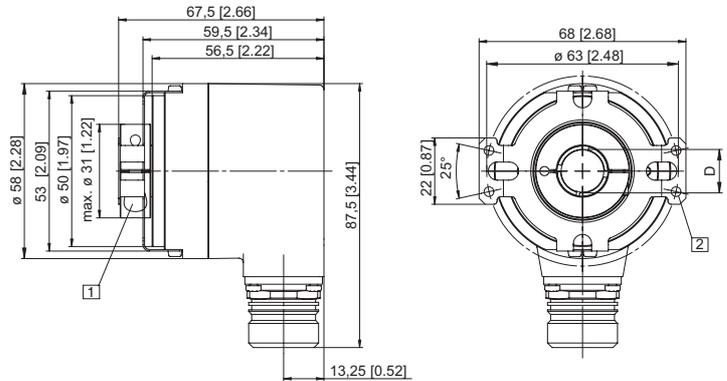
- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw

$D = \varnothing 10^{H7}$ [0.39]

$\varnothing 12^{H7}$ [0.47]

$\varnothing 14^{H7}$ [0.55]



Flange with stator coupling, $\varnothing 63$ [2.48]

and tapered shaft

Flange type B

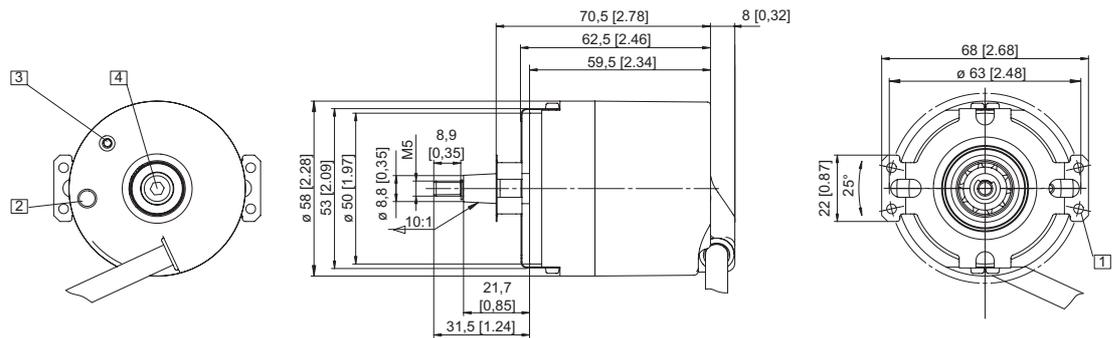
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



Absolute encoders
multiturn

Absolute encoders – multiturn

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™



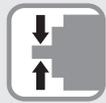
High rotational speed



Temperature range
-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.
- 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
Type

1 **X** **X** **X** . **X** **X** **2** **X**

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.



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 Type	.XXXXX.XX2X a b c d e f g h	If for each parameter of an encoder the <u>underlined preferred option</u> 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 <u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u>	b Hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 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 <u>4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</u>	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 *) <u>4 = radial M23 connector, 12 pin</u> *) 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 <u>G = SSI, gray</u>	f Resolution ¹⁾ A = 10 bit ST + 12 bit MT 1 = 11 bit ST + 12 bit MT 2 = 12 bit ST + 12 bit MT <u>3 = 13 bit ST + 12 bit MT</u> 4 = 14 bit ST + 12 bit MT 7 = 17 bit ST + 12 bit MT	g Input / output ¹⁾ <u>2 = SET, DIR input</u>	h Options (service) 1 = no option <u>2 = status LED</u> 3 = SET button and status LED	<i>Optional on request</i> - 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"	Safety characteristics
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.	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.

Absolute encoders – multiturn

Standard SIL3/PLe, mech. multiturn, optical	Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)	SSI/BiSS + SinCos
--	--	--------------------------

Mechanical characteristics		
Maximum speed shaft version	up to 70°C [158°F] up to T _{max}	12000 min ⁻¹ , 10000 min ⁻¹ (continuous) 8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed hollow shaft version	up to 70°C [158°F] up to T _{max}	9000 min ⁻¹ , 6000 min ⁻¹ (continuous) 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 10 ... 30 V DC	max. 80 mA 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: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification 	

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±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.

Absolute encoders – multiturn

Standard	SIL3/PLe, mech. multiturn, optical	Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)	SSI/BiSS + SinCos
-----------------	---	--	--------------------------

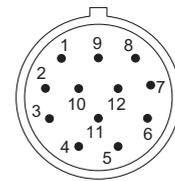
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	1, 2, A, B, E, F	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													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	3, 4	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, \bar{A} : cosine signal
- B, \bar{B} : sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



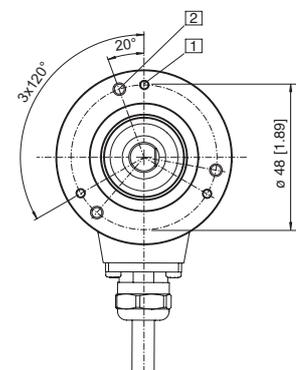
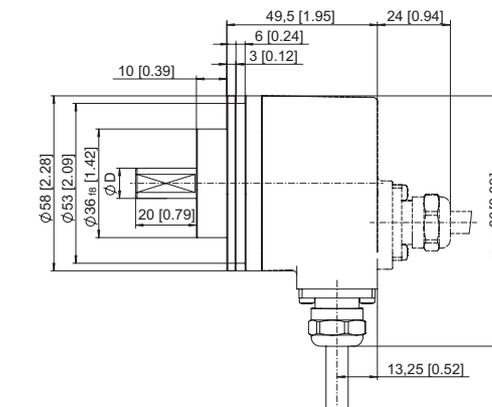
M23 connector, 12-pin

Dimensions shaft version

Dimensions in mm [inch]

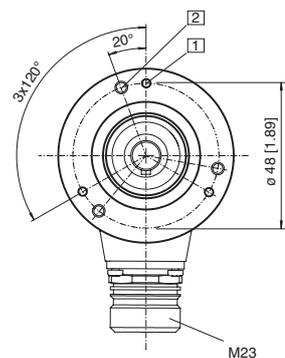
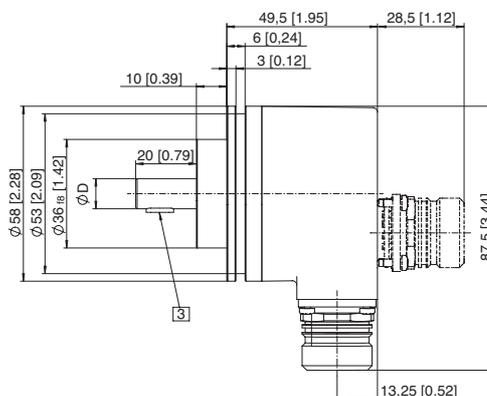
Clamping flange, \varnothing 58 [2.28]
Flange type 1 with shaft type 2
 (drawing with cable)

- 1 M3, 6 [0.24] deep
- 2 M4, 8 [0.32] deep
- D = 10^{h7} [0.39]



Clamping flange, \varnothing 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]



Absolute encoders – multiturn

Standard
SIL3/PLe, mech. multiturn, optical

Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)

SSI/BiSS + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

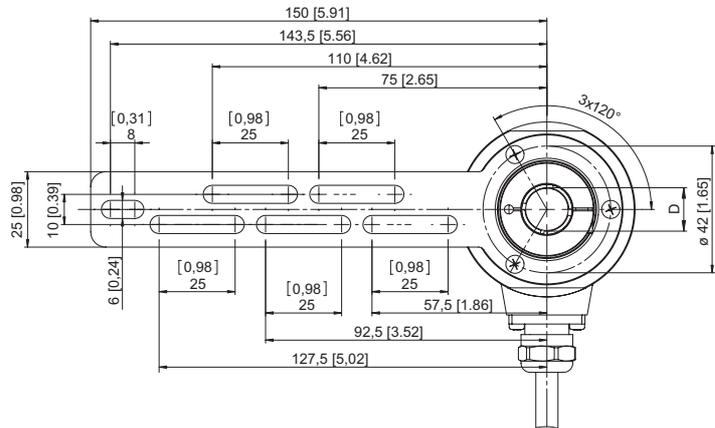
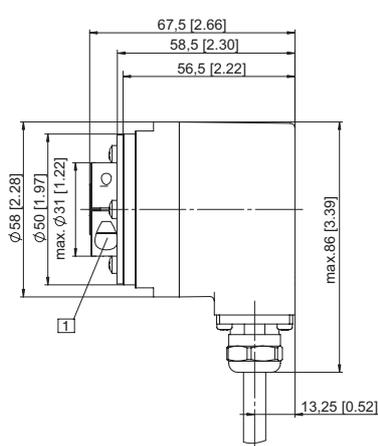
Flange with torque stop set, rigid

Flange type A

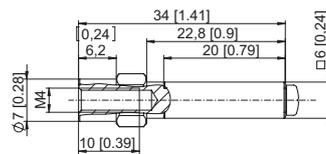
(drawing with cable)

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

D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



Torque pin with rectangular sleeve with M4 thread



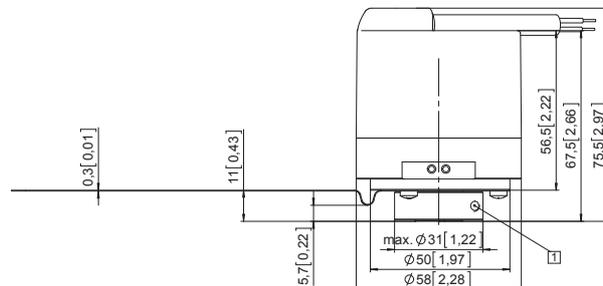
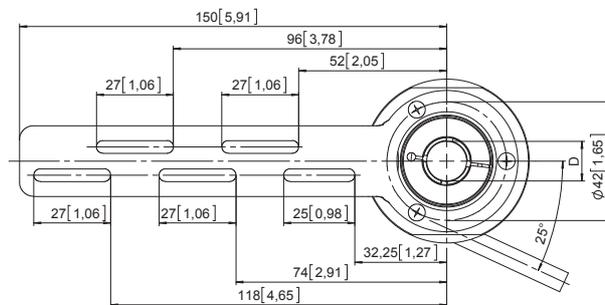
Flange with torque stop, flexible

Flange type 9

(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm

D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



Absolute encoders – multiturn

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, $\varnothing 63$ [2.48]

and hollow shaft

Flange type B

(drawing with M23 connector)

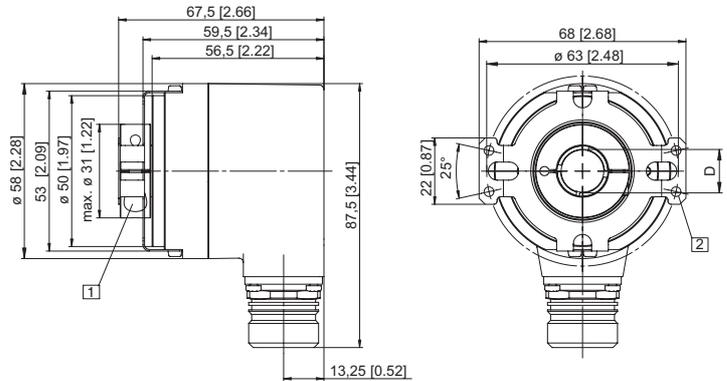
- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw

$D = \varnothing 10^{H7}$ [0.39]

$\varnothing 12^{H7}$ [0.47]

$\varnothing 14^{H7}$ [0.55]



Flange with stator coupling, $\varnothing 63$ [2.48]

and tapered shaft

Flange type B

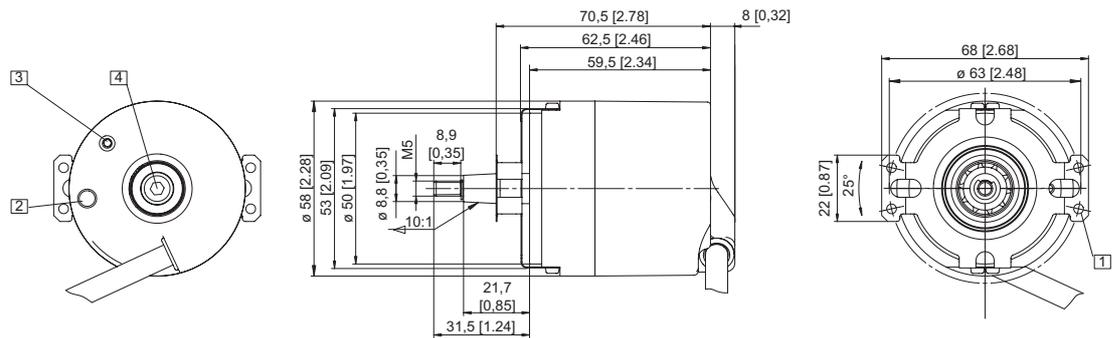
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



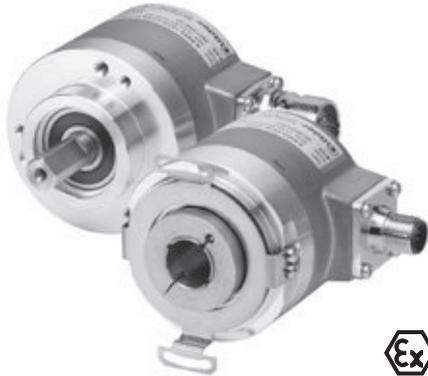
Absolute encoders
multiturn

Absolute encoders – multiturn

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.



Multiturn resolution



Safety-Lock™



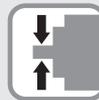
High rotational speed



Temperature range -40°... +85°C



High protection level



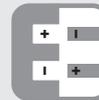
High shaft load capacity



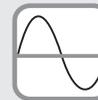
Shock / vibration resistant



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
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.



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-pin³⁾
- 6 = radial M12 connector, 8-pin³⁾

*) 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

Optional on request

- Ex 2/22
- surface protection salt spray tested
- other singleturn resolutions

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

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	8.F5883	.XXXX	.XXXX	<p>If for each parameter of an encoder the <u>underlined preferred option</u> 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.</p>											
Hollow shaft	Type	a	b	c	d	e	f	g	h	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"] <u>5 = with stator coupling, IP65, ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67, ø 63 mm [2.48"]	b Hollow shaft	3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 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 <u>2 = SSI, BiSS / 10 ... 30 V DC</u> 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 *) <u>E = tangential cable, 1 m [3.28'] PVC</u> F = tangential cable, special length PVC *) <u>4 = radial M23 connector, 12-pin</u> 6 = radial M12 connector, 8-pin ²⁾	e Code	B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u>	f Resolution (singleturn) ¹⁾	A = 10 bit 1 = 11 bit 2 = 12 bit <u>3 = 13 bit</u> 4 = 14 bit 7 = 17 bit	g Resolution (multiturn) ¹⁾	<u>2 = 12 bit MT</u> 6 = 16 bit MT 4 = 24 bit MT	h Options (service)	1 = no option 2 = status LED <u>3 = SET button and status LED</u>
<p>Optional on request</p> <ul style="list-style-type: none"> - Ex 2/22 (not for type of connection E, F) - surface protection salt spray tested - other singleturn resolutions 															
<p>*) 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)</p>															

Absolute encoders multiturn

Mounting accessory for shaft encoders	Order no.	
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"] bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.0606 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 M23 female connector with coupling nut	05.CMB 8181-0 8.0000.5012.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable M23 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6041.8211.002M 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.

Absolute encoders – multiturn

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	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V (+V = power supply)
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 V _{pp} (±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: <ul style="list-style-type: none"> – 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.

Absolute encoders – multiturn

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

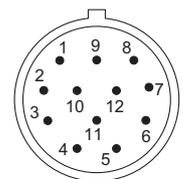
Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - - - shield
Interface	Type of connection	Features	M23 connector
1, 2	3, 4	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			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 0Vsens +Vsens \perp
			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 0Vsens +Vsens \perp
			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 \bar{A} B \bar{B} \perp
			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 \bar{A} B \bar{B} \perp
			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 sensor output	Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			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 sensor output	Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			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 \perp
			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, \bar{A} : Incremental output channel A (cosine)
- B, \bar{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 \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS
---	--	-------------------

Dimensions shaft version

Dimensions in mm [inch]

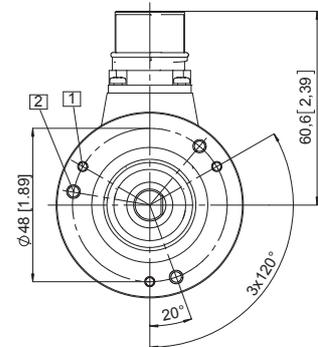
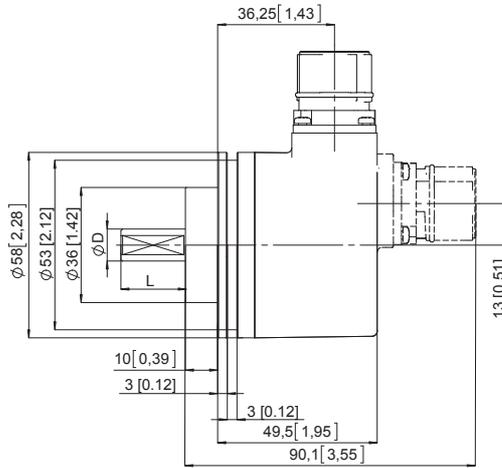
Clamping flange, \varnothing 58 [2.28]

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



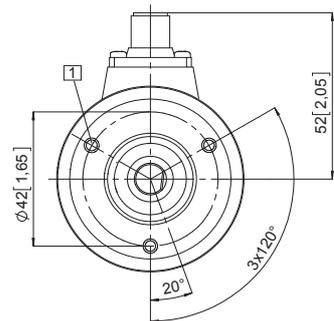
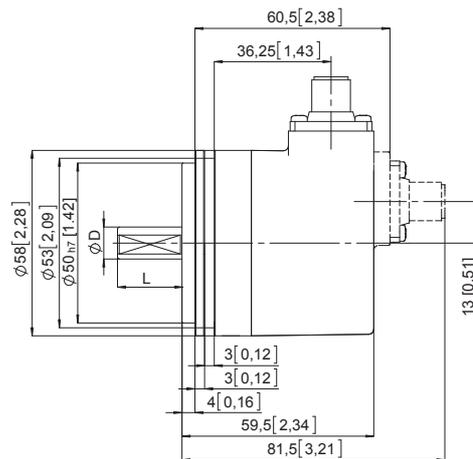
Synchro flange, \varnothing 58 [2.28]

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



Absolute encoders – multiturn

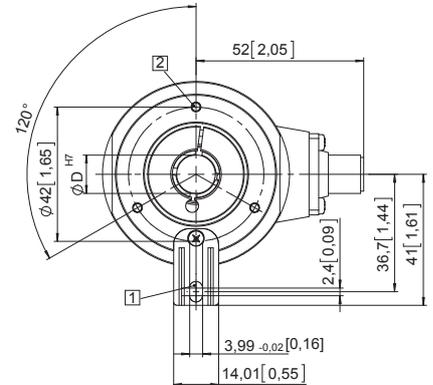
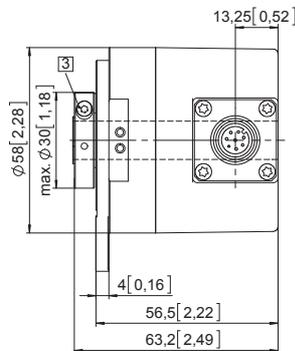
Standard electronic multiturn, optical	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS
---	--	-------------------

Dimensions hollow shaft version

Dimensions in mm [inch]

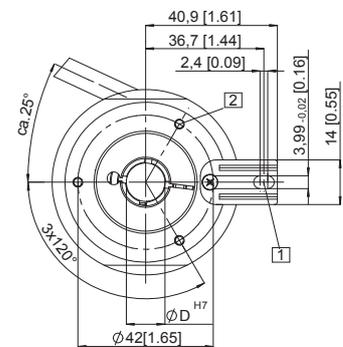
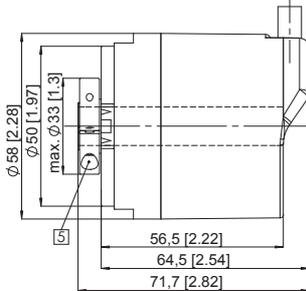
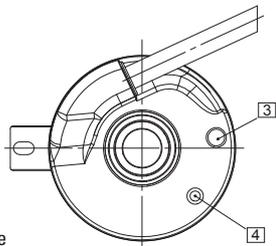
Flange with spring element, long Flange type 1 and 2 (drawing with M12 connector)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 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, \varnothing 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

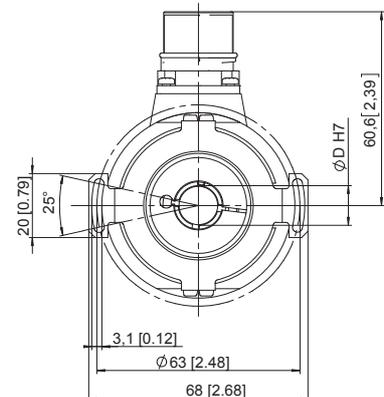
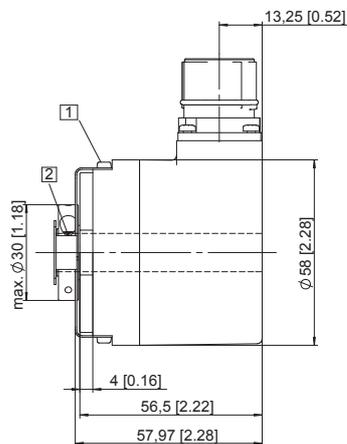


Flange with stator coupling, \varnothing 63 [2.48]

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

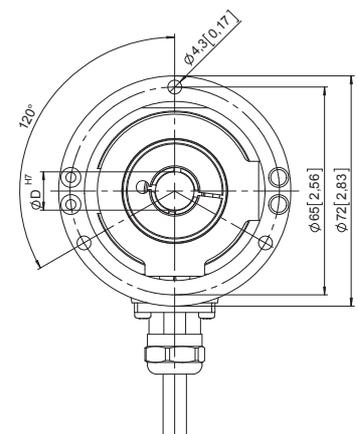
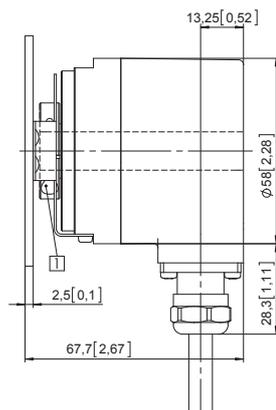


Flange with stator coupling, \varnothing 65 [2.56]

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



Absolute encoders
multiturn

Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	CANopen
---	--	----------------

Order code Hollow shaft	8.F5888 Type	.XX2X a b c d	.212X e f	If for each parameter of an encoder the <u>underlined preferred option</u> 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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> B = ø 12 mm, blind hollow shaft ¹⁾ 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"]	c Interface / power supply <u>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</u>	d Type of connection L = tangential cable, 2 m [6.56"] PVC M = tangential cable, special length PVC *) <u>E = 1 x radial M12 connector, 5-pin</u> F = 2 x radial M12 connector, 5-pin ²⁾	e Fieldbus profile ³⁾ <u>21 = CANopen encoder profile DS406 V3.2</u>	f Options (service) 2 = no option <u>3 = SET button</u> <i>Optional on request</i> - Ex 2/22 (not for type of connection L, M) - surface protection salt spray tested
*) 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)					

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].

Absolute encoders – multiturn

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), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit) default: 25 bit
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons, LSS-service DS305 V2.0
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination switchable	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object

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)

Absolute encoders – multiturn

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)					
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
2	A, B, L, M	Bus IN	Abbreviation:	0 V	+V	CL	CH	CG
			Cable colour:	WH	BN	YE	GN	GY
			Pin:	3	2	5	4	1

Interface	Type of connection	Function	2 x M12 connector					Diagram	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H		CAN_GND
2	F	Bus IN	Abbreviation:	0 V	+V	CL	CH	CG	
			Pin:	3	2	5	4	1	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
2	F	Bus OUT	Abbreviation:	CG	CL	CH	0 V	+V	
			Pin:	3	2	5	4	1	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	

Interface	Type of connection	Function	1 x M12 connector					Diagram	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H		CAN_GND
2	E	Bus IN	Abbreviation:	0 V	+V	CL	CH	CG	
			Pin:	3	2	5	4	1	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	

Absolute encoders multiturn

Dimensions shaft version

Dimensions in mm [inch]

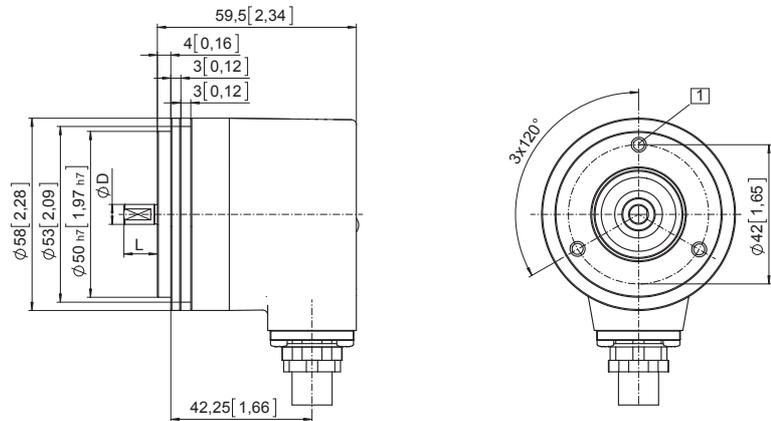
Synchro flange, ø 58 [2.28]

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



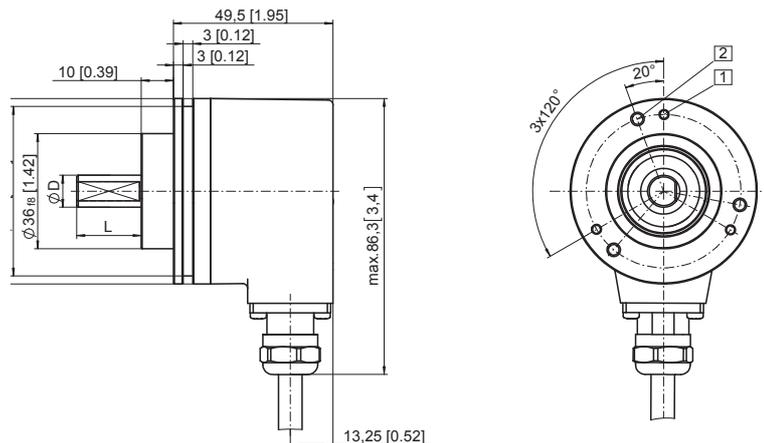
Clamping flange, ø 58 [2.28]

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



Absolute encoders – multiturn

**Standard
electronic multiturn, optical**

Sendix F5868 / F5888 (shaft / hollow shaft)

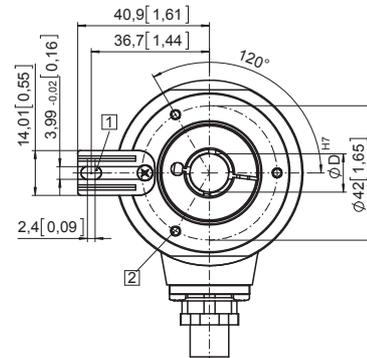
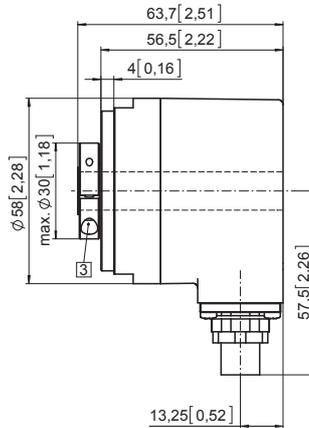
CANopen

Dimensions hollow shaft version

Dimensions in mm [inch]

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

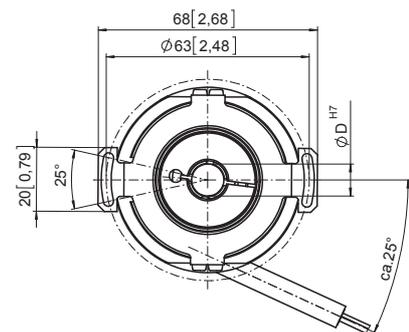
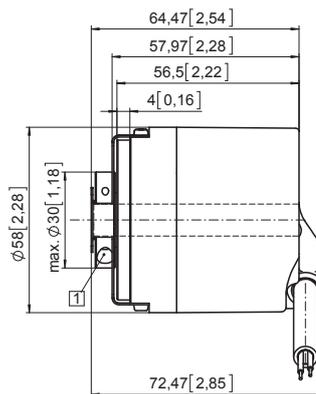
- 1 M3, 6 [0.24] deep
- 2 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm



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

Pitch circle diameter for fixing screws 63 [2.48]
(drawing with tangential cable)

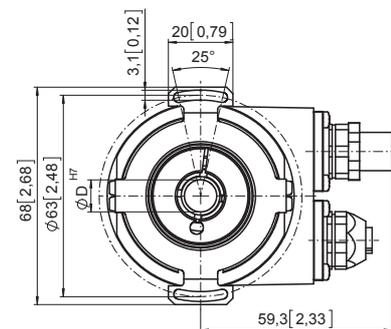
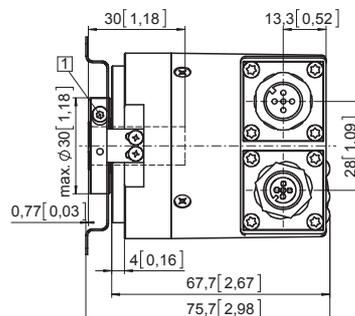
- 1 Fixing screws DIN7985 M2.5x6
- 2 Recommended torque for the clamping ring 0.6 Nm



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

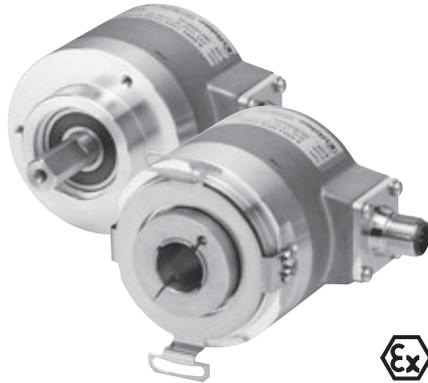
Pitch circle diameter for fixing screws 63 [2.48]
(drawing with 2 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm



Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus
---	--	---------------



The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, through hollow shaft up to 15 mm and Modbus RTU interface.



16 bit MT Multiturn resolution	Safety-Lock™	High rotational speed	Temperature range -40°...+80°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	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.

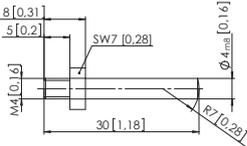
Absolute encoders
multiturn

Order code	8.F5868	.XX6E	.6112
Shaft version	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
			<i>Optional on request</i> - Ex 2/22 - surface protection salt spray tested

Order code	8.F5888	.XX6E	.6112
Hollow shaft	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
			<i>Optional on request</i> - Ex 2/22 - surface protection salt spray tested

1) Parameters can also be factory pre-set.

Absolute encoders – multiturn

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"] bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.0606 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	<table border="0"> <tr> <td>IP65 up to 70°C</td> <td>12000 min⁻¹, 10000 min⁻¹ (continuous)</td> </tr> <tr> <td>IP65 up to T_{max}</td> <td>8000 min⁻¹, 5000 min⁻¹ (continuous)</td> </tr> <tr> <td>IP67 up to 70°C</td> <td>11000 min⁻¹, 9000 min⁻¹ (continuous)</td> </tr> <tr> <td>IP67 up to T_{max}</td> <td>8000 min⁻¹, 5000 min⁻¹ (continuous)</td> </tr> </table>	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)
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	<table border="0"> <tr> <td>IP65 up to 70°C</td> <td>9000 min⁻¹, 6000 min⁻¹ (continuous)</td> </tr> <tr> <td>IP65 up to T_{max}</td> <td>6000 min⁻¹, 3000 min⁻¹ (continuous)</td> </tr> <tr> <td>IP67 up to 70°C</td> <td>8000 min⁻¹, 4000 min⁻¹ (continuous)</td> </tr> <tr> <td>IP67 up to T_{max}</td> <td>4000 min⁻¹, 2000 min⁻¹ (continuous)</td> </tr> </table>	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)
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]	<table border="0"> <tr> <td>IP65</td> <td>< 0.01 Nm</td> </tr> <tr> <td>IP67</td> <td>< 0.05 Nm</td> </tr> </table>	IP65	< 0.01 Nm	IP67	< 0.05 Nm				
IP65	< 0.01 Nm								
IP67	< 0.05 Nm								
Mass moment of inertia	<table border="0"> <tr> <td>shaft version</td> <td>3.0 x 10⁻⁶ kgm²</td> </tr> <tr> <td>hollow shaft version</td> <td>6.0 x 10⁻⁶ kgm²</td> </tr> </table>	shaft version	3.0 x 10 ⁻⁶ kgm ²	hollow shaft version	6.0 x 10 ⁻⁶ kgm ²				
shaft version	3.0 x 10 ⁻⁶ kgm ²								
hollow shaft version	6.0 x 10 ⁻⁶ kgm ²								
Load capacity of shaft	<table border="0"> <tr> <td>radial</td> <td>80 N</td> </tr> <tr> <td>axial</td> <td>40 N</td> </tr> </table>	radial	80 N	axial	40 N				
radial	80 N								
axial	40 N								
Weight	approx. 0.45 kg [15.87 oz]								
Protection acc. to EN 60529	<table border="0"> <tr> <td>housing side</td> <td>IP67</td> </tr> <tr> <td>shaft side</td> <td>IP65, opt. IP67</td> </tr> </table>	housing side	IP67	shaft side	IP65, opt. IP67				
housing side	IP67								
shaft side	IP65, opt. IP67								
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]								
Material	<table border="0"> <tr> <td>shaft/hollow shaft</td> <td>stainless steel</td> </tr> <tr> <td>flange</td> <td>aluminium</td> </tr> <tr> <td>housing</td> <td>zinc die-cast</td> </tr> </table>	shaft/hollow shaft	stainless steel	flange	aluminium	housing	zinc die-cast		
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	<table border="0"> <tr> <td>red</td> <td>error display</td> </tr> <tr> <td>green</td> <td>status display</td> </tr> <tr> <td>combination red / green</td> <td>error code</td> </tr> </table>	red	error display	green	status display	combination red / green	error code		
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								

Absolute encoders – multiturn

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

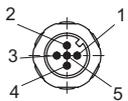
- Node address, baud rate and bus termination programmable.

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					
		Signal:	0 V power supply	+V power supply	D0	D1	
6	E Bus in	Pin:	3	2	5	4	1

Absolute encoders
multiturn

Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus
---	--	---------------

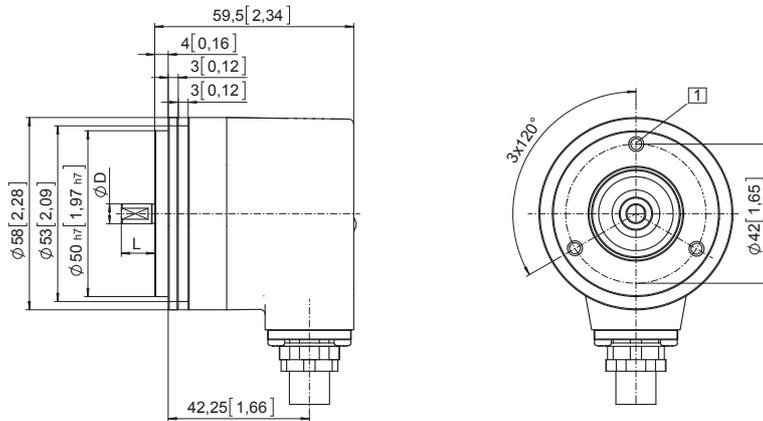
Dimensions shaft version

Dimensions in mm [inch]

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

- 1 M4, 6 [0.24] deep

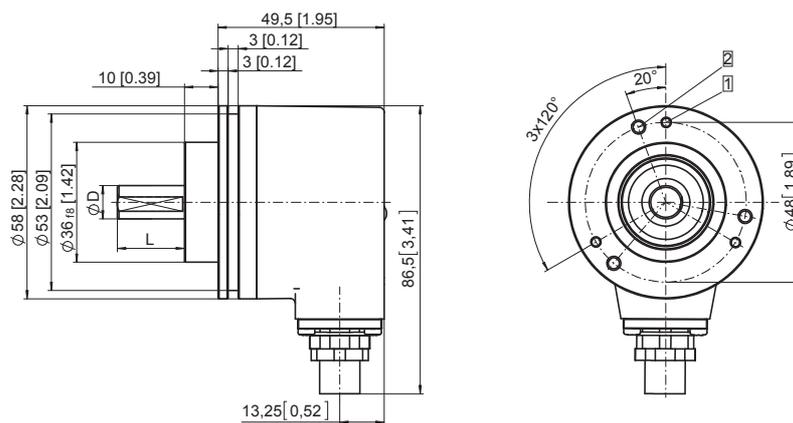
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



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



Absolute encoders – multiturn

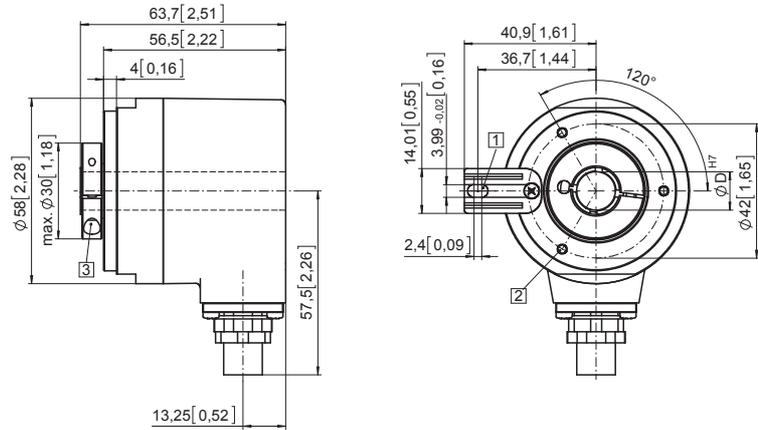
Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus
---	--	---------------

Dimensions hollow shaft version

Dimensions in mm [inch]

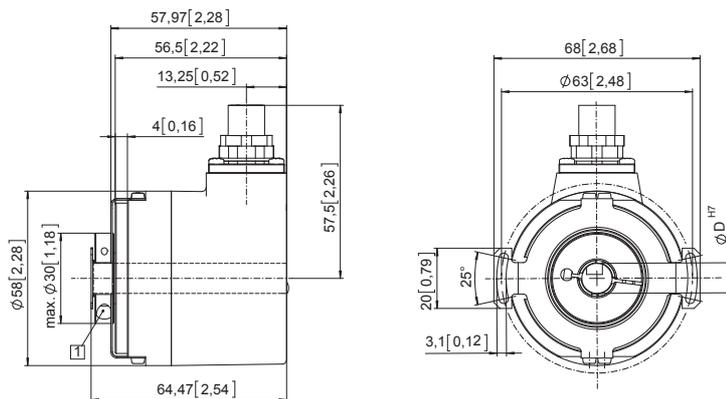
Flange with spring element, long Flange type 1 and 2

- 1 M3, 6 [0.24] deep
- 2 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm



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

- 1 Recommended torque for the clamping ring 0.6 Nm



Absolute encoders
multiturn

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

PROFIBUS DP



The multiturn encoders Sendix 5868 and 5888 with Profibus interface and optical sensor technology are the ideal solution for all Profibus applications.

With a maximum resolution of 28 bits these encoders are available with blind hollow shaft up to 15 mm.



Mechanical drive



Safety-Lock™



High rotational speed



Temperature range
-40...+80°C



High protection level
IP



High shaft load capacity



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
Type

. X X 3 X . 31 1 X
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.



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
Type

. X X 3 X . 31 1 X
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.



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.

 Absolute encoders
multiturn

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)

Absolute encoders – multiturn

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.
			Signal:	B	A	0 V	+ V	0 V	+ V	B	
3	1 (terminal box)	Terminal:	1	2	3	4	5	6	7	8	
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.

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP
---	--	--------------------

Dimensions shaft version, with removable bus terminal cover

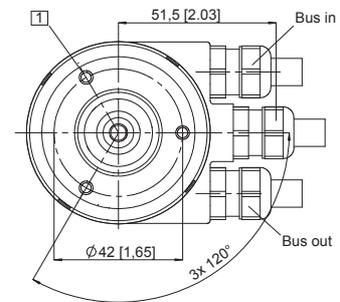
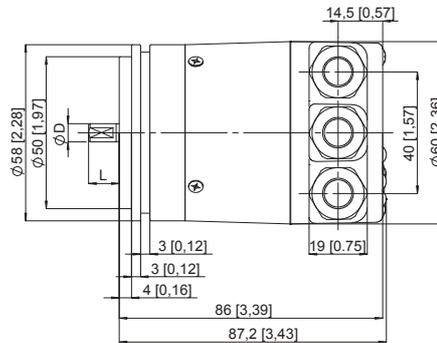
Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with cable)

- 1 M4, 6 [0.24] deep



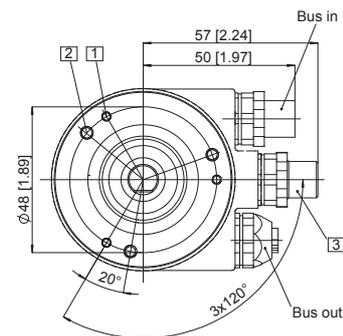
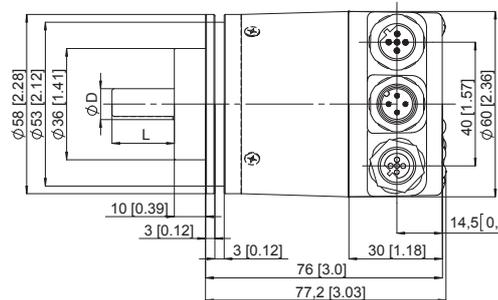
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Clamping flange, \varnothing 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

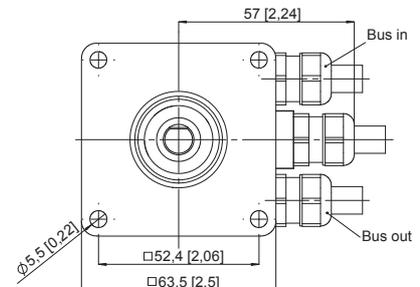
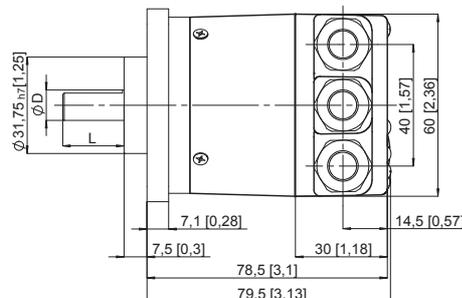


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, \square 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

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

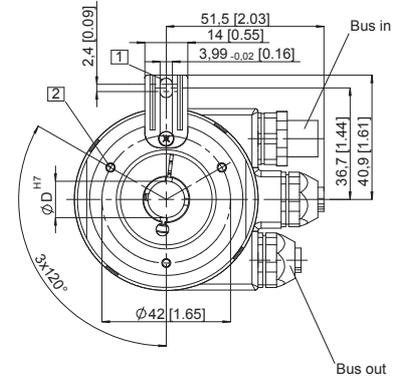
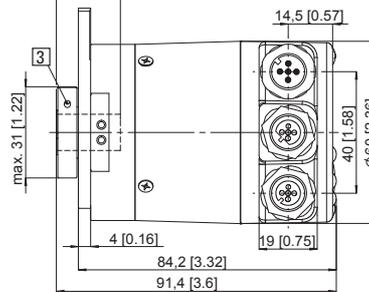
Profibus-DP

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, $\varnothing 4$ [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]

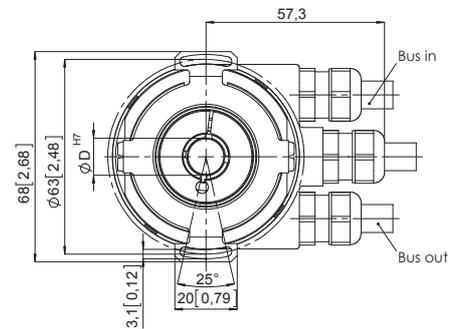
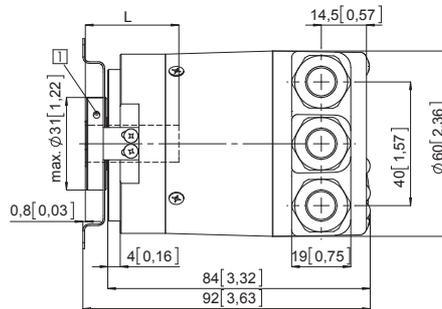


Flange with stator coupling, $\varnothing 63$ [2.48]

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]

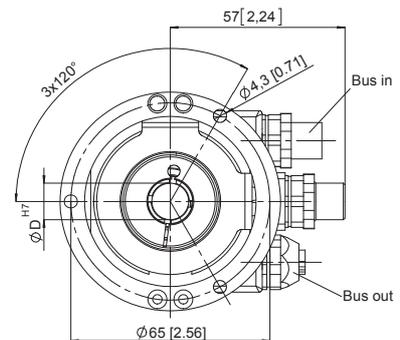
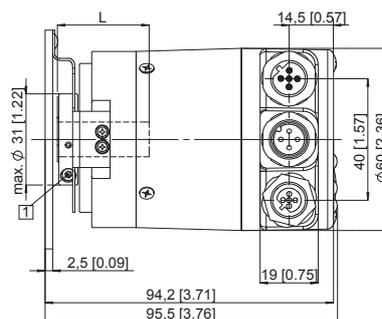


Flange with stator coupling, $\varnothing 65$ [2.56]

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]



Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
---	--	----------------------------

Order code Hollow shaft	8.5888 Type	.XXXX a b c d	.XX2X e f	<p>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.</p> <p>Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p>
<p>a <i>Flange with torque stop</i></p> <p>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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> <p>b <i>Blind hollow shaft</i></p> <p>3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"</p> <p>c <i>Interface / power supply</i></p> <p><u>2 = CANopen DS301 V4.02, 10 ... 30 V DC</u> <u>5 = CANopen DS301 V4.02, 10 ... 30 V DC</u> mit 2048 ppr incremental track (TTL-compatible) ¹⁾</p>	<p>d <i>Type of connection</i> <i>removable bus terminal cover</i></p> <p>1 = radial cable gland <u>2 = M12 connector</u> <i>Fixed connection without bus terminal cover</i></p> <p>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</p> <p>*) 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)</p>	<p>e <i>Fieldbus profile ²⁾</i></p> <p><u>21 = CANopen encoder profile DS406 V3.2</u> 22 = CANlift DS417 V1.01</p> <p>f <i>Options (service)</i></p> <p>2 = no options <u>3 = SET button</u></p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - 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), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)		max. 4096 (12 bit) scalable only via the total resolution
Total resolution		1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code		binary
Interface		CAN high-speed acc. to ISO 11898, Basic- and Full-CAN CAN specification 2.0 B
Protocol		CANopen profile DS406 V3.2 with manufacturer-specific add-ons or CANlift profile DS417 V1.1
Baud rate		10 ... 1000 kbit/s can be set via DIP switches, software configurable
Node address		1 ... 127 can be set via rotary switches, software configurable
Termination switchable		can be set via DIP switches, software configurable

Incremental track characteristics

Output driver		RS422 (TTL-compatible)
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW	typ. 1.3 V
Short circuit proof outputs		yes ²⁾
Resolution		2048 ppr

SET button (zero or defined value, option)

Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)

LED is ON with the following fault conditions
Sensor error (internal code or LED error) too low voltage, over-temperature

Absolute encoders
multiturn

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 position in absolute measuring steps (steps).
- 1 virtual device delivers the position as an absolute travel information in mm.
- Lift number programmable.
- Independent setting of the node address in relation with the CAN identifier.
- Factor for speed calculation (e.g. measuring wheel periphery).
- Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, acceleration, work area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- "Watchdog controlled" device.

All profiles stated here: Key-features

The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

Absolute encoders – multiturn

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)										
2, 5	1	Bus OUT					Bus IN					
		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)										
2, 5	A, B	Bus IN										
		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)										
2, 5	2, F	Bus OUT										
		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	\bar{A}	B	\bar{B}						0 V
		Pin:	1	2	3	4						5
Interface	Type of connection	1 x M12 connector										
2, 5	E	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	2 x M23 connector										
2, 5	J	Bus OUT										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		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										
2, 5	I	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	Sub-D connector										
2, 5	K	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	6	9	2	7						3

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

CANopen/CANopenLift

Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

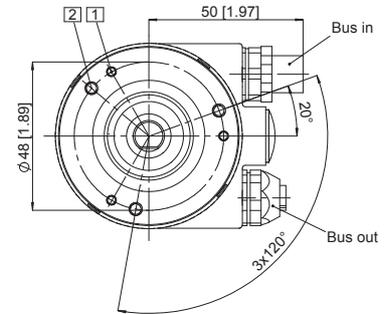
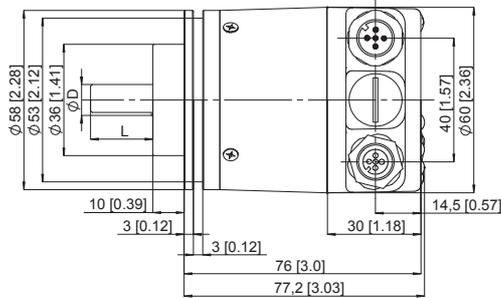
Clamping flange, \varnothing 58 [2.28]

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



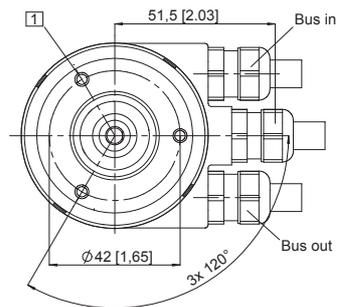
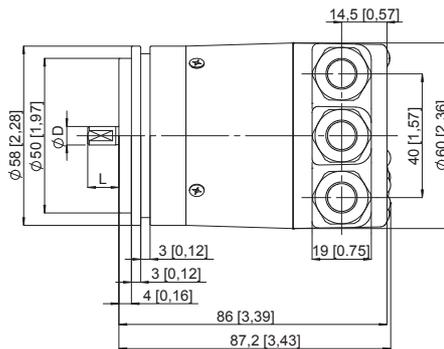
Synchro flange, \varnothing 58 [2.28]

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

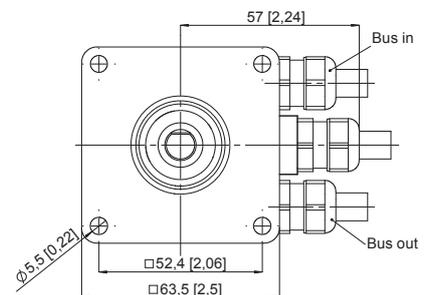
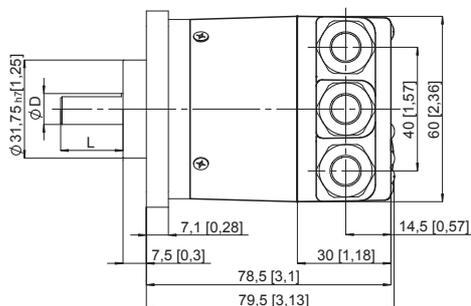


Square flange, \square 63.5 [2.5]

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



Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
---	--	----------------------------

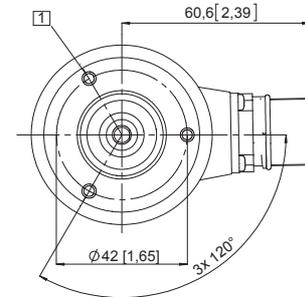
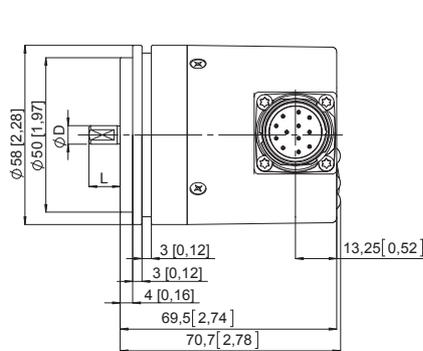
Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

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

- 1 M4, 6 [0.24] deep

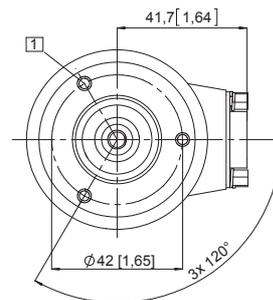
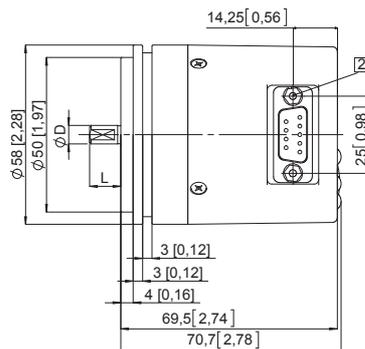
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



Synchro flange, $\varnothing 58$ [2.28] Flange type 2 and 4 (drawing with Sub-D connector)

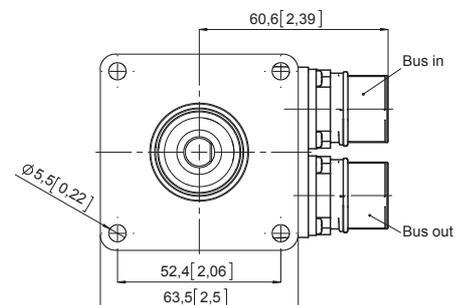
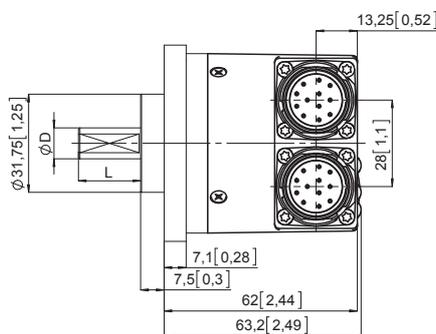
- 1 M4, 6 [0.24] deep
- 2 2 x 4/40 UNC; 3.0 [0.12] deep

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, $\square 63.5$ [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



Absolute encoders
multiturn

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

CANopen/CANopenLift

Dimensions shaft version, with fixed connection

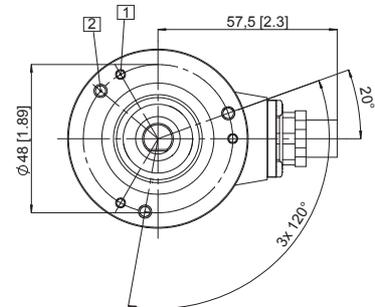
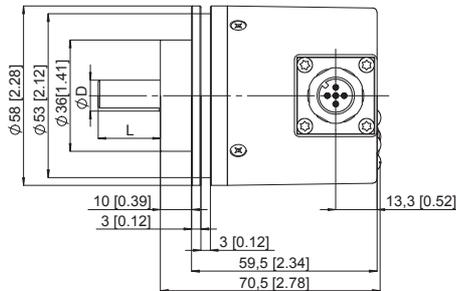
Dimensions in mm [inch]

Clamping flange, \varnothing 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



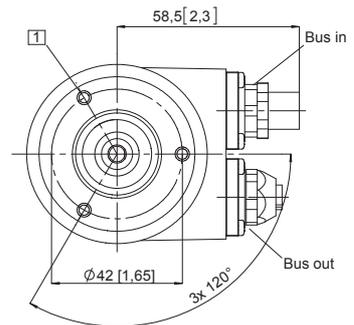
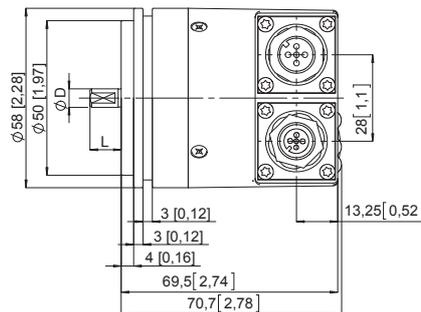
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with M12 connector)

- 1 M4, 8 [0.32] deep



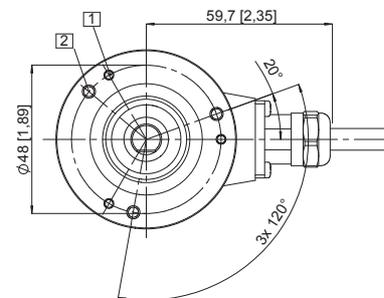
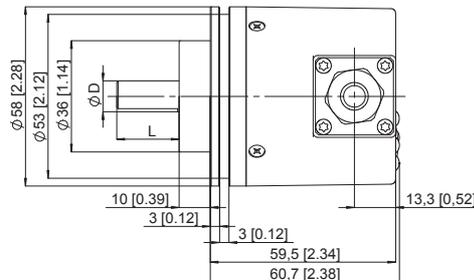
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Clamping flange, \varnothing 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

Absolute encoders – multiturn

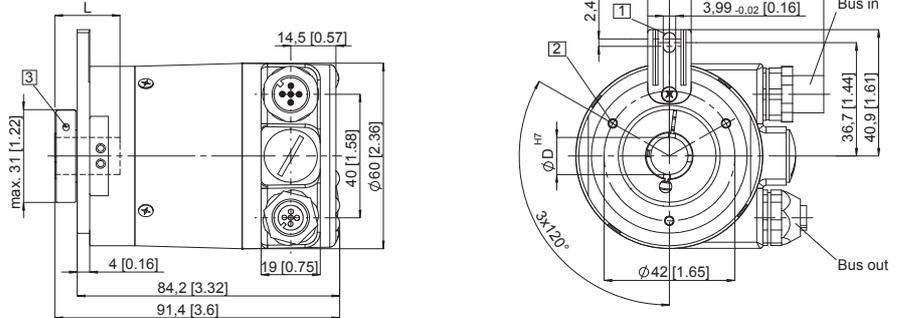
Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
---	--	----------------------------

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, $\varnothing 4$ [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]

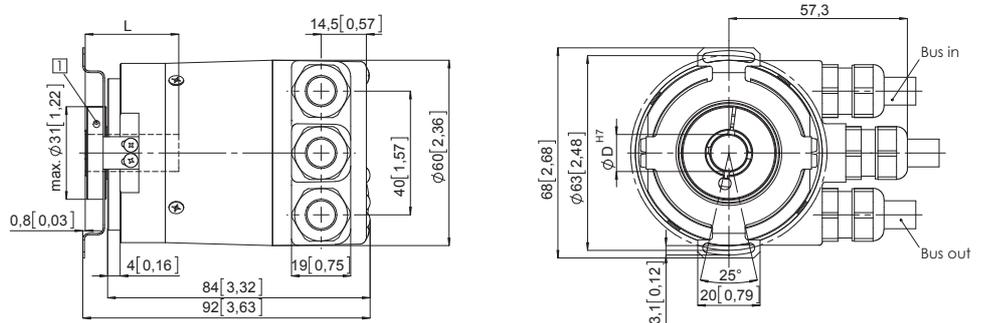


Flange with stator coupling, $\varnothing 63$ [2.48]

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]

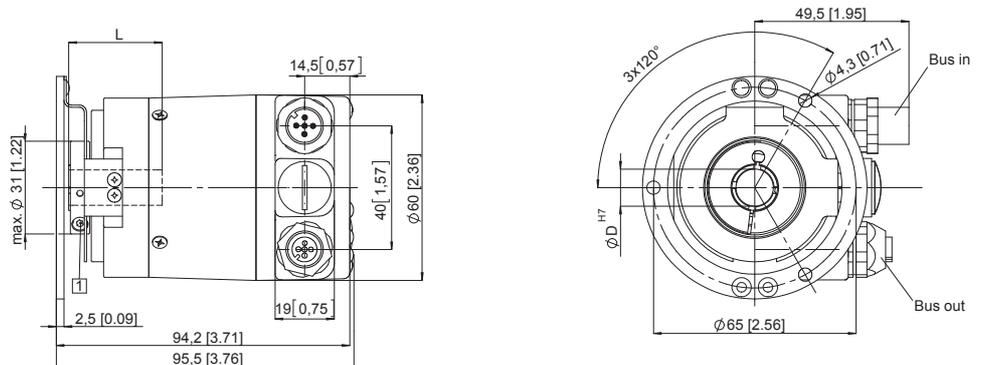


Flange with stator coupling, $\varnothing 65$ [2.56]

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]



Absolute encoders
multiturn

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

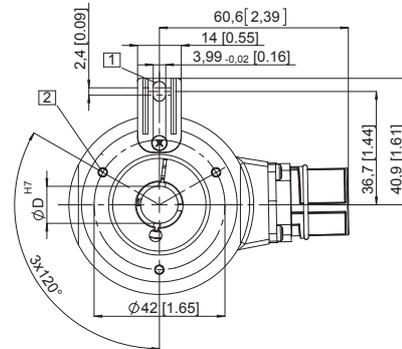
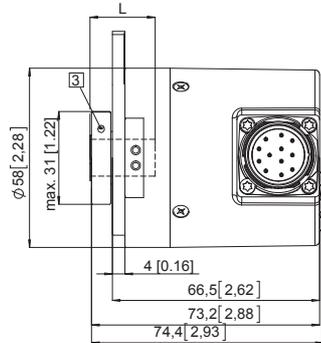
CANopen/CANopenLift

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

Dimensions in mm [inch]

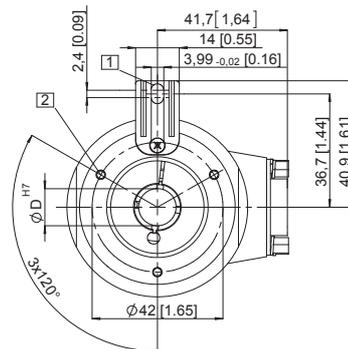
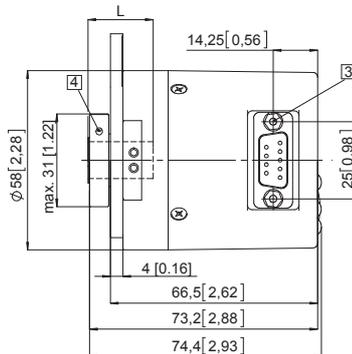
Flange with spring element, long Flange type 1 and 2 (drawing with M23 connector)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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)

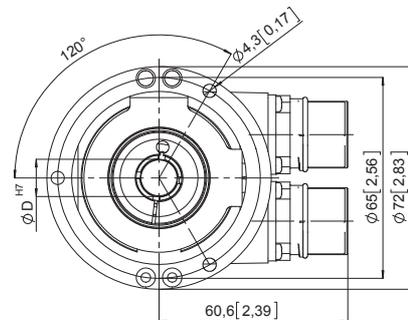
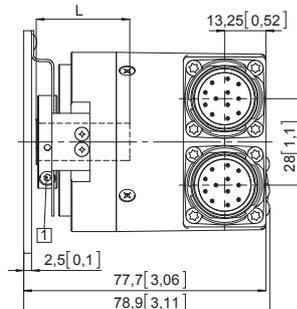
- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
 - 2 M3, 5.5 [0.21] deep
 - 3 2 x 4/40 UNC; 3.0 [0.21] deep
 - 4 Recommended torque for the clamping ring 0.6 Nm
- L: Insertion depth for blind hollow shaft: 30 [1.18]



Flange with stator coupling, $\varnothing 65$ [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]



Absolute encoders – multitrurn

**Standard
mechanical multitrurn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

CANopen/CANopenLift

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

Dimensions in mm [inch]

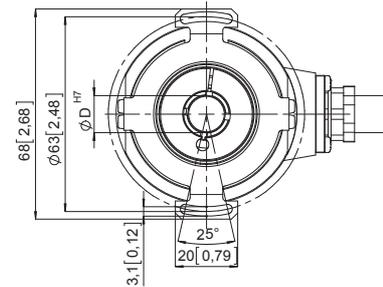
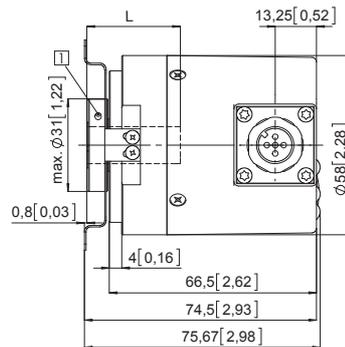
Flange with stator coupling, \varnothing 63 [2.48]

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]

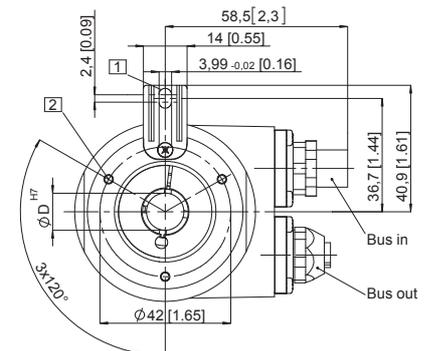
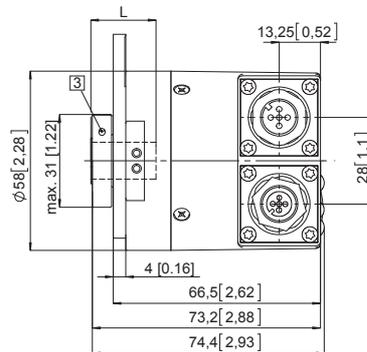


Flange with spring element, long

Flange type 1 and 2

(drawing with 2 x M12 connector)

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, \varnothing 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]



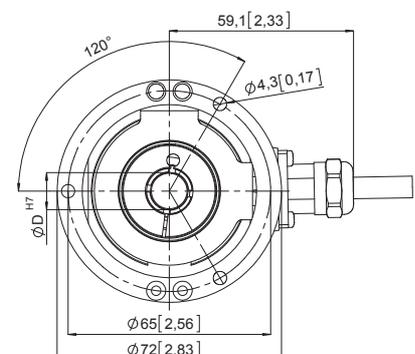
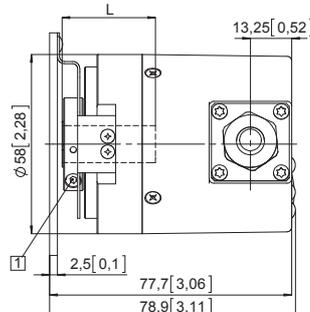
Flange with stator coupling, \varnothing 65 [2.56]

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]



Absolute encoders
multitrurn

Absolute encoders – multiturn

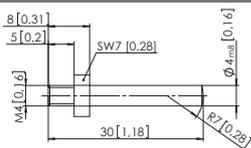
Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT
---	--	-----------------

Mounting accessory for shaft encoders		Order no.
---------------------------------------	--	-----------

Coupling	bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606
	bellows coupling \varnothing 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), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Protocol	EtherNet / EtherCAT

Diagnostic LED (red)
LED is ON with the following fault conditions: Sensor error (internal code or LED error), low voltage, over-temperature

Run LED (green)
LED is ON with the following conditions: Preop-, Safeop and Op-State (EtherCAT status machine)

2 x Link LEDs (yellow)
LED is ON with the following conditions (port IN and port OUT): Link detected

Modes
Freerun, distributed clock

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

EtherCAT

General information about CoE (CAN over EtherNet)

The EtherCAT encoders support the CANopen communication profile according to DS301. In addition device-specific profiles like the encoder profile DS406 are available.

Scaling, preset values, limit switch values and many other parameters can be programmed via the EtherCAT bus.

When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

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

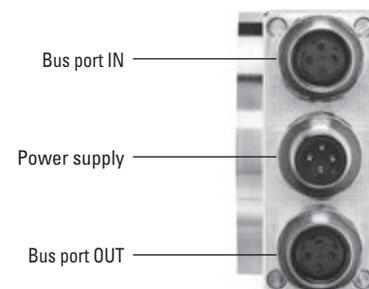
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

The following parameters are programmable:

- Position update time of 62.5 μ s.
- 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					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
B	2 (3 x M12 connector)	Bus Port IN	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			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 -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT
---	--	-----------------

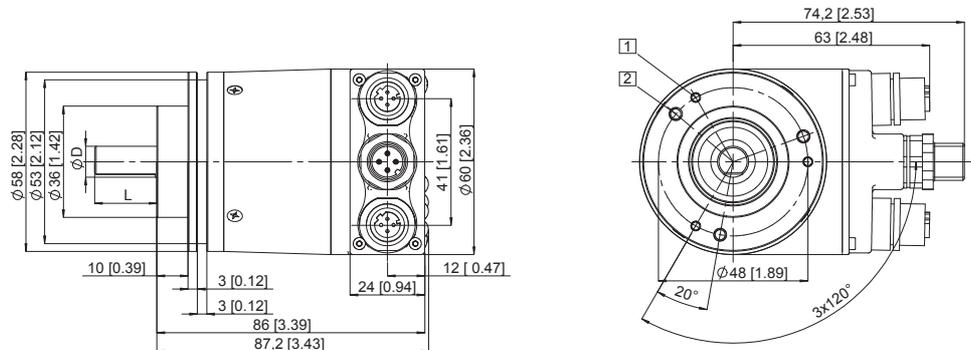
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, \varnothing 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

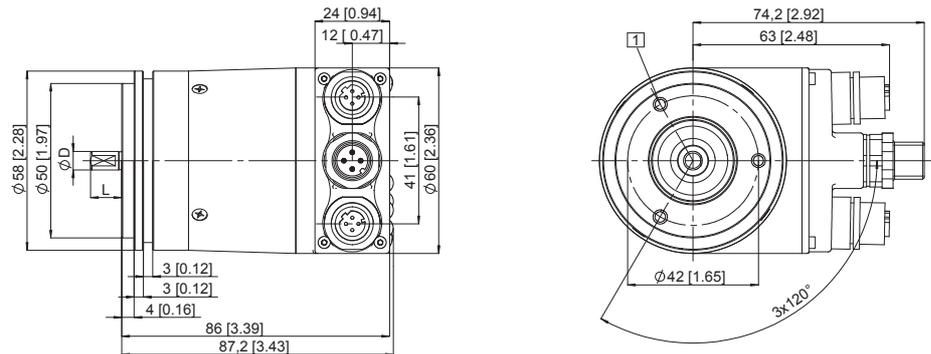
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



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

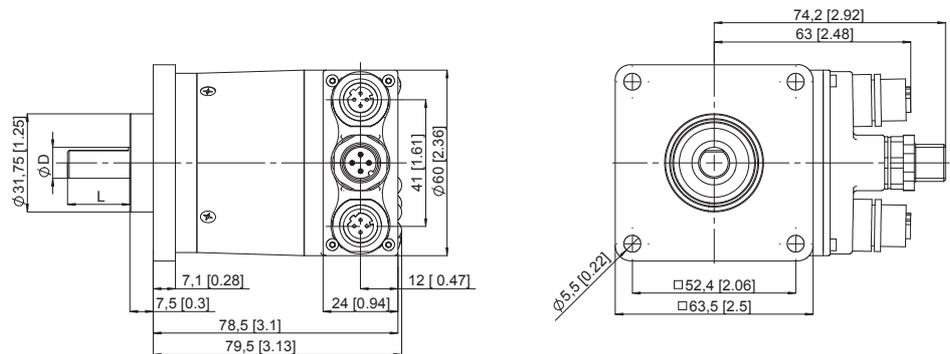
- 1 M4, 6.0 [0.24] deep

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, \square 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



Absolute encoders
multiturn

Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

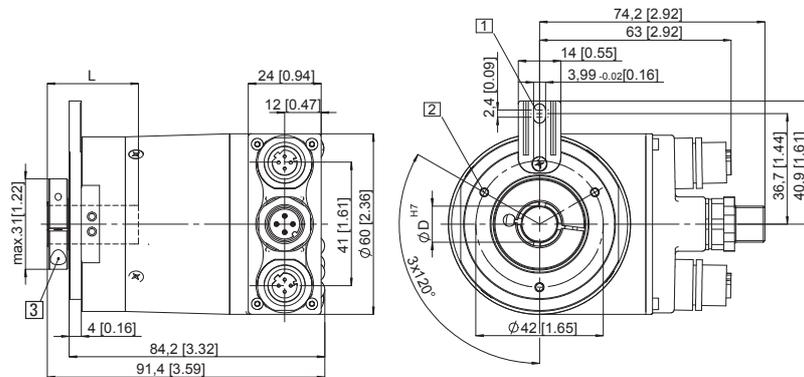
EtherCAT

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

Dimensions in mm [inch]

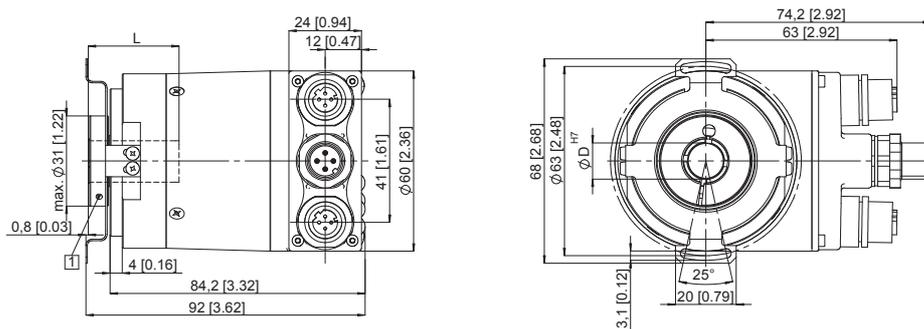
Flange with spring element, long Flange type 1 and 2

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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]



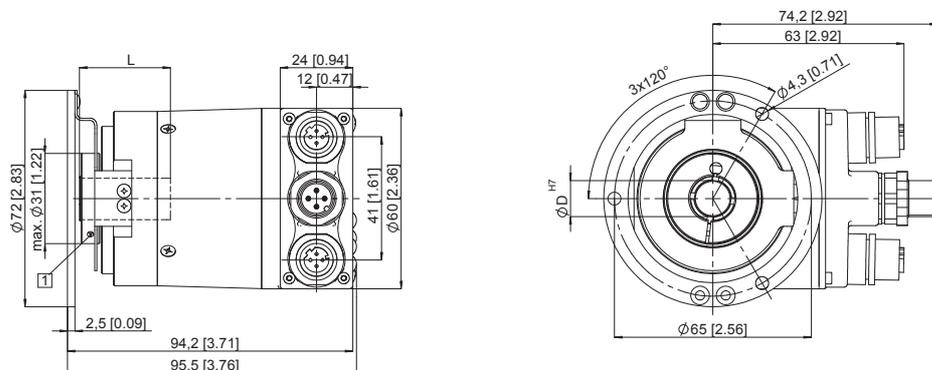
Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

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



Flange with stator coupling, $\varnothing 65$ [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]



Absolute encoders – multiturn

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.

Absolute encoders multiturn

Order code Shaft version	8.5868 Type	. X X C 2 . C 2 12	<p>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.</p>	10 by 10
a Flange	b Shaft (ø x L), with flat	c Interface / power supply	e Fieldbus profile	
<u>1 = clamping flange, IP65 ø 58 mm [2.28"]</u> 3 = clamping flange, IP67 ø 58 mm [2.28"] <u>2 = synchro flange, IP65 ø 58 mm [2.28"]</u> 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"]	<u>1 = 6 x 10 mm [0.24 x 0.39"]¹⁾</u> <u>2 = 10 x 20 mm [0.39 x 0.79"]²⁾</u> 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"	<u>C = PROFINET IO / 10 ... 30 V DC</u> d Type of connection <i>removable bus terminal cover</i> <u>2 = 3 x M12 connector, 4-pin</u>	<u>C2= PROFINET IO</u> <i>Optional on request</i> - Ex 2/22 - surface protection salt spray tested	

Order code Hollow shaft	8.5888 Type	. X X C 2 . C 2 12	<p>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.</p>	10 by 10
a Flange	b Blind hollow shaft	c Interface / power supply	e Fieldbus profile	
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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	<u>C = PROFINET IO / 10 ... 30 V DC</u> d Type of connection <i>removable bus terminal cover</i> <u>2 = 3 x M12 connector, 4-pin</u>	<u>C2= PROFINET IO</u> <i>Optional on request</i> - 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)	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 connector M12 for power supply		05.WASCSY4S 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 PROFINET IO	
Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Protocol	PROFINET IO

Link 1 and 2, LED (green / yellow)		
two coloured	green	active link
	yellow	data transfer

Error LED (red) / PWR LED (green)	
Functionality see manual	

Absolute encoders – multiturn

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

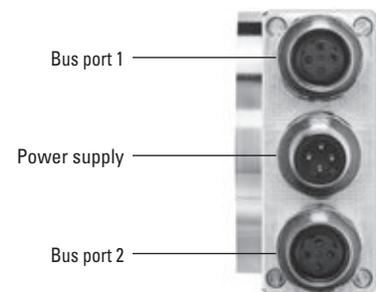
The complete encoder profile according to profile encoder version 4.1 as well as the identification & maintenance functionality version 1.16 has been implemented. IM blocks 0, 1, 2, 3 and 4 are supported.

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					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
C	2 (3 x M12 connector)	Bus port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			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 -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	

Absolute encoders multiturn



Absolute encoders – multiturn

**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

PROFINET IO

Dimensions shaft version, with removable bus terminal cover

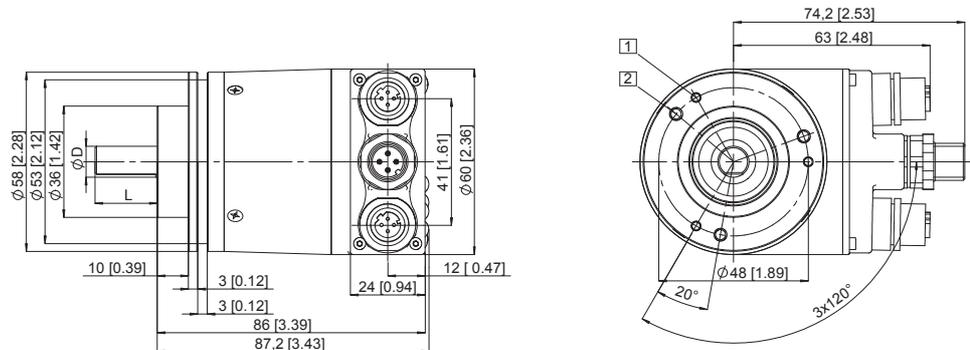
Dimensions in mm [inch]

Clamping flange, \varnothing 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

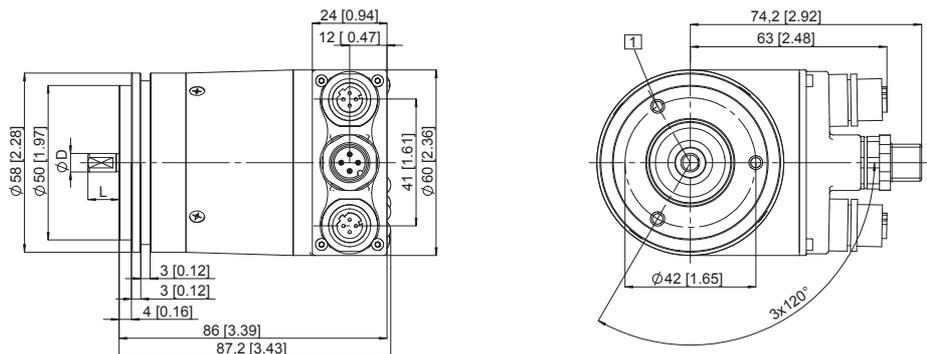


Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

- 1 M4, 6.0 [0.24] deep

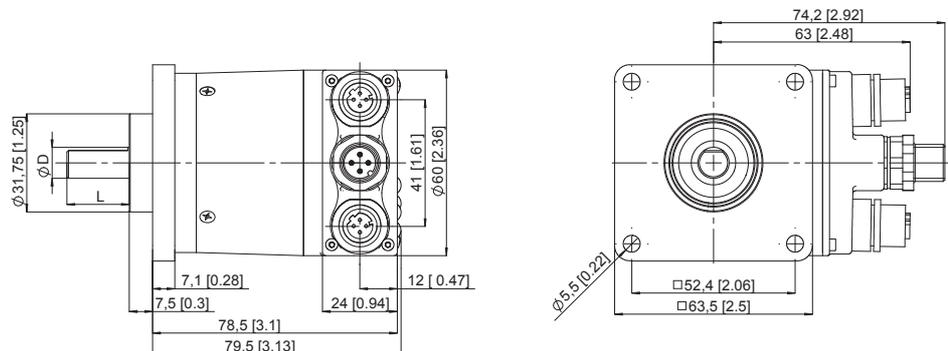
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



Square flange, \square 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



Absolute encoders – multiturn

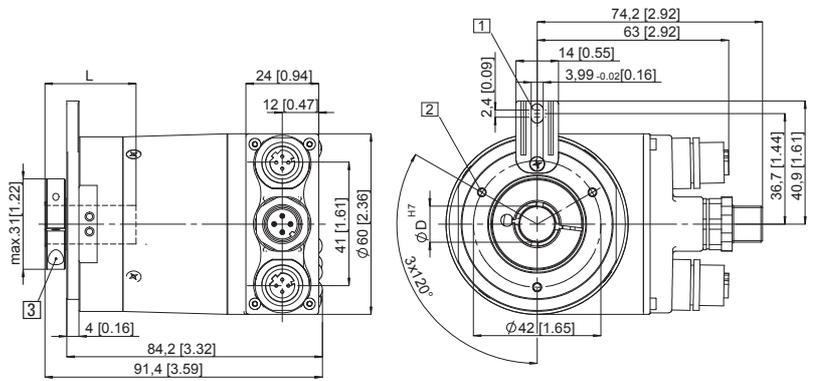
Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFINET IO
---	--	--------------------

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

Dimensions in mm [inch]

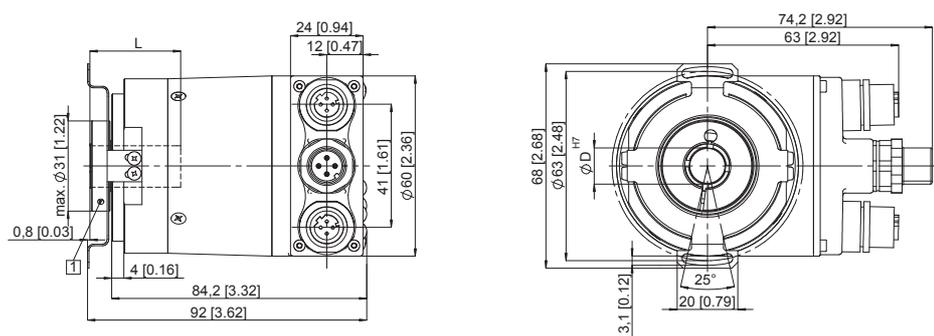
Flange with spring element, long Flange type 1 and 2

- 1 Torque stop slot, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [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]



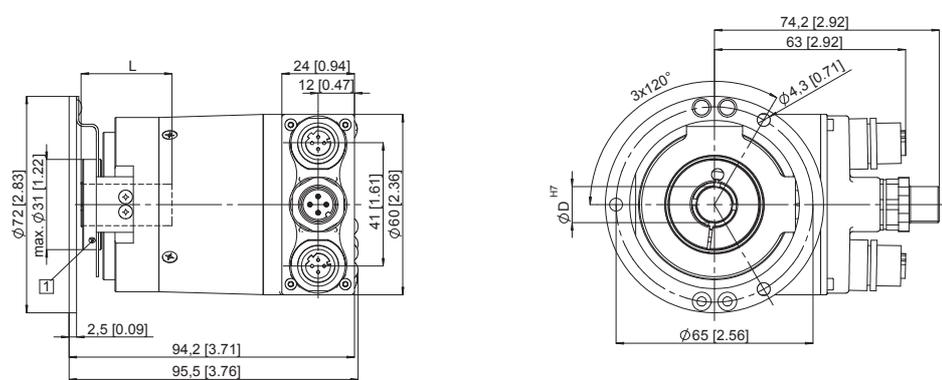
Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

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



Flange with stator coupling, $\varnothing 65$ [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]



Absolute encoders
multiturn

Absolute encoders – multiturn

Standard

ATEX/IECEx – zone 1/21, mechanical multiturn, optical

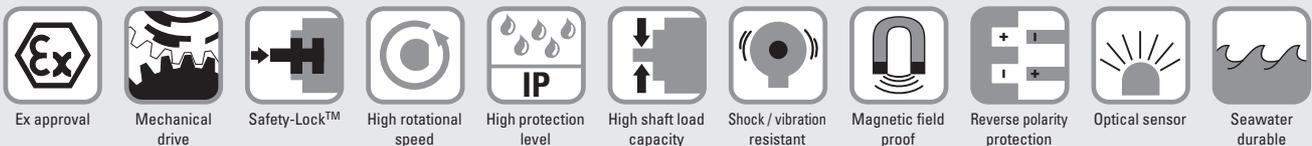
Sendix 7063 (shaft)

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.



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

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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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.

Absolute encoders
multiturn

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

Absolute encoders – multiturn

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)											
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥	⊥
2	1, 2, A, B	SET, DIR	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

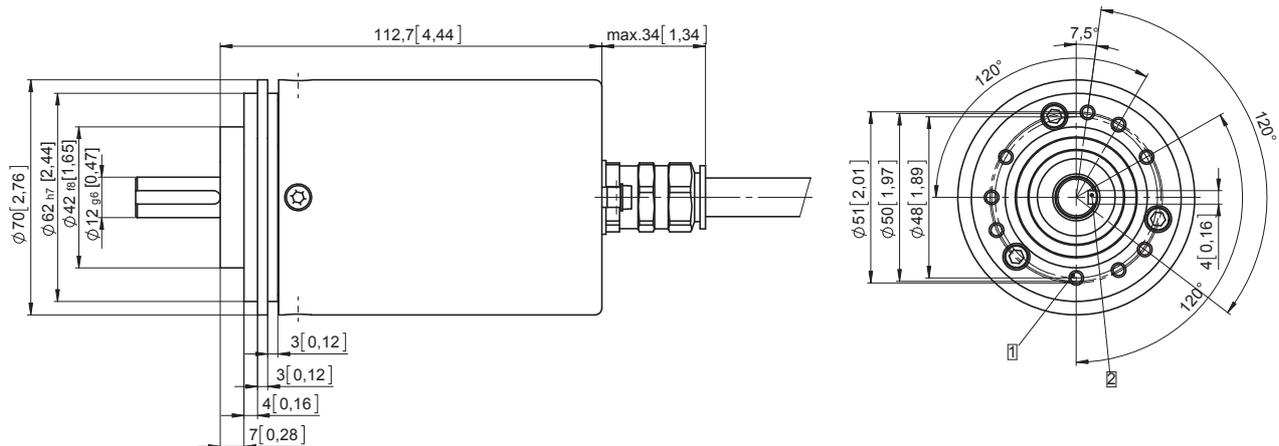
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

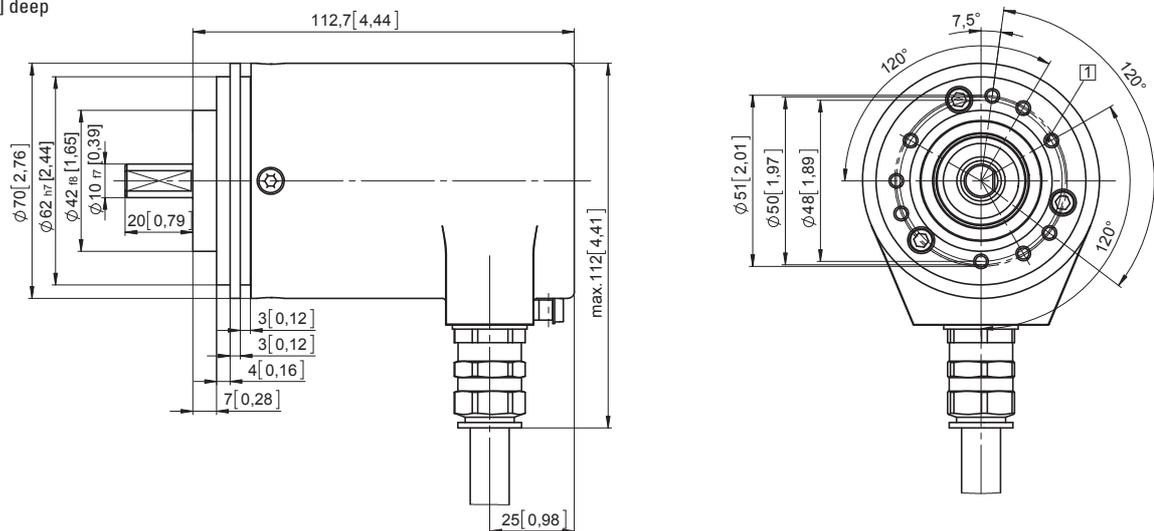
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 6 x M4, 10 [0.39] deep



Absolute encoders – multiturn

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).

Absolute encoders
multiturn

Order code	8.7063FS2	1	X	4	X	X	X	2	1	XXXX
Shaft version	Type	a	b	c	d	e	f	g	h	i 1)

- | | | |
|--|---|---|
| <p>a Flange
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p>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</p> <p>c Interface / power supply
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p> <p>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']</p> | <p>e Code
B = SSI, binary
C = BiSS, binary
G = SSI, gray</p> <p>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</p> | <p>g Inputs / outputs 2)
2 = SET input</p> <p>h Options
1 = no option</p> <p>i Cable length in dm 1)
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']</p> <p><i>Optional on request</i>
- special cable length
- stainless steel version
- other singleturn resolutions</p> |
|--|---|---|

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, 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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 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	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 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	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: <ul style="list-style-type: none"> – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification 	

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±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.

 Absolute encoders
multiturn

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	\bar{A}	B	\bar{B}	\perp	
			Cable marking:	6	1	2	3	4	5	11	7	8	9	10	shield	

- | | | | |
|---------|---|----------------|------------------|
| +V: | Encoder power supply +V DC | A, \bar{A} : | Cosine signal |
| 0 V: | Encoder power supply ground GND (0 V) | B, \bar{B} : | Sine signal |
| C+, C-: | Clock signal | \perp : | Protective earth |
| D+, D-: | Data signal | | |
| SET: | SET input. The current position becomes defined as position zero. | | |

Absolute encoders – multiturn

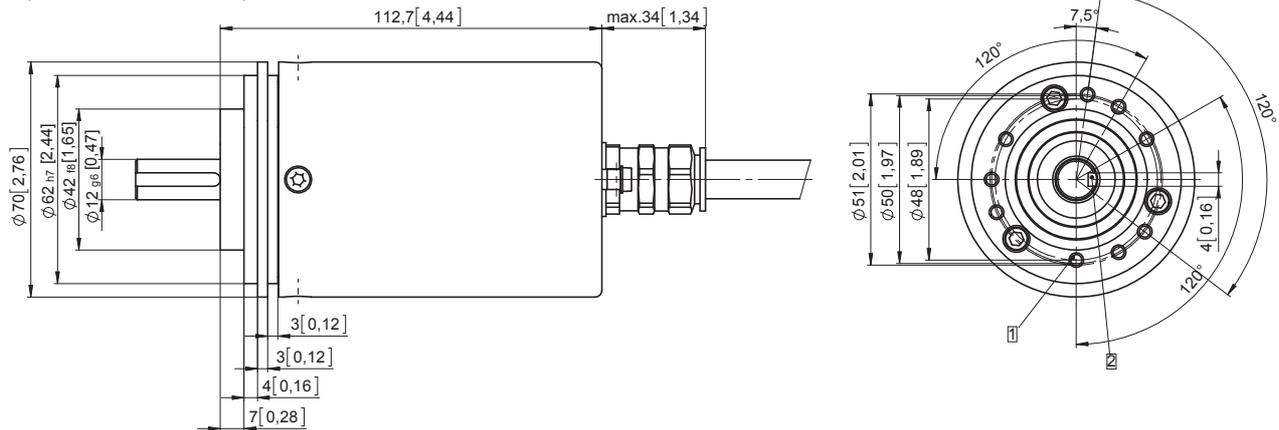
Standard ATEX/IECEX – zone 1/21, SIL2/PLd, mech. multiturn, optical	Sendix SIL 7063FS2 (shaft)	SSI/BiSS + SinCos
--	-----------------------------------	--------------------------

Dimensions

Dimensions in mm [inch]

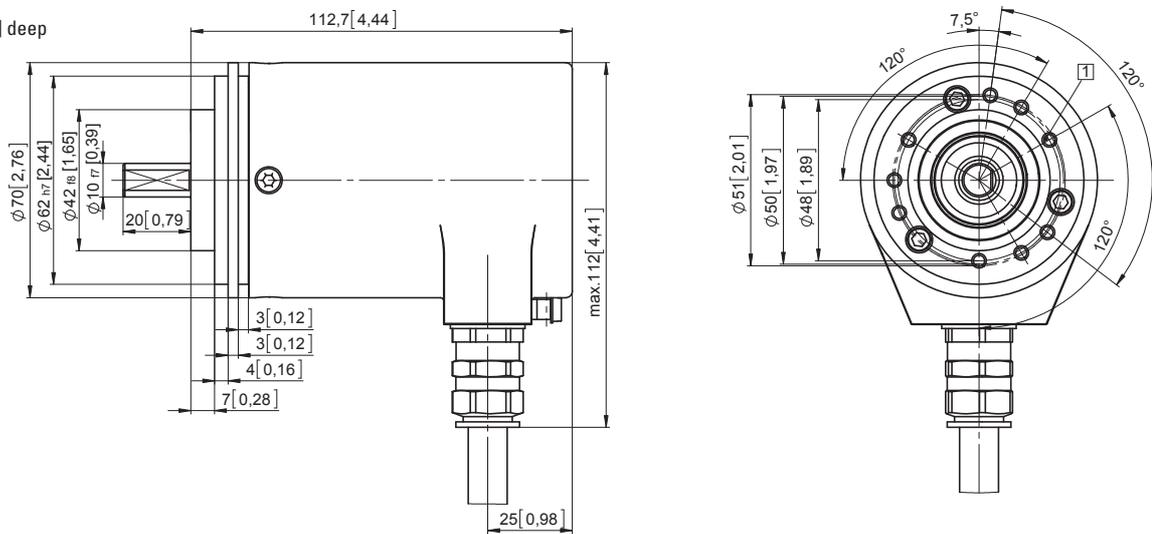
Clamping / synchronous flange, ø 70 [2.76]
Shaft type 1 with axial cable outlet

- 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



Absolute encoders – multiturn

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).

Absolute encoders
multiturn

Order code	8.7063FS3	. 1 X 4 X . X X 2 1 . XXXX
Shaft version	Type	a b c d e f g h i 1)

- | | | |
|--|--|---|
| <p>a Flange
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]</p> <p>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</p> <p>c Interface / power supply
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p> <p>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']</p> | <p>e Code
B = SSI, binary
C = BiSS, binary
G = SSI, gray</p> <p>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</p> | <p>g Inputs / outputs ²⁾
2 = SET input</p> <p>h Options
1 = no option</p> <p>i Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']</p> <p><i>Optional on request</i>
- special cable length
- stainless steel version
- other singleturn resolutions</p> |
|--|--|---|

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, 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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 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	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 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	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.

Absolute encoders – multiturn

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 V _{pp} (±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.	

Absolute encoders
multiturn

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	A	\bar{A}	B	\bar{B}	\perp	
4	1, 2, A, B	SET	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, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Protective earth

Absolute encoders – multiturn

Standard

ATEX/IECEX – zone 1/21, SIL3/PLe, mech. multiturn, optical

Sendix SIL 7063FS3 (shaft)

SSI/BiSS + SinCos

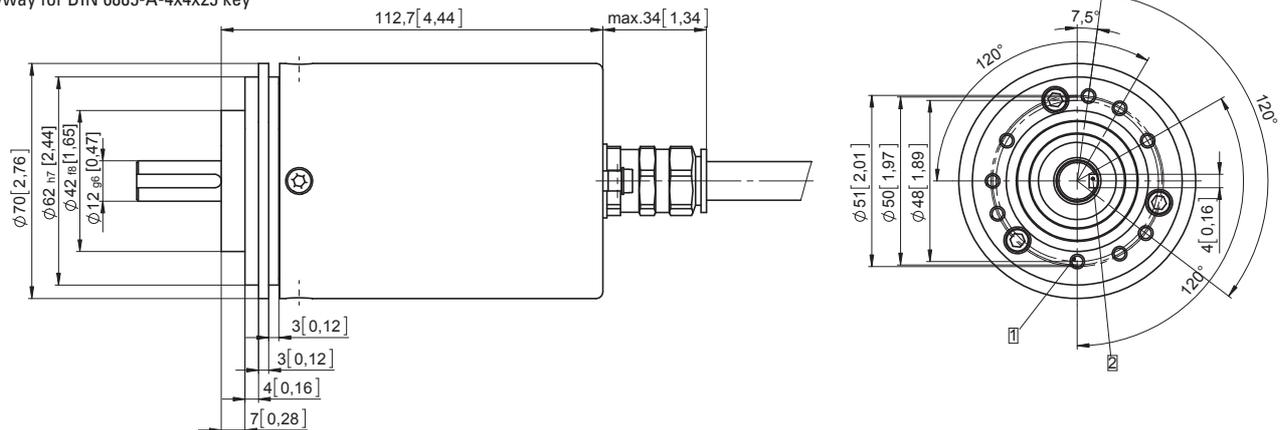
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 1 with axial cable outlet

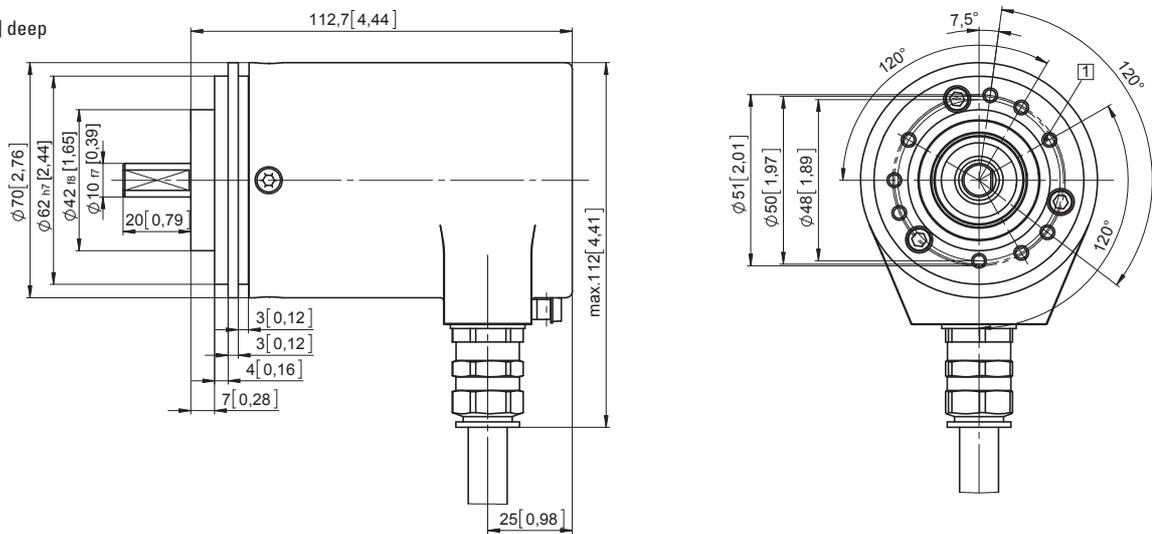
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 6 x M4, 10 [0.39] deep



Absolute encoders – multiturn

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

<h3>Compact and safe</h3> <ul style="list-style-type: none"> • 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). 	<h3>Explosion protection</h3> <ul style="list-style-type: none"> • “Flameproof-enclosure” version. • ATEX with EC type examination certificate. • IECEx with certificate of conformity (CoC).
--	--

Order code	8.7068	.1	X	3	X	.31	11	.XXXX
Shaft version	Type	a	b	c	d	e	f	1)
a Flange	1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]	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']			f Cable length in dm 1)	0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']	
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	e Fieldbus profile	31 = PROFIBUS DP V0 encoder profile class 2			<i>Optional on request</i> - special cable length - stainless steel version		
c Interface / power supply	3 = PROFIBUS DP V0 / 10 ... 30 V DC							

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
multiturn

Absolute encoders – multiturn

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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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 AWW-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.

Absolute encoders – multiturn

Standard	Sendix 7068 (shaft)	PROFIBUS DP
ATEX/IECEX – zone 1/21, mechanical multiturn, optical		

Terminal assignment

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

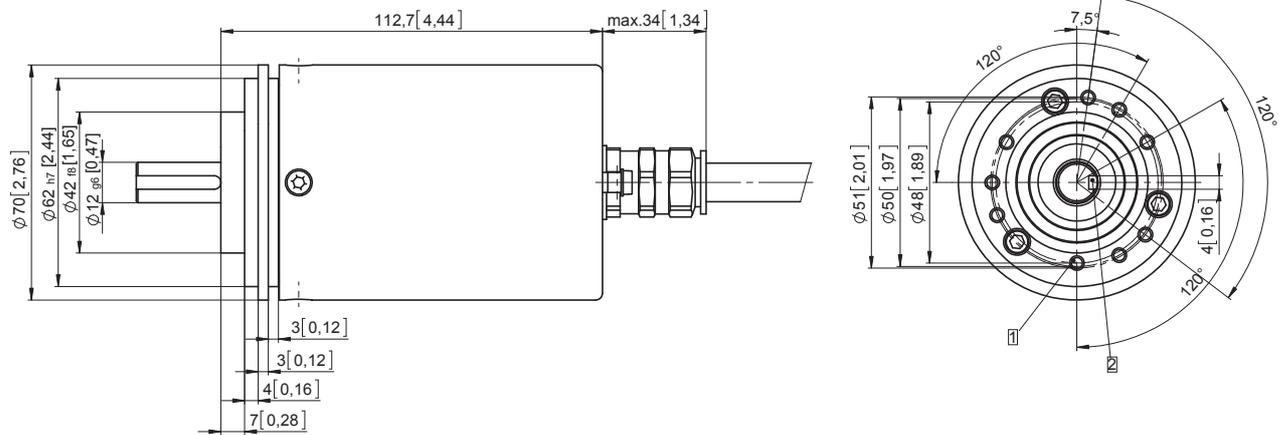
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 1 with axial cable outlet

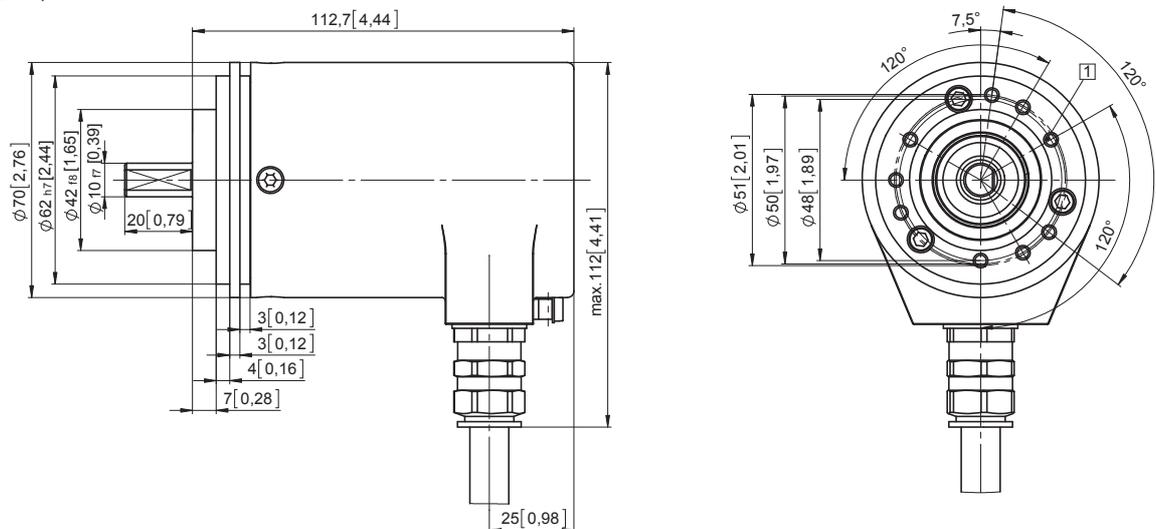
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 6 x M4, 10 [0.39] deep



Absolute encoders – multiturn

Standard

ATEX/IECEX – zone 1/21, mechanical multiturn, optical

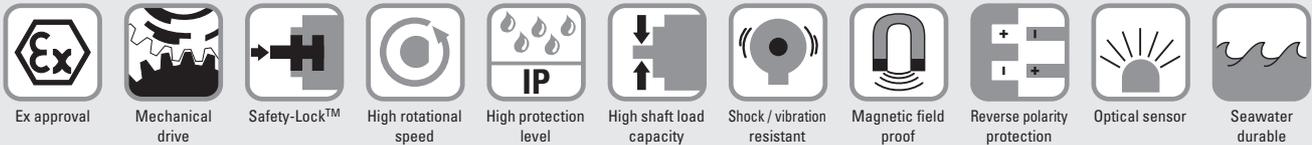
Sendix 7068 (shaft)

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.



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

8.7068 . 1 X 2 X . 21 21 . XXXX

Shaft version

Type a b c d e f 1)

a Flange

1 = clamping / synchronous flange, IP67, \varnothing 70 mm [2.76"]

b Shaft ($\varnothing \times L$)

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 \varnothing 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 – multiturn

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)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	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

 Absolute encoders
multiturn

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.

Absolute encoders – multiturn

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)								
		Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
2	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

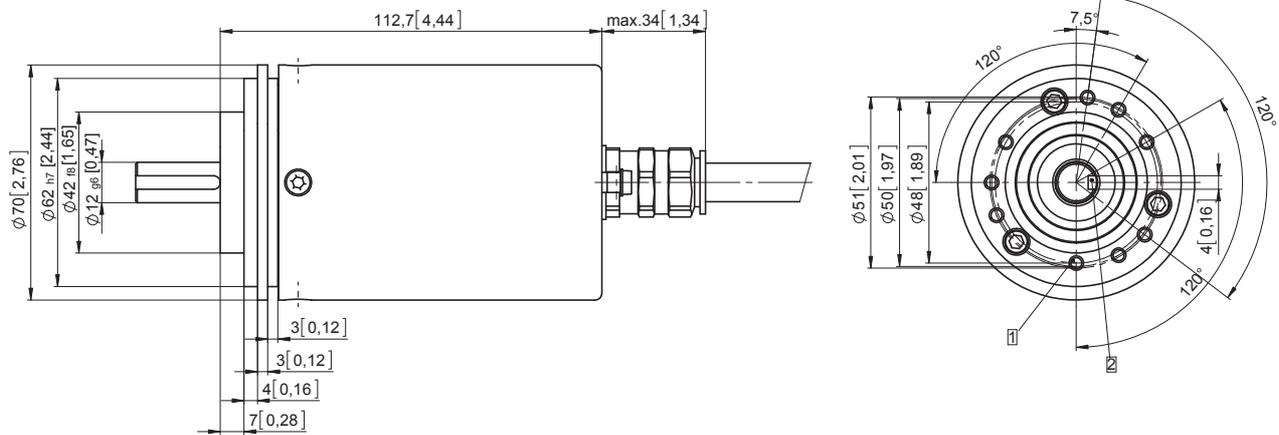
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

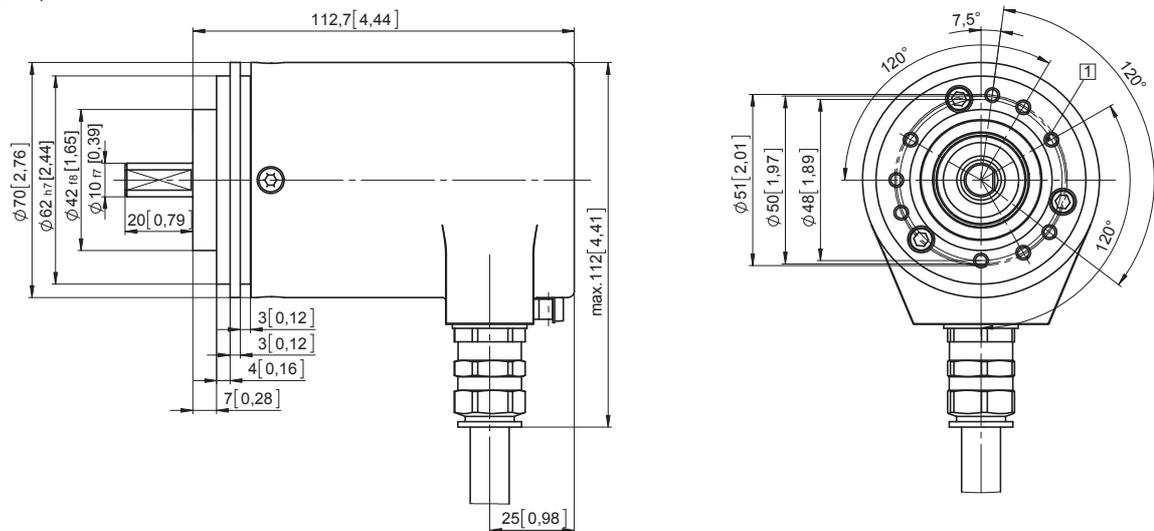
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]

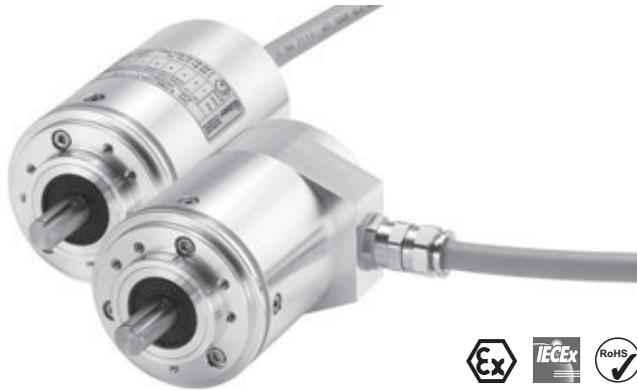
Shaft type 2 with radial cable outlet

- 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 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).

Absolute encoders multiturn

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"]	e Code B = SSI, binary C = BiSS, binary G = SSI, gray
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	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
c Interface / power supply 2 = SSI, BiSS / 10 ... 30 V DC	g Inputs / outputs ²⁾ 2 = SET, DIR input additional status output
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']	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'] <i>Optional on request</i> - special cable length - other singleturn resolutions

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

Absolute encoders – multiturn

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	⊕ 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 μ

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.

Absolute encoders – multiturn

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)												
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥	⊥	
2	1, 2, A, B	SET, DIR	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

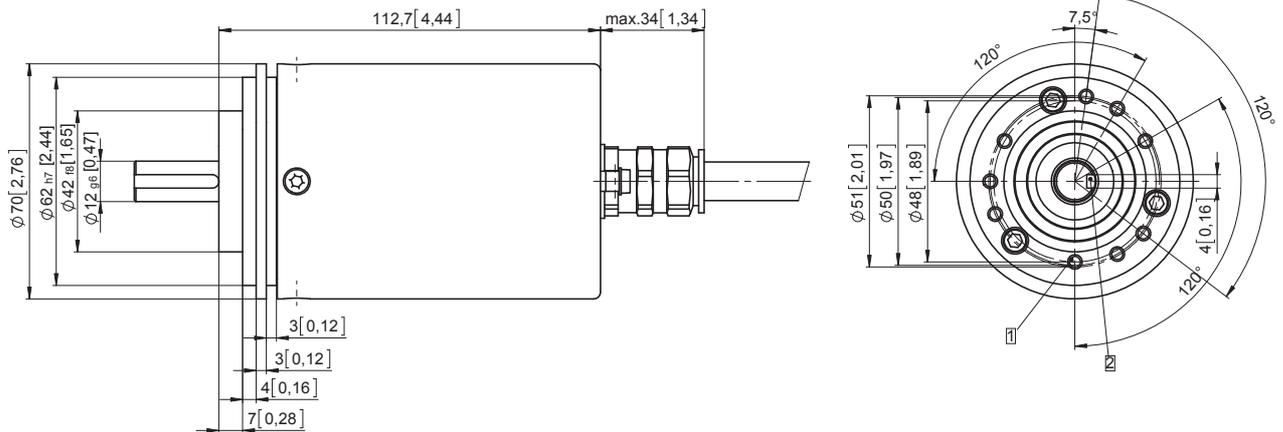
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

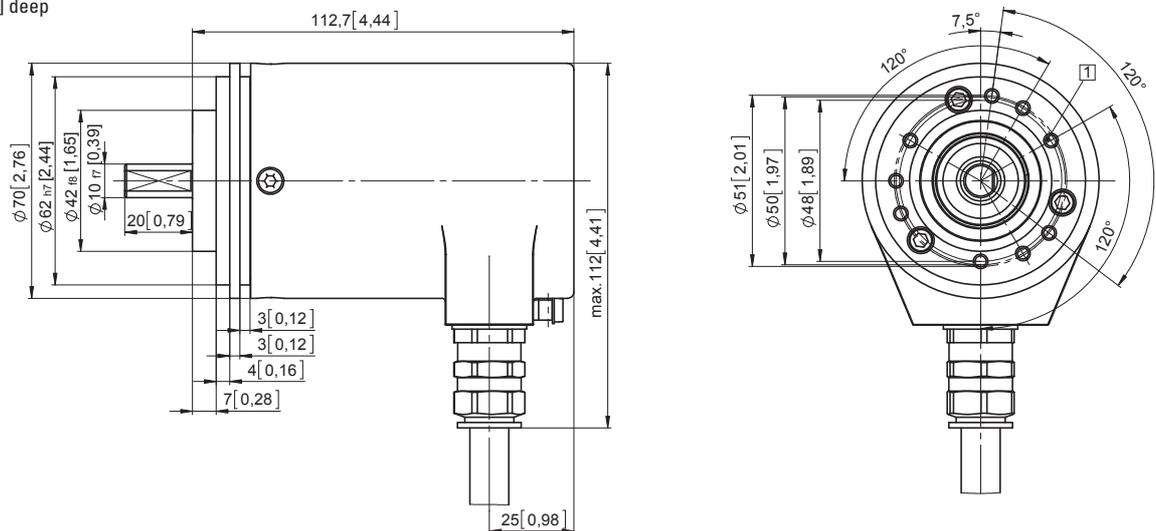
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



Clamping / synchronous flange, ø 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 6 x M4, 10 [0.39] deep



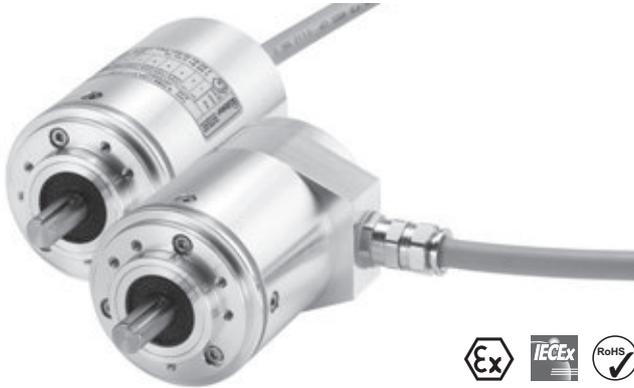
Absolute encoders
multiturn

Absolute encoders – multiturn

Standard
ATEX/IECEX – mining, mechanical multiturn, optical

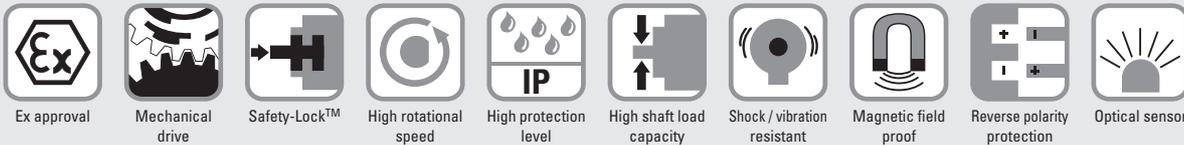
Sendix 7168 (shaft)

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.



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, \varnothing 70 mm [2.76"]
- b** Shaft ($\varnothing \times L$)
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	⊕ 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

 Absolute encoders
multiturn

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.

Absolute encoders – multiturn

Standard
ATEX/IECEx – mining, mechanical multiturn, optical

Sendix 7168 (shaft)

PROFIBUS DP

Terminal assignment

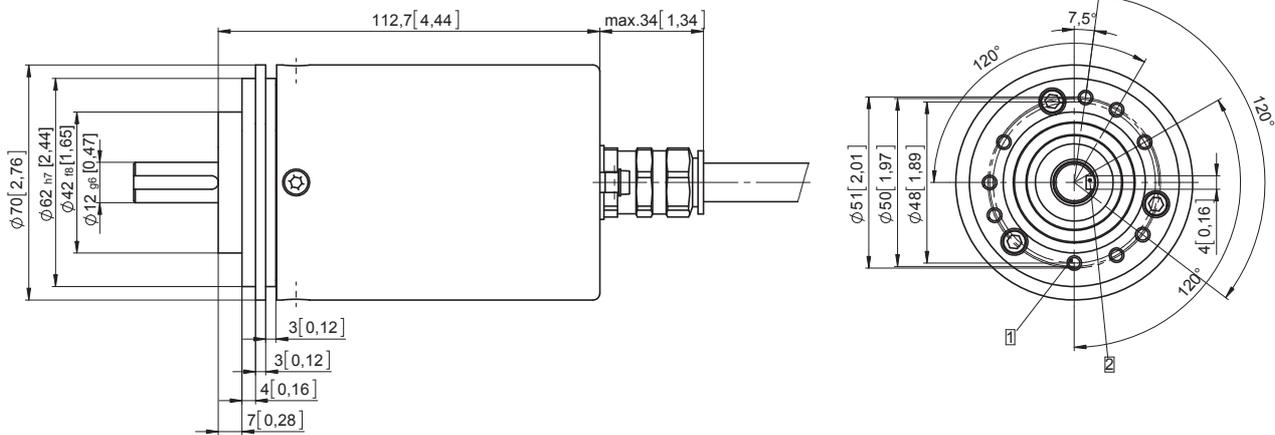
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
		Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_VDC	PB_A OUT	PB_B OUT
3	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

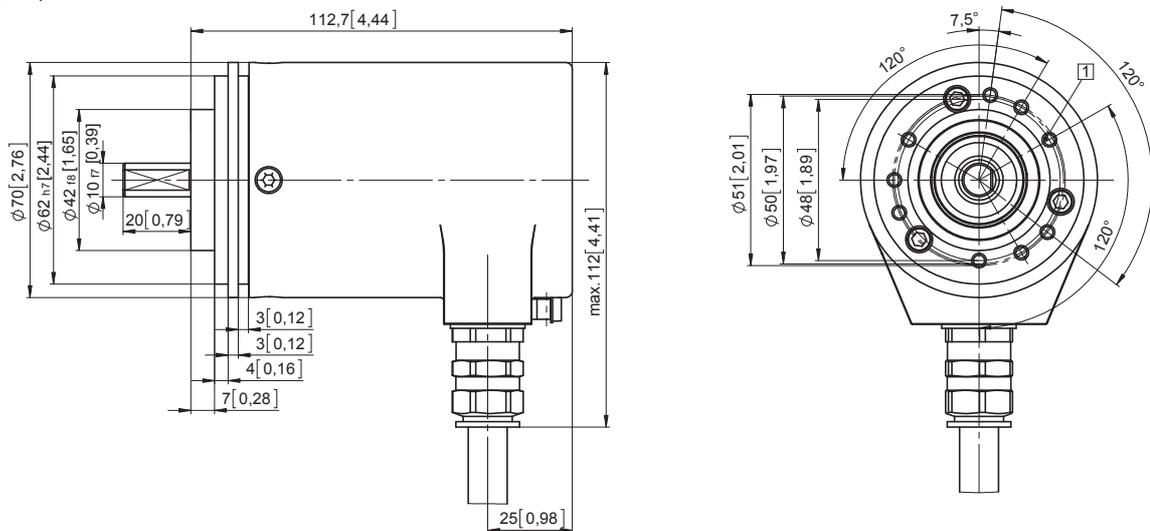
Clamping / synchronous flange, \varnothing 70 [2.76] Shaft type 1 with axial cable outlet

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



Clamping / synchronous flange, \varnothing 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.



Absolute encoders
multiturn

Ex approval	Mechanical drive	Safety-Lock™	High rotational speed	High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Optical sensor

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code	Shaft version	8.7168	. 2 X 2 X .	21 21 .	XXXX
		Type	a b c d	e	f ¹⁾
		a Flange 2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]	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']		f Cable length in dm ¹⁾ 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21'] <i>Optional on request</i> - special cable length
		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	e Fieldbus profile 21 = CANopen encoder profile DS406 V3.2		
		c Interface / power supply 2 = CANopen DS301 V4.02 / 10 ... 30 V DC			

1) Not applicable with connection types 1 and 2.

Absolute encoders – multiturn

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	⊕ 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.

Absolute encoders – multiturn

Standard	Sendix 7168 (shaft)	CANopen
ATEX/IECEX – mining, mechanical multiturn, optical		

Terminal assignment

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

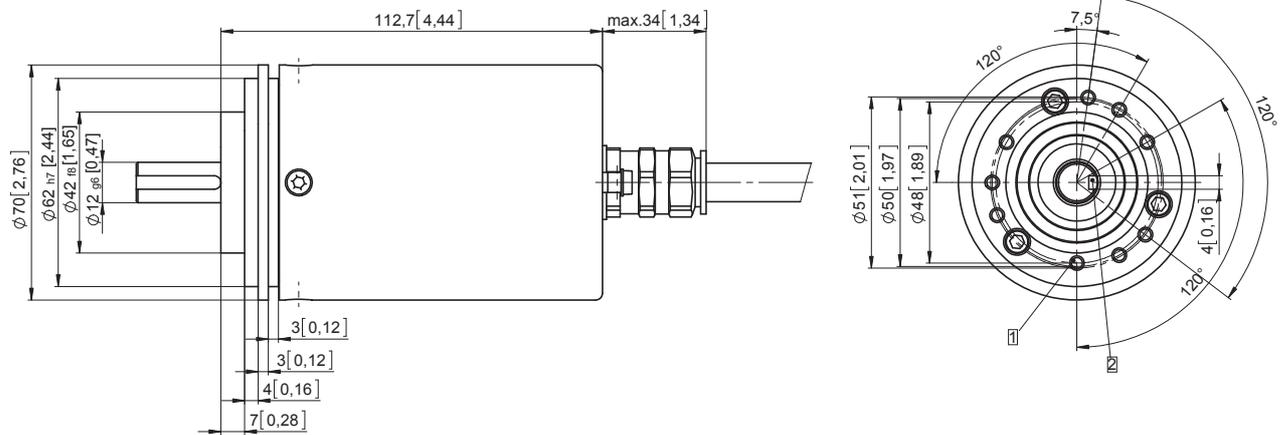
Dimensions

Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

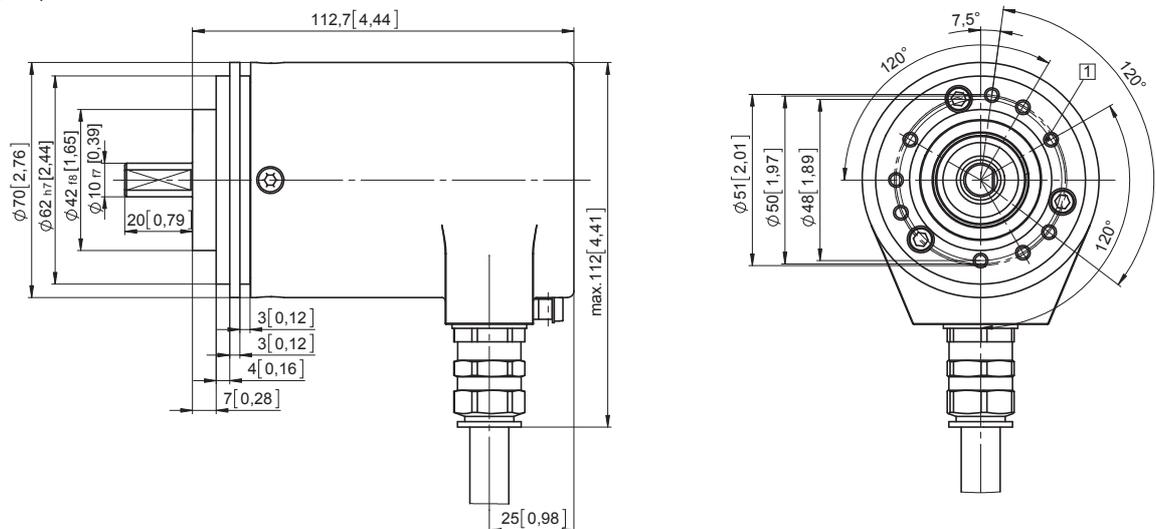
- 1 6 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



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

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:

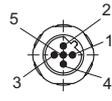
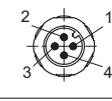
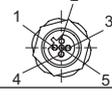
- Galvanic isolation of the fieldbus stage with DC/DC converter.
- Line driver according to RS485 max. 12 MB.
- Addressing by means of rotary switches.
- Diagnostics LED.
- Full class 1 and class 2 functionality.

 Absolute encoders
multiturn

Terminal assignment terminal box

Interface	Type of connection		Terminal box											
			Signal:	ENC.		BUS IN			BUS OUT			ENC.		Shield
3	1			+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

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	

Absolute encoders – multiturn

Large hollow shaft optical / magnetic

9080 (hollow shaft)

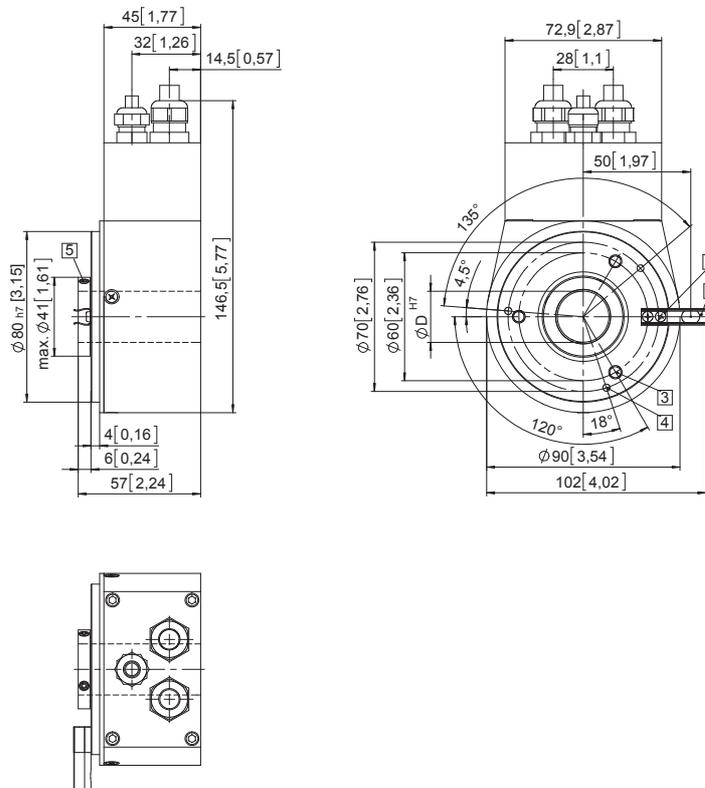
PROFIBUS DP

Dimensions

Dimensions in mm [inch]

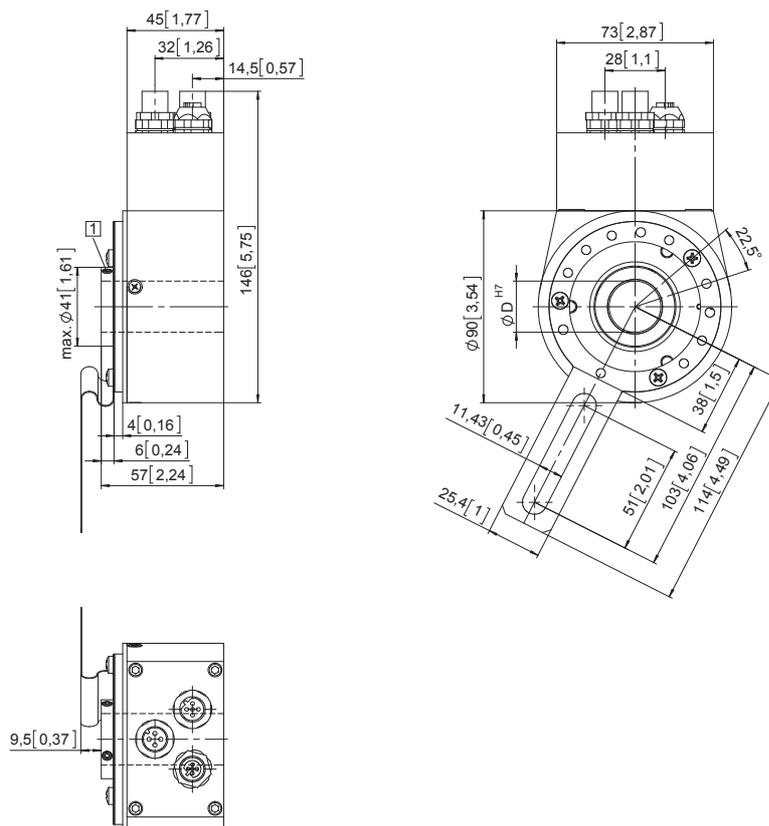
Flange with spring element

- 1 Spring element, short (flange no. 2) cylindrical pin DIN 6325, \varnothing 6 [0.24]
- 2 Spring element, long (flange no. 3) cylindrical pin DIN 6325, \varnothing 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



Absolute encoders – multiturn

**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.



DeviceNet

CANopen



High rotational speed



Temperature range
-10°...+70°C



High protection level
IP65



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.

Absolute encoders
multiturn

**Order code
Hollow shaft**

8.9080 . XXXXX . 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

e Fieldbus profile

- 1001 = DeviceNet
- 2001 = CANopen
encoder profile DSP 406

d Type of connection, removable bus terminal cover

- 1 = with cable gland M16 ¹⁾
- 2 = with 3 x M12 connector, 5-pin

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.

Absolute encoders – multiturn

Large hollow shaft optical / magnetic	9080 (hollow shaft)	CANopen / DeviceNet
--	----------------------------	----------------------------

Mounting accessory for hollow shaft encoders	Order no.
---	-----------

Cylindrical pin, long		with fixing thread	8.0010.4700.0003
for torque stops			

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

Absolute encoders – multiturn

Large hollow shaft optical / magnetic	9080 (hollow shaft)	CANopen / DeviceNet
--	----------------------------	----------------------------

CANopen - Device profile

General description

The CANopen Device profiles describe the functionality of the communication and of that part of the CANopen fieldbus system specific to the manufacturer. Device profile 406 applies to encoders and defines the individual objects independently of the manufacturer. In addition the profile makes provision for additional extended functions specific to the manufacturer; using devices that interface with CANopen offers the advantage of acquiring systems today that are prepared for the needs of the future.

The following functionality is integrated:

- Class C2 functionality.
- NMT slave.
- Diagnostics (internal) 2 bit.
- CAN LED for bus status.
- CAN LED for operating mode.

The following parameters can be programmed:

- Polling mode or auto mode with adjustable time.
- Code sequence (direction).
- Number of pulses/rotation 1 ... 8192.
- Number of revolutions 1 ... 4096.
- Total resolution.
- Preset.
- Offset.
- Number of revolutions.

DeviceNet Encoder profile

General description

The DeviceNet Device profile describes the functionality of the communication and of that part of the DeviceNet fieldbus system specific to the manufacturer. The Encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition the profile makes provision for additional extended functions specific to the manufacturer.

The following parameters can be programmed:

- Direction of rotation.
- Scaling factor
 - Number of pulses/rotation.
 - 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												
		Signal:	ENC.		BUS IN			BUS OUT			ENC.		shield	
1, 2	1		+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						Diagram
			Signal:	DRAIN	+ V DC	- V DC	CAN_H	CAN_L	
1, 2	2	Bus in	Pin:	1	2	3	4	5	
			Colour:	GY	RD	BK	WH	BU	
			Signal:	DRAIN	+ V DC	- V DC	CAN_H	CAN_L	
		Bus out	Pin:	1	2	3	4	5	
			Colour:	GY	RD	BK	WH	BU	
			Signal:	DRAIN	+ V DC	- V DC	CAN_H	CAN_L	

Absolute encoders – multiturn

**Large hollow shaft
optical / magnetic**

9080 (hollow shaft)

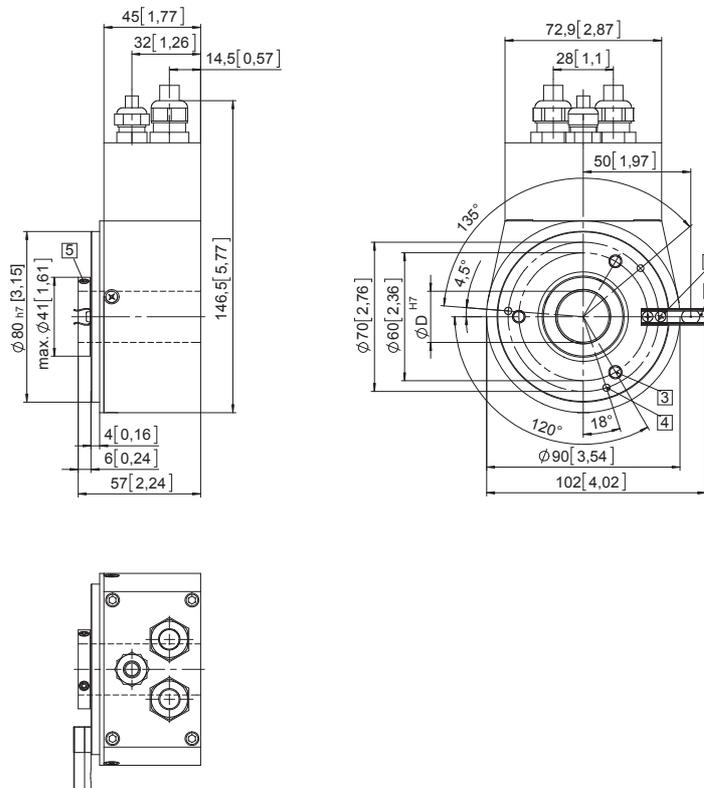
CANopen / DeviceNet

Dimensions

Dimensions in mm [inch]

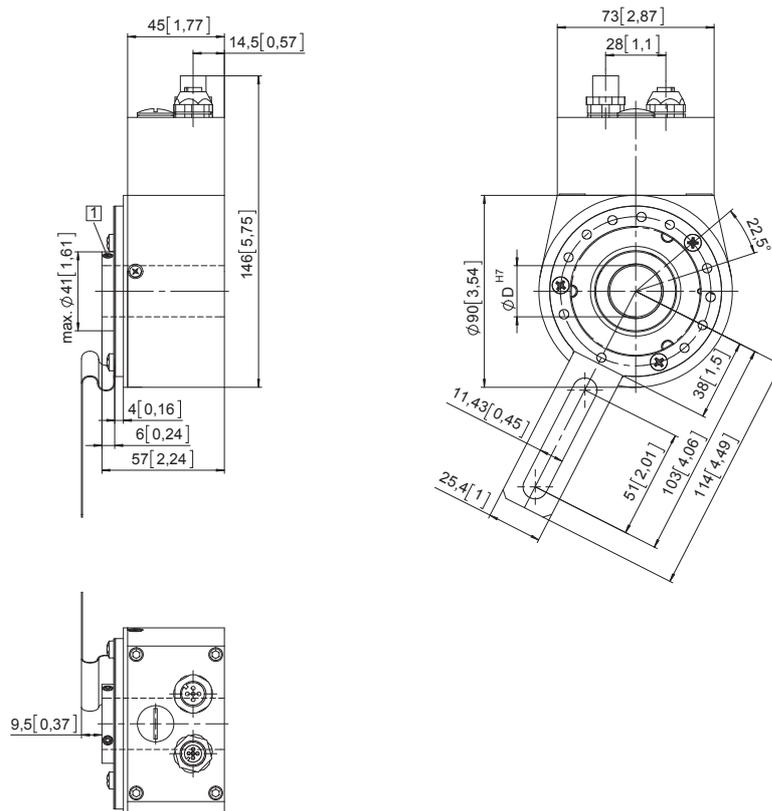
Flange with spring element

- 1 Spring element, short (flange no. 2)
cylindrical pin DIN 6325, \varnothing 6 [0.24]
- 2 Spring element, long (flange no. 3)
cylindrical pin DIN 6325, \varnothing 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



Absolute encoders – multiturn

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.

Absolute encoders
multiturn

Order code	8.9081	. 3 X 2 2 . XXXX
Hollow shaft	Type	a b c d e
a Flange	3 = with spring element, long	
b Hollow shaft	3 = \varnothing 20 mm [0.79"] 4 = \varnothing 24 mm [0.94"] 5 = \varnothing 28 mm [1.10"] 6 = \varnothing 5/8"	
c Interface / power supply	2 = SSI with 4 status outputs / 5 ... 30 V DC	<i>Optional on request</i> - other hollow shaft diameters
d Type of connection	2 = radial M23 connector, 12 pin without mating connector	
e SSI interface	2004 = 8192 x 4096 (25 bit), gray	

Mounting accessory for hollow shaft encoders		Order no.
Cylindrical pin, long	with fixing thread	8.0010.4700.0003
for torque stops		

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.

Absolute encoders – multiturn

Large hollow shaft optical / magnetic	9081 (hollow shaft)	SSI
--	----------------------------	------------

Technical data

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Mass moment of inertia	approx. 65 x 10 ⁻⁶ kgm ²
Starting torque - at 20°C [68°F]	< 0.2 Nm
Weight	approx. 0.7 kg
Protection acc. to EN 60529	IP65
Working temperature range	-20°C ... +70°C [-4°F ... +158°F]
Materials	hollow shaft stainless steel H7
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz

Electrical characteristics	
Power supply	5.0 ... 30 V DC 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

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)	cw

1) For shaft version only (at shaft end).
2) If power supply +V correctly applied.

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

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:
 - Determine the count direction of the encoder either via the V/R input or via programming
 - Apply power to the encoder
 - 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.

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%).

Absolute encoders – multiturn

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

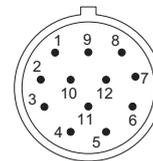
Output	Default-function
A1	battery control

Terminal assignment (SSI Synchronous Serial Interface with 12 pin connector)

Interface	Type of connection	Features	M23 connector										
			Signal:	0 V	+V	C+	C-	D+	D-	ST	VR	A1	⊥
2	2	SET Up/down input	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

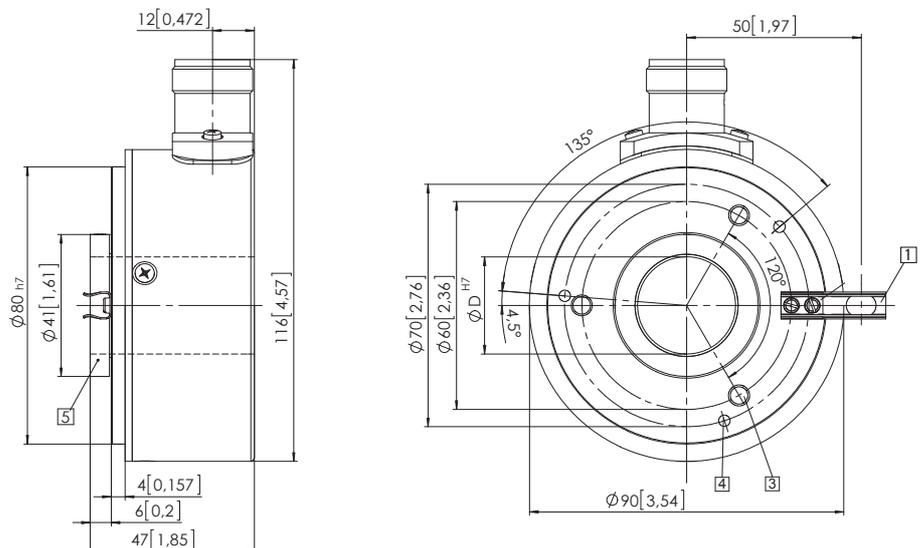


M23 connector, 12 pin

Dimensions

Dimensions in mm [inch]

- 1 Spring element, long (flange no. 3) cylindrical pin DIN 6325, \varnothing 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





KLEINER
Fritz Kuebler GmbH
www.kuebler.com

Type: 8.LI50.1121.2250
S-Nr:

Lin. Pos. 1/100 m
Zeit 1/100

4,8-30 VDC 60 mA

0V WH
+V BN
A GN
AI YE

B GN
B BN
B GN
B YE



Shield =



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	 Sensor head, magnetic band	Limes LA10 / BA1	Resolution min. 1 µm	392
	 Sensor head, magnetic band	Limes LA50 / BA5	Resolution min. 10 µm	396
Draw wire mechanics	 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
	 With absolute encoder	Draw wire encoder A41	Measuring length max. 2 m	409
	 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

Linear measuring technology

**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 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 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 . X1X1 . 2XXX
Type a b c d e f

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 . 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.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)

Linear measuring technology

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.

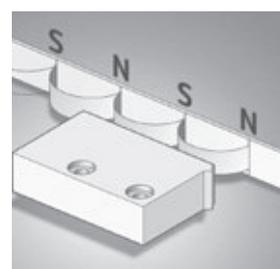
Technical data

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, \bar{A} , B, \bar{B} , 0, $\bar{0}$	
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/s ² , 1 ms	
Vibration resistance	300 m/s ² , 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 mm ² [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

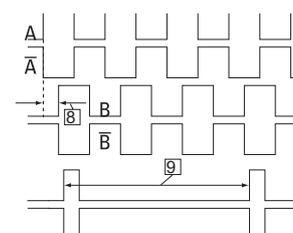
Linear measuring technology

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 than 250 kHz should be provided.

Linear measuring technology

Incremental magnetic measurement system sensor head, magnetic band

Limes LI20 / B1

Resolution min. 10 µm

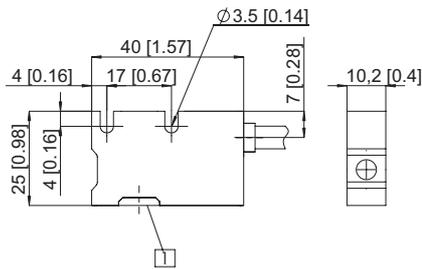
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

Dimensions

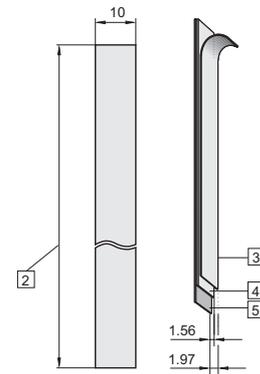
Dimensions in mm [inch]

Sensor head Limes LI20



1 Active measuring area

Magnetic band Limes B1



2 Length L, max. 50 m

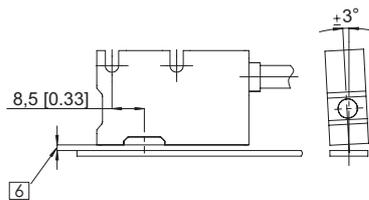
3 Masking tape

4 Magnetic band

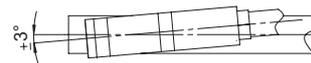
5 Carrier band

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

Linear measuring technology

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.

Linear measuring technology

Order code sensor head Limes LI50

8.LI50.X1X1.2XXX
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 0060 = 6 m
- 0020 = 2 m 0100 = 10 m
- 0040 = 4 m 0200 = 20 m
- 0050 = 5 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)

Linear measuring technology

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

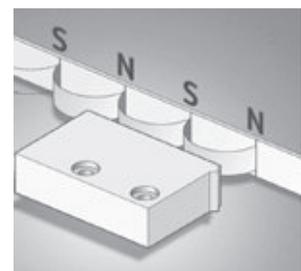
Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

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, \bar{A} , B, \bar{B} , 0, $\bar{0}$	
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/s ² , 1 ms	
Vibration resistance	300 m/s ² , 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 mm ² [AWG 25] 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	

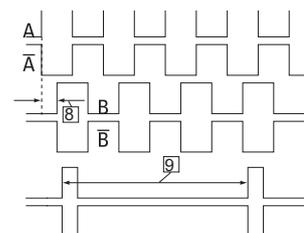
Magnetic band Limes B2	
Pole gap	5 mm from pole to pole
Dimensions	width 10 mm thickness 1.97 mm incl. masking tape
Temperature coefficient	16 x 10 ⁻⁶ /K
Working temperature	-20°C ... +80°C [-4°F ... +176°F] -20°C ... +65°C [-4°F ... +144°F] (when mounted solely with adhesive tape)
Storage temperature	-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 than 250 kHz should be provided.

Linear measuring technology

Incremental magnetic measurement system sensor head, magnetic band	Limes LI50 / B2	Resolution min. 5 µm
---	------------------------	-----------------------------

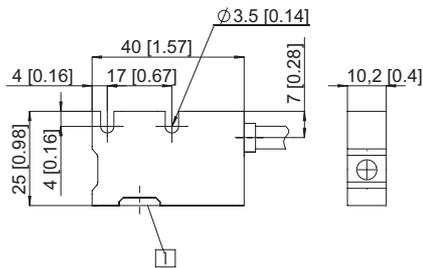
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

Dimensions

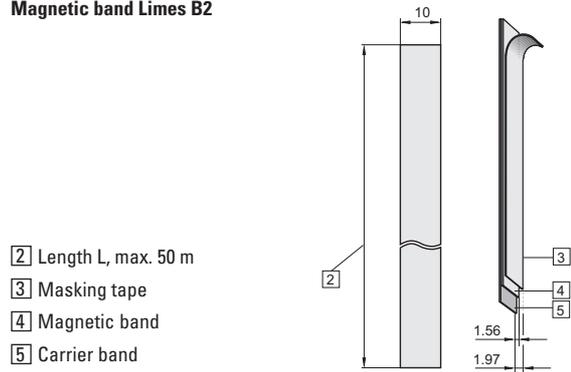
Dimensions in mm [inch]

Sensor head Limes LI50



1 Active measuring area

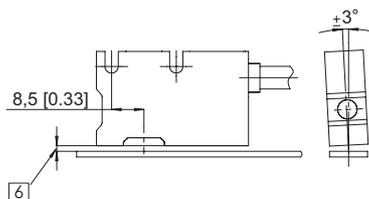
Magnetic band Limes B2



- 2 Length L, max. 50 m
- 3 Masking tape
- 4 Magnetic band
- 5 Carrier band

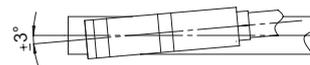
Permissible mounting tolerances

Tilting

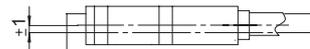


6 Distance sensor head / magnetic band:
0.1 ... 2.0 mm (recommended 1 mm)

Torsion



Offset



1) PH = Shield is attached to connector housing.

Linear measuring technology

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.



DC 10 ... 30 V Power supply	8 m Max. measuring length	0,2 mm Max. distance to measuring tape	10 m/s Max. speed	1 µm High resolution	IP64 Protection	Reverse polarity protection	Shock / vibration resistant	-10° ... +70°C Temperature range	SinCos
--	-------------------------------------	--	-----------------------------	--------------------------------	---------------------------	------------------------------------	------------------------------------	--	---------------

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 Type	. 1 2 X 2 a b c d
a Model 1 = IP64, standard	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
b baud rate 2 = standard (CANopen, 250 k)	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 Type	. 10 . 010 . XXXX a b
a Width 10 = 10 mm	b Length (measuring range = length - 0.1 m) 0005 = 0.5 m 0040 = 4 m 0010 = 1 m 0060 = 6 m 0020 = 2 m 0080 = 8 m 0030 = 3 m	Optional on request - other lengths
	Stock types 8.BA1.10.010.0080	

Linear measuring technology

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 mm ² [AWG 26]	05.00.60B1.B211.005M
Unprepared cable, cut to length	6 x 2 x 0.14 mm ² [AWG 26] PVC cable	8.0000.6900.XXXX ¹⁾
	6 x 2 x 0.14 mm ² [AWG 26] PUR cable	8.0000.6Y00.XXXX ¹⁾
	5 x 2 x 0.14 mm ² [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 10 m/s
	permanent absolute positions reading 1 m/s
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 1 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 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) µm 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 typ. 3.8 V
	LOW at I _{Load} = 20 mA typ. 1.3 V
Clock rate	25 bit (24 + 1 failurebit for distance)
Code	Gray
SSI clock rate	80 kHz ... 0.4 MHz
Monoflop time	≤ 40 µs
Data refresh rate	≤ 250 µs

CANopen interface	
Interface	CAN High-Speed acc. to ISO 11898, Basic and Full CAN, CAN specification 2.0 B
Protocol	CANopen
Baud rate	250 kbit/s; 125 ... 1000 kbit/s configurable
Termination	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 V _{pp} (±10%)
Short circuit proof	yes
Pulse rate	1 SinCos per 1 mm pole

1) XXXX = cable length in meters (e.g. 10 m = 0010).

Linear measuring technology

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 $\alpha = 16 \times 10^{-6} 1/K$ temperature coefficient $\Delta\delta$ = relative temperature change based on 20°C [+68°F] in °K

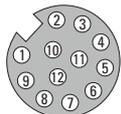
Working temperature	-20°C ... +70°C [-4°F ... +158°F] (in case of mounting with adhesive tape only)
Storage temperature	-20°C ... +80°C [-4°F ... +176°F]
Mounting	adhesive joint
Additional length	100 mm in order to obtain an optimal measuring result, the magnetic band should be about 0.1 m longer than 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	\bar{A}	B	\bar{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	\bar{A}	B	\bar{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, \bar{A} : Cosine signal
- B, \bar{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



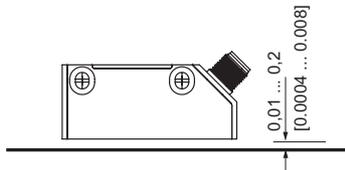
Linear measuring technology

Absolute magnetic measurement system sensor head, magnetic band	Limes LA10 / BA1	Measuring length max. 8 m Resolution min. 1 µm
--	-------------------------	---

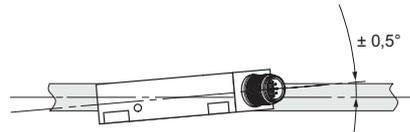
Permissible mounting tolerances

Dimensions in mm [inch]

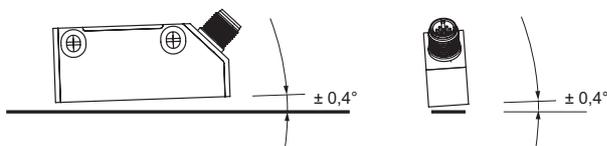
Distance sensor head / magnetic band (incl. masking tape)



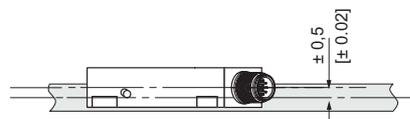
Torsion



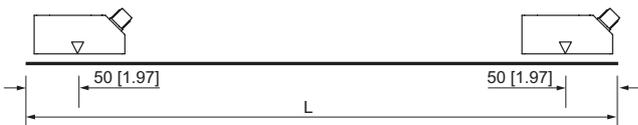
Tilting



Offset



Measuring range



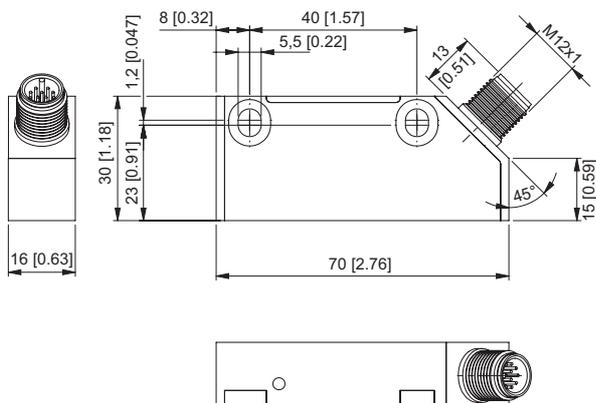
Observe mounting direction



Dimensions

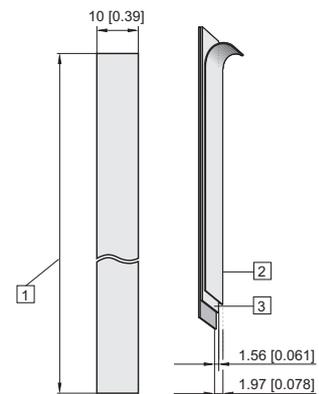
Dimensions in mm [inch]

Sensor head Limes LA10



Magnetic band Limes BA1

- 1 Length L, max. 8 m
- 2 Masking tape
- 3 Magnetic band



Linear measuring technology

**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.



SSI CANopen

DC 10 ... 30 V	 20 m	 1,5 mm	 4 m/s	 0.01 mm	 IP40	 Reverse polarity protection	 Shock / vibration resistant	 -10° ... +70°C	 Magnetic sensor
Power supply	Max. measuring length	Max. distance to measuring tape	Max. speed	High resolution	Protection	Reverse polarity protection	Shock / vibration resistant	Temperature range	Magnetic sensor

Robust and versatile

- Resolution 0.01 mm / measuring lengths max. 20 m.
- Rugged die-cast zinc housing.
- Position 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 . 12X1
Type a b c d

a Model 1 = IP40, standard	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
b baud rate 2 = standard (CANopen, 250 k)			

**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 0060 = 6 m 0020 = 2 m 0100 = 10 m 0040 = 4 m 0200 = 20 m 0050 = 5 m	Stock types 8.BA5.20.010.0200
------------------------------	--	---

Linear measuring technology

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/s ² , 1 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 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

Linear measuring technology

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 $\alpha = 16 \times 10^{-6} 1/K$ 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

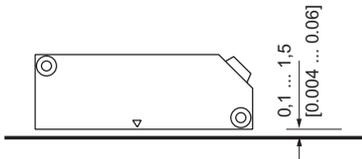
Linear measuring technology

Absolute magnetic measurement system Sensor head, magnetic band	Limes LA50 / BA5	Measuring length max. 20 m Resolution min. 10 µm
--	-------------------------	---

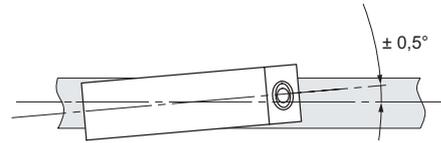
Permissible mounting tolerances

Dimensions in mm [inch]

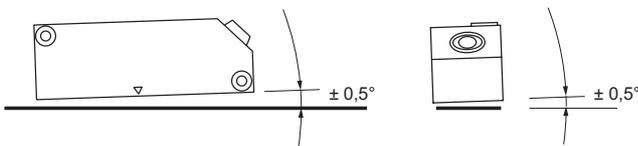
Distance sensor head / magnetic band (incl. masking tape)



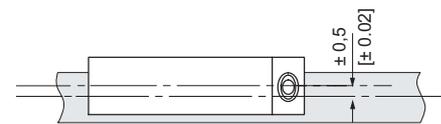
Torsion



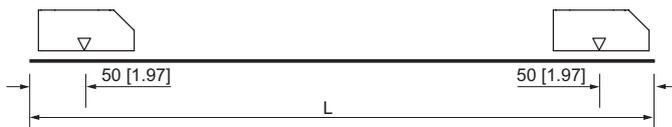
Tilting



Offset



Measuring range



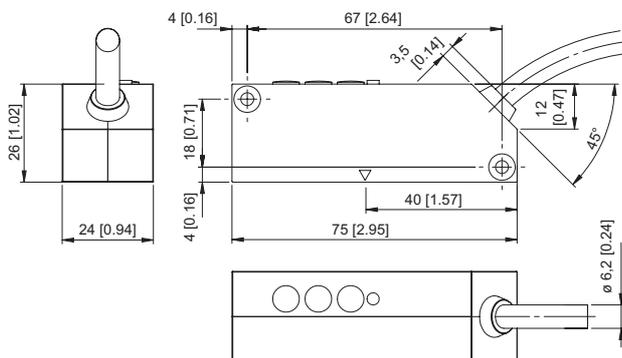
Observe mounting direction



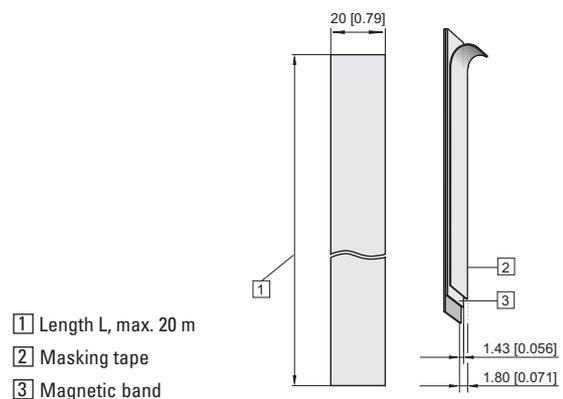
Dimensions

Dimensions in mm [inch]

Sensor head Limes LA50



Magnetic band Limes BA5



Linear measuring technology

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 **D5.350X . AXX . 0000**
draw wire encoder

Type **a** **b** **c**

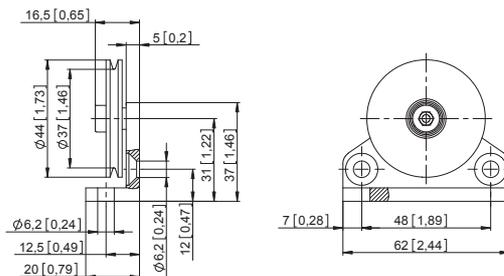
a Measuring range
A = 300 mm ¹⁾
B = 600 mm

b 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

c 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 suitable for potentiometer output.

Linear measuring technology

Draw wire mechanics with analogue sensor	Draw wire encoder A30	Measuring length max. 0.6 m Traverse speed max. 0.8 m/s
---	------------------------------	--

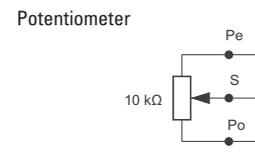
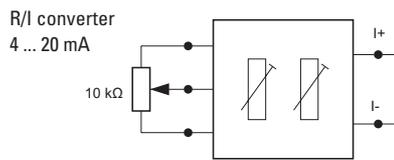
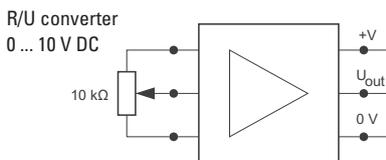
Technical data

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 \varnothing 0.4 mm plastic-coated

Electrical characteristics			
Analogue output	0 ... 10 V DC	4 ... 20 mA	potentiometer 10 k Ω
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		

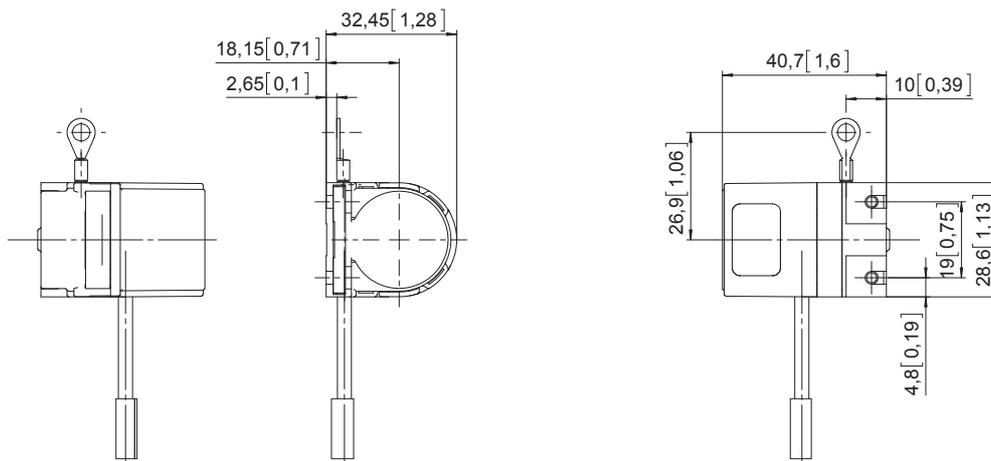
Terminal assignment

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



Dimensions

Dimensions in mm [inch]



Linear measuring technology

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 **D5.350 X . AXX X . 0000**
draw wire encoder

Type **a** **b** **c**

a Measuring range

- 1 = 1000 mm
- 2 = 2000 mm

b 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

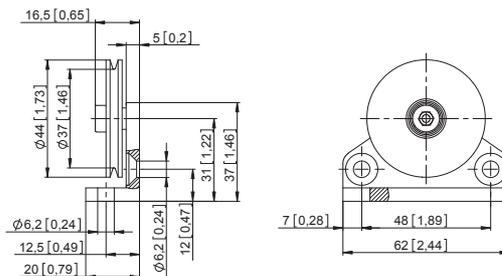
c Type of connection

- 1 = cable 2 m [6.56'] for measuring range 1000 mm: axial for measuring range 2000 mm: radial
- 2 = radial M12 connector, 4-pin (only available for measuring range 2000 mm)

Accessories for draw wire encoder

Order no.

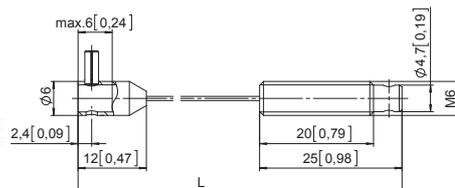
Guide pulley



- 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

Linear measuring technology

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
---	--	--

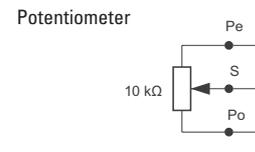
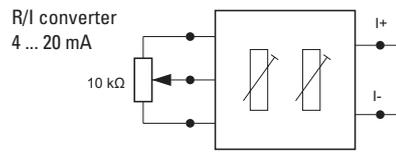
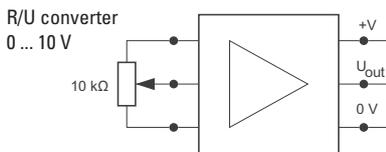
Technical data

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 \varnothing 0.45 mm plastic-coated

Electrical characteristics			
Analogue output	0 ... 10 V	4 ... 20 mA	potentiometer 10 k Ω
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

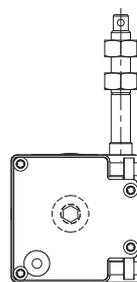
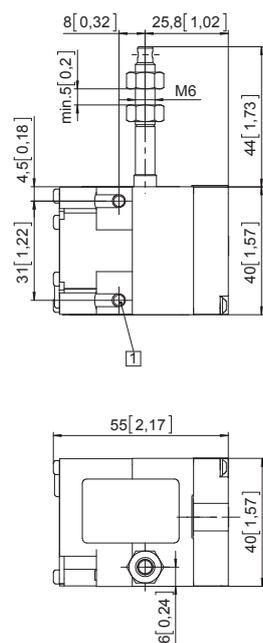
Colour	BN	WH	GN	
Pin M12	1	2	3	4
0 ... 10 V	+ 24 V DC	0 V	U_{out}	n.c.
0 ... 20 mA	I+	I-	n.c.	n.c.
Potentiometer	Po	Pe	S	n.c.



Dimensions

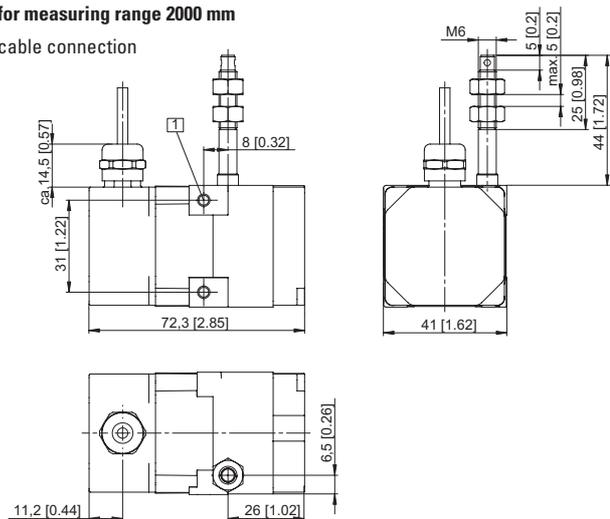
Dimensions in mm [inch]

for measuring range 1000 mm

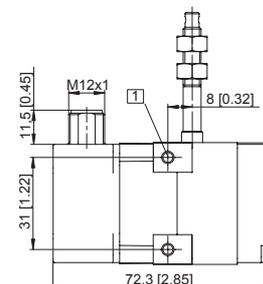


for measuring range 2000 mm

cable connection



M12 connector



1 2 x M4, max. screw-in depth 8 mm [0.32"]

Linear measuring technology

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 XX . 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

	125	1250	2500
Pulses / revolution			
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

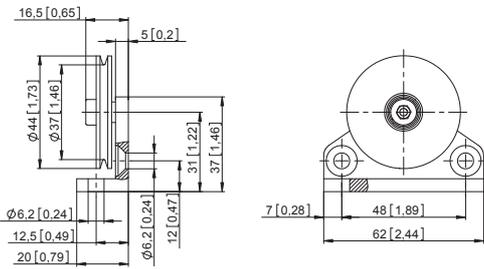
Recommended standard devices

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

Linear measuring technology

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	a b c
a Measuring range 0025 = 250 mm 0050 = 500 mm 0125 = 1250 mm	b 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
	c Type of connection 1 = axial cable, 2 m [6.56'] PVC 3 = axial M12 connector, 4-pin
	<i>Optional on request</i> - 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

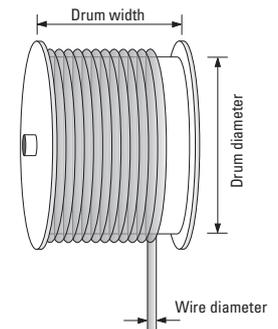
Technical data

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/s ²	200 m/s ²	300 m/s ²
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.

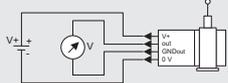
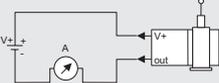
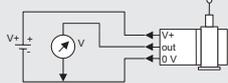
Operating principle

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		

Linear measuring technology

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.

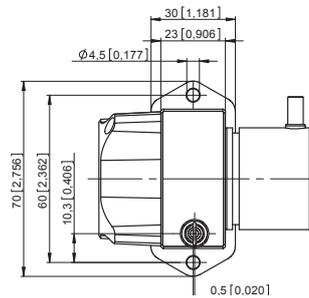
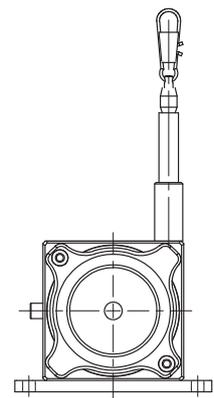
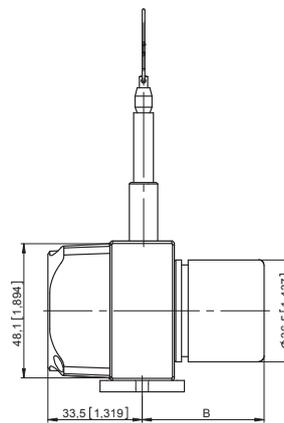
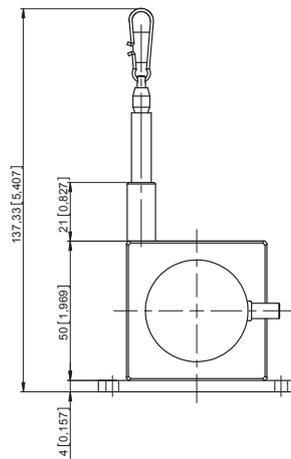
Connector (analogue output)



Dimensions

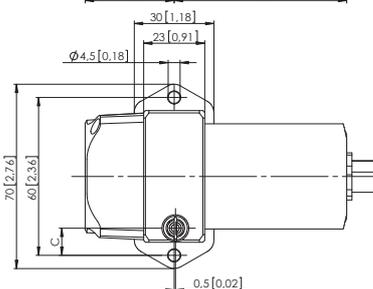
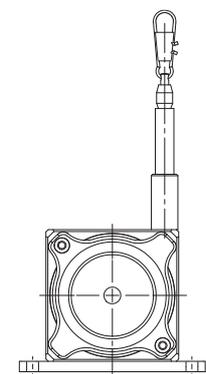
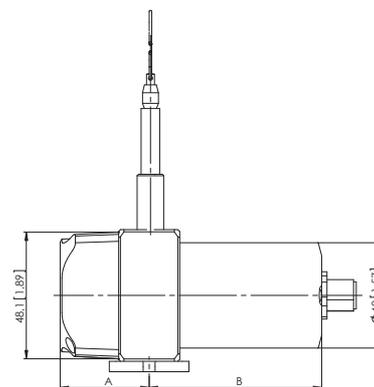
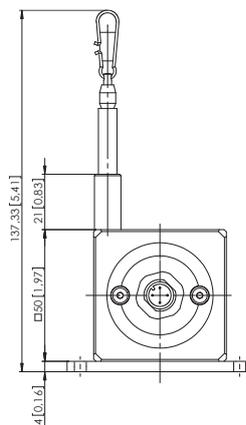
Dimensions in mm [inch]

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]

Linear measuring technology

**Draw wire mechanics
with incremental encoder**

Draw wire encoder A40

**Measuring length max. 2 m
Traverse speed max. 0.8 m/s**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range	up to 2000 mm
Absolute accuracy	±0.1 % for the whole measuring range
Repetition accuracy	±0.15 mm per direction of travel
Resolution (incremental)	0.1 mm standard encoder with 1000 ppr
Traversing speed	max. 800 mm/s
Required force	approx. 10 N (on wire)
Material	housing reinforced plastic wire stainless steel ø 0.45 mm
Weight	approx. 210 g [7.41 oz]

Electrical characteristics (encoder)

Output circuits	Push-pull	Push-pull
Power supply	5 ... 24 V DC	8 ... 30 V DC
Current consumption (no load)	max. 50 mA	max. 50 mA
Permissible load / channel	max. +/- 50 mA	max. +/- 50 mA
Pulse rate	max. 160 kHz	max. 160 kHz
Switching level	HIGH LOW	min. +V - 2.5 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 protected outputs	yes	yes
CE compliant acc. to	EMC guideline 2004/108/EC RoHS guideline 2011/65/EU	

Mechanical characteristics (encoder)

Protection acc. to EN 60529	IP54
Working temperature	-20°C ... +85°C [-4°F ... +185°F]
Shock resistance acc. to EN 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Description of the incremental encoder (connected on load side)

- Compensation for temperature and ageing
- Short-circuit protected outputs
- Reverse polarity protected power supply input
- Push-pull output

Terminal assignment of the encoder

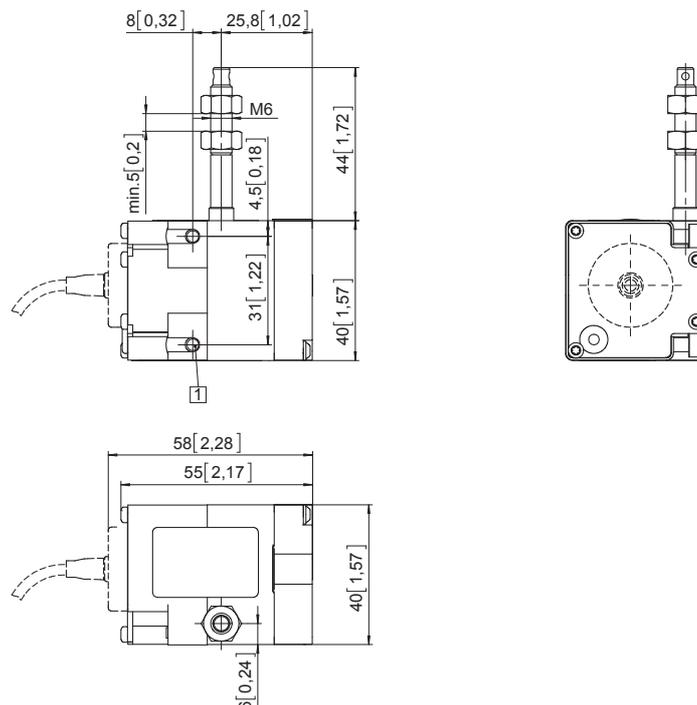
Signal	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$
Cable colour	WH	BN	GN	YE	GY	PK	BU	RD

Isolate unused outputs before initial start-up.

Dimensions

Dimensions in mm [inch]

1 2 x M4, max. screw-in depth 8 mm [0.32"]



Linear measuring technology

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 XX . XXXX**

Type **a** **b** **c** **d** **e**

- | | | | |
|---|---|---|--|
| <p>a <i>Measuring range</i>
02 = 2000 mm</p> | <p>b <i>Encoder used</i>
F3 = Sendix absolute F3663, SSI
F8 = Sendix absolute F3668, CANopen</p> | <p>c <i>Output circuit</i>
depends on the encoder used</p> | <p>e <i>Resolution / Protocol / Options</i>
depends on the encoder used</p> |
| | | <p>d <i>Type of connection</i>
depends on the encoder used</p> | |

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

Linear measuring technology

Linear measuring technology

Draw wire mechanics with absolute encoder

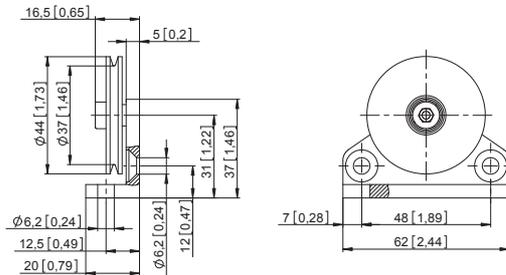
Draw wire encoder A41

**Measuring length max. 2 m
Traverse speed max. 1 m/s**

Guide pulley for draw wire encoder

Order no.

Guide pulley

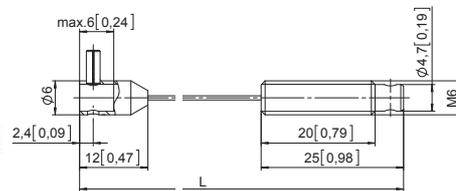


Order code for the set:

- 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)

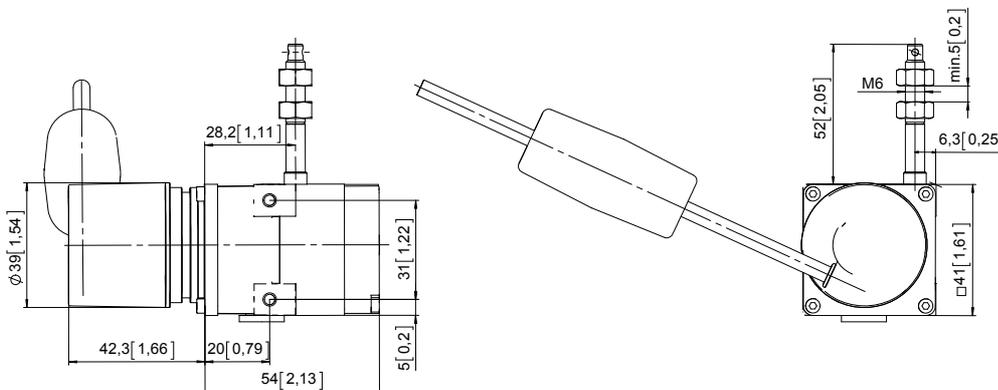
Measuring range	up to 2000 mm
Traversing speed	max. 1000 mm/s
Working temperature	-10°C ... +80°C [+14°F ... +176°F]
Weight	approx. 200 g [7.06 oz]
Required force	≥ 2 N (on wire)
Linearity	± 0.35 % for the whole measuring range
Repetition accuracy	± 0.15 mm per direction of travel
Material	housing zinc die-cast wire stainless steel ϕ 0.45 mm

Electrical characteristics (encoder)

The electrical characteristics can be found in the data sheets of the encoders.

Dimensions

Dimensions in mm [inch]



Linear measuring technology

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 <small>Type</small>	03 <small>a</small>	. XX XX <small>b c d</small>	. XXXX <small>e</small>
-------------------------------------	-------------------------------	--	-----------------------------------

- | | | | |
|---|--|---|---|
| <p>a <i>Measuring range</i>
03 = 3000 mm</p> | <p>b <i>Encoder used</i>
2Z = Sendix incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868</p> | <p>c <i>Output circuit</i>
depends on the encoder used</p> <p>d <i>Type of connection</i>
depends on the encoder used</p> | <p>e <i>Resolution / Protocol / Options</i>
depends on the encoder used</p> <p><i>Optional on request</i>
- Other measuring ranges</p> |
|---|--|---|---|

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 <small>Type</small>	03 <small>a</small>	. XXX <small>b c</small>	2 . 0000 <small>d</small>
-------------------------------------	-------------------------------	------------------------------------	-------------------------------------

- | | | |
|---|---|--|
| <p>a <i>Measuring range</i>
03 = 3000 mm</p> | <p>b <i>Analogue sensor output / power supply</i>
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</p> | <p>c <i>Type of connection</i>
2 = radial M12 connector, 4 pin (wire exit direction)</p> <p><i>Optional on request</i>
- Other measuring ranges</p> |
|---|---|--|

Linear measuring technology

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'] Paraline 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

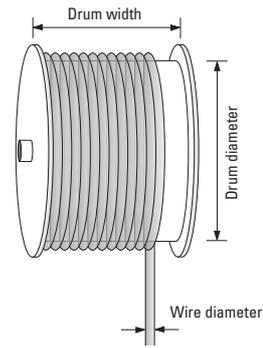
Electrical characteristics			
Analogue output	0 ... 10 V DC	4 ... 20 mA	potentiometer 10 kΩ
Power supply	15 ... 28 V DC	–	–
Operating range	–	15 ... 28 V DC	max. 48 V DC
Load	max. 500 Ω	max. 500 Ω	–
Temperature range	-40°C ... +80°C [-40°F ... +176°F]		
CE compliant acc. to	EMC guideline 2004/108/EC 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.

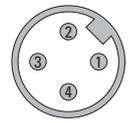
Note
 Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



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 kΩ	Po	Pe	S	n.c.

Connector (analogue output)



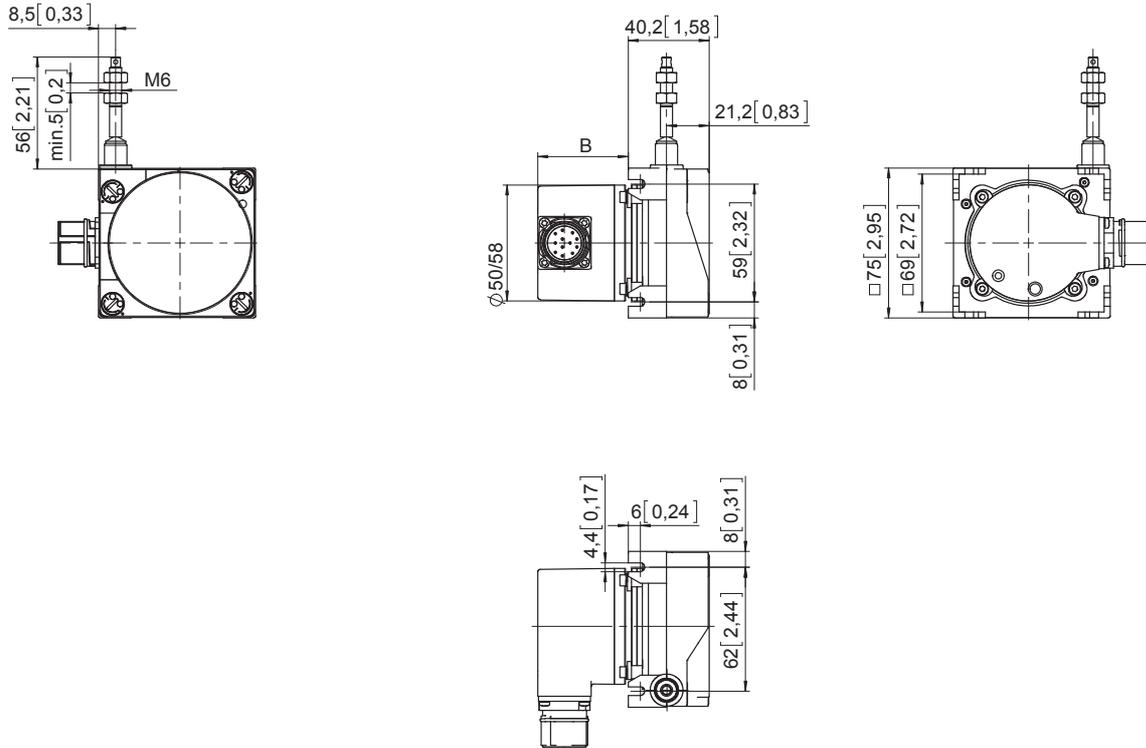
Linear measuring technology

Draw wire mechanics with encoder or analogue sensor	Draw wire encoder B75	Measuring length max. 3 m Traverse speed max. 0.8 m/s
--	------------------------------	--

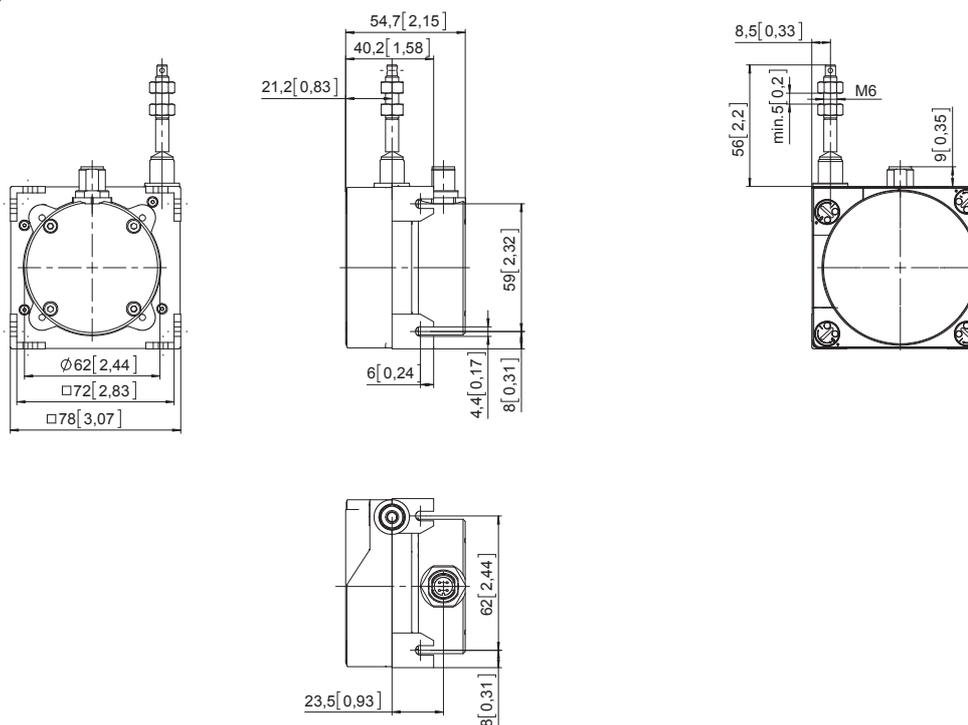
Dimensions

Dimensions in mm [inch]

With encoder



With analogue sensor



Linear measuring technology

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
140 m/s²



Long service life



Wide temperature range



High protection level
IP



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 . XXXX . 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

	200	2000	4000
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

	F5863 / 5863	F5868 / 5868
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

Linear measuring technology

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
a Measuring range 0100 = 1000 mm 0200 = 2000 mm 0300 = 3000 mm	b 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 c Type of connection 1 = axial cable, 2 m [6.56'] PVC 3 = M12 connector, 4-pin
<i>Optional on request</i> - 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

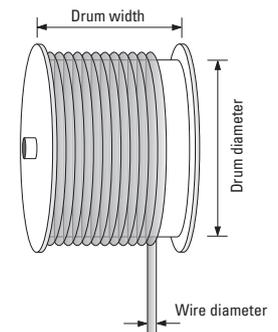
Technical data

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/s ²	140 m/s ²	140 m/s ²
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		

Linear measuring technology

Draw wire mechanics with encoder or analogue sensor

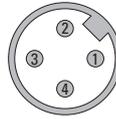
Draw wire encoder B80

**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)

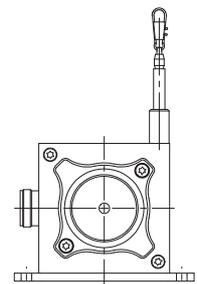
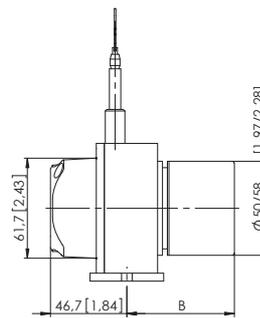
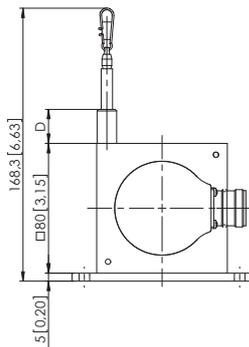


Dimensions

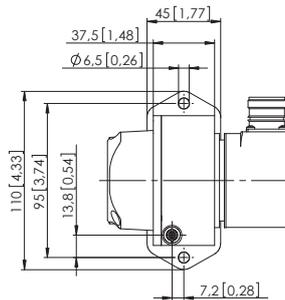
Dimensions in mm [inch]

Draw wire mechanics with encoder

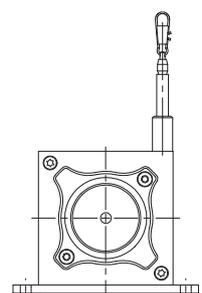
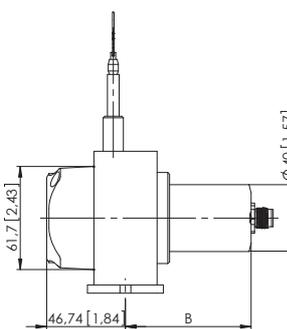
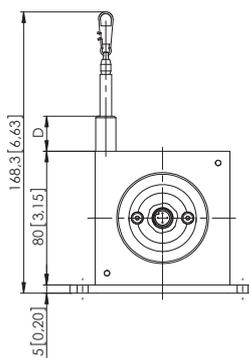
Measuring range	D
1000 mm	21 [0.83]
2000 mm	35 [1.38]
3000 mm	35 [1.38]



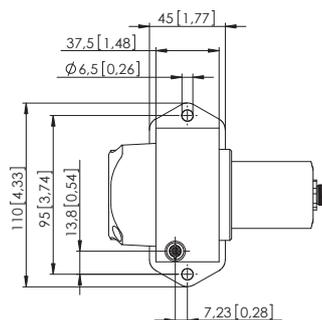
Dimension B depends on the encoder used	
Encoder	B
Sendix incremental (5000) D8.4B1.XXXX.00XX.XXXX	54.25 [2.12]
Sendix absolute (5863) D8.4B1.XXXX.63XX.XXXX	66.75 [2.63]
Sendix absolute (5868) D8.4B1.XXXX.68XX.XXXX	93.25 [3.67]



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	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]



Linear measuring technology

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.

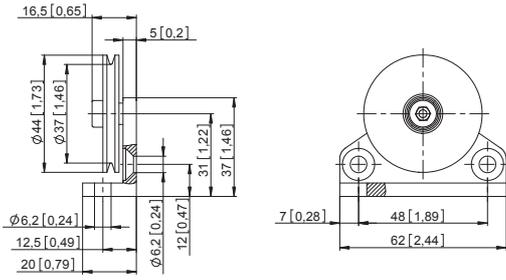
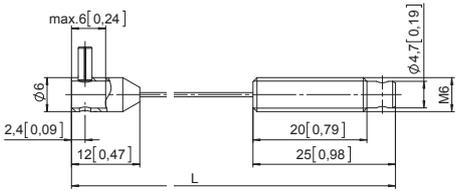


Flexible and simple

- Possibility for user to exchange encoder.
- Measuring lengths 2800 mm or 6000 mm.
- Simple installation.

Order code with encoder	D8.1 Type	XXX a	. XX	XX b	XX c	X d	. XXXX 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⁾

Linear measuring technology

Accessories for draw wire encoder		Order no.	
<p>Guide pulley</p> 		<p>Order code for the set:</p> <ul style="list-style-type: none"> - Guide pulley (anodised aluminium) - 2 x countersunk screws for lateral fixing - 2 x hexagonal screws for fixing on a flat surface 	<p>8.0000.7000.0045</p>
<p>Extension cable</p> 		<ul style="list-style-type: none"> Steel wire 2 m [6.56'] Steel wire 5 m [16.40'] Steel wire 10 m [32.81'] Paraleine 2 m [6.56'] 	<p>8.0000.7000.0033</p> <p>8.0000.7000.0034</p> <p>8.0000.7000.0035</p> <p>8.0000.7000.0032</p>

1) These data depend on the chosen encoder.

Linear measuring technology

**Draw wire mechanics
with encoder**

Draw wire encoder C105

**Measuring length max. 6 m
Traverse speed max. 3 m/s**

Technical data

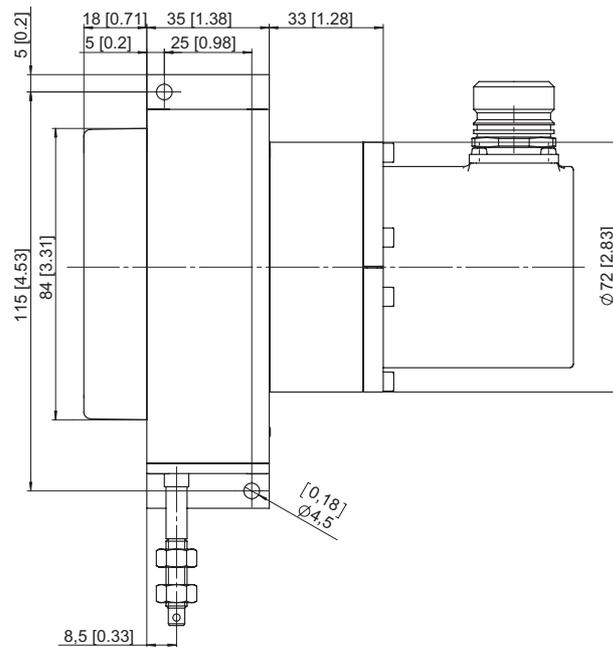
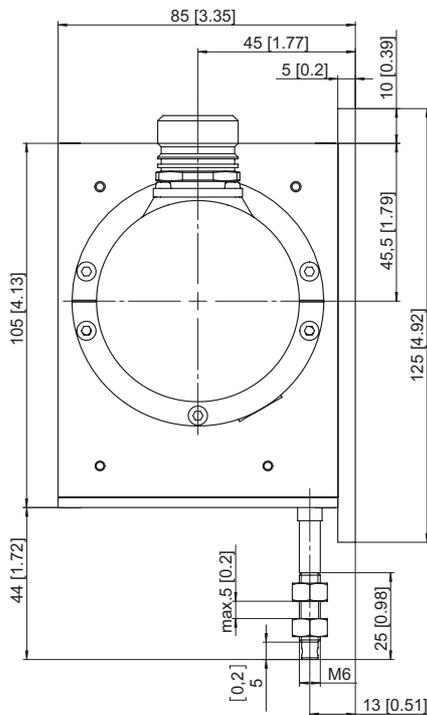
Mechanical characteristics

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 \varnothing 1.05 mm 6000 mm steel wire – with \varnothing 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]



Linear measuring technology

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 140 m/s ²	Long service life	Wide temperature range	High protection level IP	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.

Linear measuring technology

Order code with encoder

D8.4C1	. 0600	. XX	XX	. XXXX
Type	a	b	c d	e

a Measuring range
0600 = 6000 mm

b Encoder used
00 = Sendix incremental 5000
F3 = Sendix absolute 5863
63 = Sendix absolute 5863
F8 = Sendix absolute 5868
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		
	F5863 / 5863	F5868 / 5868
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

Linear measuring technology

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
a Measuring range 0600 = 6000 mm	b 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
	c Type of connection 1 = axial cable, 2 m [6.56'] PVC 3 = M12 connector, 4-pin
	<i>Optional on request</i> - 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

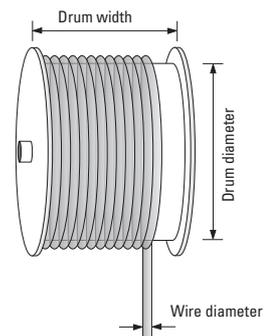
Mechanical characteristics (draw wire mechanics)	
Measuring range	6000 mm
Extension force	F _{min} 8.8 N F _{max} 12.3 N
Max. speed.	10 m/s
Max. acceleration	140 m/s ²
Linearity	analogue output ±0.1 % (of the measuring range) with encoder ±0.05 % (of the measuring range)
Weight	approx. 1600 g [56.44 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		

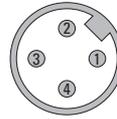
Linear measuring technology

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.

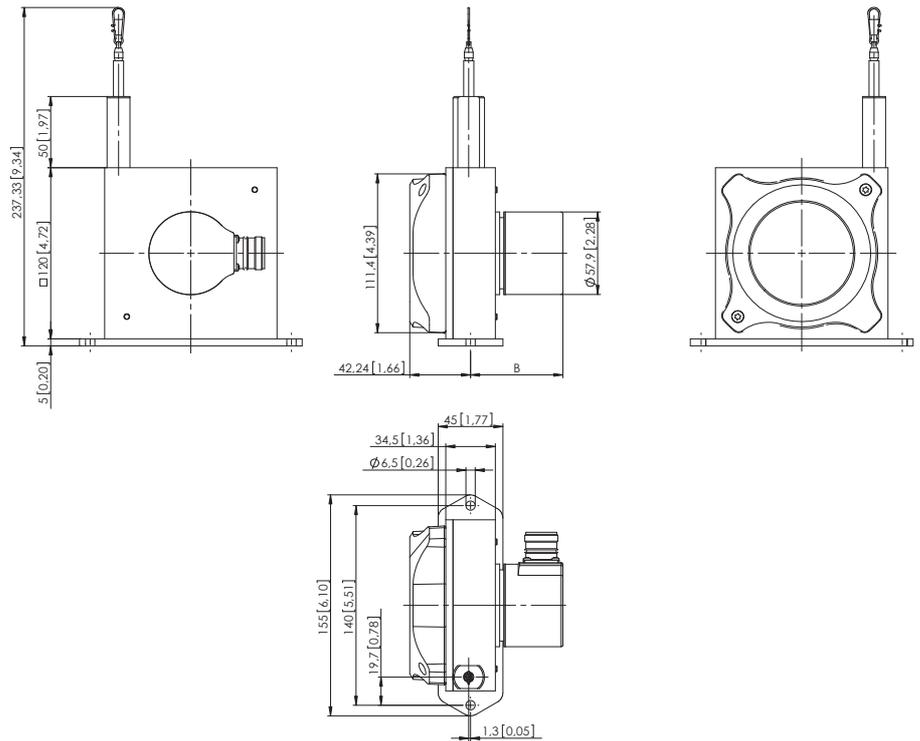
Connector (analogue output)



Dimensions

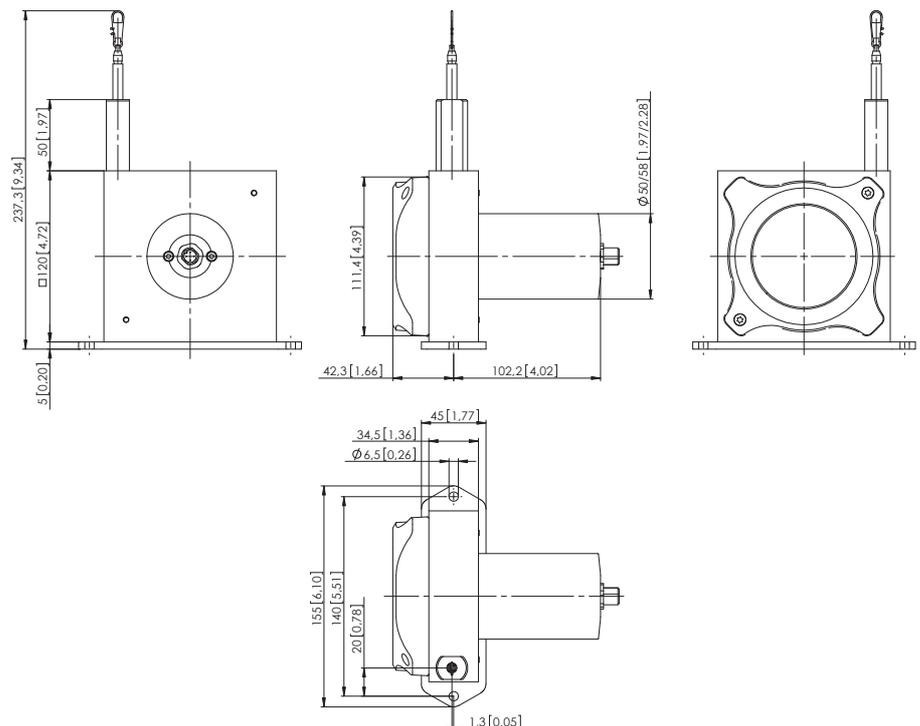
Dimensions in mm [inch]

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



Linear measuring technology

Linear measuring technology

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.



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 . XXXX . XXXX
Type a b c d e

a Measuring range

0800 = 8 000 mm	3000 = 30 000 mm
1000 = 10 000 mm	3500 = 35 000 mm
1200 = 12 000 mm	4000 = 40 000 mm
1500 = 15 000 mm	4250 = 42 500 mm
2000 = 20 000 mm	
2500 = 25 000 mm	

b Encoder used

00 = Sendix incremental 5000
F3 = Sendix absolute 5863
63 = Sendix absolute 5863
F8 = Sendix absolute 5868
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 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)

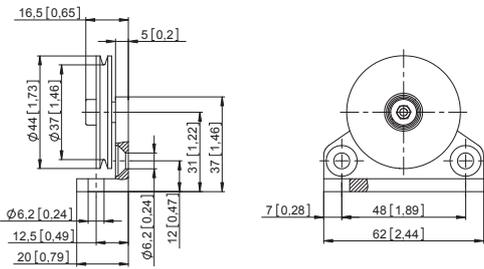
Recommended standard devices

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

Linear measuring technology

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
a Measuring range	b Analogue sensor output / power supply
0800 = 8 000 mm 3000 = 30 000 mm 1000 = 10 000 mm 3500 = 35 000 mm 1500 = 15 000 mm 4000 = 40 000 mm 2000 = 20 000 mm 2500 = 25 000 mm	A11 = 4 ... 20 mA / 12 ... 30 V DC A22 = 0 ... 10 V / 12 ... 30 V DC A33 = potentiometer 1 kΩ / max. 30 V DC
	c Type of connection
	1 = axial cable, 2 m [6.56'] PVC 3 = M12 connector, 4-pin
	<i>Optional on request</i>
	- 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.
 	8.0000.7000.0045
	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

Connection technology for analogue sensor	Order no.
Connector, self-assembly (straight)	8.0000.5116.0000
Cordset, pre-assembled	05.00.6081.2211.002M

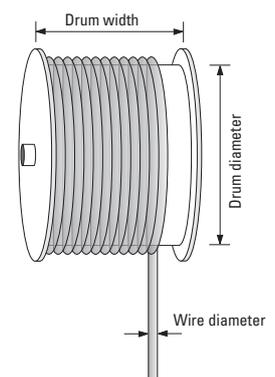
Technical data						
Mechanical characteristics (draw wire mechanics)						
Measuring range		8000 mm	10000 mm 12000 mm 15000 mm	20000 mm	25000 mm 30000 mm	35000 mm 40000 mm 42500 mm
Extension force	F_{min}	7.2 N	8.7 N	7.0 N	7.3 N	7.0 N
	F_{max}	16.0 N	16.9 N	12.4 N	15.7 N	14.1 N
Max. speed		10 m/s	6 m/s	5 m/s	5 m/s	5 m/s
Max. acceleration		140 m/s ²	80 m/s ²	60 m/s ²	60 m/s ²	60 m/s ²
Linearity	analogue output	±0.1 % (of the measuring range)				
	encoder	±0.05 % (of the measuring range)				
Weight		depending on the measuring and 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 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.



Linear measuring technology

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			

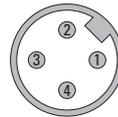
CE compliant acc. to

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.

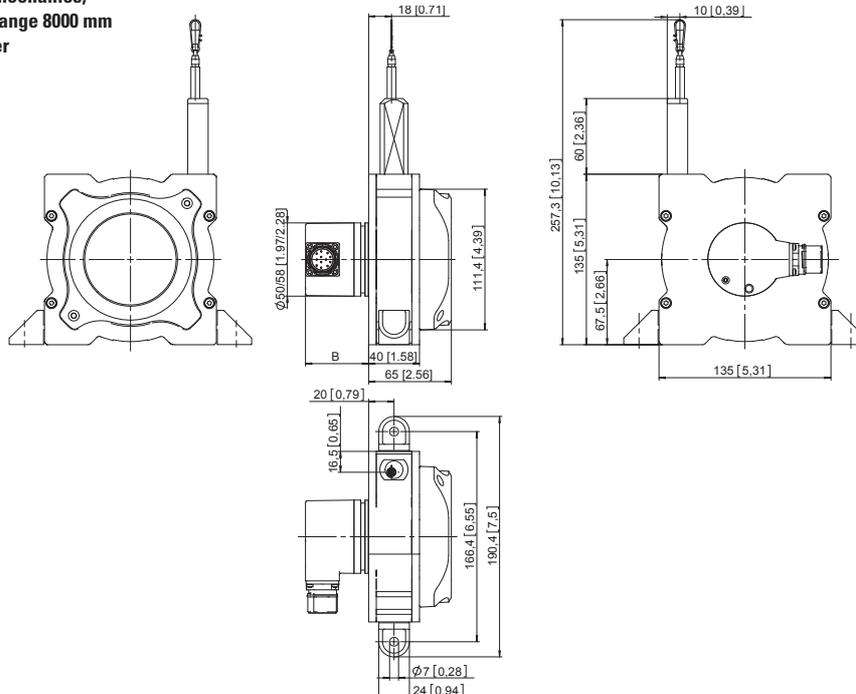
Connector (analogue output)



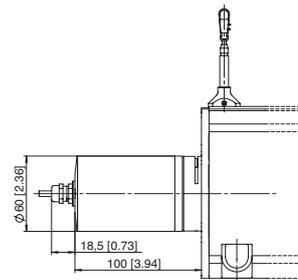
Dimensions

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]

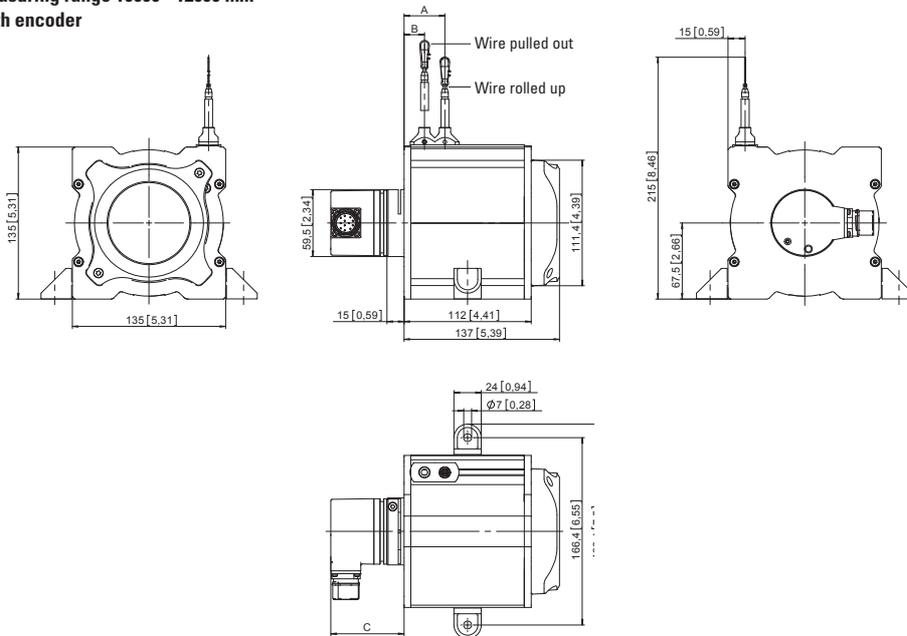
Linear measuring technology

Draw wire mechanics with encoder or analogue sensor	Draw wire encoder D135	Measuring length max. 42.5 m Traverse speed max. 5 m/s
--	-------------------------------	---

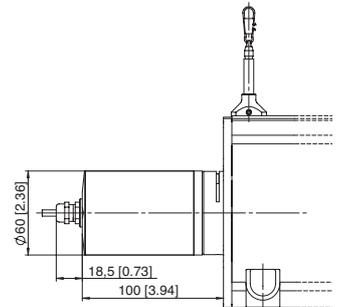
Dimensions

Dimensions in mm [inch]

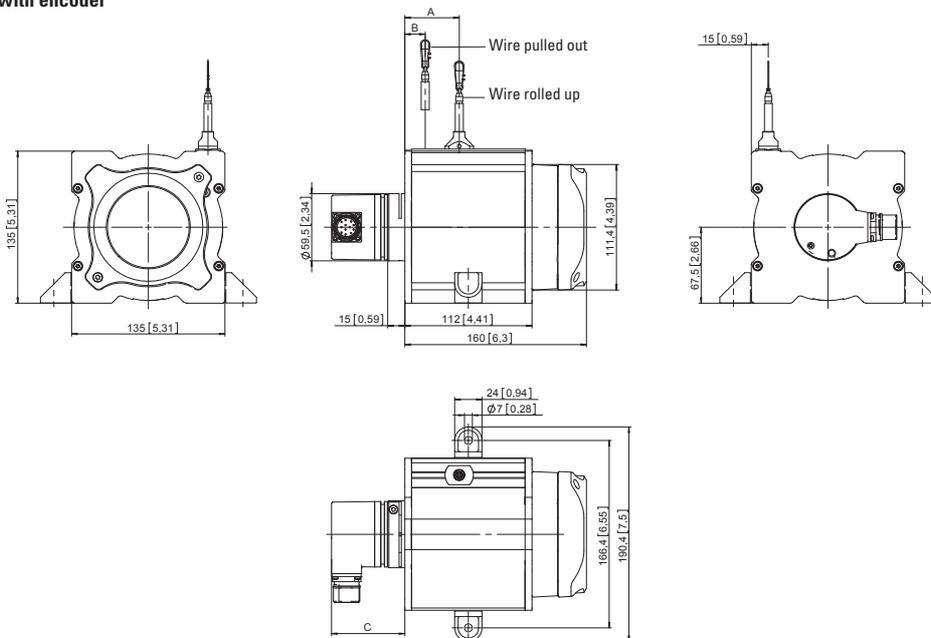
Draw wire mechanics, measuring range 10000 - 12000 mm with encoder



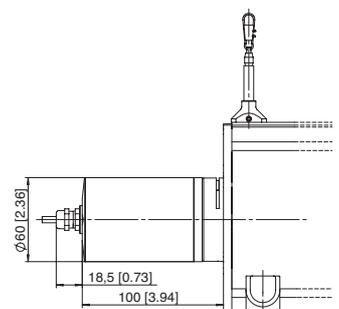
with analogue output



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]

Linear measuring technology

Draw wire mechanics with encoder or analogue sensor

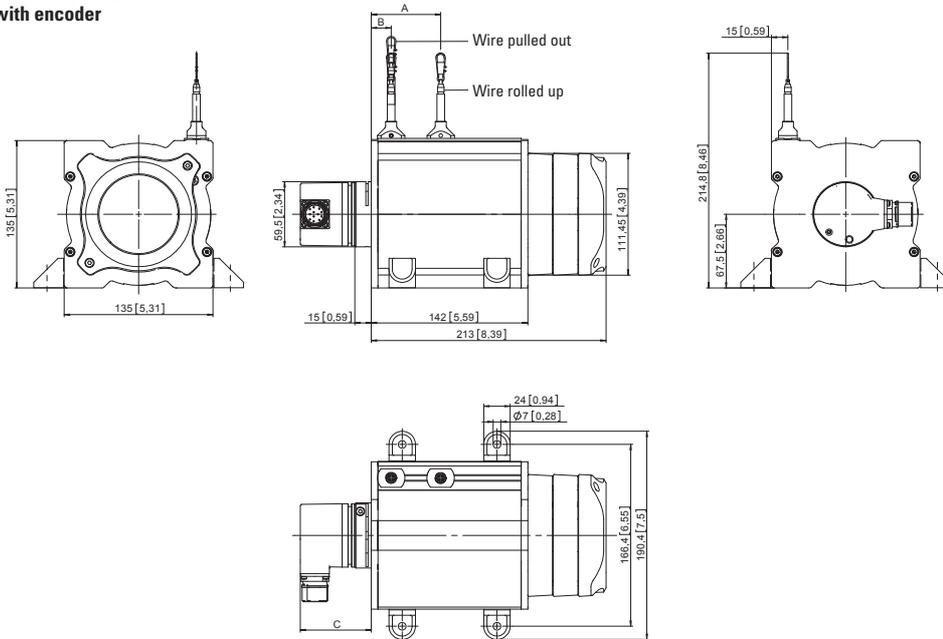
Draw wire encoder D135

**Measuring length max. 42.5 m
Traverse speed max. 5 m/s**

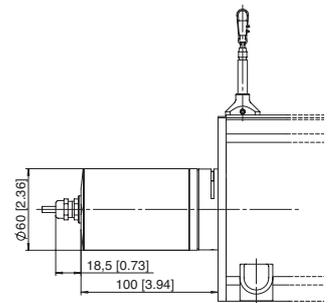
Dimensions

Dimensions in mm [inch]

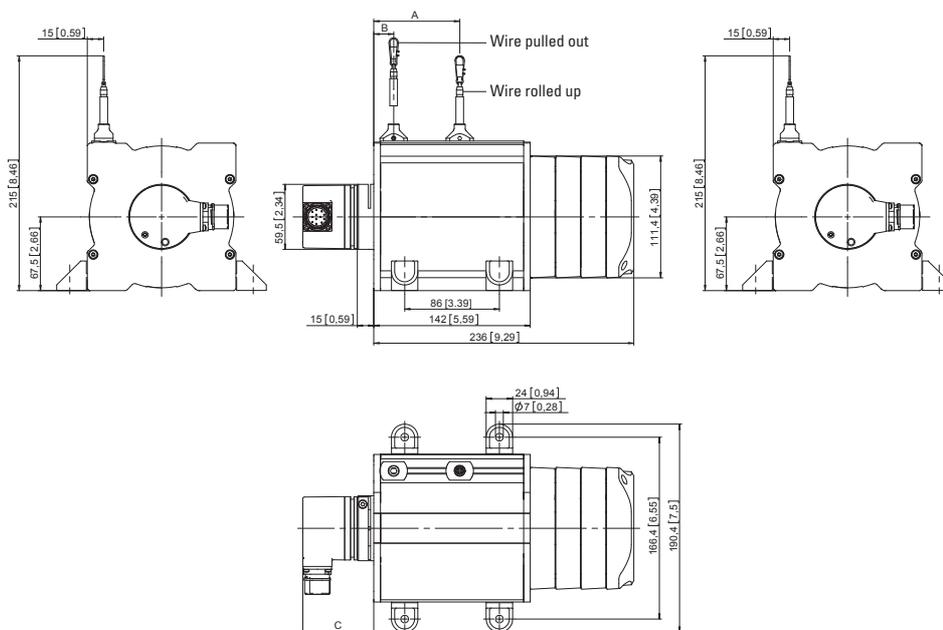
Draw wire mechanics, measuring range 25000 - 30000 mm with encoder



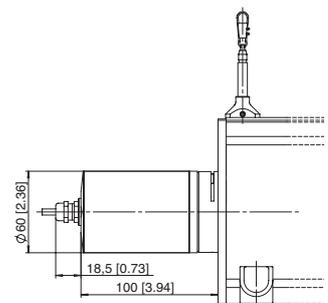
with analogue output



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]

Linear measuring technology

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:

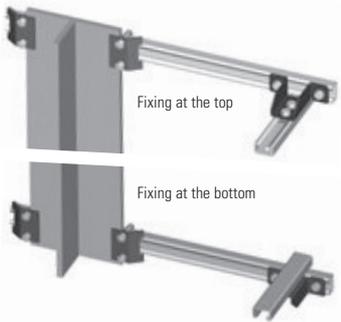
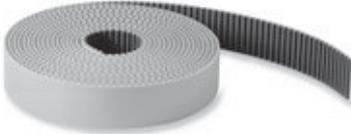
SSI: 8.5863.12XX.XXXX

CANopen / CANopenLift: 8.5868.12XX.XXXX



Linear measuring technology

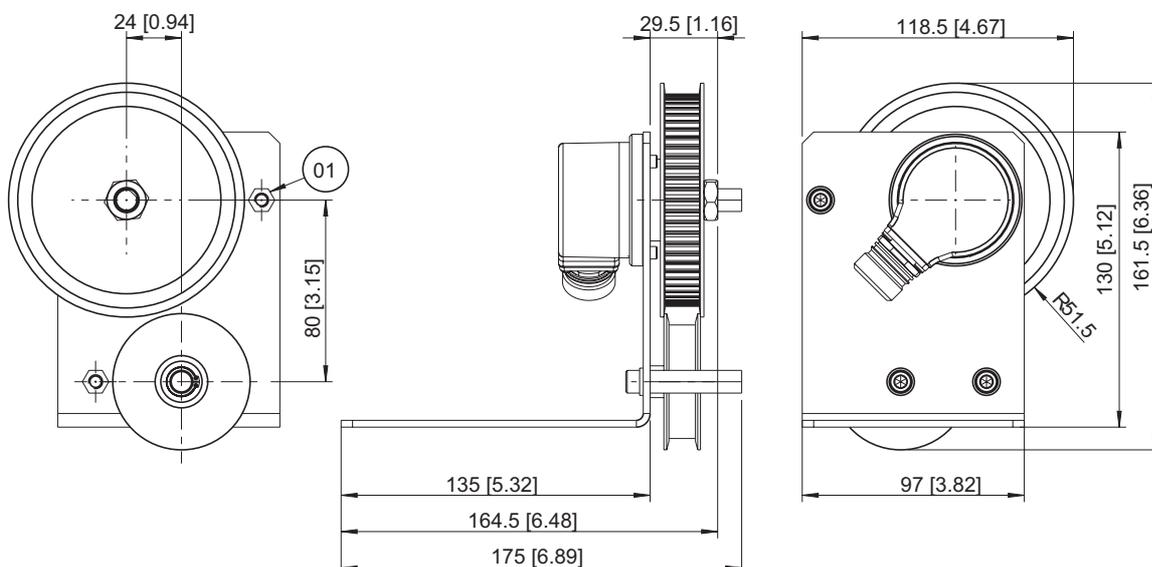
Elevator measuring system for shaft-copying	Encoder mounting fixture, guided-belt, LM3	max. height 53 m
--	---	-------------------------

Accessories for encoder mounting fixture LM3		Order no.
Fixing kit  <p>Fixing at the top</p> <p>Fixing at the bottom</p>	Complete kit consists of: - C-rails, 700 mm - Bracket - Screws - Other small components	8.BLM2.01
Toothed belt 	<ul style="list-style-type: none"> - 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] <p>Calculation of the required length of toothed belt = Elevator height + approx. 5 m (depending on the distance between top and bottom fixing)</p>	05.ZAR1.XXX <small> 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 </small>

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]



Linear measuring technology

Length measuring kit mini measurement system	Measuring wheel system, incl. encoder	Incremental
---	--	--------------------



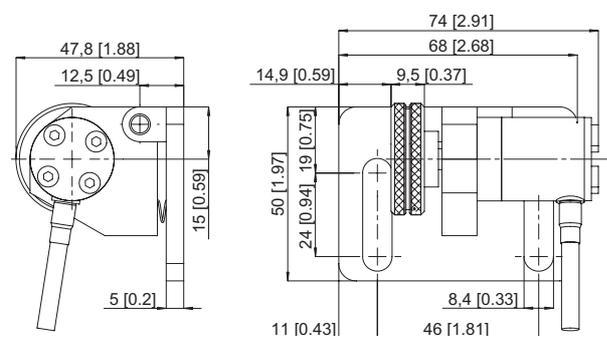
Very compact mini measurement system with incremental interface.

Easy to install	Compact construction
<ul style="list-style-type: none"> The measuring wheel, the sensor and the fastening are pre-assembled and thus easy to install: fix – connect – ready-to-go. 	<ul style="list-style-type: none"> Dimensions of the whole unit 74 x 50 x 52 mm. Measuring wheel circumference 100 mm.

Order code	05.2400.0040.1000.50 XX	a
<i>Resolution</i> 0.1 mm	<i>Cable outlet</i> radial cable, 2 m [6.56'] PVC	a <i>Measuring wheel</i> 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]



Linear measuring technology

Linear measuring technology

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.

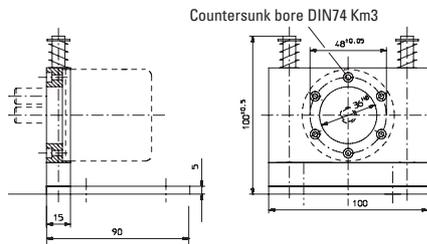
Typical areas of application are:

- Wood working industry
- Textile industry
- Handling and automation technology
- Mechanical engineering / special machines

Single components

Order no.

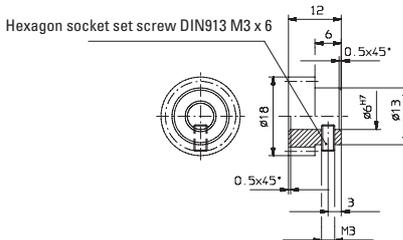
Flexible holding device for encoders



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 \varnothing 6 mm [0.24"]
with bore diameter \varnothing 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

Linear measuring technology

**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.

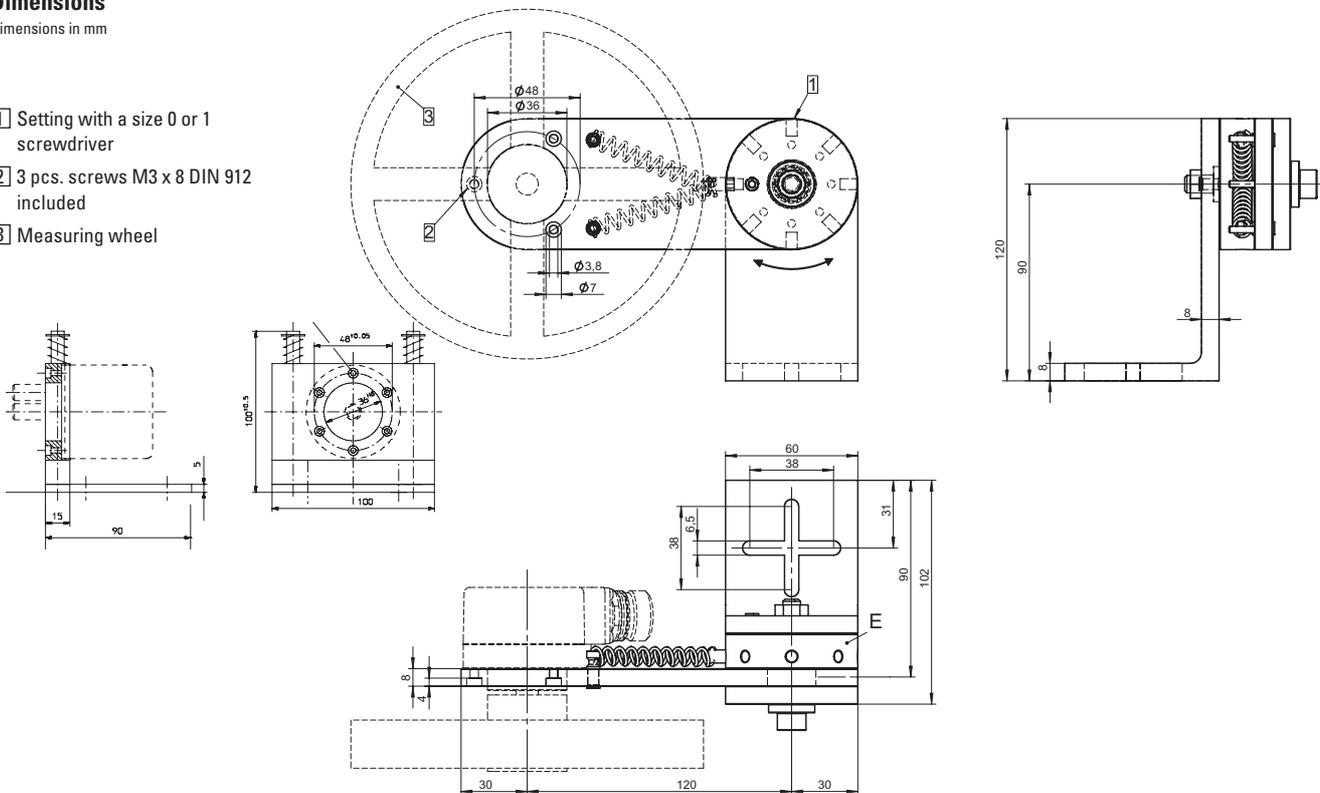
Order code

8.0010.7000.0010

Dimensions

Dimensions in mm

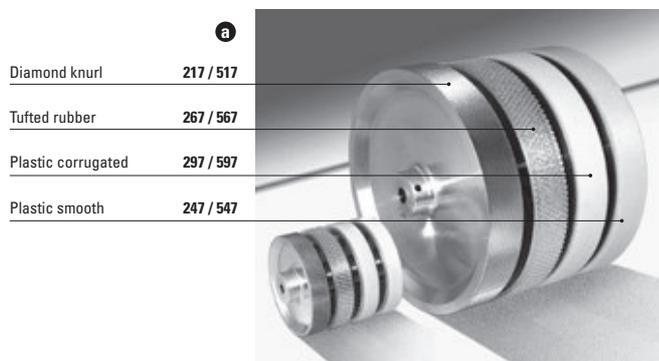
- 1 Setting with a size 0 or 1 screwdriver
- 2 3 pcs. screws M3 x 8 DIN 912 included
- 3 Measuring wheel



Linear measuring technology

Length measuring kits measuring wheels

Various wheel coatings



Diamond knurl	217 / 517
Tufted rubber	267 / 567
Plastic corrugated	297 / 597
Plastic smooth	247 / 547

Measuring wheels for measuring the length of products in movement, e.g. in the paper, metal, textile, wood or plastic industry.

Various 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 . 00 XX
a b

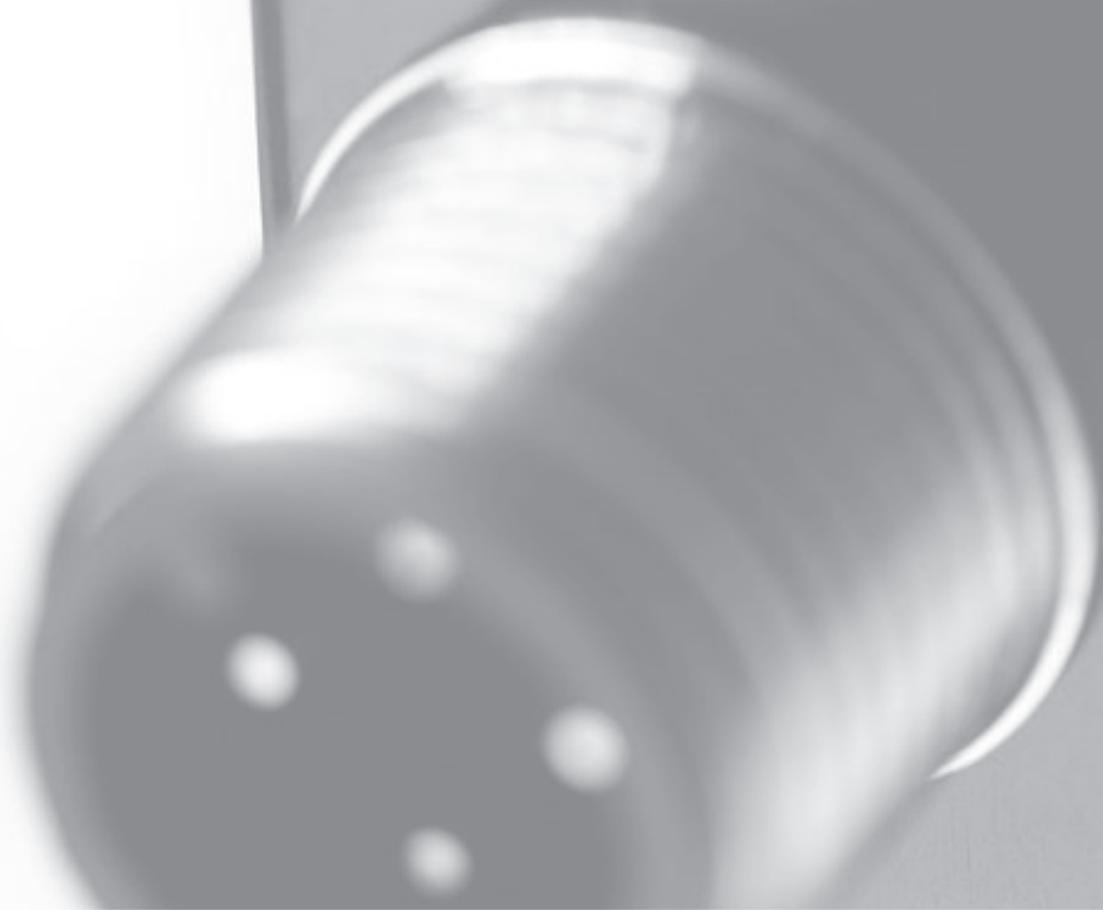
Measuring wheel Circumference / ϕ / width	Profile measuring wheels (s.o.)	Coating	Coating hard- ness Shore A	Wheel no. a	Weight	Standard bore b ¹⁾	Material of wheel body	Working temperature
0.2 m / ϕ 63.7 mm / 12 mm [7.87" / ϕ 2.51" / 0.47"]	1	diamond knurl (aluminium)		217	60 g [2.12 oz]	06 = 6 mm [0.24"] 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 / ϕ 159.2 mm / 25 mm [19.69" / ϕ 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" / ϕ 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

Linear measuring technology

KUEBLER

www.kuebler.com
SLS40



Inclinometers

	Type	Interface	Page
Inclinometers	 IS40, 1-dimensional	Analogue	438
MEMS, capacitive	IS40, 2-dimensional	Analogue	440
	 IS60, 1-dimensional	CANopen	442
	IS60, 2-dimensional	CANopen	444

Inclinometers

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.

mA, V Output	IP 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

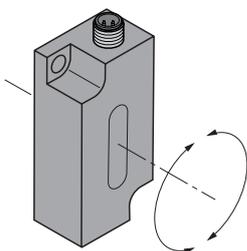
- Small design – minimal space requirement.
- For use in vehicle technology, solar installations, cranes and hoists or in commercial vehicles.

Order code Inclinometer IS40	8.IS40 Type	. 1 4 X 2 1 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°



Inclinometers

Inclinometer MEMS / capacitive	IS40, 1-dimensional	Analogue
---	----------------------------	-----------------

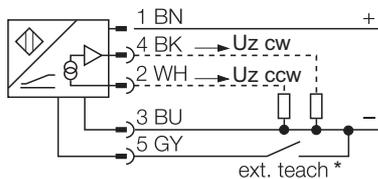
Technical data

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/s ² , 11 ms
Vibration resistance	100 m/s ² , 10 ... 2000 Hz
Dimensions	60 x 30 x 20 mm [2.36 x 1.18 x 0.79"]

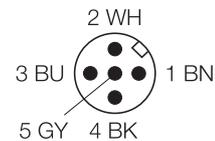
Interface characteristics	
Voltage output	0.1 ... 4.9 V DC short-circuit protected to +V
Load resistance voltage output	≥ 40 kΩ
Output impedance voltage output	99 ... 105 Ω
Current output	4 ... 20 mA
Load resistance current output	≤ 200 Ω

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



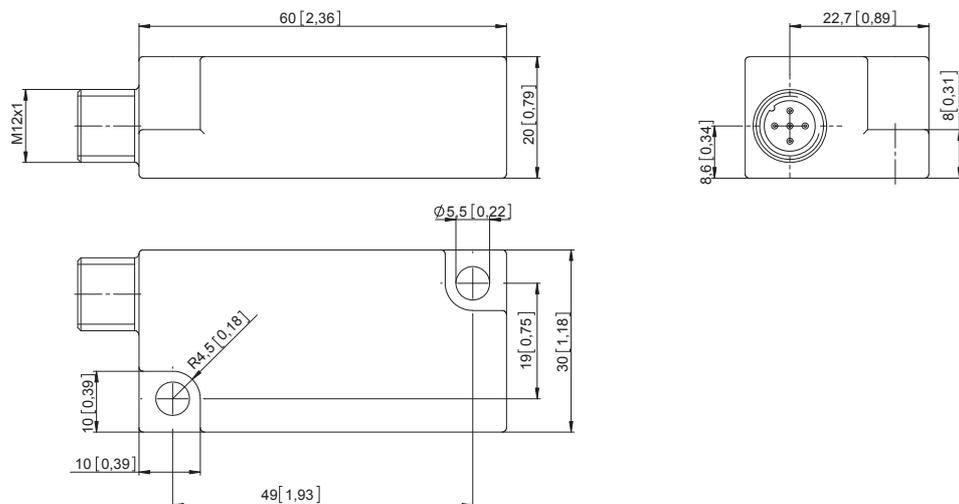
Terminal assignment



*) Teach adapter, accessory (Order no. 05.TX40.1)

Dimensions

Dimensions in mm [inch]



Inclinometers

**Inclinometer
MEMS / capacitive**

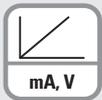
IS40, 2-dimensional

Analogue



The inclinometer IS40 permits 2-dimensional inclinations to be measured.

Versions are available for the measuring ranges $\pm 10^\circ$, $\pm 45^\circ$ or $\pm 60^\circ$. 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 . 2XXX1
Type

a Measuring direction 2 = 2-dimensional x/y	b Measuring range 1 = $\pm 10^\circ$ 2 = $\pm 45^\circ$ 3 = $\pm 60^\circ$	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

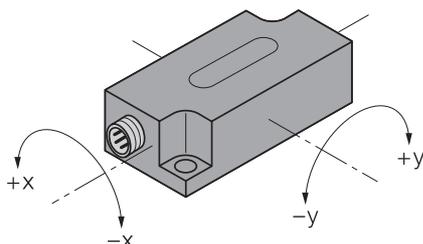
Cordset, pre-assembled

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) Available only in combination with power supply 10 ... 30 V DC

2) In relation to the power supply 5 V DC (Available only in combination with power supply 5 V DC)

Inclinometers

Inclinometer MEMS / capacitive	IS40, 2-dimensional	Analogue
---	----------------------------	-----------------

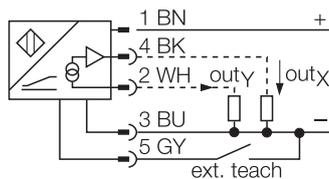
Technical data

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/s ² , 11 ms
Vibration resistance	100 m/s ² , 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

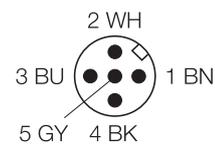
Electrical characteristics	
Power supply	5 V DC ±0.25 V or 10 ... 30 V DC (depending on version)
Power consumption (no load)	≤ 20 mA
Reverse polarity protection	yes
Measuring axes	2 (x/y)
Measuring range	±10°, ±45°, ±60°
Resolution	for version ±10° ≤ 0.05° for version ±45° ≤ 0.1° for version ±60° ≤ 0.15°
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



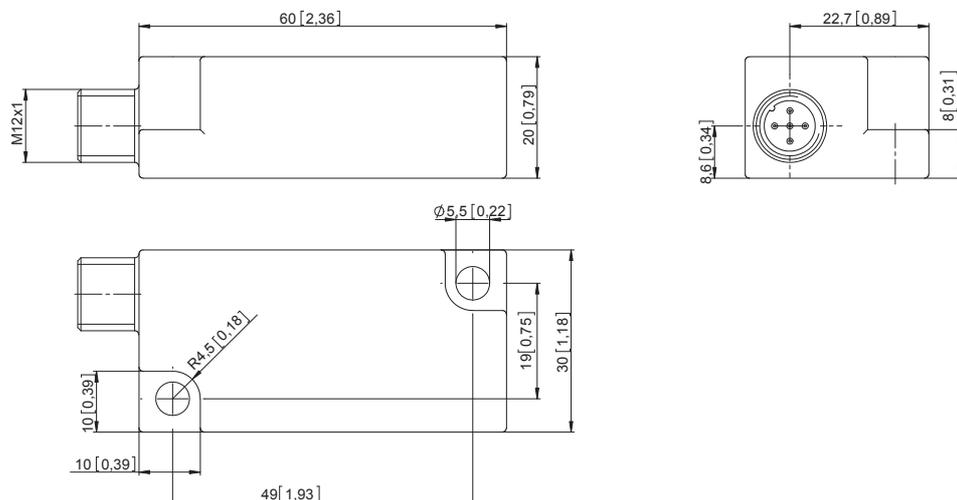
ext. teach: if this input is connected to 0 V, then the output of the inclinometer is reset to 0°.

Terminal assignment



Dimensions

Dimensions in mm [inch]



Inclinometers

**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.



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 . **14523**
Type

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
M12 male connector with external thread, Bus out

05.B-8151-0/9
05.BS-8151-0/9

Cordset, pre-assembled

M12 female connector with coupling, 6 m [19.69'] PVC cable, Bus in
M12 male connector with external thread, 6 m [19.69'] PVC cable, Bus out

05.00.6021.2211.006M
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

Inclinometers

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/s ² , 11 ms
Vibration resistance	100 m/s ² , 10 ... 2000 Hz
Dimensions	68 x 42.5 x 42.5 mm [2.68 x 1.67 x 1.67"]

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

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

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

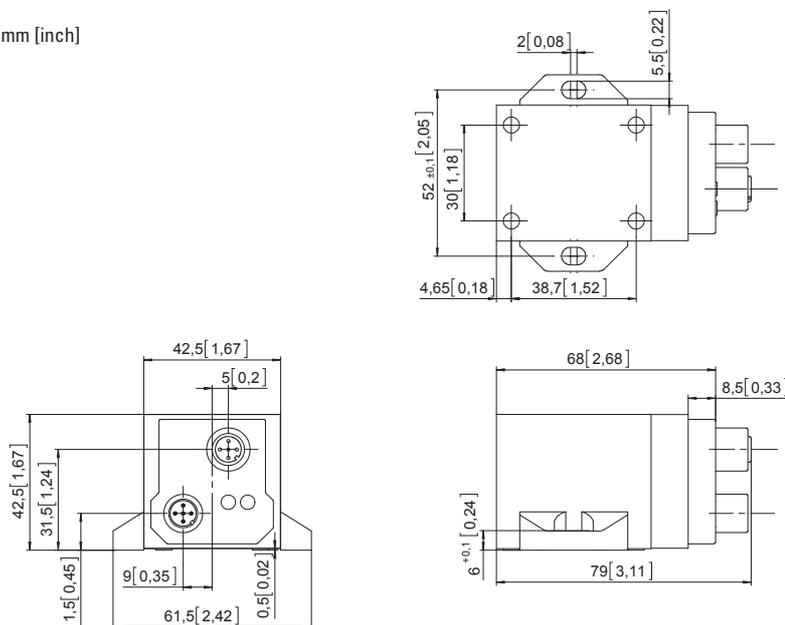
Terminal assignment

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]



Inclinometers

**Inclinometer
MEMS / capacitive**

IS60, 2-dimensional

CANopen



The inclinometer IS60 permits 2-dimensional inclinations to be measured. Versions are available for the measuring ranges $\pm 10^\circ$, $\pm 45^\circ$ or $\pm 60^\circ$.

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.



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 . 2X523
Type

a Measuring direction
2 = 2-dimensional x/y

b Measuring range
1 = $\pm 10^\circ$
2 = $\pm 45^\circ$
3 = $\pm 60^\circ$

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
M12 male connector with external thread, Bus out

05.B-8151-0/9

05.BS-8151-0/9

Cordset, pre-assembled

M12 female connector with coupling, 6 m [19.69'] PVC cable, Bus in
M12 male connector with external thread, 6 m [19.69'] PVC cable, Bus out

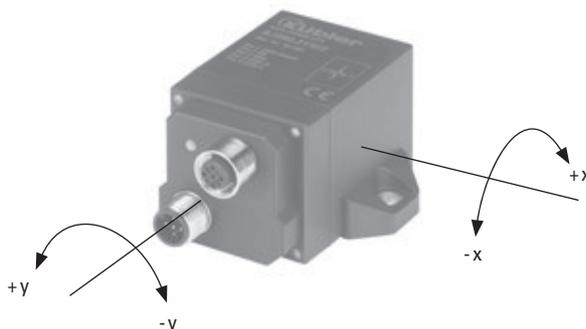
05.00.6021.2211.006M

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



Inclinometers

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/s ² , 11 ms
Vibration resistance	100 m/s ² , 10 ... 2000 Hz
Dimensions	68 x 42.5 x 42.5 mm [2.68 x 1.67 x 1.67"]

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

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

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

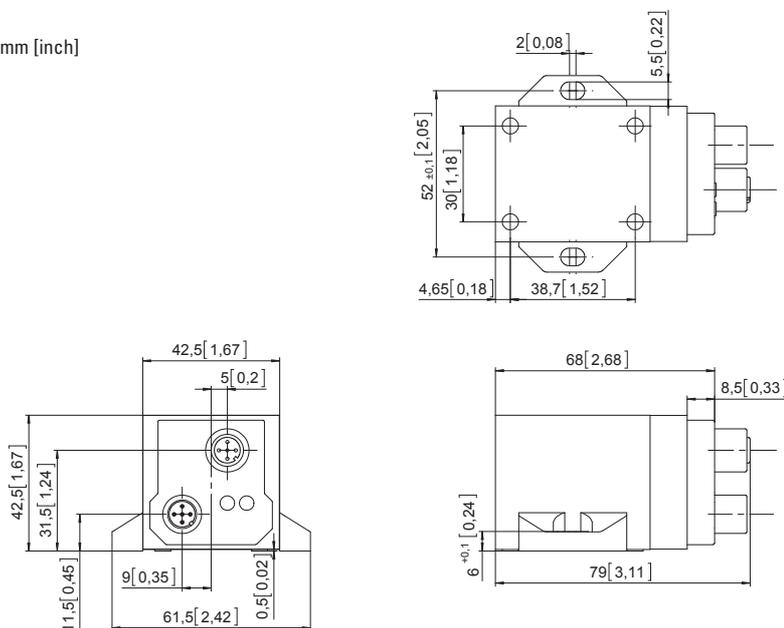
Terminal assignment

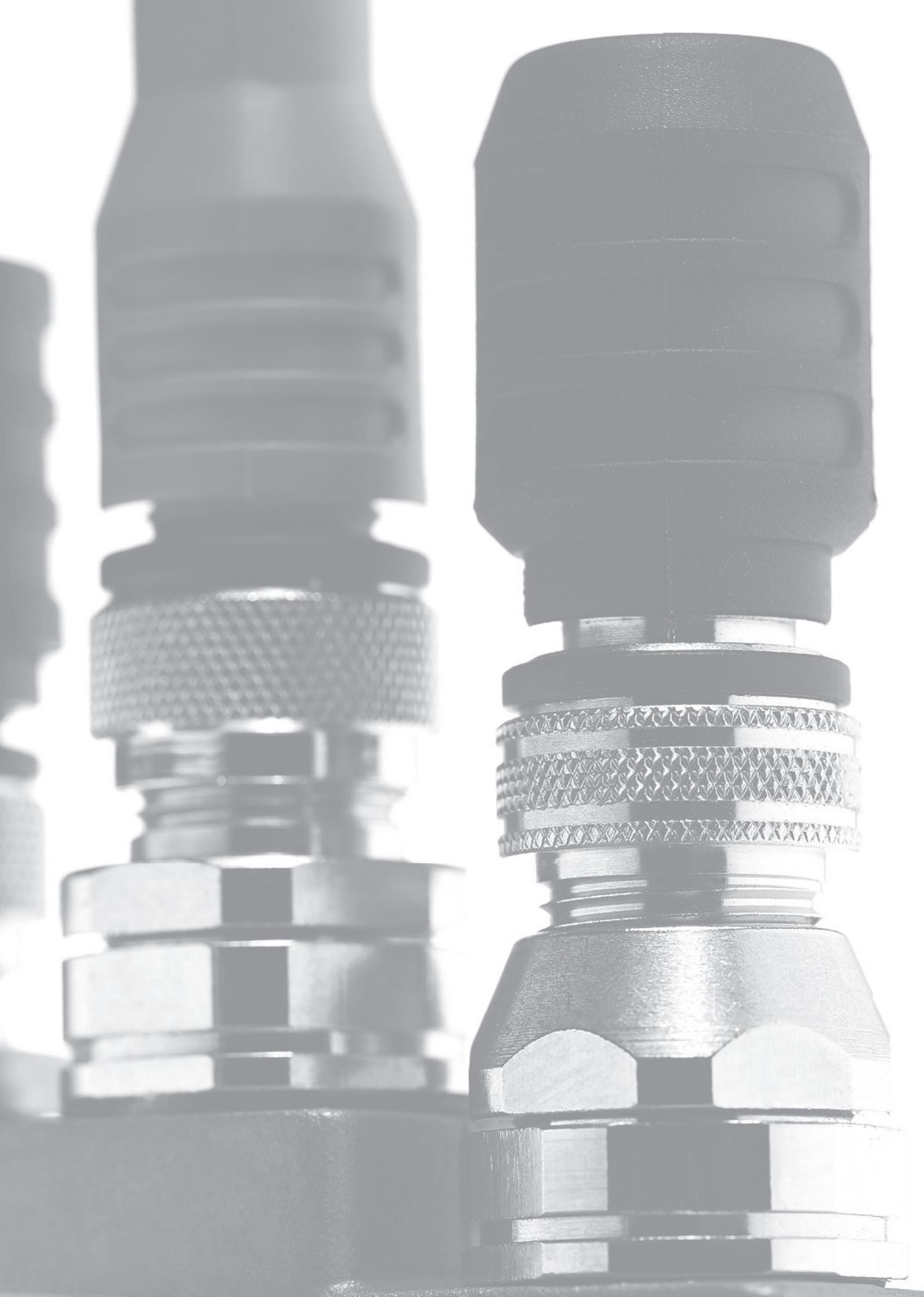
PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Power supply (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L Bus cable



Dimensions

Dimensions in mm [inch]





Connection technology

			Page
Cable	Unprepared, cut to length		448
M12 connection technology	Connectors, self-assembly		451
	Cordsets, pre-assembled		457
M23 connection technology	Connectors, self-assembly		467
	Cordsets, pre-assembled		469
MIL connection technology	Connectors, self-assembly		473
Sub-D connection technology	Cordsets, pre-assembled		474
Optical fibre transmission modules	Optical fibre transmitter and receiver	RS422 / HTL	483
	Optical fibre transmitter and receiver	SSI	485

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

Connection technology

Cable		Unprepared, cut to length			Order no.
5 core + shield					
PVC electronic cable LiVCY  	Cross section	5 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6300.XXXX ¹⁾	
	Permanent working temperature range	flexible installation -5°C ... +70°C [+23°F ... +158°F] secure installation -30°C ... +70°C [-22°F ... +158°F]	incremental encoders without inversions		
	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			
8 core + shield					
TPE electronic trailing cable halogen-free, silicon-free  	Cross section	5 x 0.75 mm ² [AWG18]	suitable for:	8.0000.6600.XXXX ¹⁾	
	Permanent working temperature range	flexible installation -35°C ... +100°C [-31°F ... +212°F] secure installation -40°C ... +100°C [-40°F ... +212°F]	H100 with speed switch, robust incremental encoders without inversions		
	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					
PUR trailing cable halogen-free    	Cross section	8 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6P00.XXXX ¹⁾	
	Permanent working temperature range	flexible installation -20°C ... +90°C [-4°F ... +194°F] secure installation -40°C ... +90°C [-40°F ... +194°F]	Limes, 365X, 368X SSI and analogue Safety-M		
	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 mm ² [AWG25] + 2 x 0.5 mm ² [AWG20]	suitable for:	8.0000.6F00.XXXX ¹⁾	
	Permanent working temperature range	flexible installation -40°C ... +90°C [-40°F ... +194°F] secure installation -50°C ... +90°C [-58°F ... +194°F]	Limes, 365X, 368X SSI and analogue Safety-M		
	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					
PUR electronic trailing cable halogen-free  	Cross section	4 x 2 x 0.25 mm ² [AWG23] + 2 x 1 mm ² [AWG17]	suitable for:	8.0000.6400.XXXX ¹⁾	
	Permanent working temperature range	flexible installation -40°C ... +90°C [-40°F ... +194°F] secure installation -50°C ... +90°C [-58°F ... +194°F]	H100, H120 LA10, LA50 Safety-M		
	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)

Connection technology

Cable		Unprepared, cut to length			Order no.
12 core + shield					
PUR electronic trailing cable halogen-free 	Cross section		10 x 0.14 mm ² [AWG25] + 2 x 0.5 mm ² [AWG20]	suitable for:	8.0000.6100.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-30°C ... +80°C [-22°F ... +176°F] -50°C ... +90°C [-58°F ... +194°F]	robust incremental encoders	
 	Bending radius	flexible installation secure installation	min. 50 mm [1.97"] min. 35 mm [1.38"]		
	Cable diameter		approx. 6.9 mm ±0.3 mm		
PVC electronic cable LiYCY 	Cross section		12 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6200.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-10°C ... +90°C [+14°F ... +194°F] -30°C ... +90°C [-22°F ... +194°F]	incremental encoders standard cable	
	Bending radius	flexible installation secure installation	min. 100 mm [3.94"] min. 65 mm [2.56"]		
	Cable diameter		approx. 6.7 mm ±0.2 mm		
PUR electronic trailing cable halogen-free 	Cross section		6 x 2 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6Y00.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-30°C ... +90°C [-22°F ... +194°F] -40°C ... +90°C [-40°F ... +194°F]	robust incremental encoders LA10	
  	Bending radius	flexible installation secure installation	min. 90 mm [3.54"] min. 40 mm [1.57"]		
	Cable diameter		approx. 7.5 mm ±0.2 mm		
TPE electronic cable halogen-free 	Cross section		5 x 2 x 0.14 mm ² + 2 x 0.5 mm ²	suitable for:	8.0000.6E00.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-25°C ... +110°C [-13°F ... +230°F] -40°C ... +135°C [-40°F ... +275°F]	high temperatures or encoders with sine wave output	
 	Bending radius	flexible installation secure installation	min. 90 mm [3.54"] min. 70 mm [2.76"]		
	Cable diameter		approx. 8.5 mm ±0.9 mm		
PVC electronic cable LiYCY 	Cross section		6 x 2 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6900.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-5°C ... +70°C [+23°F ... +158°F] -30°C ... +80°C [-22°F ... +176°F]	absolute encoders with SSI or 4 ... 20 mA analogue output, twisted pair conductors	
	Bending radius	flexible installation secure installation	min. 110 mm [4.33"] min. 75 mm [2.95"]		
	Cable diameter		approx. 7.3 mm ±0.2 mm		
18 core + shield					
PVC electronic cable LiYCY 	Cross section		18 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6700.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-5°C ... +70°C [+23°F ... +158°F] -30°C ... +80°C [-22°F ... +176°F]	absolute encoders with parallel output, twisted pair conductors	
	Bending radius	flexible installation secure installation	min. 120 mm [4.72"] min. 100 mm [3.94"]		
	Cable diameter		approx. 7.8 mm ±0.2 mm		

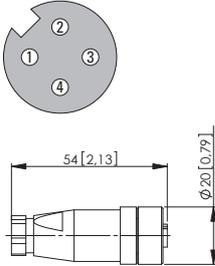
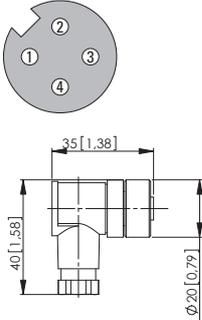
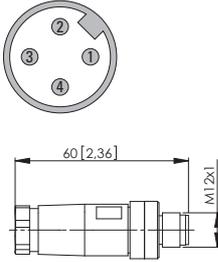
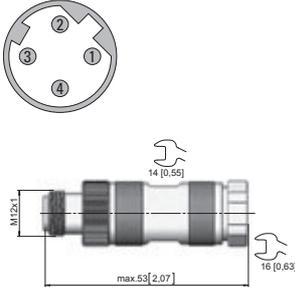
1) XXXX = cable length in meters (e.g. 10 m = 0010)

Connection technology

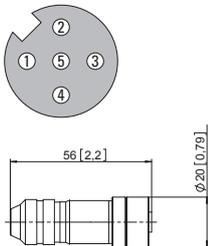
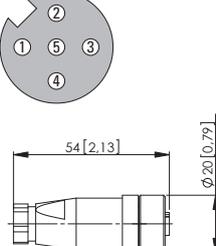
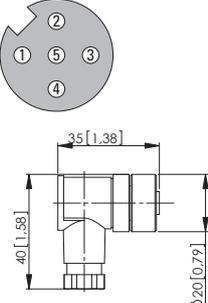
Cable		Unprepared, cut to length		
PROFIBUS DP - cable				
Order no.				
PUR outer jacket, PE wire insulation halogen-free  	Cross section	2 x 0.34 mm ² [AWG22]	suitable for:	05.KABEL451.XXX ¹⁾
	Permanent working temperature range	flexible installation -25°C ... +60°C [-13°F ... +140°F] secure installation -50°C ... +90°C [-58°F ... +194°F]	all Profibus fieldbus encoders, Safety-M BM31, Safety-M modular SMBU and SMBS	
	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		
DeviceNet - cable				
Order no.				
PUR outer jacket, PE wire insulation  	Cross section	2 x 0.52 mm ² [AWG24] + 2 x 1.04 mm ² [AWG17]	suitable for:	05.KABEL5723.XXX ¹⁾
	Permanent working temperature range	flexible installation -30°C ... +70°C [-22°F ... +158°F] secure installation -40°C ... +80°C [-40°F ... +176°F]	all DeviceNet fieldbus encoders, Safety-M BM11	
	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		
CANopen - cable				
Order no.				
PVC electronic cable  	Cross section	3 x 2 x 0.25 mm ² [AWG23]	suitable for:	8.0000.6V00.XXXX ¹⁾
	Permanent working temperature range	flexible installation -10°C ... +90°C [+14°F ... +194°F] secure installation -30°C ... +90°C [-22°F ... +194°F]	all CANopen fieldbus encoders, Safety-M BM21, Safety-M modular SMBU	
	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		
Industrial EtherNet - cable				
Order no.				
PUR electronic cable  	Cross section	2 x 2 x 0.34 mm ² [AWG22]	suitable for:	05.00.6031.1111.XXXM ¹⁾
	Permanent working temperature range	flexible installation -30°C ... +70°C [-22°F ... +158°F] secure installation -40°C ... +80°C [-40°F ... +176°F]	all EtherCAT / PROFINET IO / EtherNet IP encoders, Safety-M BMB1 and BMC1, Safety-M modular SMBU and SMBS	
	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	  	

1) XXXX = cable length in meters (e.g. 10 m = 0010)

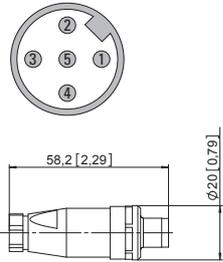
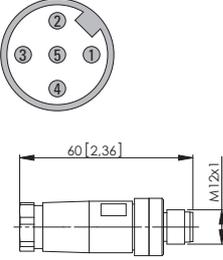
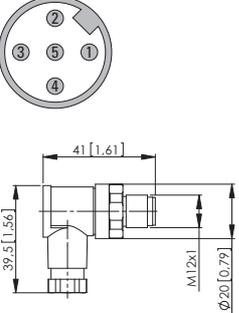
Connection technology

M12 connection technology		Connectors, self-assembly		Order no.
4 pin				
Female connector with coupling nut A coded, straight power supply Housing: plastic, IP67 	screw connections, for cable \varnothing 4 ... 6 mm [0.16 ... 0.24"] 	suitable for our series: EMIO.SIO.10xP 5858 / 5878 5868 / 5888 9080	05.B8141-0	
Female connector with coupling nut A coded, right-angle power supply Housing: plastic, IP67 	screw connections, for cable \varnothing 4 ... 6 mm [0.16 ... 0.24"] 	suitable for our series: EMIO.SIO.10xP 5858 / 5878 5868 / 5888 9080	05.B8241-0	
Male connector with external thread A coded, straight power supply Housing: metal / plastic, IP67 	screw connections, for cable \varnothing 4 ... 6 mm [0.16 ... 0.24"] 	suitable for: versions with cable outlet	05.BS8141-0	
Male connector with external thread D coded, straight Housing: metal, IP67 	screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"] 	suitable for our series: 5858 / 5878 5868 / 5888  Conformance tested 	05.WASCSY4S	

Connection technology

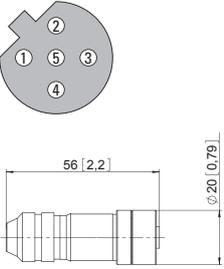
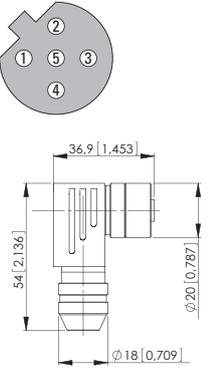
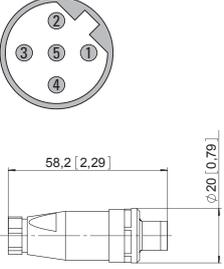
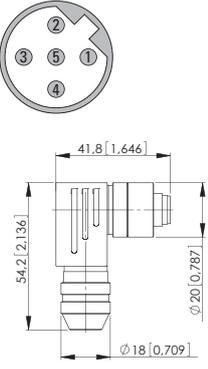
M12 connection technology		Connectors, self-assembly		Order no.
5 pin				
Female connector with coupling nut A coded, straight Housing: metal, IP67 	screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"] 	suitable for our series: A50, B80, C120, D135, IS40 3651 / 3671 F3658 / F3658 F3668 / F3668 M3658 / M3678 M3668 / M3688 M3668R / M3688R F5868 / F5888 5858 / 5878 5868 / 5888 9080 IS60		8.0000.5116.0000
Female connector with coupling nut A coded, straight Housing: plastic, IP67 	screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"] 	suitable for our series: A50, B80, C120, D135, IS40 3651 / 3671 9080 IS60		05.B-8151-0/9
Female connector with coupling nut A coded, right-angle Housing: plastic, IP67 	screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"] 	suitable for our series: A50, B80, C120, D135, IS40 3651 / 3671 9080 IS60		05.B-8251-0/9

Connection technology

M12 connection technology		Connectors, self-assembly		Order no.
5 pin				
<p>Male connector with external thread A coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>F3658 / F3658 F3668 / F3668 M3658 / M3678 M3668 / M3688 M3668R / M3688R F5868 / F5888 5858 / 5878 5868 / 5888 9080 IS60</p> 	<p>8.0000.5111.0000</p>	
<p>Male connector with external thread A coded, straight</p> <p>Housing: metal / plastic, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>9080 IS60</p> <p>EMIO.SIO.10xP</p> 	<p>05.BS-8151-0/9</p>	
<p>Male connector with external thread A coded, right-angle</p> <p>Housing: metal / plastic, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>9080 IS60</p> 	<p>05.BS-8251-0/9</p>	

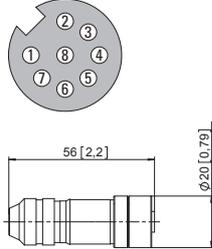
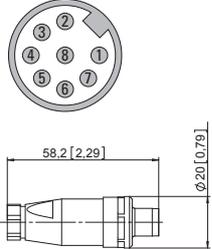
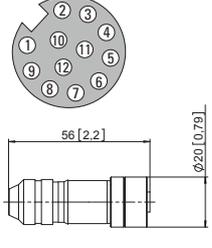
Connection technology

M12 connection technology Connectors, self-assembly

5 pin			Order no.
<p>Female connector with coupling nut B coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p> 	05.BMWS 8151-8.5
<p>Female connector with coupling nut B coded, right-angle</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p> 	05.BMWS 8251-8.5
<p>Male connector with external thread B coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p> 	05.BMSWS 8151-8.5
<p>Male connector with external thread B coded, right-angle</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p> 	05.BMSWS 8251-8.5

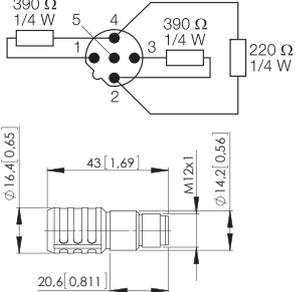
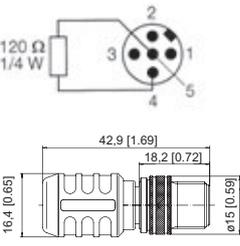
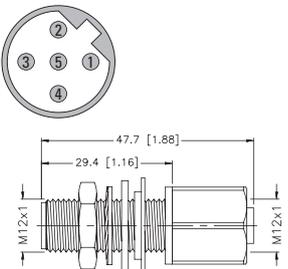
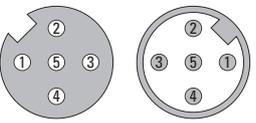
Connection technology

M12 connection technology **Connectors, self-assembly**

8 pin			Order no.												
<p>Female connector with coupling nut A coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <table border="0"> <tr><td>3610 / 3620</td><td>5821</td></tr> <tr><td>F3653 / F3673</td><td>5814 / 5834</td></tr> <tr><td>F3663 / F3683</td><td>5853 / 5873</td></tr> <tr><td>5000 / 5020</td><td>5863 / 5883</td></tr> <tr><td>5006 / 5026</td><td>58x4FSx</td></tr> <tr><td>A020 / A02H</td><td>5876</td></tr> </table>	3610 / 3620	5821	F3653 / F3673	5814 / 5834	F3663 / F3683	5853 / 5873	5000 / 5020	5863 / 5883	5006 / 5026	58x4FSx	A020 / A02H	5876	05.CMB 8181-0
3610 / 3620	5821														
F3653 / F3673	5814 / 5834														
F3663 / F3683	5853 / 5873														
5000 / 5020	5863 / 5883														
5006 / 5026	58x4FSx														
A020 / A02H	5876														
<p>Male connector with external thread A coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for:</p> <p>versions with cable outlet</p>	05.CMBS 8181-0												
12 pin			Order no.												
<p>Female connector with coupling nut A coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for:</p> <p>LA10</p>	8.0000.5162.0000												

Connection technology

M12 connection technology **Connectors, self-assembly**

Accessories		Order no.	
<p>Securing clip for M12 connectors</p> <p>Material: plastic</p> 	<p>against accidental disconnection under load</p> <p>working temperature range -25°C ... +90°C [-13°F ... +194°F]</p>	<p>8.0000.5000.0006</p>	
<p>Terminating resistor Male connector with external thread B coded, straight</p> <p>Housing: metal / plastic, IP67</p> 	 <p>390 Ω 1/4 W 220 Ω 1/4 W</p> <p>Dimensions: 43 [1.69], 20.6 [0.811], 14.2 [0.56], 16.4 [0.65]</p>	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p> 	<p>05.RSS4.5-PDP-TR</p>
<p>Terminating resistor Male connector with external thread A coded, straight</p> <p>Housing: metal / plastic, IP67</p> 	 <p>120 Ω 1/4 W</p> <p>Dimensions: 42.9 [1.69], 18.2 [0.72], 16.4 [0.65], 9.5 [0.58]</p>	<p>suitable for our series:</p> <p>F5868 / F5888 5858 / 5878 5868 / 5888 9080</p> 	<p>05.RSE 57 TR2</p>
<p>M12 lead-through B coded, straight</p> <p>Housing: metal, IP67</p> 	 <p>Dimensions: 47.7 [1.88], 29.4 [1.16], 12x1</p>	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p> 	<p>05.FKW-FSW45/M12</p>
<p>T-junction A coded, 5 pin</p> <p>Housing: metal / plastic, IP67</p> 	<p>2 x female connector with coupling nut 1 x male connector with external thread</p> 	<p>suitable for:</p> <p>M12 connectors</p> 	<p>05.FKM5-FKM5-FSM5</p>

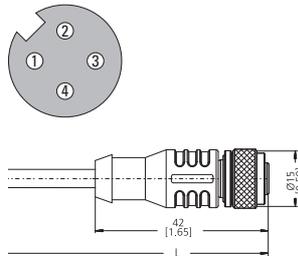
Connection technology

M12 connection technology Cordsets, pre-assembled

With connector, 4 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Female connector with coupling nut + single-ended A coded, straight power supply

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Terminal assignment

Pin female contacts:	1	2	3	4
Wire colour:	BN	WH	BU	BK

suitable for our series:

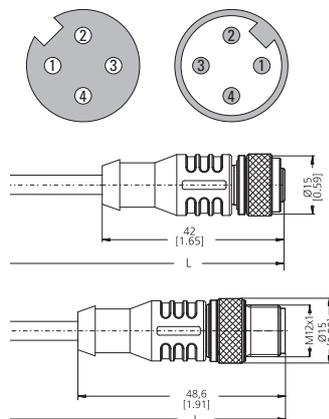
EMIO.SIO.10xP
5858 / 5878
5868 / 5888
9080

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.

Connection technology

M12 connection technology **Cordsets, pre-assembled**

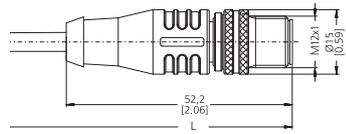
With connector, 4 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Male connector with external thread
single-ended
D coded, straight

Cable: PUR, 2 x 2 x 0.34 mm² [AWG22]
 Housing: metal /plastic, IP67



Port A (1) and B (2)



suitable for our series:

5858 / 5878
 5868 / 5888



Terminal assignment

Pin male contacts:	1	2	3	4
Wire colour:	YE	OG	WH	BU

Cable length ¹⁾

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.

Connection technology

M12 connection technology Cordsets, pre-assembled

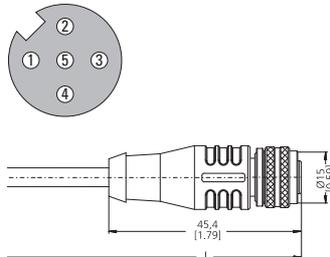
With connector, 5 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Female connector with coupling nut + single-ended A coded, straight

Cable: PVC, 5 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



Terminal assignment



suitable for our series:

A50, B80, C120, D135
IS40

Pin female contacts:	1	2	3	4	5	PH ²⁾
Wire colour:	BN	WH	BU	BK	GY	PH ²⁾

Cable length¹⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

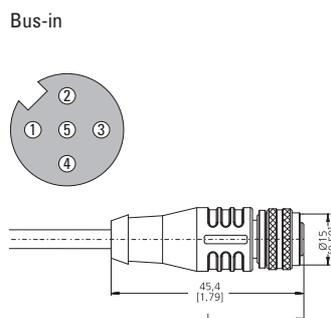
05.00.6081.2211.002M
05.00.6081.2211.005M
05.00.6081.2211.010M
05.00.6081.2211.015M

Female connector with coupling nut + single-ended A coded, straight

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Terminal assignment



suitable for our series:

9080
IS60

DeviceNet

Pin female contacts:	1	2	3	4	5
Wire colour:	± 3)	RD	BK	WH	BU

Cable length¹⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

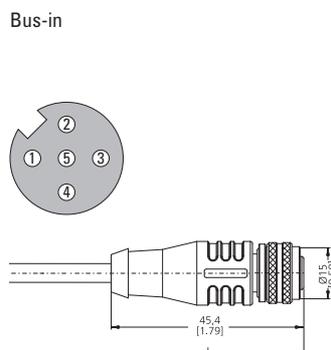
05.00.6021.2211.002M
05.00.6021.2211.005M
05.00.6021.2211.010M
05.00.6021.2211.015M

Female connector with coupling nut + single-ended A coded, straight

Cable: PVC, 3 x 2 x 0.25 mm²
Housing: metal / plastic, IP67



Terminal assignment



suitable for our series:

M3658 / M3678
F5868 / F5888
5858 / 5878
5868 / 5888

CANopen

Pin female contacts:	1	2	3	4	5	PH ²⁾
Wire colour:	GY	BN	WH	GN	YE	PH ²⁾

Cable length¹⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

05.00.6091.A211.002M
05.00.6091.A211.005M
05.00.6091.A211.010M
05.00.6091.A211.015M

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

Connection technology

M12 connection technology

Cordsets, pre-assembled

With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

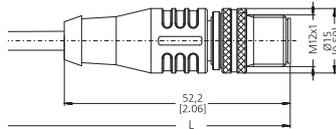
Order no.

Male connector with external thread + single-ended
A coded, straight

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Bus out



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⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

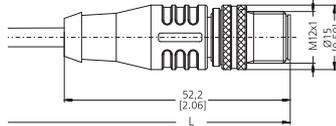
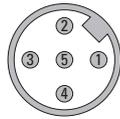
05.00.6021.2411.002M
05.00.6021.2411.005M
05.00.6021.2411.010M
05.00.6021.2411.015M

Male connector with external thread + single-ended
A coded, straight

Cable: PVC, 3 x 2 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



Bus out



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⁾

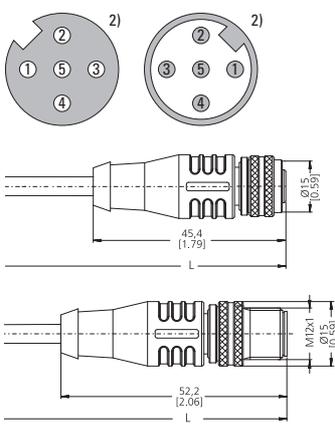
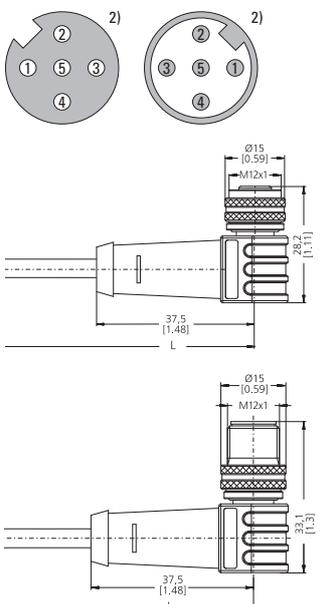
2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

05.00.6091.A411.002M
05.00.6091.A411.005M
05.00.6091.A411.010M
05.00.6091.A411.015M

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

Connection technology

M12 connection technology Cordsets, pre-assembled

With connector, 5 pin		Working temp. -30°C ... +80°C [-22°F ... +176°F]	Order no.
<p>Female connector with coupling nut + male connector with external thread A coded, straight</p> <p>Cable: PUR, 4 x 0.34 mm² [AWG22] Housing: metal / plastic, IP67</p> 	<p>Bus in / out</p> 	<p>suitable for our series:</p> <p>EMIO.SIO.10xP</p> <p>9080</p> <p><i>DeviceNet.</i></p> <p><i>Cable length ¹⁾</i></p> <ul style="list-style-type: none"> 2 m [6.56'] 5 m [16.40'] 10 m [32.81'] 15 m [49.21'] 	<ul style="list-style-type: none"> 05.00.6021.2422.002M 05.00.6021.2422.005M 05.00.6021.2422.010M 05.00.6021.2422.015M
<p>Female connector with coupling nut + male connector with external thread A coded, right-angle</p> <p>Cable: PUR, 4 x 0.34 mm² [AWG22] Housing: metal / plastic, IP67</p> 	<p>Bus in / out</p> 	<p>suitable for our series:</p> <p>9080</p> <p><i>DeviceNet.</i></p> <p><i>Cable length ¹⁾</i></p> <ul style="list-style-type: none"> 2 m [6.56'] 5 m [16.40'] 10 m [32.81'] 15 m [49.21'] 	<ul style="list-style-type: none"> 05.00.6021.2523.002M 05.00.6021.2523.005M 05.00.6021.2523.010M 05.00.6021.2523.015M

1) Other cable lengths on request.
2) Shield with pin 1.

Connection technology

M12 connection technology

Cordsets, pre-assembled

With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

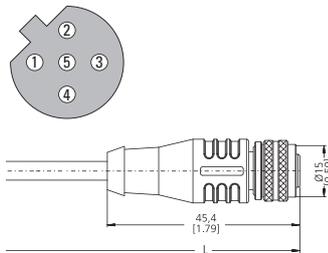
Order no.

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⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

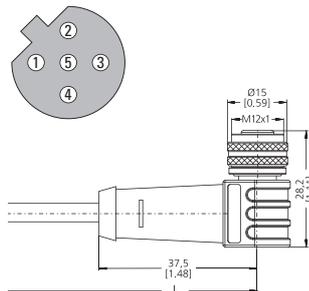
05.00.6011.3211.002M
05.00.6011.3211.005M
05.00.6011.3211.010M
05.00.6011.3211.015M

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⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

05.00.6011.3311.002M
05.00.6011.3311.005M
05.00.6011.3311.010M
05.00.6011.3311.015M

1) Other cable lengths on request.
2) Shield on housing.

Connection technology

M12 connection technology Cordsets, pre-assembled

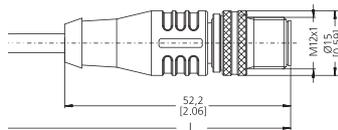
With connector, 5 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Male connector with external thread + single-ended
B coded, straight

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67



Bus out



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 length¹⁾

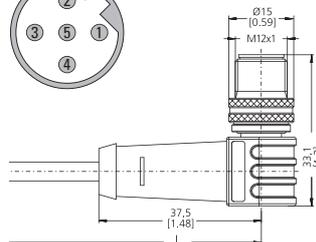
2 m [6.56']	05.00.6011.3411.002M
5 m [16.40']	05.00.6011.3411.005M
10 m [32.81']	05.00.6011.3411.010M
15 m [49.21']	05.00.6011.3411.015M

Male connector with external thread + single-ended
B coded, right-angle

Cable: PUR, 2 x 0.34 mm²
Housing: metal / plastic, IP67



Bus out



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 length¹⁾

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.

Connection technology

M12 connection technology

Cordsets, pre-assembled

With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

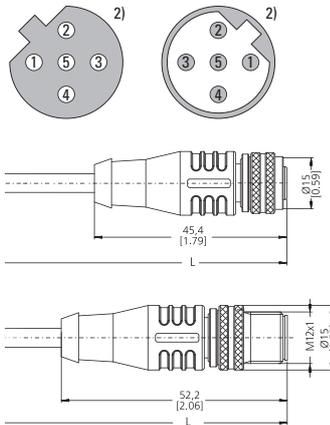
Order no.

Female connector with coupling nut + male connector with external thread 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



Cable length ¹⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

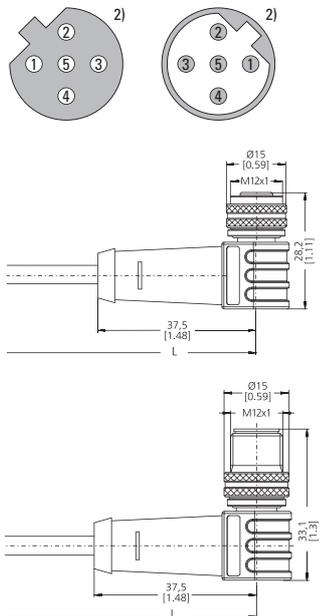
05.00.6011.3432.002M
05.00.6011.3432.005M
05.00.6011.3432.010M
05.00.6011.3432.015M

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



Cable length ¹⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

05.00.6011.3533.002M
05.00.6011.3533.005M
05.00.6011.3533.010M
05.00.6011.3533.015M

1) Other cable lengths on request.
2) Shield on housing.

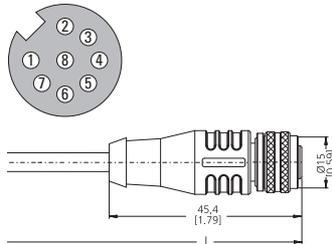
Connection technology

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

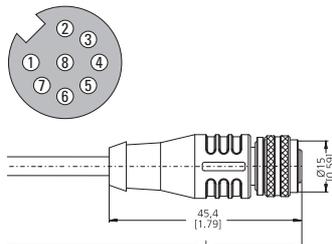
Pin female contacts:	1	2	3	4	5	6	7	8	PH ²⁾
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	PH ²⁾

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

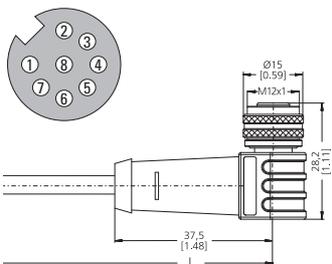
Pin female contacts:	1	2	3	4	5	6	7	8	PH ²⁾
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	PH ²⁾

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

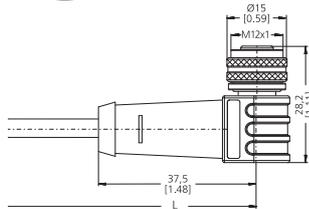
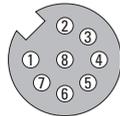
1) Other cable lengths on request.
2) Shield on housing.

M12 connection technology Cordsets, pre-assembled

With connector, 8 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

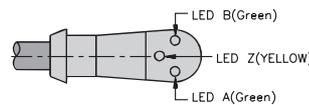
Female connector with coupling nut + single-ended
A coded, right-angle
with integrated control LEDs

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⁾

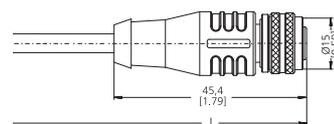
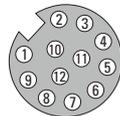
2 m [6.56']
 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

05.E-WKC 8T-PX3-930-0002
05.E-WKC 8T-PX3-930-0005
05.E-WKC 8T-PX3-930-0010
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)

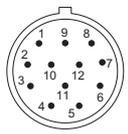
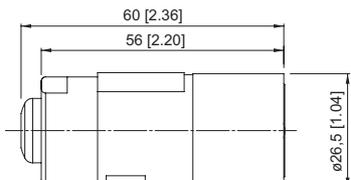
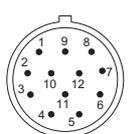
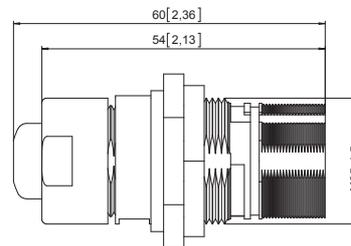
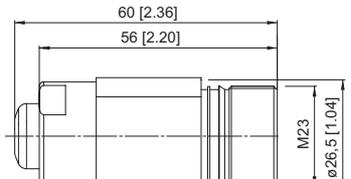
Cable length ¹⁾

2 m [6.56']
 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

05.00.60B1.B211.002M
05.00.60B1.B211.005M
05.00.60B1.B211.010M
05.00.60B1.B211.015M

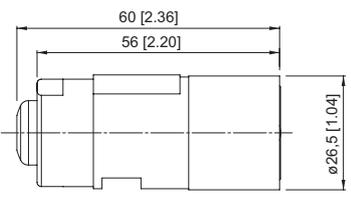
1) Other cable lengths on request.
 2) Shield on housing.

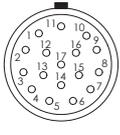
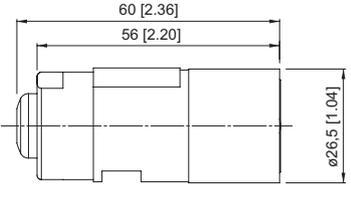
Connection technology

M23 connection technology		Connectors, self-assembly		Order no.
12 pin				
<p>Male connector with external thread pin assignment ccw</p> <p>Housing: metal, IP67</p> 	<p>solder connections, for cable \varnothing 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>  	<p>suitable for:</p> <p>versions with cable outlet</p>	<p>8.0000.5015.0001</p>	
<p>Male connector with external thread pin assignment ccw central fastening</p> <p>Housing: metal, IP67</p> 	<p>solder connections, for cable \varnothing 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>  	<p>suitable for:</p> <p>versions with cable outlet</p>	<p>8.0000.5015.0000</p>	
<p>Female connector with coupling nut pin socket assignment cw</p> <p>Housing: metal, IP67</p> 	<p>solder connections, for cable \varnothing 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>  	<p>suitable for:</p> <p>5000 / 5020 580X / 582X 5814 / 5834 5814FSx / 5834FSx F5863 / F5883 585x / 587x 5853FSx / 5873FSx 586x / 588x 5863FSx / 5883FSx 9000 908x A02x</p>	<p>8.0000.5012.0000</p>	

Connection technology

M23 connection technology Connectors, self-assembly

12 pin			Order no.														
<p>Female connector with coupling nut pin socket assignment cw (EX zone 2/22 on request)</p> <p>Housing: metal, IP67</p> 	<p>solder connections, for cable \varnothing 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>  	<p>suitable for:</p> <table border="0"> <tr> <td>5000 / 5020</td> <td>580X / 582X</td> </tr> <tr> <td>5814 / 5834</td> <td>5814FSx / 5834FSx</td> </tr> <tr> <td>F5863 / F5883</td> <td></td> </tr> <tr> <td>585X / 587X</td> <td>5853FSx / 5873FSx</td> </tr> <tr> <td>586X / 588X</td> <td>5863FSx / 5883FSx</td> </tr> <tr> <td>9000</td> <td>908X</td> </tr> <tr> <td>A02X</td> <td></td> </tr> </table>	5000 / 5020	580X / 582X	5814 / 5834	5814FSx / 5834FSx	F5863 / F5883		585X / 587X	5853FSx / 5873FSx	586X / 588X	5863FSx / 5883FSx	9000	908X	A02X		<p>8.0000.5012.0000.Ex</p>
5000 / 5020	580X / 582X																
5814 / 5834	5814FSx / 5834FSx																
F5863 / F5883																	
585X / 587X	5853FSx / 5873FSx																
586X / 588X	5863FSx / 5883FSx																
9000	908X																
A02X																	

17 pin			Order no.				
<p>Female connector with coupling nut pin socket assignment ccw</p> <p>Housing: metal, IP67</p> 	<p>solder connections, for cable \varnothing 5.5 ... 10.5 mm [0.22 ... 0.41"]</p>  	<p>suitable for:</p> <table border="0"> <tr> <td>5850 / 5870</td> <td></td> </tr> <tr> <td>5852 / 5872</td> <td></td> </tr> </table>	5850 / 5870		5852 / 5872		<p>8.0000.5042.0000</p>
5850 / 5870							
5852 / 5872							

Connection technology

M23 connection technology Cordsets, pre-assembled

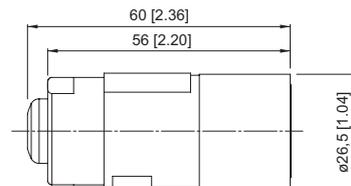
With connector, 12 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Female connector with coupling nut + single-ended

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67



pin socket assignment cw



suitable for our series with RS422 or SinCos output:

5000 / 5020 5803 / 5823
5804 / 5824 5805 / 5825
5814 / 5834 5814FSx / 5834FSx
A020 / A02H H120

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 length¹⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

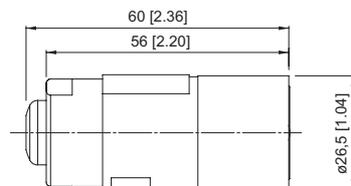
8.0000.6901.0002
8.0000.6901.0005
8.0000.6901.0010
8.0000.6901.0015

Female connector with coupling nut + single-ended

Cable: PUR, 10 x 0.14 mm² [AWG25] +
2 x 0.5 mm² [AWG20]
Housing: metal, IP67



pin socket assignment cw



suitable for our series with RS422 or SinCos output:

5000 / 5020 5803 / 5823
5804 / 5824 5805 / 5825
5814 / 5834 5814FSx / 5834FSx
A020 / A02H H120

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 length¹⁾

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

8.0000.6101.0002
8.0000.6101.0005
8.0000.6101.0010
8.0000.6101.0015

1) Other cable lengths on request.
2) Shield on housing.

M23 connection technology Cordsets, pre-assembled

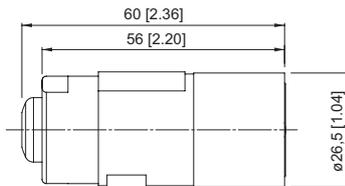
With connector, 12 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Female connector with coupling nut + single-ended

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67



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	

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 length¹⁾

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.

Connection technology

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

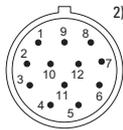
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67



pin socket assignment cw

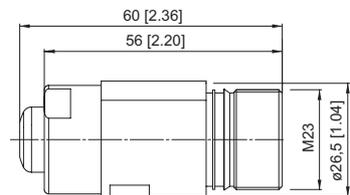
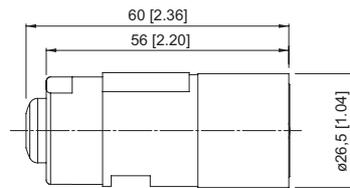


pin socket assignment ccw



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']
5 m [16.40']
10 m [32.81']
15 m [49.21']

8.0000.6905.0002
8.0000.6905.0005
8.0000.6905.0010
8.0000.6905.0015

Female connector with coupling nut + male connector with external thread

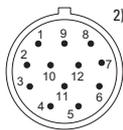
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67



pin socket assignment cw

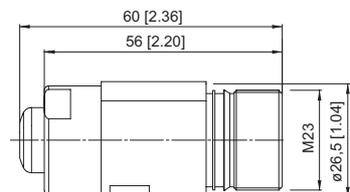
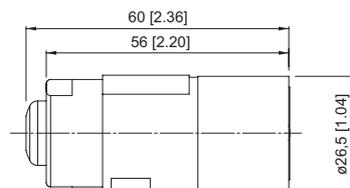


pin socket assignment ccw



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']
5 m [16.40']
10 m [32.81']
15 m [49.21']

8.0000.6905.0002.0032
8.0000.6905.0005.0032
8.0000.6905.0010.0032
8.0000.6905.0015.0032

1) Other cable lengths on request.
2) Shield on housing.

Connection technology

M23 connection technology Cordsets, pre-assembled

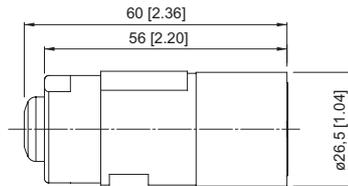
With connector, 17 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

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

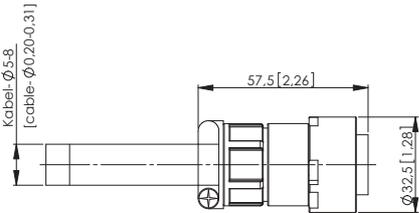
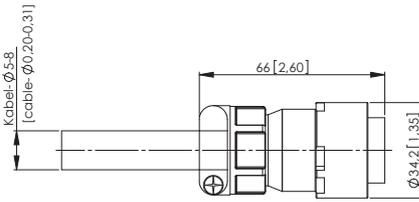
Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Wire colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	WH-GN	BN-GN	WH-YE	YE-BN	WH-GY

Cable length ¹⁾

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.

Connection technology

MIL connection technology		Connectors, self-assembly		Order no.
7 pin				
Female connector with coupling nut Housing: metal, IP67	solder connections, for cable \varnothing 5 ... 8 mm [0.20 ... 0.32"]	suitable for our series: 5803 / 5823		8.0000.5052.0000
	 			
10 pin				
Female connector with coupling nut Housing: metal, IP67	solder connections, for cable \varnothing 5 ... 8 mm [0.20 ... 0.32"]	suitable for our series: 5000 / 5020 5803 / 5823 A02H LM3		8.0000.5062.0000
	 			

Connection technology

Sub-D connection technology Cordsets, pre-assembled

With Sub-D connector + M12 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

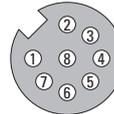
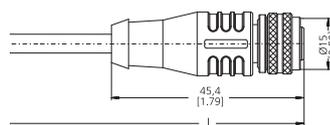
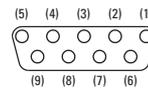
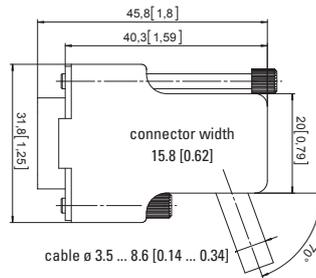
Order no.

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']
 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

8.0000.6V00.0002.0084
8.0000.6V00.0005.0084
8.0000.6V00.0010.0084
8.0000.6V00.0015.0084

1) Other cable lengths on request.
 2) Shield on housing.

Connection technology

Sub-D connection technology Cordsets, pre-assembled

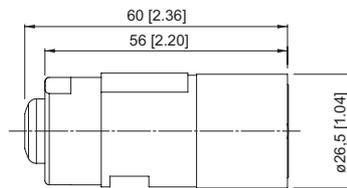
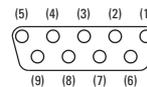
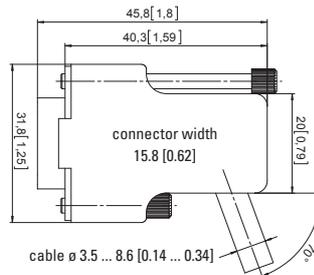
With Sub-D connector + M23 connector Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

**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']
5 m [16.40']
10 m [32.81']
15 m [49.21']

8.0000.6V00.0002.0085
8.0000.6V00.0005.0085
8.0000.6V00.0010.0085
8.0000.6V00.0015.0085

1) Other cable lengths on request.
2) Shield on housing.

Connection technology

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.

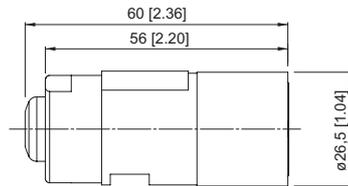
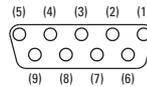
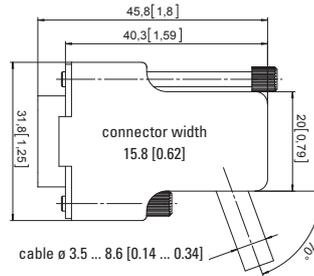
**Sub-D male connector, 9-pin, cable outlet 70°
+ M23 female connector with coupling nut,
12 pin**

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



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 length¹⁾

for terminal X31, X32, X33, X34 at MS1, MSP1, MS2, MSP2	2 m [6.56']
	5 m [16.40']
	10 m [32.81']
	15 m [49.21']

8.0000.6V00.0002.0081
8.0000.6V00.0005.0081
8.0000.6V00.0010.0081
8.0000.6V00.0015.0081

1) Other cable lengths on request.
2) Shield on housing.

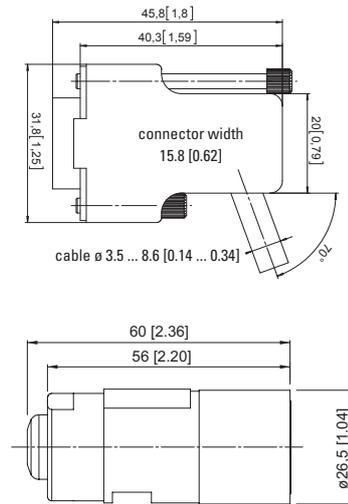
Connection technology

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

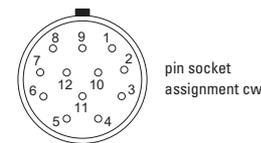
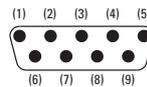
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
 Housing Sub-D: ABS, metallised, IP20
 Housing M23: metal, IP67



suitable for our series:

5853 / 5873 5853FSx / 5873FSx
 5863 / 5883 5863FSx / 5883FSx
 F5863 / F5883

MS1, MSP1, MS2, MSP2



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							

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							

Cable length ¹⁾

for terminal X31, X32	2 m [6.56']	8.0000.6900.0002.0068
at MS1, MSP1, MS2, MSP2	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
for terminal X33, X34	2 m [6.56']	8.0000.6900.0002.0072
at MSP1, MSP2	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.

Connection technology

Sub-D connection technology Cordsets, pre-assembled

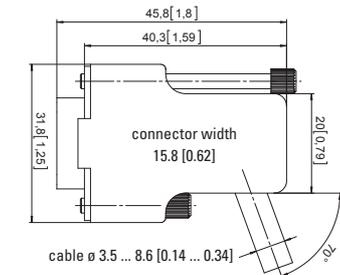
With Sub-D connector + M23 connector

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

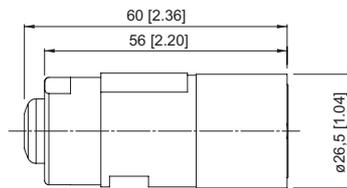
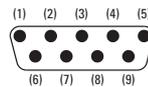
2 x Sub-D male connector, 9-pin, cable outlet 70° + M23 female connector with coupling nut, 12 pin

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 length¹⁾

2 m [6.56']
 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

8.0000.6900.0002.0070
8.0000.6900.0005.0070
8.0000.6900.0010.0070
8.0000.6900.0015.0070

1) Other cable lengths on request.
 2) Shield on housing.

Connection technology

Sub-D connection technology Cordsets, pre-assembled

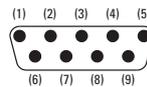
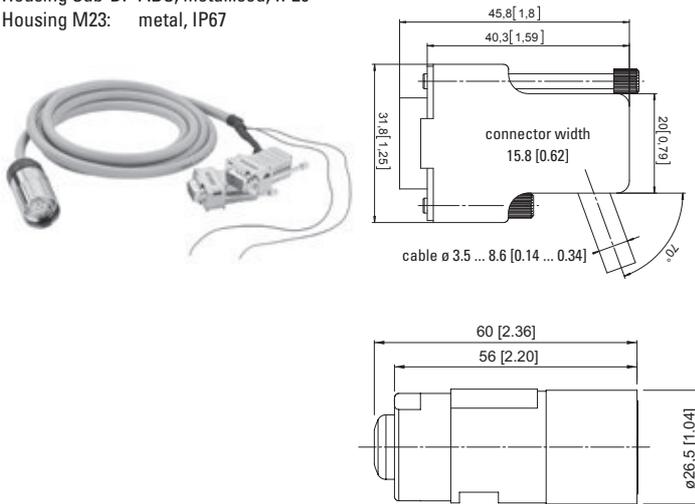
With Sub-D connector + M23 connector Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

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



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 length¹⁾

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

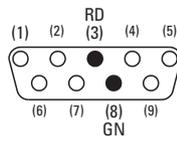
With Sub-D connector

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

Cable length ¹⁾

Pin Sub-D:	1	2	3	4	5	6	7	8	9	PH ²⁾
Wire colour:	-	-	RD	-	-	-	-	GN	-	

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.

Connection technology

Sub-D connection technology Cordsets, pre-assembled

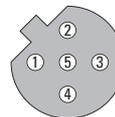
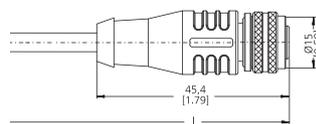
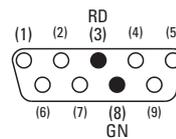
With Sub-D connector + M12 connector Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Sub-D male connector, 9 pin, cable outlet 90° Bus in
Profibus master with terminating resistor + M12 female connector with coupling nut, 5 pin, B coded

Cable: PUR, 2 x 0.34 mm² [AWG22]
 Housing Sub-D: ABS, metallised
 Housing M12: metal / plastic

suitable for our series:

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 length¹⁾

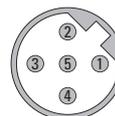
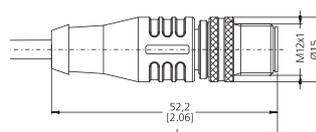
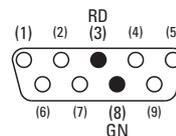
2 m [6.56']	05.00.6011.5532.002M
5 m [16.40']	05.00.6011.5532.005M
10 m [32.81']	05.00.6011.5532.010M
15 m [49.21']	05.00.6011.5532.015M

Sub-D male connector, 9 pin, cable outlet 90° Bus out
Profibus master with terminating resistor + M12 male connector with external thread, 5 pin, B coded

Cable: PUR, 2 x 0.34 mm² [AWG22]
 Housing Sub-D: ABS, metallised
 Housing M12: metal / plastic

suitable for our series:

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 length¹⁾

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.

Connection technology

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.

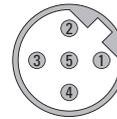
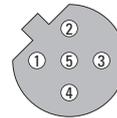
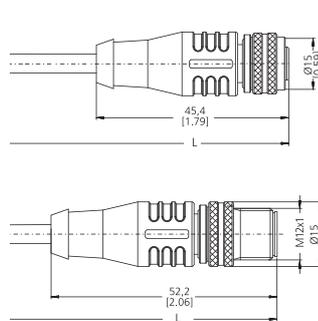
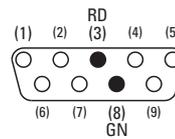
**Sub-D male connector, 9 pin, cable outlet 90°
Profibus master with terminating resistor +
M12 male connector with external thread and
M12 female connector with coupling nut,
5 pin, B coded**

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 length¹⁾

2 x 2 m [6.56']
2 x 5 m [16.40']
2 x 10 m [32.81']
2 x 15 m [49.21']

05.00.6012.5536.002M
05.00.6012.5536.005M
05.00.6012.5536.010M
05.00.6012.5536.015M

1) Other cable lengths on request.
2) Shield on housing.

Connection technology

Optical fibre transmission modules Transmitter and receiver RS422/HTL



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.

<p>Innovative</p> <ul style="list-style-type: none"> • 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. <p>Compact</p> <ul style="list-style-type: none"> • Can be installed even where space is tight. • Minimal installation depth. • Connections plug-in HD-Sub D15 or terminal clamp. 	<p>Application areas</p> <ul style="list-style-type: none"> • Process control technology and automation technology. • Applications sensitive to interference. • High voltage plants. • Plants with long transmission distances. • Potential separation. • Explosive areas.
--	---

Order code	Optical fibre transmitter / receiver	6.LWL	X	.	XX	
		a	b		c	
a	b	c	Scope of delivery:			
S = Optical fibre transmitter E = Optical fibre receiver	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	Type of connection 0 = Terminal clamp 1 = Plug-in connector HD-Sub D15	- Optical fibre module - Multilingual operating manual		Optical fibre transmitter versions can be combined with any version of the optical fibre receivers.	

Accessories	Order no.
<p>Simplex Patch cable ST-ST - Multimode</p>	<p>Connector: 2 x ST/PC, optical fibre: 1 x 50/125</p> <p>05.B09-B09-821-XXXX</p> <p>XXXX = Length in m Standard lengths: 2 m, 5 m, 8 m, 10 m, 15 m, 20 m, ... (in 5 m steps)</p>
<p>ST Multimode coupling</p>	<p>Barrel: ceramic, slotted</p> <p>05.LWLK.001</p>

* Comparison of costs:
Costs per meter standard copper cable compared to costs per meter optical fibre signal cable + costs of transmitter + costs of receiver.

Connection technology

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, \bar{A} , B, \bar{B} , 0, $\bar{0}$
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, \varnothing 9 mm [0.35] on the bottom side of the housing
Glass fibre	multimode fibre, 50/125 μ m, 62.5/125 μ m

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	protected against contact	
	max. conductor diameter	2.5 mm ² [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	\bar{A}	\bar{B}	$\bar{0}$ (\bar{C})	A	B	0 (C)	\bar{D}	D	+V	0 V linked internally	Shield
	Terminal	1	2	3	4	5	6	7	10	8	9, 11, 12	-

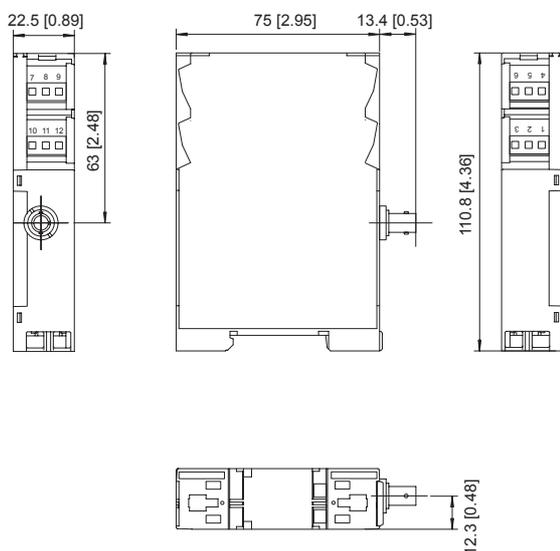
Type of connection	HD-Sub D15, optical fibre transmitter											Terminal		
1	Signal	\bar{A}	\bar{B}	$\bar{0}$ (\bar{C})	A	B	0 (C)	\bar{D}	D	+V _{out} to encoder	0 V linked internally	Shield	0 V linked internally	+V _{out} to encoder, linked internally
	Terminal	8	6	3	9	7	4	1	2	15	11, 12	13	1	2

Type of connection	HD-Sub D15, optical fibre receiver											Terminal		
1	Signal	\bar{A}	\bar{B}	$\bar{0}$ (\bar{C})	A	B	0 (C)	\bar{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

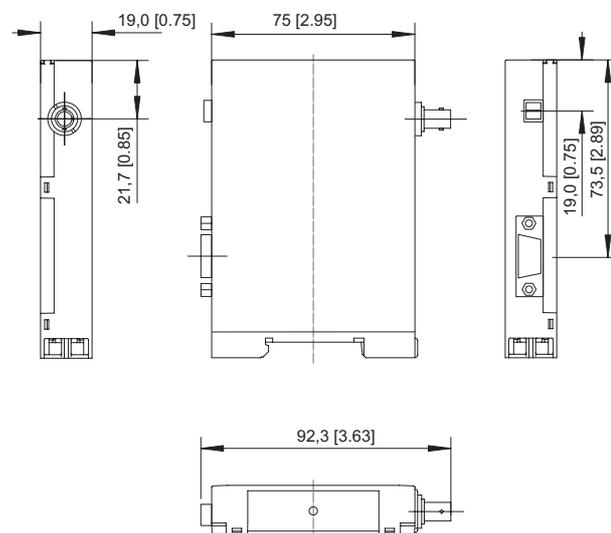
Dimensions

Dimensions in mm [inch]

Terminal clamp



Plug-in connector, HD-Sub D15



Connection technology

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.

<h3>Reliable transmission</h3> <ul style="list-style-type: none"> • Safe signal transmission up to 2000 m. • Resists extremely strong electro-magnetic fields. <h3>Easy installation</h3> <ul style="list-style-type: none"> • 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. 	<h3>Application areas</h3> <ul style="list-style-type: none"> • Process control technology and automation technology. • Crane systems. • High voltage plants. • Heavy industry. • Wind power plants. • Drive technology. • Rolling mills.
--	--

Order code	6.LWLA . XXXX				
Optical fibre transmitter / receiver	<table border="1" style="font-size: small;"> <tr> <td style="text-align: center;">a</td> <td style="text-align: center;">b</td> <td style="text-align: center;">c</td> </tr> </table>	a	b	c	
a	b	c			
<p>a</p> <p>S = Optical fibre transmitter E = Optical fibre receiver</p>	<p>b Power supply</p> <p>1 = 10 ... 30 V DC 4 = 5 V DC</p>	<p>c Type of connection</p> <p>0 = Terminal clamp 1 = Plug-in connector Sub-D9</p>			
		<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Optical fibre transmission module - Operating manual, dual language, German and English 			

Accessories		Order no.
<p>Simplex Patch cable ST-ST - Multimode</p>	<p>Connector: 2 x ST/PC, Optical fibre: 1 x 50/125</p>	<p>05.B09-B09-821-XXXX</p> <p style="font-size: x-small;">XXXX = Length in m Standard lengths: 2 m, 5 m, 8 m, 10 m, 15 m, 20 m, ... (in 5 m steps)</p>
<p>ST Multimode coupling</p>	<p>Barrel: ceramic, slotted</p>	<p>05.LWLK.001</p>

* Comparison of costs:
 Costs per meter standard copper cable compared to costs per meter optical fibre signal cable + costs of transmitter + costs of receiver

Connection technology

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

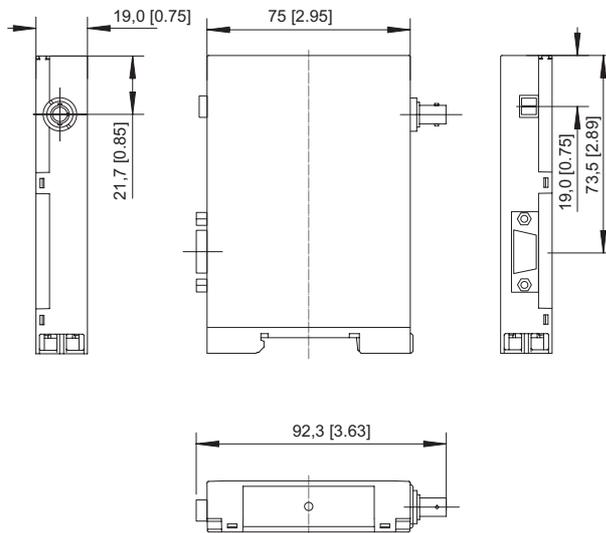
Screw terminal, 2 pin			
Signal:	0 V	+V	
Pin female contact:	1	2	

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]





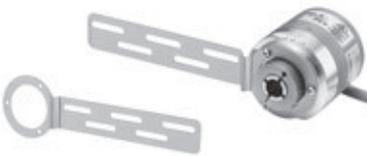
Accessories

			Page
Fixing components for hollow shaft encoders	For encoders up to \varnothing 58 mm	Overview	490
	For encoders $>$ \varnothing 58 mm	Overview	492
	For encoders up to \varnothing 58 mm	Details	493
	For encoders $>$ \varnothing 58 mm	Details	498
<hr/>			
Fixing components for shaft encoders		Overview	501
		Details	502
<hr/>			
Robust bearing unit		Suitable for Sendix 50xx and 58xx	507
<hr/>			
Connection of motor and encoder	Couplings	Bellows- / spring washer-type coupling	508
	Couplings	Bellows coupling (FS)	510
	Flexible shaft coupling	Double loop coupling	511
<hr/>			
Bearing box			512
<hr/>			
General accessories			513
<hr/>			

Accessories

Fixing components for hollow shaft encoders				For encoders up to \varnothing 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
	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	493	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	493	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	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	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	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	494	X			X	X					
	Stator coupling, double-winged For applications with high demands for accuracy	63 [2.48]	8.0010.4D00.0000	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	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	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	495		X	X		X	X		X	X	X

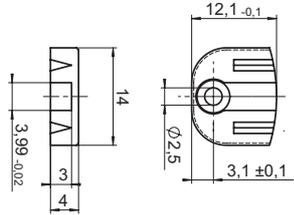
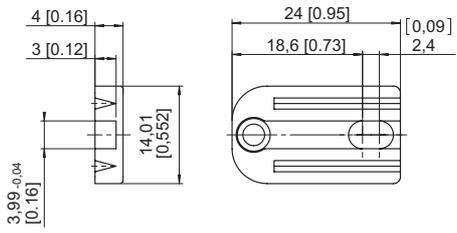
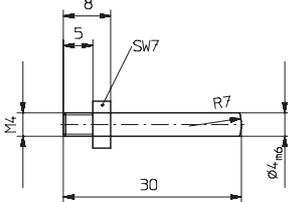
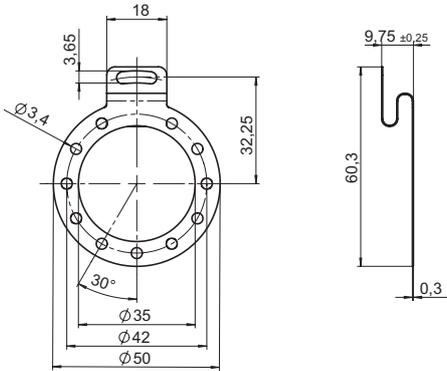
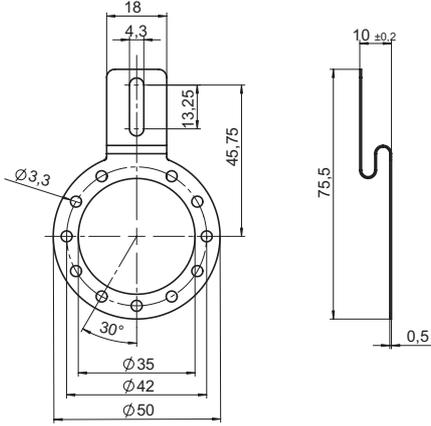
Accessories

Fixing components for hollow shaft encoders		For encoders up to \varnothing 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	
	<p>Stator coupling</p> <p>Designed for functional safety thanks to the 4-screw-principle.</p>	63 [2.48]	<p>8.0010.4048.00FS</p> <p><i>Connection to the application:</i> 4 screws</p>	496	X	X	X	X	X			X	X	X	X
	<p>Torque stop, flexible</p> <p>Designed for functional safety. For applications with axial and radial play and low dynamics.</p>	77 ... 278 [3.03 ... 10.94]	<p>8.0010.4047.00FS</p> <p><i>Connection to the application:</i> 1 screw</p>	496	X	X	X	X	X			X	X	X	X
	<p>Torque stop set, rigid</p> <p>Designed for functional safety. For applications with very low axial and radial play and low dynamics.</p>	71 ... 281 [2.80 ... 11.06]	<p>8.0010.4051.00FS</p> <p><i>Connection to the application:</i> 1 screw</p>	497	X	X	X	X	X			X	X	X	X

Accessories

Fixing components for hollow shaft encoders		For encoders > ø 58 mm			Overview			
Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	A020	A02H	9080, 9081	H120
	Spring element, short For applications with reduced mounting space	76 [2.99]	8.0010.4J00.0000 <i>Connection to the application: cylindrical pin</i>	498	X	X	X	
	Spring element, long For applications with high axial play	110 [4.33]	8.0010.4K00.0000 <i>Connection to the application: cylindrical pin</i>	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 <i>Connection to the application: 1 screw</i>	498			X	
	Fastening arm, short For applications with axial play	149 [5.87]	8.0010.4T00.0000 <i>Connection to the application: s. details</i>	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 <i>Connection to the application: 1 screw</i>	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 <i>Connection to the application: 1 screw</i>	499	X	X	X	X
	Stator coupling For applications with axial and radial play and high dynamics	119 [4.69]	8.0010.40V0.0000 <i>Connection to the application: 2 screws</i>	499	X	X		X

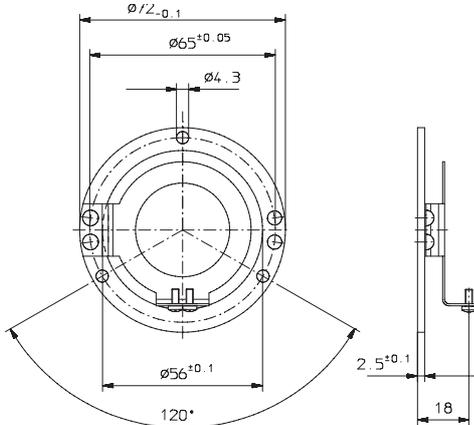
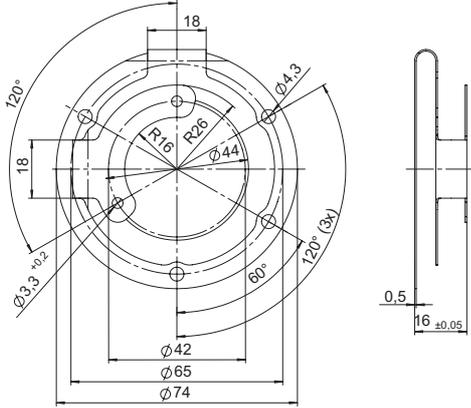
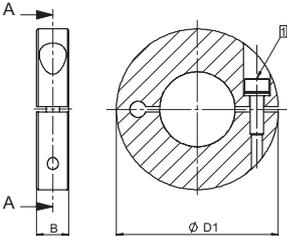
Accessories

Fixing components for hollow shaft encoders		For encoders up to \varnothing 58 mm	Details
Dimensions / Details	Dimensions in mm [inch]		Order no.
Spring element, short 		<i>Scope of delivery:</i> - spring element (plastic) - 1 screw for fixing to the encoder <i>Connection to application:</i> - cylindrical pin (8.0010.4700.0000) (not supplied)	8.0010.4H00.0000
Spring element, long 		<i>Scope of delivery:</i> - spring element (plastic) - 1 screw for fixing to the encoder <i>Connection to application:</i> - 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 		<i>Scope of delivery:</i> - Fastening arm (stainless steel) - 3 screws for fixing to the encoder <i>Connection to application:</i> - 1 screw (not supplied)	8.0010.40M0.0000
Fastening arm, medium 		<i>Scope of delivery:</i> - Fastening arm (stainless steel) - 3 screws for fixing to the encoder <i>Connection to application:</i> - 1 screw (not supplied)	8.0010.40E0.0000

Accessories

Fixing components for hollow shaft encoders		For encoders up to $\varnothing 58$ mm	Details	
Dimensions / Details			Order no.	
Fastening arm, long			<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Fastening arm (stainless steel) - 3 screws for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 1 screw (not supplied) 	8.0010.4R00.0000
Stator coupling, double-winged for front fixing onto the encoder flange			<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Stator coupling (stainless steel) - 2 screws for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 2 screws (not supplied) 	8.0010.4C00.0000
Stator coupling, double-winged for side fixing onto the encoder flange			<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Stator coupling (stainless steel) <p>① 4 screws M2 x 4 [0.16] for fixing to the encoder 5882</p> <p>② 4 screws M2.5 x 6 [0.24] for fixing to the encoders 582X, 587X, 502X</p> <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 2 socket head screws M3 x 8 [0.32] with washer (supplied) 	8.0010.4D00.0000

Accessories

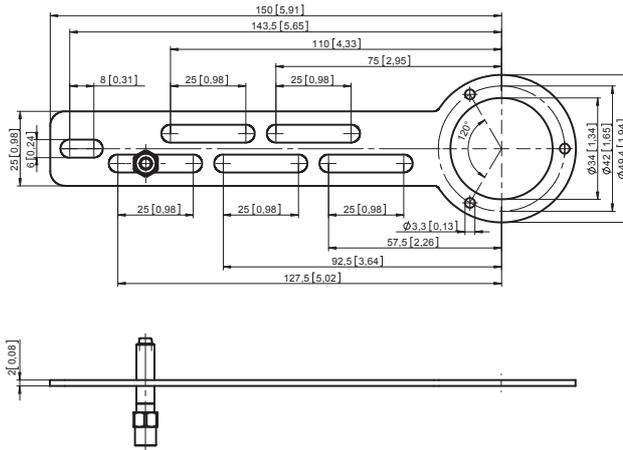
Fixing components for hollow shaft encoders		For encoders up to \varnothing 58 mm		Details																							
Dimensions / Details	Dimensions in mm [inch]	Order no.																									
Stator coupling for side fixing onto the encoder flange 		Scope of delivery: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - 3 screws (not supplied) 	8.0010.1602.0000																								
Stator coupling for front fixing onto the encoder flange 		Scope of delivery: <ul style="list-style-type: none"> - Stator coupling (stainless steel) - 2 screws for fixing to the encoder Connection to application: <ul style="list-style-type: none"> - 3 screws (not supplied) 	8.0010.40L0.0000																								
Spring tether element 		Scope of delivery: <ul style="list-style-type: none"> - Drahtfederelement - 1 Schraube zur Befestigung am Drehgeber Connection to application: <ul style="list-style-type: none"> - 1 screw (not supplied) 	8.0010.40W0.0000																								
Clamping ring Stainless steel, for high rotational speeds 		<table border="1"> <thead> <tr> <th></th> <th>for encoder</th> <th>B</th> <th>D1</th> <th>for hollow shaft \varnothing</th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">582X</td> <td></td> <td>6 [0.236]</td> <td>29 [1.14]</td> <td>10 [0.39]</td> <td>8.0000.4V00.0000</td> </tr> <tr> <td></td> <td>6.2 [0.244]</td> <td>30 [1.18]</td> <td>12 [0.47]</td> <td>8.0000.4W00.0000</td> </tr> <tr> <td>5020</td> <td></td> <td>6.2 [0.244]</td> <td>30 [1.18]</td> <td>12 [0.47]</td> <td>8.0010.4W01.0000</td> </tr> </tbody> </table>		for encoder	B	D1	for hollow shaft \varnothing		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	
	for encoder	B	D1	for hollow shaft \varnothing																							
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																						

Accessories

Fixing components for hollow shaft encoders For encoders up to \varnothing 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:

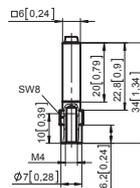
- 1 screw (not supplied)

Max. permissible shaft connection tolerances:

- Axial offset $< \pm 0,25$ mm
- Radial offset $< \pm 0,20$ mm
- Angular offset $< 1^\circ$

8.0010.4051.00FS

Cylindrical pin (replacement)

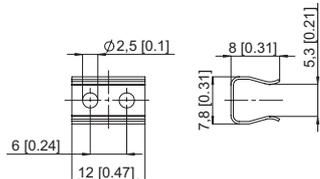
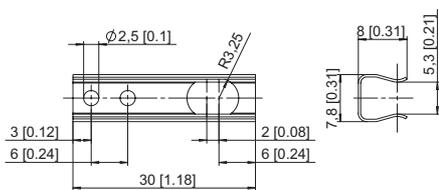
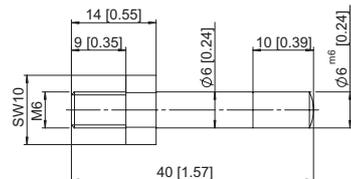
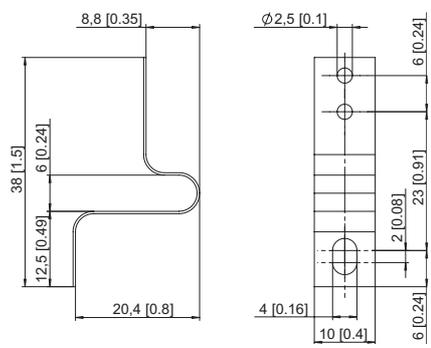
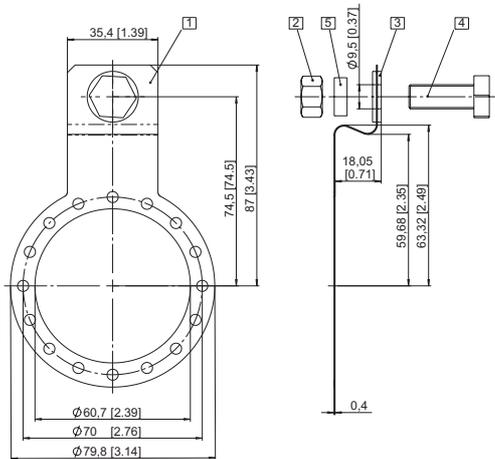


suitable for:

Fastening arm
8.0010.4051.00FS

8.0010.4049.0075

Accessories

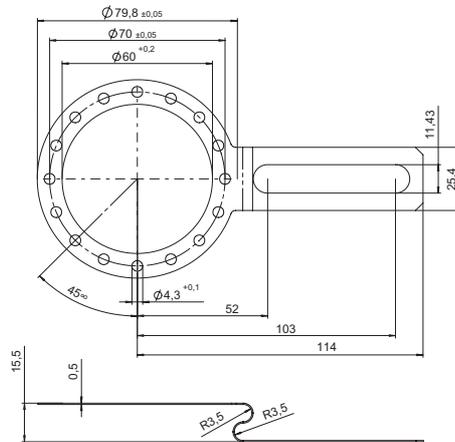
Fixing components for hollow shaft encoders		For encoders > ø 58 mm	Details
Dimensions / Details	Dimensions in mm [inch]		Order no.
Spring element, short 			8.0010.4J00.0000 <i>Scope of delivery:</i> - Spring element (stainless steel) - 2 screws for fixing to the encoder <i>Connection to application:</i> - Cylindrical pin (8.0010.4700.0003) (not supplied)
Spring element, long 			8.0010.4K00.0000 <i>Scope of delivery:</i> - Spring element (stainless steel) - 2 screws for fixing to the encoder <i>Connection to application:</i> - Cylindrical pin (8.0010.4700.0003) (not supplied)
Cylindrical pin, long with fastening thread 			8.0010.4700.0003 suitable for spring element short (8.0010.4J00.0000) and long (8.0010.4K00.0000)
Tether square 			8.0010.4G00.0000 <i>Scope of delivery:</i> - Tether square (stainless steel) - 2 screws for fixing to the encoder <i>Connection to application:</i> - 1 screw (not supplied)
Fastening arm, short 			8.0010.4T00.0000 <i>Scope of delivery:</i> 1 Fastening arm (stainless steel) - 3 screws for fixing to the encoder <i>Connection to application:</i> 2 Hexagonal nut 3/8 - 16 UNC 3 Washer (isolating) 4 Hexagonal screw 3/8 16 UNC x 1" (supplied) 5 Washer D10,4x 15 x 15 (supplied)

Accessories

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



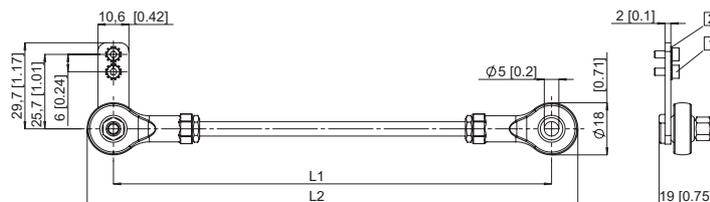
Tether arm	L1	L2	
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]	8.0010.40S0.0000
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]	8.0010.40T0.0000
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]	8.0010.40U0.0000

Scope of delivery:

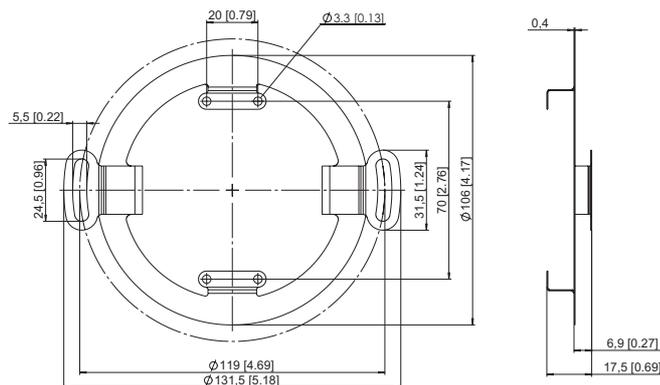
- Tether arm
- 1 2 socket cap screws M2.5 x 6 [0.24]
- 2 2 lock washers for fixing to the encoder

Connection to application:

- 1 screw (not supplied)



Stator coupling



Scope of delivery:

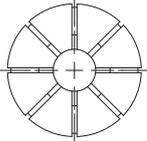
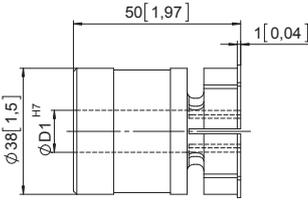
- Stator coupling (stainless steel)
- 4 screws for fixing to the encoder

Connection to application:

- 2 screws (not supplied)

8.0010.40V0.0000

Accessories

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 <ul style="list-style-type: none"> • Improved reliability • Extension of the service life of the encoder Scope of delivery: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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]   	ø D1: 12 mm [0.47"] 14 mm [0.55"] 15 mm [0.59"] 16 mm [0.63"] 18 mm [0.71"] 20 mm [0.79"] 25 mm [0.98"] 30 mm [1.18"] 32 mm [1.26"] 1/2" 5/8" 3/4" 1" 1 1/4"		8.0010.4091.0000 8.0010.4027.0000 8.0010.4038.0000 8.0010.4019.0000 8.0010.4080.0000 8.0010.4011.0000 8.0010.4012.0000 8.0010.4016.0000 8.0010.4015.0000 8.0010.4013.0000 8.0010.4070.0000 8.0010.4090.0000 8.0010.4050.0000 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"] external diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]		8.0010.4017.0000 8.0010.4029.0000

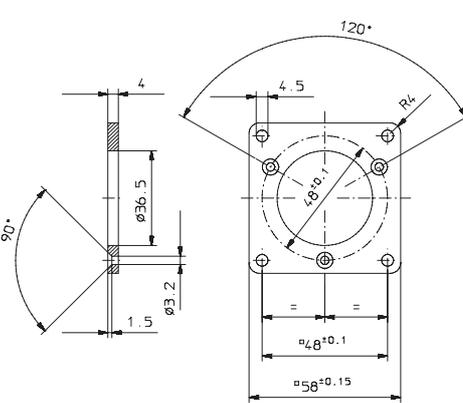
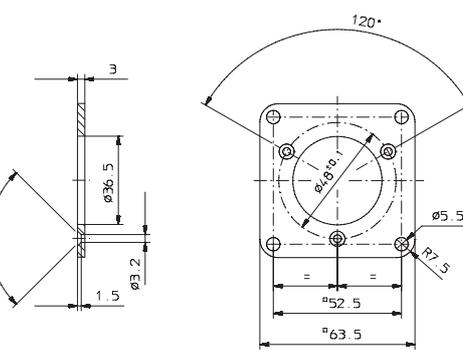
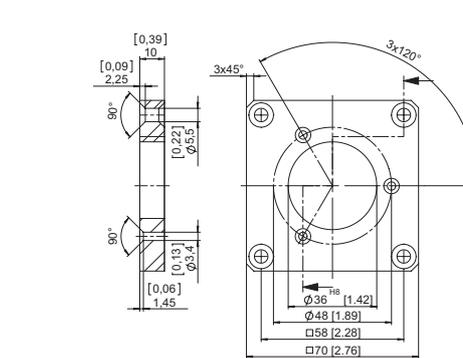
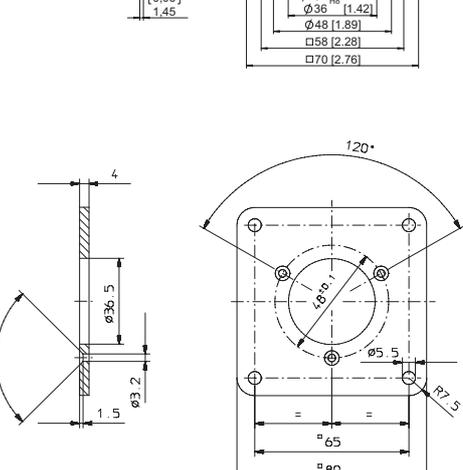
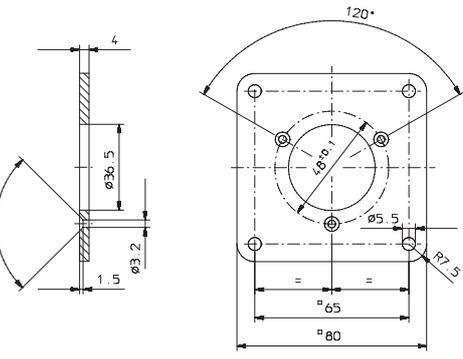
Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC motor and considerably shorten the service life of the encoder bearings. For more details please call our technical hotline (+49 7720 3903 92) or send us an email (info@kuebler.com)

Accessories

Fixing components for shaft encoders				Overview									
Overview				Details s.page	Incremental encoders			Abs. singleturn encoders			Abs. multiturn encoders		
Figure	Description	Order no.			5000	5803, 5804, 5805	7000	5853, 5858	5850, 5852	7053, 7058	5863, 5868	F5863, F5868	7063, 7068
	Flange, square Suitable for shaft encoders with clamping flange □ 58.0 [2.28"] 4 [0.16"] thick □ 63.5 [2.5"] 3 [0.12"] thick □ 70.0 [2.76"] 10 [0.39"] thick □ 80.0 [3.15"] 4 [0.16"] thick	8.0010.2100.0000 8.0010.2120.0000 8.0010.2600.0000 8.0010.2800.0000	502	X	X		X	X		X	X		
	Flange ø 65 mm [2.56"] With this adapter flange, Kübler 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	
	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

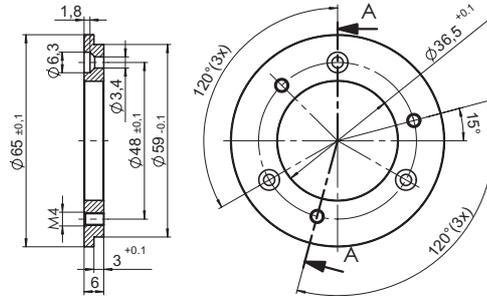
Dimensions / Details	Dimensions in mm [inch]	Order no.
<p>Flange, square</p> 		<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - flange (aluminium) - 3 screws for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 4 screws (not supplied)
		<p>8.0010.2100.0000</p>
		<p>8.0010.2120.0000</p>
		<p>8.0010.2600.0000</p>
		<p>8.0010.2800.0000</p>

Accessories

Fixing components for shaft encoders

Dimensions / Details

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].

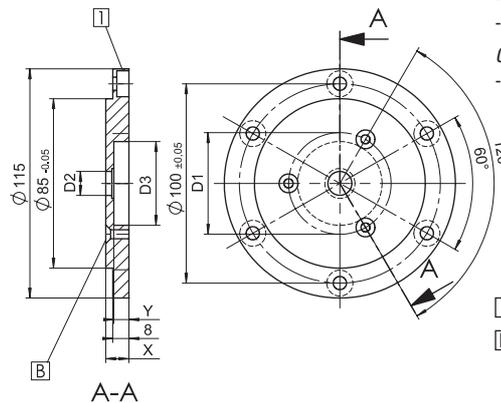


Scope of delivery:
 - flange (aluminium)
 - 3 screws for fixing to the encoder

Connection to application:
 - 3 screws (not supplied)

Order no. **8.0010.2230.0000**

Flange, ø 115 [4.53], Euroflange (Euro REO 444)



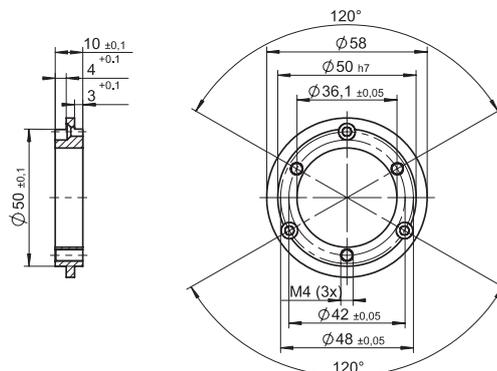
Scope of delivery:
 - flange (aluminium)
 - 3 screws for encoder mounting

Connection to application:
 - 6 screws (not supplied)

1 Countersunk DIN 74-Hm6
 B See table

encoder type	D1	D2	D3	X	Y	B	Order no.
580X/5000	48 [1.89]	36 [1.42]	58 [2.28]	11 [0.43]	1 [0.039]	DIN 74-BM3	8.0010.2160.0000
70XX	51 [2.01]	12 [0.47]	42 [1.65]	11.5 [0.45]	7.5 [0.30]	DIN 74-BM4	8.0010.2170.0000

Flange, ø 58 [2.28]
 Converts encoders with a clamping flange into synchro flange.

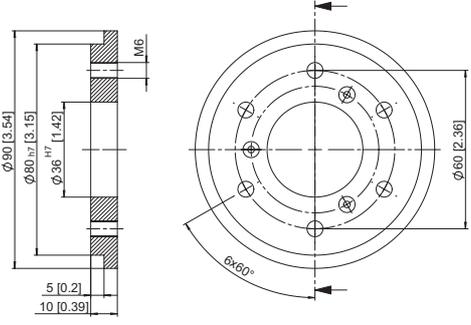
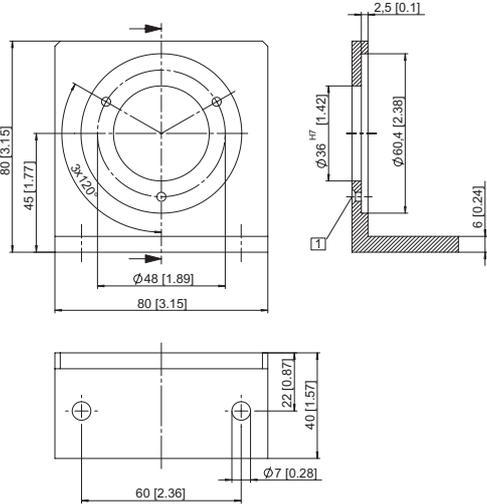


Scope of delivery:
 - flange (aluminium)
 - 3 screws for encoder mounting

Connection to application:
 - 3 screws (not supplied)

Order no. **8.0010.2180.0000**

Accessories

Fixing components for shaft encoders		Details
Dimensions / Details	Dimensions in mm [inch]	Order no.
<p>Flange, \varnothing 90 [3.54]</p> <p>Mechanically compatible with former encoder type 9000</p> 		<p>8.0010.2270.0000</p> <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - flange - 3 screws for encoder mounting <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 6 screws (not supplied)
<p>Angular flange</p> 		<p>8.0010.2300.0000</p> <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - angular flange (aluminium) - 3 screws for encoder mounting <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 2 screws (not supplied) <p>1 Countersunk DIN 74-Hm6</p>

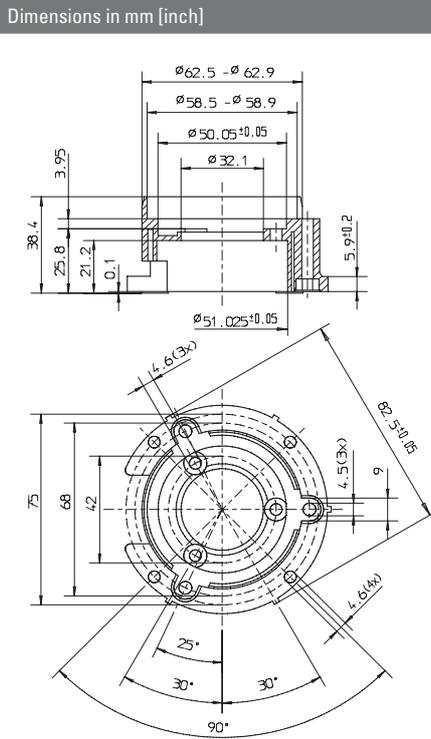
Accessories

Fixing components for shaft encoders

Dimensions / Details

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

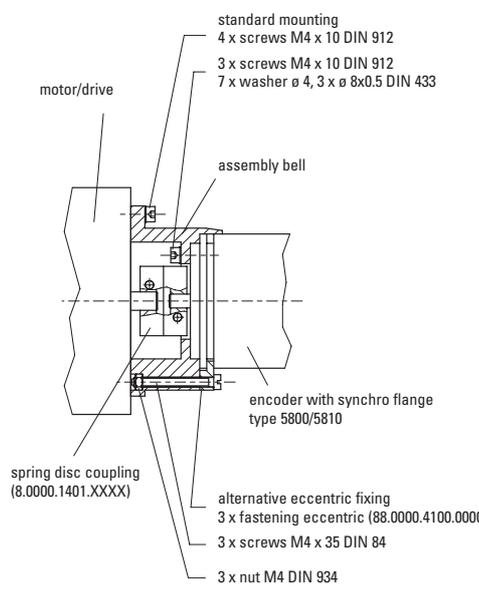


Scope of delivery:

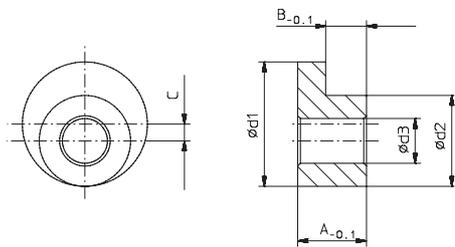
- Assembly bell
- Spring washer type coupling (8.0000.1401.XXXX)
- 4 hexagon socket head cap screws DIN 912 M4 x 12 [0.47]
- 3 hexagon socket head cap screws DIN 912 M4 x 10 [0.39]
- 7 washers DIN 433 $\varnothing 4$ [0.16]
- 3 fastening eccentrics (8.0000.4B00.0000)
- 3 hexagon head screws DIN 84 M 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



Accessories

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	<i>encoder type</i>	<i>D1</i>	<i>D2</i>	<i>D3</i>	<i>A</i>	<i>B</i>	<i>C</i>	
	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
		<i>Scope of delivery:</i> - 3 eccentrics - 3 screws (Use at least three fastening eccentrics to mount the encoder)						

Accessories

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

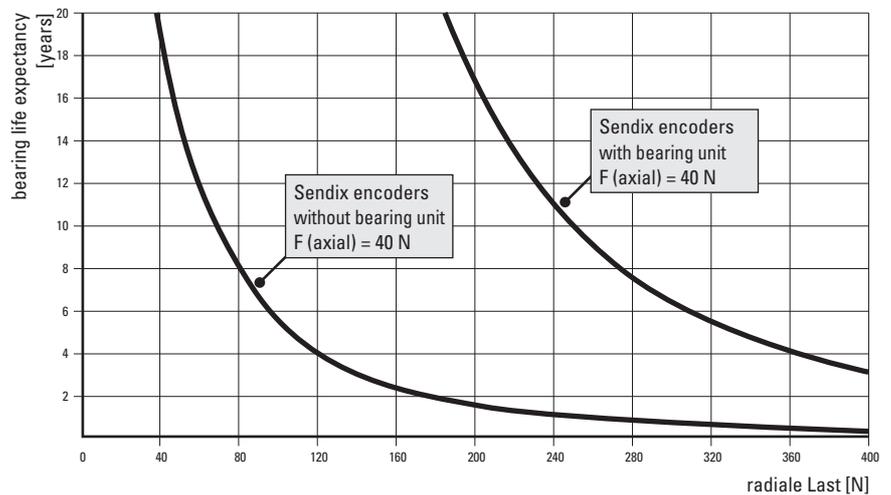
Robust bearing unit

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

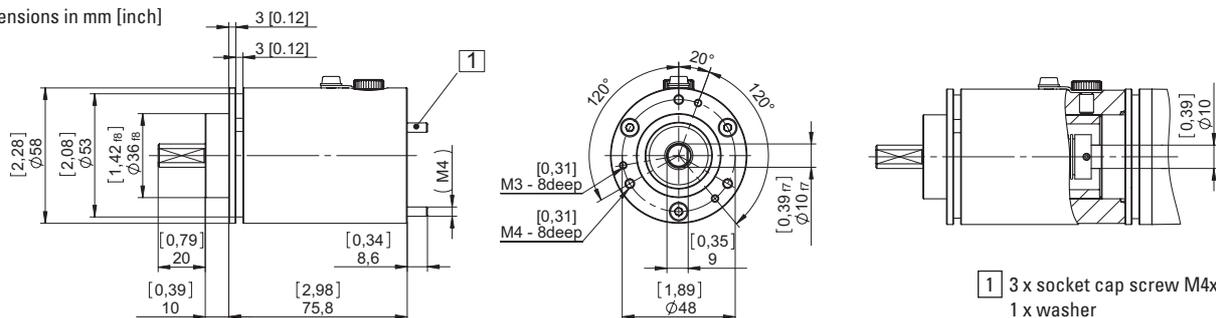
Bearing life expectancy L10

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

Accessories

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 a b c
a Type of coupling	b Bore diameter d1 (see technical data)	Example: d1 = 10 mm [0.39"] and d2 = 12 mm [0.47"] Order no. = 8.0000.1X0X.1012
102 = Bellows-type ø 19 mm [0.75"]	Note: for the bore diameter d1 = 1/4" please enter Code A2	
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"]	c Bore diameter d2 (see technical data)	

Technical data		8.0000.1102.XXXX	8.0000.1202.XXXX	8.0000.1301.XXXX	8.0000.1401.XXXX	8.0000.1502.XXXX
Type						
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 bellow or spring washer/casing	Al, anodised stainless steel	Al, anodised stainless steel	Al, anodised stainless steel	Al, anodised PA 6.6 gf.	Al, anodised 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]	08 / 06 [0.32 ... 0.24]	06 / 06 [0.24 ... 0.24]	12 / 12 [0.47 ... 0.47]	15 / 12 [0.59 ... 0.47]
		12 / 10 [0.47 ... 0.39]	06 / 06 [0.24 ... 0.24]		12 / 10 [0.47 ... 0.39]	14 / 12 [0.55 ... 0.47]
		10 / 10 [0.39 ... 0.39]	06 / 04 [0.24 ... 0.16]		10 / 10 [0.39 ... 0.39]	14 / 10 [0.55 ... 0.39]
		10 / 08 [0.39 ... 0.32]	04 / 04 [0.16 ... 0.16]		10 / 06 [0.39 ... 0.24]	10 / 10 [0.39 ... 0.39]
		10 / 06 [0.39 ... 0.24]			06 / 06 [0.24 ... 0.24]	06 / 06 [0.24 ... 0.24]
		08 / 08 [0.32 ... 0.32]			1/4" / 10	
		06 / 06 [0.24 ... 0.24]			1/4" / 06	

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.

Accessories

Connection of motor and encoder	Couplings	Bellows and spring washer couplings
--	------------------	--

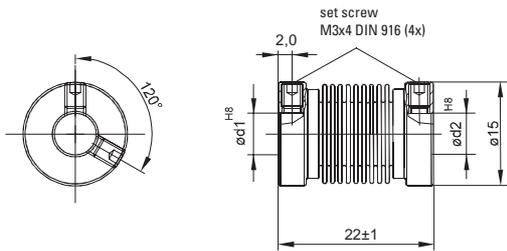
Metal bellows-type couplings (.1102, .1202 und .1502)

Metal bellows-type couplings are recommended as an inexpensive type of coupling. They are also suitable for compensating larger angle displacements.

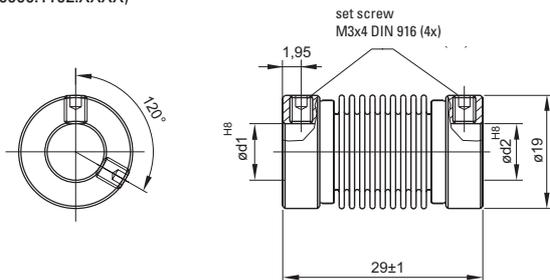
Dimensions

Dimensions in mm

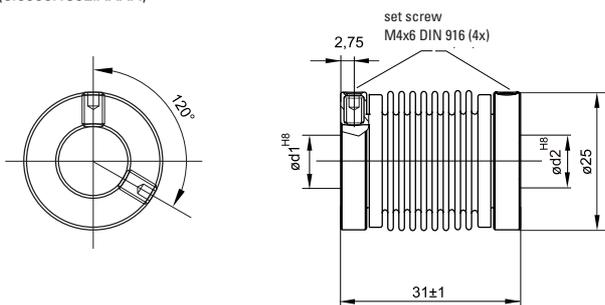
Bellows-type coupling $\varnothing 15$ [0.59]
(8.0000.1202.XXXX)



Bellows-type coupling $\varnothing 19$ [0.75]
(8.0000.1102.XXXX)



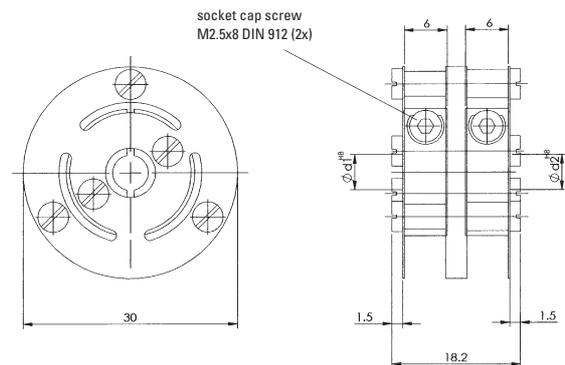
Bellows-type coupling $\varnothing 25$ [0.98]
(8.0000.1502.XXXX)



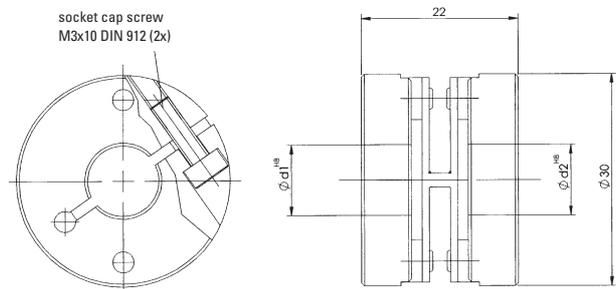
Spring washer-type couplings (.1301 und .1401)

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.

Spring washer-type coupling, one-part
(8.0000.1301.XXXX)

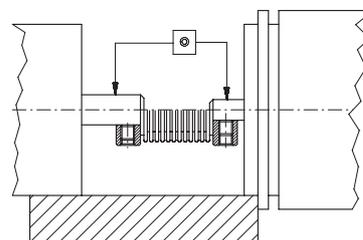


Spring washer-type coupling, three part, plug-in
(8.0000.1401.XXXX)



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.



Accessories

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	8.0000	. 1 X FS . XX XX	
Couplings	Type	a b c	
a Type of coupling	5 = bellows coupling ø 25 mm [0.98"]	b Bore diameter d1 (see technical data)	Example: d1 = 10 mm and d2 = 12 mm order no. = 8.0000.15FS.1012
		c Bore diameter d2 (see technical data)	

Accessory		Order no.
Screw retention	Loctite 243, 5 ml	8.0000.4G05.0000

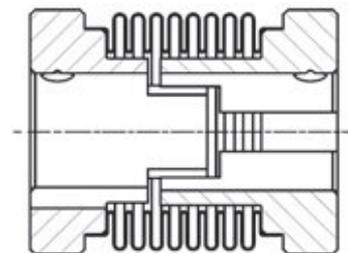
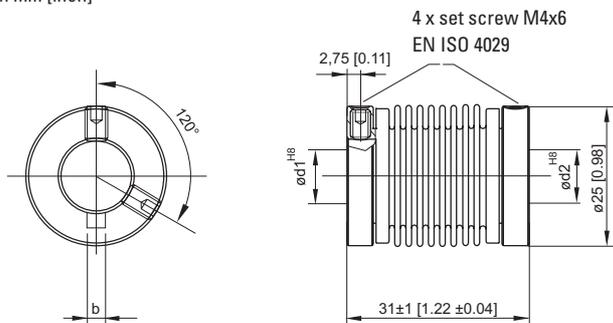
Technical data

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]

Accessories

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**

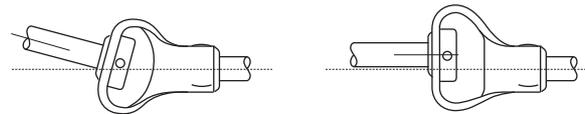
Order no. size 2

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**

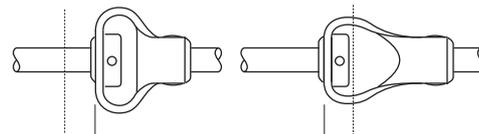
Technical data		
	Size 1	Size 2
Max. speed	3000 min ⁻¹	3000 min ⁻¹
Max. torque	0.5 Nm	2,0 Nm
Max. offset of shafts	radial ± 2 mm axial ± 2 mm angular ± 10°	± 3 mm ± 4 mm ± 12°
Torsion spring stiffness	13 Nm/rad	28 Nm/rad
Radial spring stiffness	13 N/mm	7 N/mm
Moment of inertia	41 gcm ²	106 gcm ²
Max. 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 connecting element	steel galvanized Polyurethane

Functional principle

Compensation of an angular misalignment Compensation of a radial misalignment



Compensation of a axial misalignment

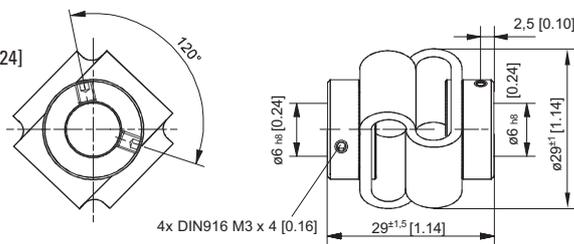


Dimensions

Dimensions in mm

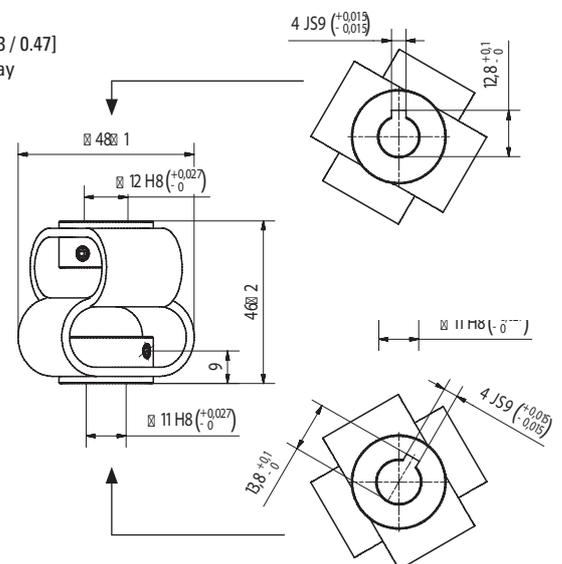
Size 1

6 / 6
[0.24 / 0.24]



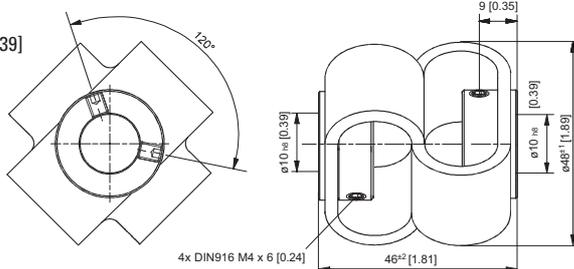
Size 2

11 / 12 [0.43 / 0.47]
with keyway



Size 2

10 / 10
[0.39 / 0.39]



Accessories

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 $\varnothing 10 \times 20$ mm.

Order no. **8.0010.8200.0004**

Scope of delivery

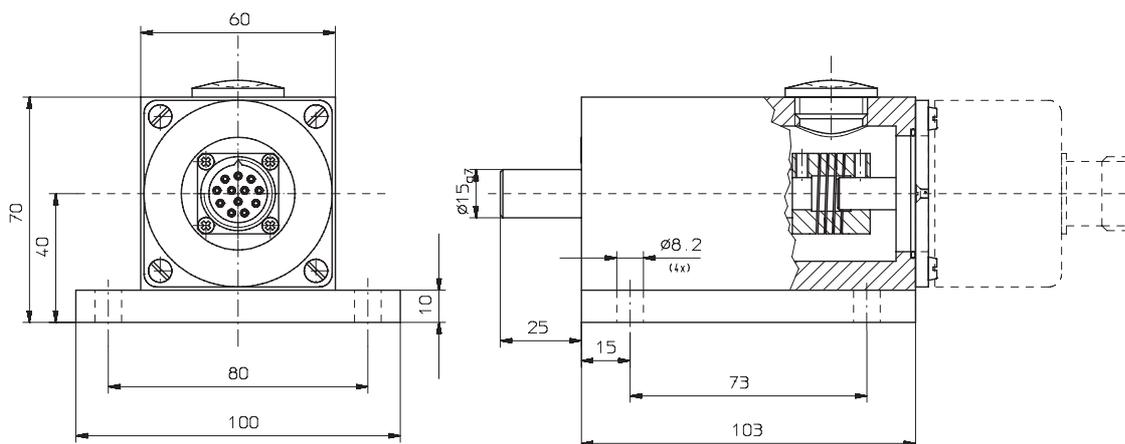
- Bearing box with lock cover and sealing
- Coupling for shaft $\varnothing 10$ mm
- Flange adapter 8.0010.2100.0000
- 3 x countersunk head screws DIN 63 M 3 x 8
- 4 x slotted cheese head screws DIN 84 M 4 x 8

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

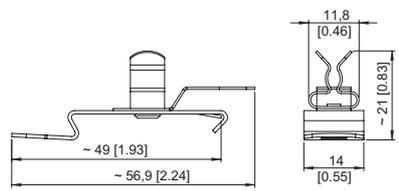
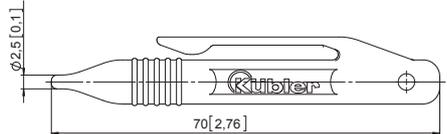
Dimensions

Dimensions in mm



Accessories

General accessories

Dimensions / Details	Dimensions in mm [inch]	Order no.
<p>Screw retention Loctite 243 (5 ml)</p> 	<p>Chemical basis: dimethacrylate ester Components: single-component (no mixing required) Viscosity: medium, thixotrope Cure: anaerobic Secondary cure: activator Use: screw retention Strength: medium</p>	<p>8.0000.4G05.0000</p>
<p>EMC shield terminal</p> 	 <p>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)</p>	<p>8.0000.4G06.0000</p>
<p>Stylus for the set key</p> 	 <p>For easy operation of the set key on the encoder Material POM (HKS8 orange)</p>	<p>8.0010.4052.0000</p>



Addresses

	Page
Kübler worldwide	520
Contact partners in Germany	522



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
I. 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 Soganklik
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 Folsgaard A/S
Theilgaardstr 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
Holkitie 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 Ernő 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.
Skipholt 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@eltenco.no
www.eltenco.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 8276
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@syscom.ro
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 Tranås
Phone +46 75-242 4100
Fax +46 75-242 4119
info@aut.oem.se
www.oemautomatic.se

Serbia
RAP Electronics d.o.o.
Dorda Stanojevic 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.solich@kuebler.com
www.kuebler.com

Turkey
Kübler Turkey Otomasyon
Ticaret Ltd. Sti.
Yeni mahalle Balikesir Cad.
Uprise Elit Residence C1 AB Blok
No:180 Soganklik
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 Lepshe 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@amecon.com.ar
www.amecon.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 Elétricos 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 Hassana El-Sheraie St.Off
El-Horiya St-Heliopolis
Cairo
Phone +20 2 2418 50 20
Fax +20 2 2415 92 65
hfarid@aeecocontrols.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
chrisliu@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
Eilerslie
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
O 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, Kwaeobop-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 Arab Emirates
Baer Measurements LLC
P.O. Box 111393
Al Gaiht 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 Neundorfer
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

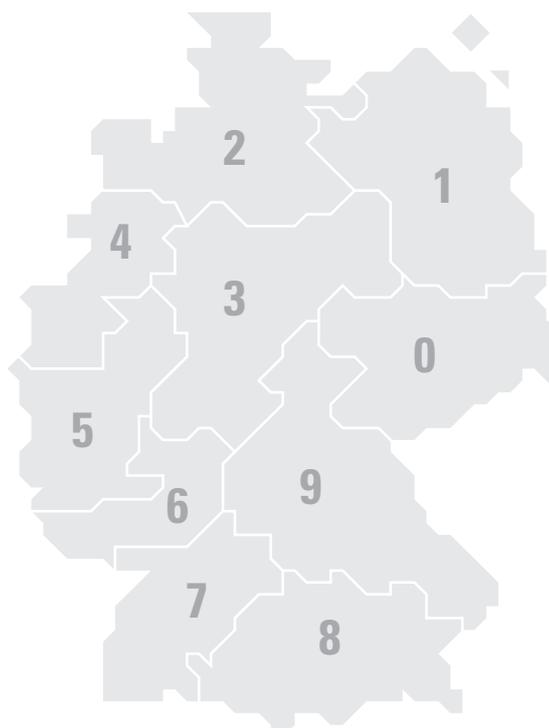
Catalogue distributors (Germany):

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
Keltnering 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





Kubler

www.kuebler.com



Position and Motion
Sensors



Functional Safety



Transmission
Technology



Counters and Process
Devices

■■■ *pulses for automation*

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