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Kübler Service

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Position and Motion Sensors

Our Pulses for Innovations



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

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

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

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

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

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



Kübler Service for worldwide Planning Reliability



24one

24one delivery promise

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

10 by 10

10 by 10

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

48 h

48 h Express-Service

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



Technical Support

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

Kübler Germany / Austria +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



Sample Service

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



Safety Services

- Adapted service packages
- Individual customer solutions

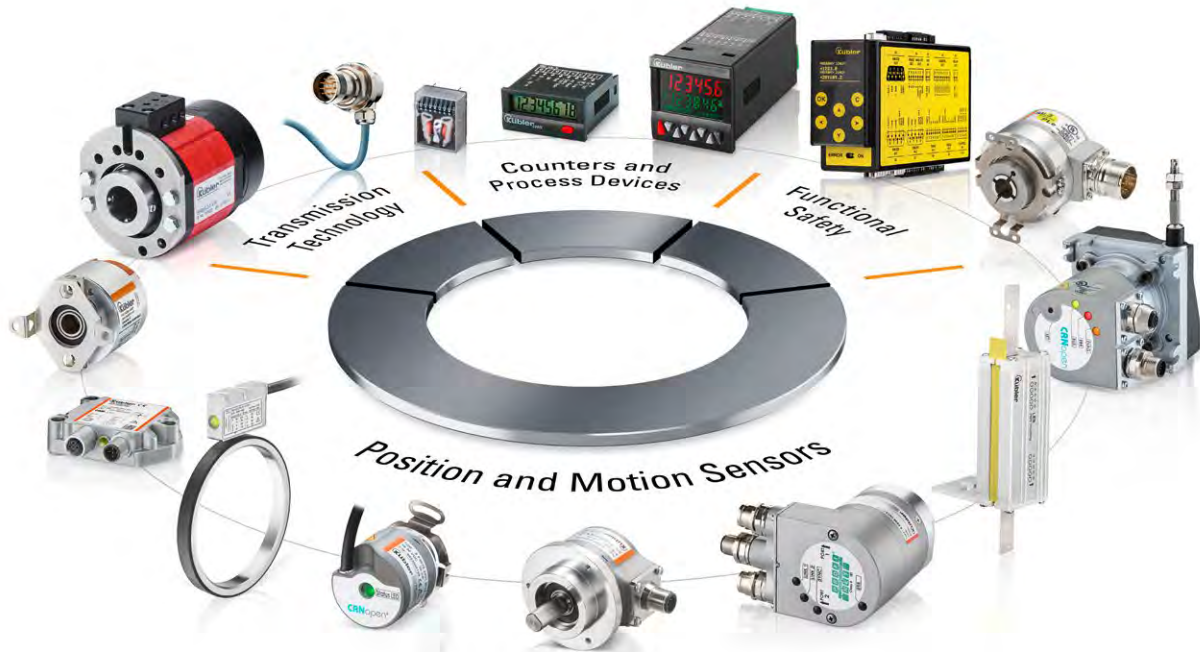


Tailor-made Solutions – Kübler Design System (KDS) OEM Products and Systems (OPS)

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

Kübler Turkey +90 216 999 9791
 Kübler China +86 10 8471 0818
 Kübler India +91 2135 618200
 Kübler USA +1 855 583 2537

Our Product Portfolio



Position and Motion Sensors

- Incremental and absolute encoders
- Motor Feedback Systems
- Bearingless encoders
- Shaft copying systems
- Linear magnetic measuring systems
- Draw-wire encoders
- Inclinometers
- Connection technology

Transmission Technology

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

Functional Safety

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

Counters and Process Devices

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

We offer Solutions for the following Industries:

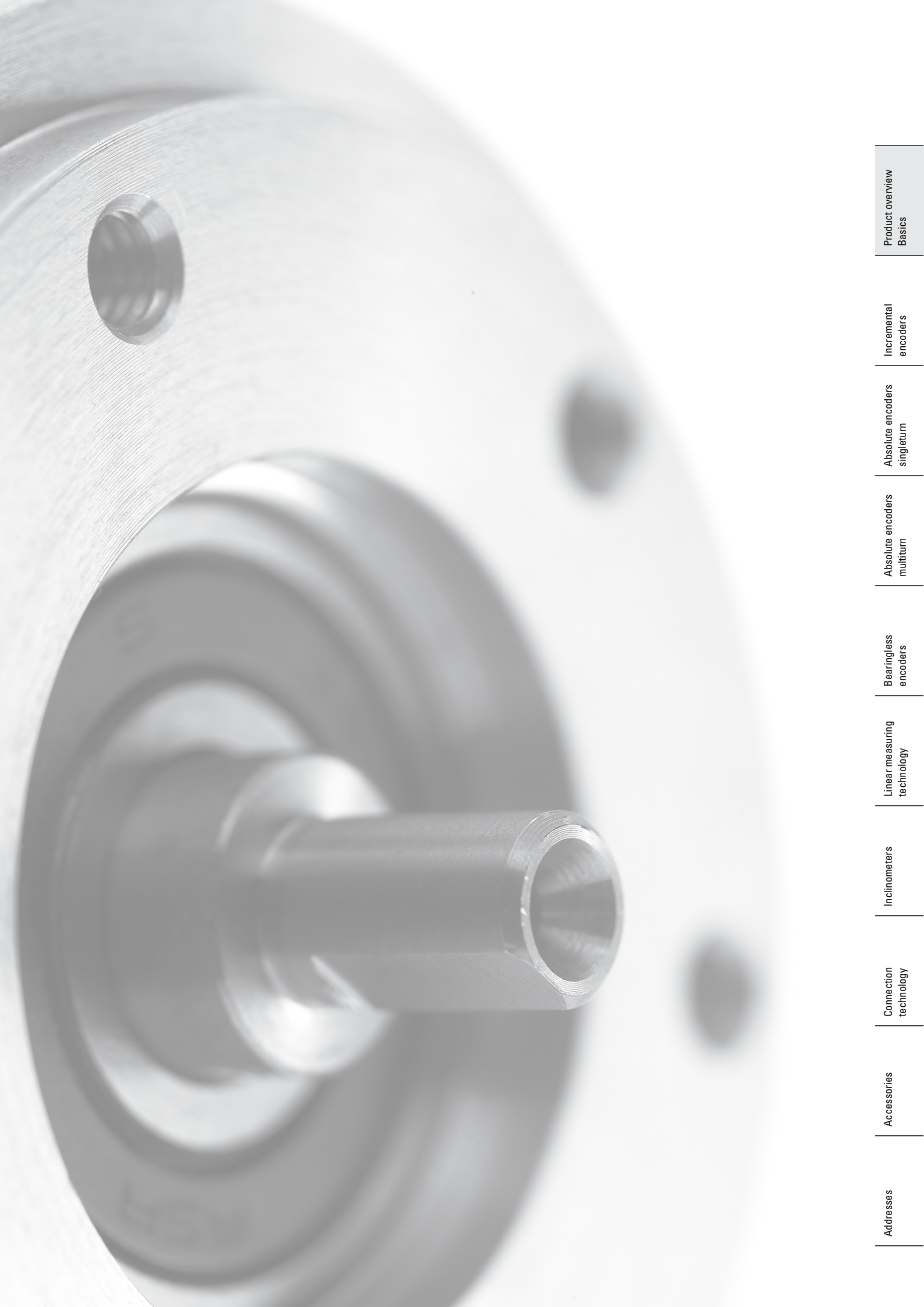


The high performance level and reliability of the Kübler products are based on our long experience in these demanding application sectors. Learn more about our application-specific solutions under:

www.kuebler.com/industries

Position and Motion Sensors

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Connection
technology

Inclinometers

Linear measuring
technology

Bearingless
encoders

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Absolute encoders
singleturn

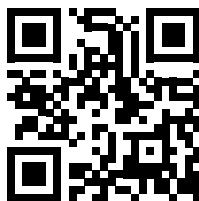
Incremental
encoders

Product overview
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Product overview / Technical basics

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



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singleturn

Absolute encoders
multiturn

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technology

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Product overview

Incremental encoders

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ± 1°)	Optical (Accuracy ± 0.015°)	Resolution max. in ppr	Push-pull	RS422	SinCos	Open collector	Ø Hollow shaft max. in mm [inch]	Speed max. in min ⁻¹ (shaft/ hollow shaft)	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	•	UL US	54
	Miniature, magnetic 2430 (shaft) 2440 (hollow shaft)	24 [0.94]	•	-	256	-	•	-	-	6 [0.24]	12.000	-20 ... +85 [-4 ... +185]	IP67	cable	5	300	•	-	57
	Compact, optical Sendix Base KIS40 (shaft) Sendix Base KIH40 (hollow s.)	40 [1.57]	-	•	2.500	•	•	-	•	8 [0.31]	4.500	-20 ... +70 [-4 ... +158]	IP64	cable	5 10 ... 30	250	•	UL US	60
	Compact, optical 3610 (shaft) 3620 (hollow shaft)	36 [1.43]	-	•	3.600	•	•	-	-	8 [0.31]	12.000	-20 ... +85 [-4 ... +185]	IP64	cable M12	5 5 ... 18 8 ... 30	300	•	UL US	64
	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	•	UL US	68
	Standard, optical Sendix 5000 (shaft) Sendix 5020 (hollow shaft) 24one ¹⁾	58 [2.28]	-	•	5.000	•	•	-	•	15 [0.59] 15.87 [5/8"]	12.000	-40 ... +85 [-40 ... +185]	IP67	cable M12 M23 MIL Sub-D	5 5 ... 30 10 ... 30	300	•	UL US Ex _{2/22}	72
	Standard, optical Sendix Base KIS50 (shaft) Sendix Base KIH50 (hollow s.)	58 [2.28]	-	•	5.000	•	•	-	•	15 [0.59]	6.000	-20 ... +70 [-4 ... +158]	IP65	cable M12 M23	5 5 ... 30 10 ... 30	300	•	CE Ex _{2/22}	85
	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	•	UL US	89
	Standard, optical sine wave output, with zero pulse 5804 (shaft) 5824 (hollow shaft)	58 [2.28]	-	•	5.000	-	-	•	-	12 [0.47]	12.000	-20 ... +85 [-4 ... +185]	IP65	cable M23	5 10 ... 30	180	•	UL US	94
	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	•	UL US Ex _{2/22}	98
	Standard, optical Motor-Line Sendix 5834 (tapered shaft)	58	-	•	1.024 and 2.048	-	-	•	-	10 [0.39] tapered shaft	12.000	-40 ... +90 [-40 ... +194]	IP67	cable PCB connector	5 10 ... 30	400	•	UL US	102
	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]	12.000/ 9.000	-40 ... +90 [-40 ... +194]	IP65	cable M12 M23	5 10 ... 30	400	•	UL US Ex _{2/22} SIL2 PLd	105

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

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 (shaft/hollow shaft)	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 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]	12.000/9.000	-40 ... +90 [-40 ... +194]	IP65	cable M12 M23	5 10 ... 30	400	•	UL US Ex z/II SIL3 PLe	111
	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	•	UL US	117
	Standard, optical stainless-steel Sendix 5006 (shaft) Sendix 5026 (hollow shaft)	58 [2.28]	-	•	5.000	•	•	-	-	15 [0.59]	6.000	-40 ... +85 [-40 ... +185]	IP67	cable M12	5 5 ... 30 10 ... 30	300	•	UL US Ex z/II	121
	Standard, optical ATEX/IECEX – zone 1/21 7000 (shaft) 7020 (hollow shaft)	70 [2.76]	-	•	5.000	•	•	-	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 5 ... 30 10 ... 30	300	•	Ex IECEX	125
	Standard, optical ATEX/IECEX – zone 1/21 SIL2 / PLd Sendix SIL 7014FS2 (shaft)	70 [2.76]	-	•	1.024 and 2.048	-	-	•	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 10 ... 30	400	•	Ex IECEX SIL2 PLd	130
	Standard, optical ATEX/IECEX – zone 1/21 SIL3 / PLe Sendix SIL 7014FS3 (shaft)	70 [2.76]	-	•	1.024 and 2.048	-	-	•	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 10 ... 30	400	•	Ex IECEX SIL3 PLe	133
	Standard, optical ATEX/IECEX – mining 7100 (shaft) 7120 (hollow shaft)	70 [2.76]	-	•	5.000	•	•	-	-	-	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	5 5 ... 30 10 ... 30	300	•	Ex IECEX	136
	Standard, optical large hollow shaft 5821 (hollow shaft)	58 [2.28]	-	•	5.000	•	•	-	-	28 [1.10]	2.500	-20 ... +70 [-4 ... +158]	IP64	cable M12	5 8 ... 30	300	•	-	141
	Large hollow shaft, optical A020 (hollow shaft)	100 [3.94]	-	•	5.000	•	•	•	-	42 [1.65]	3.000	-40 ... +70 [-40 ... +140]	IP65	cable M12 M23	5 5 ... 30 10 ... 30	300	•	UL US	144
	Large hollow shaft, optical robust A02H (hollow shaft)	100 [3.94]	-	•	5.000	•	•	•	-	42 [1.65]	6.000	-40 ... +80 [-40 ... +176]	IP65	cable M12 M23 MIL	5 5 ... 30 10 ... 30	300	•	UL US Ex z/II GL	148
	Heavy Duty, optical Sendix H100 (shaft)	115 [4.53]	-	•	3.600	•	•	-	-	-	6.000	-40 ... +100 [-40 ... +212]	IP66	cable ¹⁾	5 ... 30 10 ... 30	300	•	Ex z/II	155
	Heavy Duty, optical Sendix H120 (hollow shaft)	100 [3.94]	-	•	5.000	•	•	-	-	28 [1.10]	6.000	-40 ... +100 [-40 ... +212]	IP67	cable ¹⁾ M12 M23 opt. fiber	5 10 ... 30	300	•	Ex z/II	160

1) With terminal box

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Absolute encoders
singleturn

Absolute encoders
multiturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Inclinometers

Connection technology

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Product overview

Absolute encoders Singleturn

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit	SSI interface	BiSS interface	Analog/RS485 interface	Parallel interface	Additional incremental track	Speed max. in min ⁻¹ (shaft/ hollow shaft)	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	•	-	168
	Compact, magnetic analog 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	•		171
	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	•		186
	Standard, optical parallel, highspeed 5852 (shaft) 5872 (hollow shaft)	58 [2.28]	-	•	14	-	-	-	•	-	12.000/ 6.000	-20 ... +85 [-4 ... +185]	IP66	cable M23	5 10 ... 30	•		197
	Standard, optical Sendix 5853 (shaft) Sendix 5873 (hollow shaft)	58 [2.28]	-	•	21	•	•	-	-	Sin Cos RS422	12.000/ 9.000	-40 ... +90 [-40 ... +194]	IP67	cable M12 M23	5 10 ... 30	•		201
	Standard, optical Motor-Line Sendix 5873 (tapered shaft)	58 [2.28]	-	•	21	•	•	-	-	SinCos RS422	12.000	-40 ... +90 [-40 ... +194]	IP65	cable PCB con- nector	5 10 ... 30 4,5 ... 5,5	•		209
	Standard, optical SIL2/ PLd Sendix SIL 5853FS2 (shaft) Sendix SIL 5873FS2 (hollow s.)	58 [2.28]	-	•	17	•	•	-	-	Sin Cos	12.000/ 9.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•		214
	Standard, optical SIL3/ PLe Sendix SIL 5853FS3 (shaft) Sendix SIL 5873FS3 (hollow s.)	58 [2.28]	-	•	17	•	•	-	-	Sin Cos	12.000/ 9.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•		221
	Standard, optical stainless-steel SSI/ parallel 5876 (hollow shaft)	58 [2.28]	-	•	14	•	-	-	•	-	6.000	-20 ... +80 [-4 ... +176]	IP67	cable M12	5 10 ... 30	•		256
	Standard, optical ATEX/IECEx – zone 1/21 Sendix 7053 (shaft) Sendix 7073 (hollow shaft)	70 [2.76]	-	•	17	•	•	-	-	-	6.000/ 3.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		260
	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	•		265

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Absolute encoders Singleturn

	Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ±0.015°)	Resolution max. in bit	SSI interface	BISS interface	Analog/RS485 interface	Parallel interface	Additional incremental track	Speed max. in min ⁻¹ (shaft / hollow shaft)	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 SIL3 / PLe Sendix SIL 7053FS3 (shaft)	70 [2.76]	-	•	17	•	•	-	-	SinCos	6.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		269
 Standard, optical ATEX/IECEX – mining Sendix 7153 (shaft) Sendix 7173 (hollow shaft)	70 [2.76]	-	•	17	•	•	-	-	-	6.000/ 3.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		283




Absolute encoders Singleturn Fieldbus

	Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ±0.015°)	Resolution max. in bit	Speed max. in min ⁻¹ (shaft / hollow shaft)	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Fieldbus system	Page
 Compact, magnetic Sendix M3658 (shaft) Sendix M3678 (hollow shaft)	36 [1.43]	•	-	14	6.000	-40 ... +85 [-40 ... +185]	IP69k	cable M12	8 ... 30	•		CANopen	176
												SAE J1939	181
 Compact, optical Sendix F3658 (shaft) Sendix F3678 (hollow shaft)	36 [1.43]	-	•	16	12.000	-40 ... +85 [-40 ... +185]	IP67	cable	10 ... 30	•		CANopen	192
 Standard, optical Sendix 5858 (shaft) Sendix 5878 (hollow shaft)	58 [2.28]	-	•	16	9.000	-40 ... +80 [-40 ... +176]	IP67	cable M12 M23	10 ... 30	•	 	PROFIBUS DP	228
												CANopen	233
												EtherCat	241
												PROFINET IO	246
 Standard, optical electronic singleturn Sendix F5858 (shaft) Sendix F5878 (hollow shaft)	58 [2.28]	-	•	16	8.000	-40 ... +80 [-40 ... +176]	IP65	M12	10 ... 30	•	 	Ethernet/IP	251
 Standard, optical ATEX/IECEX – zone 1/21 Sendix 7058 (shaft) Sendix 7078 (hollow shaft)	70 [2.76]	-	•	16	6.000/ 3.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		PROFIBUS DP	273
												CANopen	278
 Standard, optical ATEX/IECEX – mining Sendix 7158 (shaft) Sendix 7178 (hollow shaft)	70 [2.76]	-	•	16	6.000/ 3.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		PROFIBUS DP	288
												CANopen	292

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Absolute encoders Multiturn

	Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ±0.015°)	Resolution max. in bit S+T+MT	SSI interface	BISS interface	Analog/RS485 interface	Additional incremental track	Speed max. in min ⁻¹	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Page
	36 [1.42]	•	-	12 + 16	-	-	4 ... 20 mA 0 ... 10 V 0 ... 5 V	-	6.000	-40 ... +85 [-40 ... +185]	IP67	cable M12	10 ... 30 15 ... 30	•	e1 pending UL US Ex 2/22	300
Compact, magnetic electronic multiturn Sendix M3661 (shaft) Sendix M3681 (hollow shaft)																
	36 [1.42]	•	-	14 + 24	•	-	-	-	6.000	-40 ... +85 [-40 ... +185]	IP67	cable M12	10 ... 30	•	e1 pending UL US Ex 2/22	306
Compact, magnetic electronic multiturn Sendix M3663 (shaft) Sendix M3683 (hollow shaft)																
	36 [1.42]	•	-	12 + 16	-	-	4 ... 20 mA 0 ... 10 V 0 ... 5 V	-	4.000	-40 ... +85 [-40 ... +185]	IP69k	cable M12	10 ... 30 15 ... 30	•	e1 pending UL US Ex 2/22	316
Compact, magnetic robust, electronic multiturn Sendix M3661R (shaft)																
	36 [1.42]	•	-	14 + 24	•	-	-	-	4.000	-40 ... +85 [-40 ... +185]	IP69k	cable M12	10 ... 30	•	e1 pending UL US Ex 2/22	320
Compact, magnetic robust, electronic multiturn Sendix M3663R (shaft)																
	36 [1.42]	-	•	17 + 24	•	•	-	SinCos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12	5 10 ... 30	•	UL US	327
Compact, optical electronic multiturn Sendix F3663 (shaft) Sendix F3683 (hollow shaft)																
	58 [2.28]	•	-	12 + 16	-	-	4 ... 20 mA 0 ... 10 V 0 ... 5 V	-	4.000	-40 ... +85 [-40 ... +185]	IP65	cable M12	10 ... 30 15 ... 30	•	UL US Ex 2/22	338
Standard, magnetic electronic multiturn Sendix M5861 (shaft)																
	58 [2.28]	•	-	14 + 24	•	-	-	-	4.000	-40 ... +85 [-40 ... +185]	IP65	cable M12	10 ... 30	•	UL US Ex 2/22	342
Standard, magnetic electronic multiturn Sendix M5863 (shaft)																
	58 [2.28]	-	•	17 + 24	•	•	-	SinCos RS422	12.000	-40 ... +85 [-40 ... +185]	IP67	cable M12 M23	5 10 ... 30	•	UL US Ex 2/22	349
Standard, optical electronic multiturn Sendix F5863 (shaft) Sendix F5883 (hollow shaft)																
	58 [2.28]	-	•	17 + 24	•	-	-	SinCos RS422	9.000	-40 ... +85 [-40 ... +185]	IP65	cable	5 10 ... 30	•	UL US pending	357
Standard, optical Motor-Line electronic multiturn Sendix F5883M (hollow shaft)																
	58 [2.28]	-	•	17 + 12	•	•	-	SinCos RS422	12.000	-40 ... +90 [-40 ... +194]	IP67	cable M12 M23	5 10 ... 30	•	UL US Ex 2/22	361
Standard, optical mechanical multiturn Sendix 5863 (shaft) Sendix 5883 (hollow shaft)																

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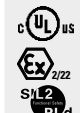

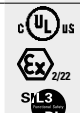









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Product overview

Absolute encoders Multiturn

		Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ±0.015°)	Resolution max. in bit S+MT	SSI interface	BiSS interface	Analog/RS485 interface	Additional incremental track	Speed max. in min ⁻¹ (shaft / hollow shaft)	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Page
	Standard, optical mechanical multiturn SIL2 / PLd Sendix SIL 5863FS2 (shaft) Sendix SIL 5883FS2 (hollow s.)	58 [2.28]	-	•	17 + 12	•	•	-	SinCos	12.000/ 9.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•		369
	Standard, optical mechanical multiturn SIL3 / PLe Sendix SIL 5863FS3 (shaft) Sendix SIL 5883FS3 (hollow s.)	58 [2.28]	-	•	17 + 12	•	•	-	SinCos	12.000/ 9.000	-40 ... +90 [-40 ... +194]	IP65	cable M23	5 10 ... 30	•		376
	Standard, optical mechanical multiturn ATEX/IECEx – zone 1/21 Sendix 7063 (shaft) Sendix 7083 (hollow shaft)	70 [2.76]	-	•	17 + 12	•	•	-	-	6.000/ 3.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		429
	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	•		434
	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	•		438
	Standard, optical mechanical multiturn ATEX/IECEx – mining Sendix 7163 (shaft) Sendix 7183 (hollow shaft)	70 [2.76]	-	•	17 + 12	•	•	-	-	6.000/ 3.000	-40 ... +60 [-40 ... +140]	IP67	cable	10 ... 30	•		452
	Large hollow shaft AX	-	• ¹⁾	• ¹⁾	17 + 24	• ¹⁾	• ¹⁾	• ¹⁾	• ¹⁾	4.500	-	IP64	• ¹⁾	• ¹⁾	•	-	467

Product overview Basics

Incremental encoders

Absolute encoders singleturn

Absolute encoders multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology





























Accessories

Addresses

1) Depends on the encoder used.

Product overview





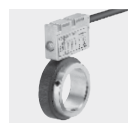





Absolute encoders Multiturn Fieldbus

	Ø Dimensions in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in bit S+MT	Speed max. in min ⁻¹	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	RoHS compliant	Approvals	Fieldbus system	Page
	36 [1.42]	•	–	14 + 24	6.000	-40 ... +85 [-40...+185]	IP67	cable M12	10 ... 30	•	  	CANopen	311
	36 [1.42]	•	–	14 + 24	4.000	-40 ... +85 [-40...+185]	IP69k	cable M12	10 ... 30	•	  	CANopen	323
	36 [1.42]	–	•	14 + 24	12.000	-40 ... +85 [-40...+185]	IP67	cable	10 ... 30	•		CANopen	333
	58 [2.28]	•	–	14 + 24	4.000	-40 ... +85 [-40...+185]	IP65	cable M12	10 ... 30	•	 	CANopen	345
	58 [2.28]	–	•	16 + 16	12.000	-40 ... +80 [-40...+176]	IP67	cable M12	10 ... 30	•	 	CANopen EtherNet/IP MODBUS RTU	383 393 398
	58 [2.28]	–	•	16 + 16	9.000	-40 ... +85 [-40...+185]	IP65	cable	10 ... 30	•		CANopen	389
	58 [2.28]	–	•	16 + 12	9.000	-40 ... +85 [-40...+185]	IP67	cable M12 Sub-D	10 ... 30	•	 	PROFIBUS DP CANopen / CANopenLift EtherCAT PROFINET IO	403 408 419 424
	70 [2.76]	–	•	16 + 12	6.000	-40 ... +60 [-40...+140]	IP67	cable	10 ... 30	•	 	PROFIBUS DP CANopen	442 447
	70 [2.76]	–	•	16 + 12	6.000	-40 ... +60 [-40...+140]	IP67	cable	10 ... 30	•	 	PROFIBUS DP CANopen	457 462
	–	• ¹⁾	• ¹⁾	17 + 24	4.500	–	IP64	• ¹⁾	• ¹⁾	•	–	• ¹⁾	467



1) Depends on the encoder used.

Product overview

Bearingless encoders Incremental

	Hollow shaft max. in mm ["]	Magnetic (Accuracy ±1°)	With zero pulse	Resolution max. in ppr	Push-pull RS422	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	Page
  Incremental, standard magnetic RI120 (hollow shaft)	30 [1.18]	•	-	3.600	•	•	12.000 -20 ... +80 [-4°F ... +176°F]	IP69k	cable	4,8 ... 26 4,8 ... 30	250	•	472
  Incremental, standard zero pulse, magnetic RI150 (hollow shaft)	35 [1.38]	•	•	3.600	•	•	12.000 -20 ... +80 [-4°F ... +176°F]	IP69k	cable	4,8 ... 26 4,8 ... 30	250	•	475
 Incremental, standard magnetic RI120/Limes LI120 (hollow shaft)	30 [1.18]	•	-	3.600	•	•	12.000 -20 ... +80 [-4°F ... +176°F]	IP69k	cable	4,8 ... 26 4,8 ... 30	250	•	478
 Incremental, standard zero pulse, magnetic RI150/Limes LI150 (hollow shaft)	35 [1.38]	•	•	3.600	•	•	12.000 -20 ... +80 [-4°F ... +176°F]	IP69k	cable	4,8 ... 26 4,8 ... 30	250	•	482
  Incremental, large hollow shaft magnetic RI1200 (hollow shaft)	390 [15.35]	•	-	16.000	•	•	12.000 -20 ... +80 [-4°F ... +176°F]	IP69k	cable	4,8 ... 26 4,8 ... 30	250	•	485
  Incremental, large hollow shaft zero pulse, magnetic RI1500 (hollow shaft)	350 [13.78]	•	•	6.400	•	•	12.000 -20 ... +80 [-4°F ... +176°F]	IP69k	cable	4,8 ... 26 4,8 ... 30	250	•	489

Bearingless encoders Absolut

	Hollow shaft max. in mm ["]	Magnetic (Accuracy ±1°)	With zero pulse	Resolution max. in ppr	SSI CANopen	Speed max. in min ⁻¹	Temperature range in °C [°F]	Protection max.	Type of connection	Power supply in V DC	Pulse frequency max. in kHz	RoHS compliant	Page
  Absolut singleturn, standard, magnetic RLA50 (hollow shaft)	30 [1.18]	•	-	16.000	•	•	1.000 -10 ... +70 [+14°F ... +167°F]	IP40	M12	10 ... 30	-	•	492

Product overview

Linear measuring technology Magnetic measurement system

	Measuring range max. in m	Accuracy max.	Resolution max. in μm	Dimensions in mm [inch]	Incremental RS422/Push-Pull	Incremental SinCos	Absolute analog	Absolute SSI/BISS	Absolute fieldbus	Traverse speed max. in m/s	Temperature range in $^{\circ}\text{C}$ [$^{\circ}\text{F}$]	Protection max.	Type of connection	RoHS compliant	Page
	50	dep. on meas. length 0.08 mm for 1 m	10	10x25x40 [0.39 x 0.98 x 1.57]	•	-	-	-	-	25	-20 ... +80 [-4 ... +176]	IP69k	cable	•	498
	50	dep. on meas. length 0.1 mm for 1 m	5	10x25x40 [0.39 x 0.98 x 1.57]	•	-	-	-	-	16	-20 ... +80 [-4 ... +176]	IP69k	cable	•	501
	8	dep. on meas. length 0.03 mm for 1 m	1	16x30x70 [0.63 x 1.18 x 2.76]	-	•	-	•	•	10	-10 ... +70 [+14 ... +158]	IP64	M12	•	504
	20	dep. on meas. length 0.17 mm for 1 m	10	24x26x75 [0.94 x 1.02 x 2.95]	-	-	-	•	•	4	-10 ... +70 [+14 ... +158]	IP40	cable	•	508

Linear measuring technology Draw wire mechanics

	Measuring range max. in m	Accuracy max.	Resolution max. [mm]	Dimensions in mm [inch]	Incremental RS422/Push-Pull	Absolute analog	Absolute SSI/BISS	Absolute fieldbus	Traverse speed max. in m/s	Temperature range max. in $^{\circ}\text{C}$ [$^{\circ}\text{F}$]	Protection max.	Type of connection	RoHS compliant	Page
	0.6	$\pm 0.1\%$ of measuring range	0.15	32.45 x 40.7 x 28.6 [1.28 x 1.60 x 1.13]	-	4 ... 20 mA 0 ... 10V DC 10k Ω	-	-	0.8	-10 ... +80 [-4 ... +176]	IP50	cable	•	512
	1	$\pm 0.1\%$ of measuring range	0.1	40x40 x max. 72 [1.57 x 1.57 x 3.90]	-	4 ... 20 mA 0 ... 10V 10k Ω	-	-	0.8	-20 ... +90 [-4 ... +194]	IP50 IP65	cable	•	514
	1.25	$\pm 0.02\%$ of measuring range	0.05	50x50 x max. 99 [1.97 x 1.97 x 3.90]	•	4 ... 20 mA 0 ... 10V 1k Ω	•	•	10	-40 ... +120 [-40 ... +248]	IP67	cable M12	•	516
	2	$\pm 0.1\%$ of measuring range	0.15	32.45 x 40.7 x 28.6 [1.28 x 1.60 x 1.13]	•	4 ... 20 mA 0 ... 10V DC 10k Ω	-	-	0.8	-10 ... +80 [-4 ... +176]	IP45	cable	•	521
	2	$\pm 0.1\%$ of measuring range	0.1	40x40 x max. 72 [1.57 x 1.57 x 2.83]	•	4 ... 20 mA 0 ... 10V 10k Ω	-	-	0.8	-20 ... +90 [-4 ... +194]	IP50 IP65	cable	•	514

Product overview

Linear measuring technology Draw wire mechanics

		Measuring range max. in m	Accuracy max.	Resolution max. [mm]	Dimensions in mm [inch]	Incremental RS422/Push-Pull	Absolute analog	Absolute SSI/BISS	Absolute fieldbus	Integrated inclinometer	Redundant sensors	Traverse speed max. in m/s	Temperature range max. in °C [°F]	Protection max.	Type of connection	RoHS compliant	Page	Product overview Basics
	Draw wire encoder A41 with absolute encoder	2	±0.35 % of measuring range	0.15	41x41x max. 96.3 [1.61 x 1.61 x 3.79]	-	4 ... 20 mA 0 ... 10 V 10kΩ	•	•	-	-	1	-10 ... +80 [-4 ... +176]	IP50	cable	•	523	Incremental encoders
	Draw wire encoder B75 with encoder or analog sensor	3	±0.35 % of measuring range	0.15	75x75x max. 127.4 [2.95 x 2.95 x 5.02]	-	4 ... 20 mA 0 ... 10 V 10kΩ	•	•	-	-	0,8	-40 ... +80 [-40 ... +176]	IP65	cable	•	526	Absolute encoders singleturn
	Draw wire encoder B80 with encoder or analog sensor	3	±0.02 % of measuring range	0.05	80x80x max. 144 [3.15 x 3.15 x 5.67]	-	4 ... 20 mA 0 ... 10 V 1kΩ	•	•	-	-	10	-40 ... +120 [-40 ... +248]	IP67	cable M12 M23	•	530	Absolute encoders multiturn
	Draw wire encoder C60 with analog sensor	4	±0.1 % of measuring range	0.1	60x60 x 125 [2.36 x 2.36 x 4.92]	-	4 ... 20 mA 0 ... 10 V 1kΩ	-	•	-	•	3	-40 ... +85 [-40 ... +185]	IP69k	cable M12	•	536	Absolute encoders multiturn
	Draw wire encoder C100 with redundant sensors, integrated inclinometer	5	±0.1 % of measuring range	0.3	98x108 x 68.4 [3.68 x 4.26 x 2.69]	-	0 ... 10 V 0.5 ... 4.5 V	-	•	•	•	1	-40 ... +85 [-40 ... +185]	IP67	cable M12	•	542	Bearingless encoders
	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	•	547	Linear measuring technology
	Draw wire encoder C120 with encoder or analog sensor	6	±0.02 % of measuring range	0.08	120x120x max. 136 [4.72 x 4.72 x 5.35]	-	4 ... 20 mA 0 ... 10 V 1kΩ	-	•	-	-	10	-40 ... +85 [-40 ... +185]	IP67	cable M12 M23	•	550	Inclinometers
	Draw wire encoder D120 with analog sensor	10	±0.05 % of measuring range	0.1	120x120 x max. 381,5 [4.72 x 4.72 x 15.02]	-	4 ... 20 mA 0 ... 10 V 1kΩ	-	•	-	•	3	-40 ... +85 [-40 ... +185]	IP69k	cable M12	•	556	Inclinometers
	Draw wire encoder D125 with redundant sensors, integrated inclinometer	10	±0.5 % of measuring range	0.6	124x124 x 94 [4.88 x 4.88 x 3.70]	-	0 ... 10 V 0.5 ... 4.5 V	-	•	•	•	1	-40 ... +85 [-40 ... +185]	IP67	M12	•	563	Connection technology
	Draw wire encoder D135 with encoder or analog sensor	42.5	±0.02 % of measuring range	0.08	135x135 x max. 318 [5.32 x 5.32 x 12.52]	-	4 ... 20 mA 0 ... 10 V 1kΩ	•	•	-	-	10	-40 ... +120 [-40 ... +248]	IP67	cable M12 M23	•	567	Accessories

Product overview

Linear measuring technology Length measuring kits



Lift measuring system for shaftcopying
LM3

Measuring length max. in m	Accuracy max.	Resolution min. in mm	Dimensions in mm [inch]	Incremental RS422/Push-Pull	Incremental SinCos	Absolute analog	Absolute SSI/BISS	Absolute fieldbus	Traverse speed max.	Temperature range in °C [°F]	Protection max.	Type of connection	RoHS compliant	Page
53	±0.5 mm	0.1	dep. on type	•	•	–	•	•	6 m/s	-20 ... +85 [-4 ... +185]	IP67	cable M12 M23 MIL	•	595
∞	±0.015°	0.1	–	•	•	•	•	•	5 m/s	-25 ... +80 [-13 ... +176]	IP67	cable M12 M23 MIL	•	574
∞	±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	•	579
∞	0.5 mm	0.1	dep. on rack	•	•	–	•	–	0.5 m/s	-20 ... +80 [-4 ... +176]	IP67	cable M12 M23 MIL	•	580
∞	±0.015°	0.1	dep. on the measuring wheel	•	•	–	•	–	2.000 min ⁻¹	-25 ... +80 [-13 ... +176]	IP67	cable M12 M23 MIL	•	581



Length measuring kit with spring encoder arm
Limes Kit TB1



Length measuring kit, mini measuring wheel system, incremental incl. encoder



Length measuring kit with rack and pinion incremental / absolute incl. encoder / preset counter



Length measuring kit with measuring wheels incremental / absolute incl. encoder / preset counter

Linear measuring technology Shaft copying systems



Absolute shaft copying system
LEB










Measuring length max. in m	Traverse speed max. in m/s	SIL3	EN 81-20/21/50	Incremental	Absolut	Resolution min. in mm	Dimensions in mm [inch]	CANopen Lift (DS417)	CANopen (DS406)	CAN	SSI	RS485	Type of connection	RoHS compliant	Page
392	5 (higher on request)	–	(•)	–	•	1	135 x 45 x 33 [5.31 x 1.77 x 1.30]	•	•	•	•	•	cable 5 m	•	585
53	1.6	–	(•)	•	•	0.1	dep. on type	•	•	•	•	–	cable, M12, M23, MIL	•	589



Lift measuring system for shaftcopying
LM3

Product overview

Inclinometers







		Measuring angle max.	Accuracy max.	Resolution max.	Dimensions in mm [inch]	Absolute analog	CANopen	Modbus	Reaction time in s	Temperature range in °C [°F]	Protection max.	Type of connection connector	RoHS compliant	Approvals	Page	
		Inclinometer MEMS, capacitive analog IN81, 1- and 2-dimensional	±85° 360°	±0.2°	12 bit	80 x 60 x 23 [3.15 x 2.36 x 0.91]	4 ... 20 mA 0.1 ... 4.9 V 0.5 ... 4.5 V 0 ... 5 V 0 ... 10 V	-	-	0.1	-40 ... +85 [-40 ... +185]	IP69k	M12	•   pending	594	
		Inclinometer MEMS, capacitive CANopen IN88, 1- and 2-dimensional	±85° 360°	±0.4°	0.01°	80 x 60 x 23 [3.15 x 2.36 x 0.91]	-	•	-	0.1	-40 ... +85 [-40 ... +185]	IP69k	M12	•   pending	599	
		Inclinometer MEMS, capacitive Modbus IN88, 1- und 2-dimensional	±85° 360°	±0.4°	0.01°	80 x 60 x 23 [3.15 x 2.36 x 0.91]	-	-	•	0.1	-40 ... +85 [-40 ... +185]	IP69k	M12	•   pending	602	
		Inclinometer MEMS, capacitive analog IS40, 1-dimensional	360°	±0.5°	0.15°	60 x 30 x 20 [2.36 x 1.18 x 0.79]	4 ... 20 mA 0.1 ... 4.9 V	-	-	0.1	-30 ... +70 [-24 ... +158]	IP69k	M12	•	-	606
		Inclinometer MEMS, capacitive analog IS40, 2-dimensional	±60°	±0.5°	0.15°	60 x 30 x 20 [2.36 x 1.18 x 0.79]	4 ... 20 mA 0.1 ... 4.9 V 2 % ... 98 %	-	-	0.1	-30 ... +70 [-24 ... +158]	IP69k	M12	•	-	608
		Inclinometer MEMS, capacitive CANopen IS60, 1-dimensional	360°	±0.5°	0.1°	68 x 42.5 x 42.5 [2.68 x 1.67 x 1.67]	-	•	-	0.1	-40 ... +80 [-40 ... +176]	IP69k	M12	•	-	610
		Inclinometer MEMS, capacitive CANopen IS60, 2-dimensional	±60°	±0.5°	0.1°	68 x 42.5 x 42.5 [2.68 x 1.67 x 1.67]	-	•	-	0.1	-40 ... +80 [-40 ... +176]	IP69k	M12	•	-	612

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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	•	–	616
	8 core + shield	–	•	–	8 x 0,14 8 x 0.14 [AWG25] 3 x 2 x 0,14 [AWG25] + 2 x 0,5 [AWG20]	approx. 5.5 approx. 7.4	–	•	616
	10 core + shield	–	•	–	4 x 2 x 0.25 [AWG23] + 2 x 1 [AWG17]	approx. 7.9	•	•	616
	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	•	•	617
	18 core + shield	•	–	–	18 x 0.14 [AWG25]	approx. 7.8	–	•	618
	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	•	•	618


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	•	•	•	•	619
	M23	12/17	Metal	Solder pins	5.5 - 10.5	•	–	•	–	640
	MIL	7/10	Metal	Solder pins	5 - 8	•	–	–	–	647

Product overview

Connection technology Cordsets, pre-assembled

		PVC cable	PUR cable	TPE cable	Optical fiber	Straight connector	Right angle connector	for incremental encoders	for SSI/ BiSS encoders	for fieldbus	for analog interfaces	Page
	with M12 connector	•	•	–	–	•	•	•	•	•	•	627
	with M23 connector	•	•	•	–	•	–	•	•	–	•	642
	with PCB connector	•	–	–	–	–	–	•	•	–	–	648
	with Sub-D connector	–	•	–	–	–	•	–	–	•	–	649
	Simplex patch cable optical fiber	–	–	–	•	•	–	•	•	–	–	654

Optical fiber transmission modules (LWL)

		Interface	Transmission distance in m	Input frequency in kHz	Temperature range in °C [°F]	Power / Current in VDC	Power consumption in W	Page
	Optical fiber module, incremental LWL	RS422 HTL	2.000	400	-10 ... +60 [-14 ... +140]	5 10 ... 30	2	654
	Optical fiber module, absolute LWL.A	SSI	2.000	1.000	-10 ... +70 [-14 ... +158]	5 10 ... 30	1	656

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.

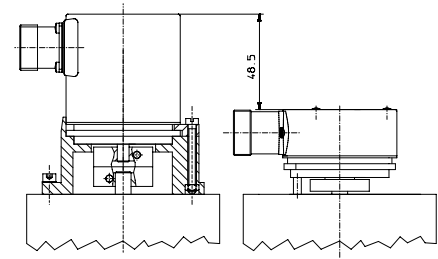
Incremental encoders generate pulses, where the number of pulses can be a measure of speed, length or position.

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.

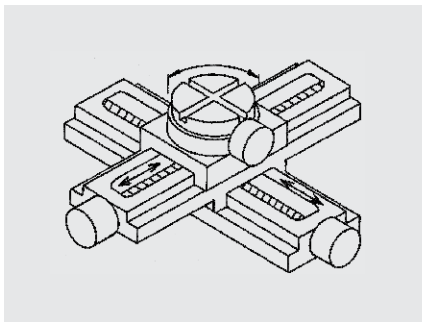
Using a hollow shaft encoder saves up to 30 % of costs and up to 50 % of the required space compared to a shaft encoder. This is achieved by avoiding additional couplings, brackets and other assembly aids.

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.

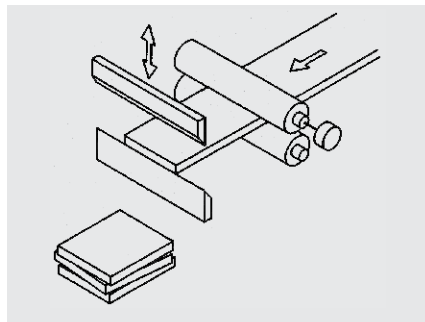


Application examples

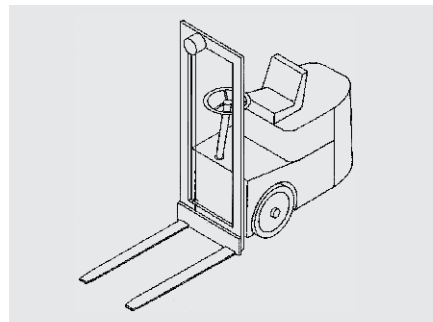
Angular measurement



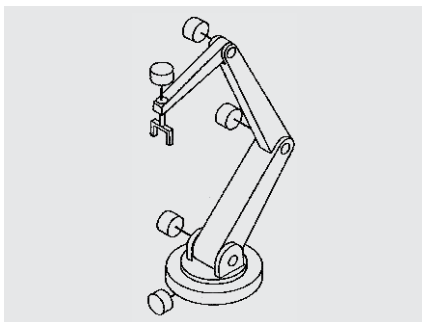
Positioning



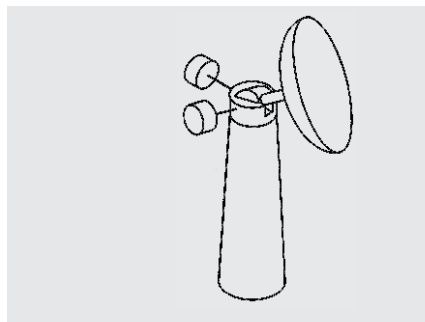
Detecting of fork's position



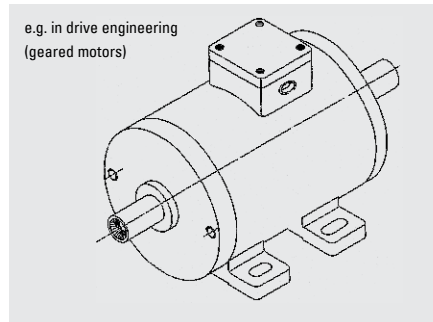
Detecting of position



Angular measurement



Velocity measurement



Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

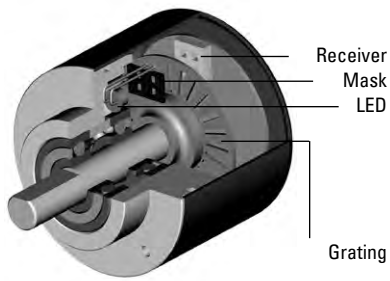
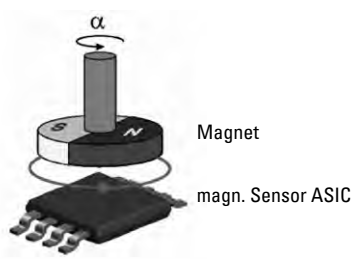

Linear measuring technology

Inclinometers

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Encoders	Functional principle		
<p>Assembly and function</p> <p>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.</p> <p>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.</p> <p>When the disc rotates this signal has a shape that approximates to a sine wave.</p> <p>Optical scanning (absolute) The light that is emitted by an LED is modulated by a code pattern, which is applied to a rotating disc; this is scanned by a special Kübler Opto ASIC. A unique bit pattern is assigned to each position and this is generally available as Gray Code.</p> <p>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.</p> <p>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.</p> <p>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.</p>		 	Product overview Basics Incremental encoders Absolute encoders singleturn Absolute encoders multiturn Bearingless encoders Linear measuring technology
<p>Limes rotary / Limes ring</p> <p>The Limes rotary magnetic measuring systems are suitable for machines and plants where installation space is tight.</p> <p>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.</p>			Inclometers Connection technology Accessories Addresses

Encoders	Incremental encoders		Product overview Basics
Processing of the signals (optical, incremental encoders)	<p>The sine wave signals are then processed in a specially designed electronic circuitry. Most controllers require square-wave signals on their input.</p>	<p>The signals are therefore pre-processed accordingly in the encoder and made available using various output circuits depending on the application.</p>	
Number of channels	<p>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.</p> <p>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.</p> <ul style="list-style-type: none"> • Shaft turning clockwise, top-view of shaft / for hollow shaft encoders, viewing the flange • Inverted signals available <p>t_r = rise time t_f = fall time</p>	<p>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.</p> <ul style="list-style-type: none"> • 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 <p>t_r = rise time t_f = fall time</p>	<p>Incremental encoders</p> <p>Absolute encoders singleturn</p> <p>Absolute encoders multiturn</p>
			<p>Bearingless encoders</p>
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Encoders Incremental encoders

Multiplication of pulses The resolution of a two channel encoder can be multiplied by two or four using special edge detection circuitry. An encoder with physically 5000 pulses per revolution can generate 20000 pulses per revolution using this technique.

Inverted signals When used in environments, with a lot of electrical noise and/or if very long cable distances are required, we recommend using encoders with inverted (complementary) signals. These signals are always available with output circuits of the RS422 type and sine wave outputs or optionally with push-pull outputs.

Resolution The required angular or linear resolution of 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.

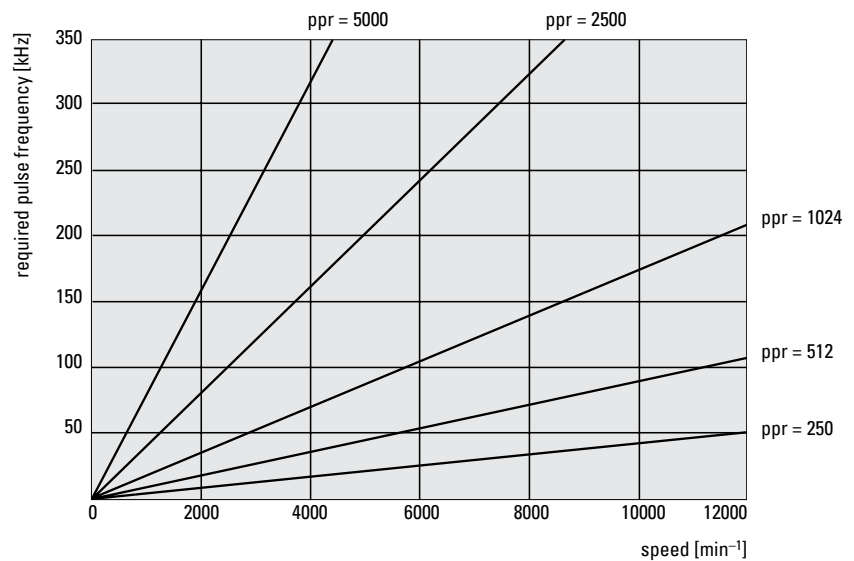
Generally this is 300 KHz, but can be up to 800 KHz with high-resolution encoders.

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

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Sensor outputs

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

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

Digital outputs

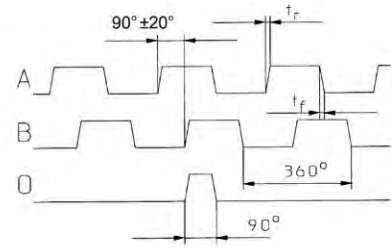
The sine wave signal from the optical system is first digitized to have square wave signals available.

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

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

When choosing the suitable output for the application the following points have to be considered:

- The corresponding unit / controller the encoder will be connected to
- The required cable length
- The sensitivity against electrical noise or other interference



Push-pull outputs (HTL)

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

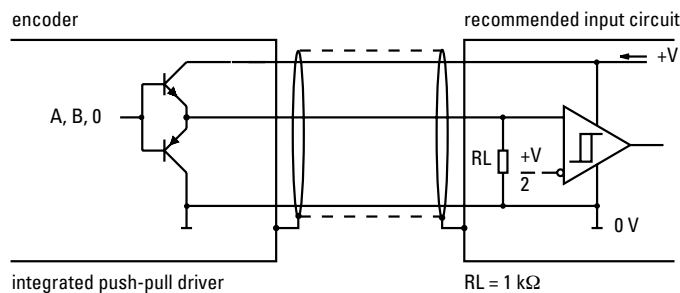
Push-pull:

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

Push-pull (7272):

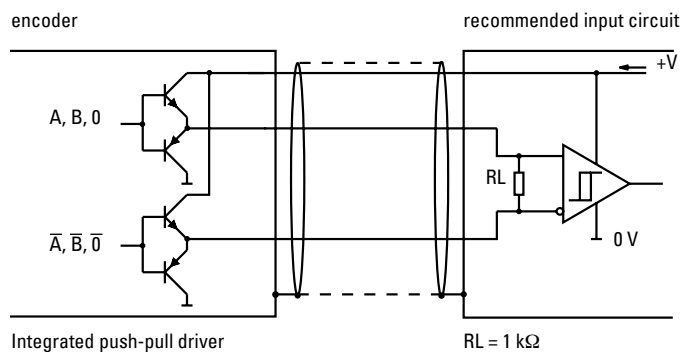
- Universal line driver 5 ... 30 V with low-level (max 0.5 V)
- Recommended for cable lengths up to 30 m
- With inverted signals

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

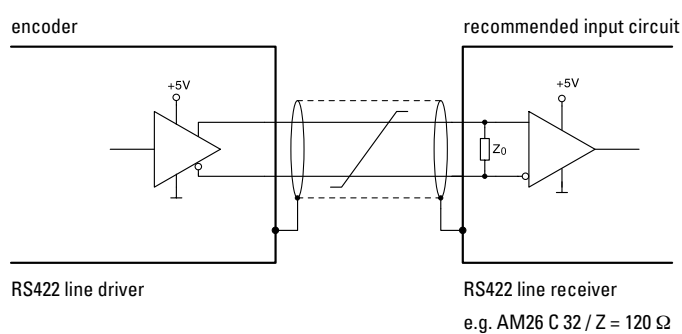


Encoders

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



RS422
Output circuit and recommended input circuit (TTL)

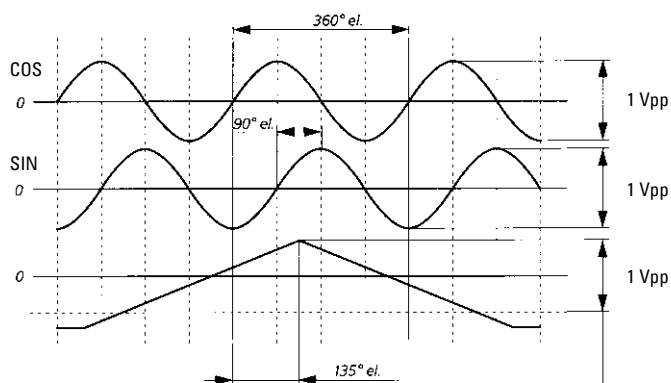


Sine wave outputs

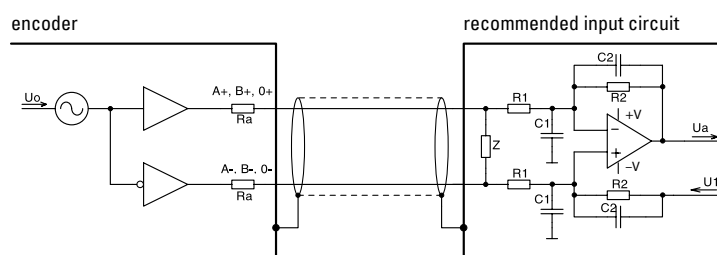
The sine wave signals are available as voltage signals. They can be further processed in the evaluation electronics. Due to the interpolation of the two signals, which are 90° out of phase, a very high resolution can be achieved.

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



$R_a = 10 \Omega$
 $C_1 = 150 \text{ pF}$
 $C_2 = 10 \text{ pF}$
 $R_1 = 10 \text{ k}\Omega$
 $R_2 = 33 \text{ k}\Omega$
 $U_0 = 2.5 \text{ V} \pm 0.5 \text{ V}$

$Z = 120 \Omega$
 $U_1 = U_0$

operation amplifier:
e.g. MC33074

Encoders

Incremental encoders

Cable lengths for incremental encoders

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

Output circuit	max. cable length	Encoder connected to e.g.
Push-pull without inverted signals	100 m ¹⁾	Kübler counter/SPS
Push-pull with inverted signals	250 m ¹⁾	SPS/IPC ²⁾
Push-Pull with inverted signals (7272)	30 m	
RS422 with inverted signals	up to 1000 m (> 50 m dep. on frequency)	SPS/IPC ²⁾
Voltage sine with inverted signals	50 m	SPS/IPC ²⁾
Sine wave 1 Vpp	50 m	10 ... 30 V DC

Annotations:

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

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1) Depends on frequency

2) IPC = industrial PC

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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.

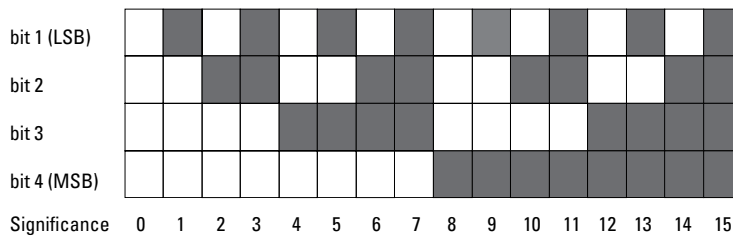
Multiturn encoders are suitable for angular measurement over more than one turn of a shaft, for example with longer traverse paths, such as high rack storage areas, cranes or machine tools.

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

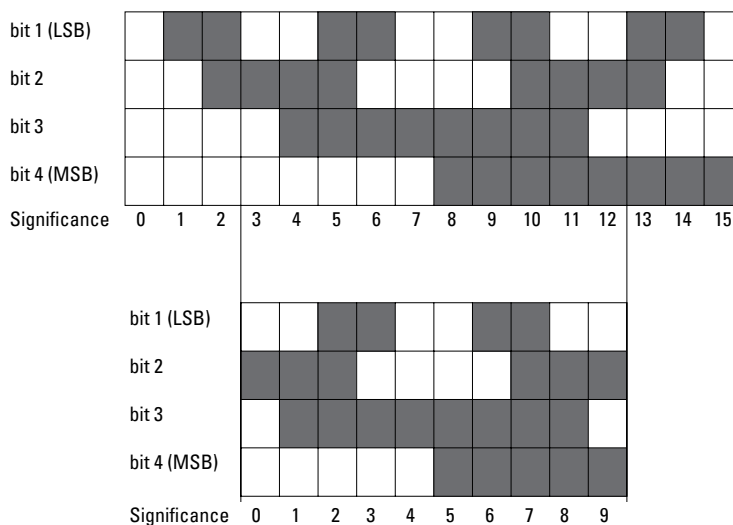
The Gray Code is a single-step code, which guarantees that from one position to the next only 1 bit changes.

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		Product overview Basics
<p>The mechanical Sendix multiturn stage with gear</p> 	<ul style="list-style-type: none"> • 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. 		Incremental encoders
<p>The patented electronic Sendix multiturn stage with Intelligent Scan Technology™</p> 	<p>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.</p>		Absolute encoders singleturn Absolute encoders multiturn
<p>Mechanical or electronic gears?</p>	<p>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.</p>	<p>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.</p>	Bearings encoders Linear measuring technology
<p>Intelligent Sensing Technology</p>	<p>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.</p>	<p>Advantages</p> <ul style="list-style-type: none"> • High operational safety • Compensation of high EMC disturbances thanks to logical filters and a novel operating principle of the system • Free of wear 	Inclinometers Connection technology Accessories Addresses

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Outputs

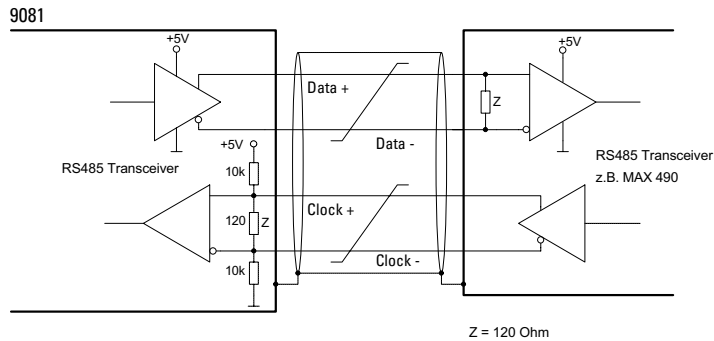
To transfer the position data to a controller, different interfaces are available.

Synchronous serial interface (SSI)

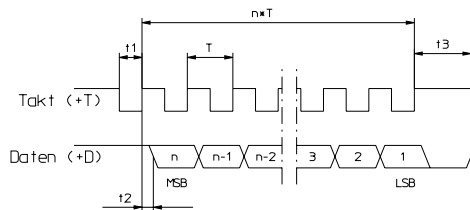
Compared to the parallel interface, the SSI interface needs less components and the EMC characteristics are much better.

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

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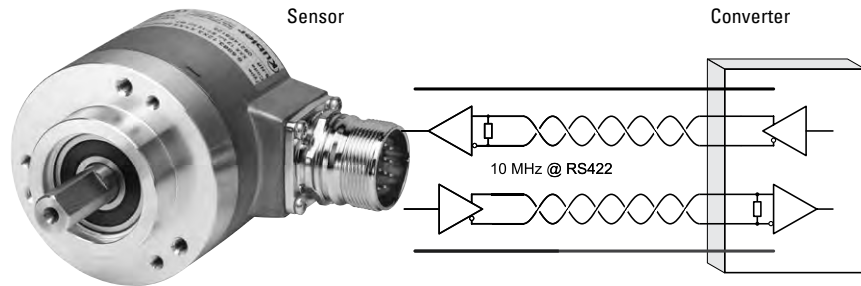
BiSS interface

Point-to-point communication

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

Advantages at a glance

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



Extended possibilities with BiSS

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

Easy supplementing of the BiSS master function

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

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

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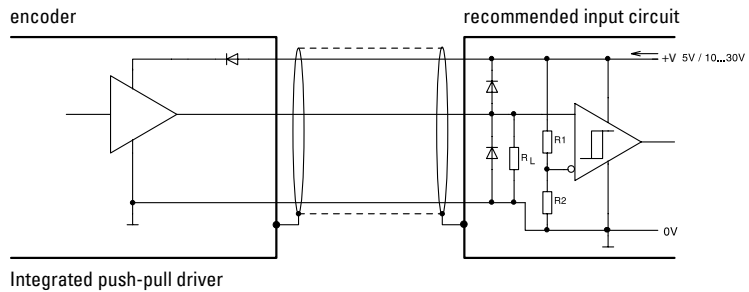
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Parallel output

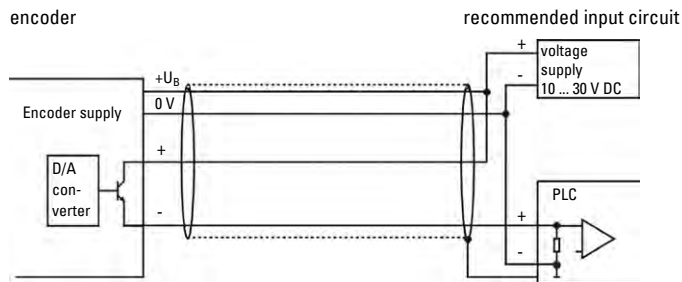
This type of transfer is very fast. All bits of a position are transferred simultaneously each via a separate line.

Output circuit and recommended input circuit



Analog output 4 ... 20 mA

Output circuit and recommended input circuit



Cable lengths

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

Interface and output circuit	max. cable length	Connected to
Parallel CMOS / TTL	2 m	SPS / IPC ¹⁾
Parallel push-pull (HTL)	100 m	SPS / IPC ¹⁾
SSI	up to 1000 m ²⁾	SPS / IPC ¹⁾
RS422 / RS485	1000 m	SPS / IPC ¹⁾
Analog 4 ... 20 mA	200 m	

Annotations:

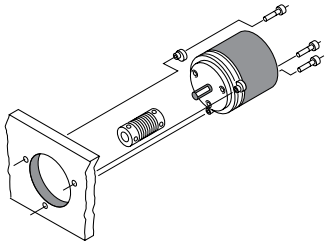
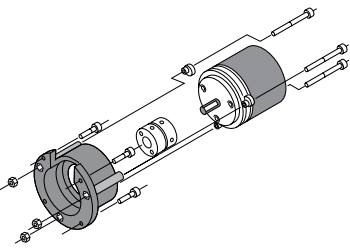
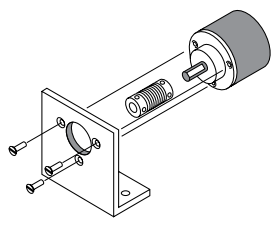
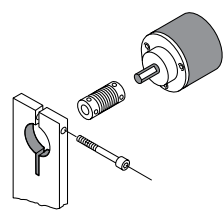
- Depending on the application the max. allowed cable length can be shorter, especially in areas with strong electrical noise
- Always use shielded cables; the cable shield should be connected at both the encoder and controller ends.
- The core diameter of the signal cores should be $\geq 0.14 \text{ mm}^2$
- 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

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	<p>Encoders shafts and in turn their bearings are subjected to loads for a variety of reasons:</p> <ul style="list-style-type: none"> • 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 <p>These load factors have a direct effect on the life expectancy of the shaft bearings and on the quality of the signal.</p> <p>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.</p>	<p>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.</p> <p>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.</p>	<p>Incremental encoders</p> <p>Absolute encoders singleturn</p> <p>Absolute encoders multiturn</p>
<h3>Mounting options for hollow shaft encoders</h3>	<p>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).</p>		<p>Bearingless encoders</p>
	<p>Extended torque stop and long pin</p>		<p>Linear measuring technology</p>
	<p>Stator coupling</p>		<p>Inclinometers</p>
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<p>Mounting examples for shaft encoders with synchronous flange</p>	<p>Fastening eccentrics + coupling (to reduce shaft overload)</p> <p>Assembly bell, fastening eccentrics + coupling (to prevent shaft overload and to isolate the encoder thermally and electrically)</p>	 	<p>Basics</p> <hr/> <p>Incremental encoders</p> <hr/> <p>Absolute encoders singleturn</p>
<p>Mounting examples for shaft encoders with clamping bracket</p>	<p>Angular bracket + coupling (to reduce shaft overload)</p> <p>Clamping device + coupling (to reduce shaft overload)</p>	 	<p>Absolute encoders multiturn</p> <hr/> <p>Bearingless encoders</p> <hr/> <p>Linear measuring technology</p>
			<p>Inclinometers</p> <hr/> <p>Connection technology</p> <hr/> <p>Accessories</p> <hr/> <p>Addresses</p>

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

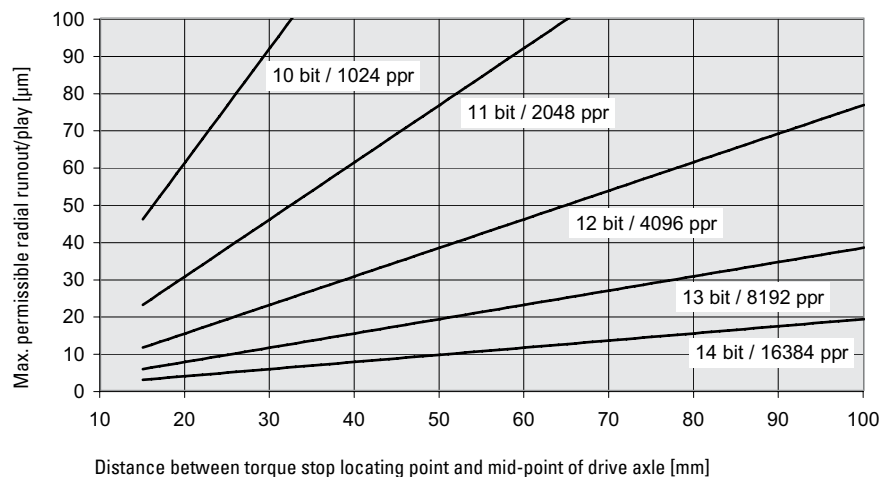
2. Deviations in accuracy caused by radial play in the drive shaft with asymmetrical mounting of the couplings

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

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

If these load values may be exceeded in a particular application, then the encoder shaft must be isolated from the radial load by interposing an appropriate shaft with its own bearings that can absorb the forces.

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

Isolation insert

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



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Functional Safety

Incremental and absolute encoders for Functional Safety

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

www.kuebler.com/safety



Safe incremental encoder function

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

Safe absolute encoder function

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

Safe mechanical connection

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

Compliance with Safety standards

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

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

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Magnetic measuring system (incremental)

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

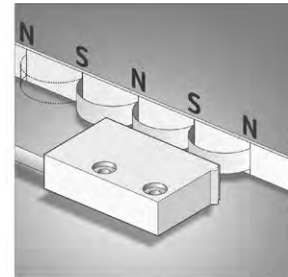


The idea:

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

The system is not affected by dust, shavings or humidity and is resistant to many liquids and to oil.

Assembly is easy - the magnetic band just has to be glued into place. There are no problems for calibration.



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

Repeat accuracy is very high.

Where is our Limes system used?

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

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

The system is not affected by vibration nor is it damaged if subjected to high shock loads.

Our flexible magnetic band offers a further interesting area of application, due to the fact that it can be fitted round very large shafts.

The maximum length of the magnetic band is 70 m!



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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



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Draw wire systems

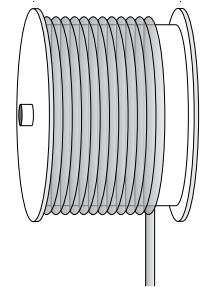
Measuring length up to 40 m,
Resolution up to 0.1 mm



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 analog sensors (0 ... 10 V, 4 ... 20 mA, potentiometer) or encoders (incremental, absolute, fieldbus)
- Measuring lengths from 250 mm up to 40000 mm
- High travelling speed
- High acceleration
- Dynamic spring traction by means of a constant force spring, long service life
- Simple wire fixing using clip
- Quick mounting
- Diamond-polished ceramic guide
- Titanium anodized aluminum housing



Length measuring kits

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

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

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Elevator functions base

Elevator functions	Explanation	Standard
Calibration trip	An elevator which has the conventional magnetic switches and not a absolute position system isn't able to notice his cabin position after a power failure. Therefore the elevator car needs a reference run before next operation. Systems with an absolute positioning can be used directly after a power failure without a reference run.	–
Inspection operation switch (top & bottom) (no SIL safety function)	Inspection control is a control device on top of the elevator car which is necessary for maintenance. During operation mode it is not allowed that the elevator car or a door moves automatically (manual mode). In addition it should be ensure that the service technician isn't able to drive above the lowest and highest station to prevent a lock up with the limit switches.	EN 81-20
Direct drive-in – depending on frequency converter	With an absolute shaft copy system the shaft is emulated digitally. The control unit calculates all necessary switching and flush signals for all paces and stopping points. There are no crossovers anymore like it is known from magnetic switches. The elevator car always stops directly at the absolute position of the stopping point. Moreover the ride comfort will be improved.	–
Switchover or shutoff points definition	After the assembling each stopping point has to be fit finally. Often it is necessary that the magnetic switches and flags have to be re-adjusted several times. Due to the absolute position the re-adjustment is done within the software of the control unit.	–
Overspeed inspection drive (no SIL safety function)	The speed during inspection run isn't allowed to exceed 0,63 m/s. This can be established with an absolute position of LEB / LES. The control system is able to stop the run if necessary.	EN 81-20

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Elevator functions Safe-Sensor – in addition to “Elevator functions base”

Elevator functions	Explanation	Standard	SIL level
Final limit switches top & down (SIL 1)	The elevator car isn't allowed to drive above the lowest and highest station at any time. Actually therefore magnetic switches are needed which disconnect the safety circuit when they are triggered. The SAFE product stores this end position during the teaching process and break the safety circuit when the position is reached.	EN 81-20	1
Earlier door opening/ relevelling	If an earlier door opening or relevelling is necessary a bridge device has to be installed. This bridge device needs two independent transmitters for each stopping point that a bridging of the safety circuit is realizable. Usually an elevator isn't able to move with an open door (safety circuit would be open). However it is possible to bridge the safety circuit within a door zone and by two independent signal transmitters. LEB / LES is able to provide these two independent signals. The bridge device isn't a part of the product because in most cases it is already part of the control unit.	EN 81-20	2
Unintended car movement (UCM)	New elevators have to be equipped with a safety device which avoid an unintended car movement if the shaft door isn't locked and the elevator car door isn't closed. A safety circuit triggers a certified USM-safety device (brake, overspeed governor and so on).	EN 81-20	2
Triggering overspeed detection	The safety gear is a mechanical safety device to provide a free fall of an elevator application. As soon as the elevator exceeds the allowed speed the elevator car is stopped and held automatically. The safety gear is triggered by the speed limiter (today: most time a mechanical part triggers automatically during an overspeed with help of centrifugal forces). With help of LES it is possible to determine a safe position and a safe speed of the cabin which triggers the safety gear if necessary.	EN 81-20	3
Pre-triggering overspeed detection	During an overspeed of the cabin the safety circuit has to be open before the safety gear is triggered. By reading the safe position which means consequently also the speed, it is possible to define an advance speed. By this advance speed the safety circuit is opened before the safety gear is triggered.	EN 81-20	2
Inspection limitation with reduced overhead depth / pit depth - safety function	Some applications have the necessary protection space in the shaft top or in the shaft mine so much shortened that these spaces are nearly not existed during the normal mode. That means that additional technical requirements are essential (for example folding support) to provide a temporary protection space. These components are monitored by switches which intervene in the safety circuit. Excursus: Inspection at a reduced shaft mine: 1) The service technician opens the shaft door and goes to the shaft mine. To the same time the safety circuit is opened and an information is sent to the control system. The consequence is that the elevator isn't able to move anymore: No inspection and normal drive or relevelling.. 2) After the service technician put the folding support up and down the elevator is allowed to do an inspection run. A new limit switch position is applied for this drive that nobody can be hurt because of the cabin. LES stores this safe position. The result is that the elevator isn't able to drive anymore (inspection limit switches).	EN 81-21	2
Delay control circuit with short-stroke buffers	If the cabin moves with a higher speed than the buffer allows, it is necessary to have a safety device. The cabin drives for example with 5 m/s and the buffer is covered for 1 m/s – for high-rise application the buffer would be too large. Now it has to be guaranteed that the elevator isn't able to move with nominal speed against the buffer. That means that the speed has to be reduced in front of the buffer. In most cases this is solved by mechanical switches. With LES it is possible to define a position and from this point the speed will be reduced.	EN 81-21	3

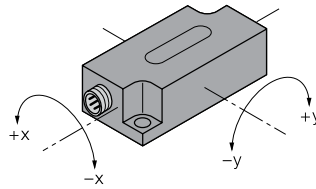
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Inclinometers

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

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Connection technology Introduction / Cables and connectors

The idea behind our connection technology system



Connection technology from Kübler = system safety!

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

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

Your benefit:

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



Material information - cables

PVC

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

PUR

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

Material information - connectors

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

Metals for contacts and housings

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

Plastics for insulator and housing

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

Connection technology Introduction / Cables and connectors

Coding of the M12 x 1 connectors

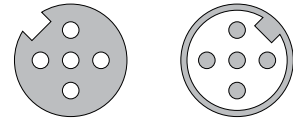
The connectors are coded to guarantee protection against polarity reversal. This coding is achieved by means of a peg or a notch in the contact carrier.

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

A-coding

Female connector with coupling nut:
Male connector with external thread:
Use:

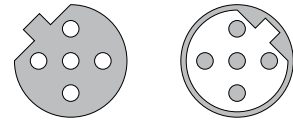
Coding notch
Coding peg
CANopen and
8-pin connector



B-coding

Female connector with coupling nut:
Male connector with external thread:
Use:

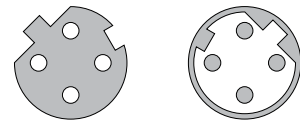
Coding peg
Coding notch
Profibus



D-coding

Female connector with coupling nut:
Male connector with external thread:
Use:

Coding peg and
Coding notch
Coding peg and
Coding notch
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.

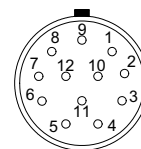


"Allround" shielding with Kübler cordsets

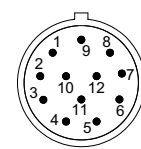
Counting direction cw/ccw

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 fiber signal transmission	General information		Product overview Basics
<p>Description</p>	<p>The system is made up of an optical fiber transmitter and an optical fiber receiver.</p> <p>The optical fiber transmitter converts the electrical signals of an encoder into optical fiber signals. A simple glass fiber allows reliable transmission up to distances of 2000 m.</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 fiber 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 fiber 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 fiber modules</p>	<p>The optical fiber 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>		Absolute encoders singleturn
<p>Laying and connection of glass fiber 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>	Absolute encoders multiturn
<p>Glass fiber cables</p>	<p>The modules can be connected together using 50/125 µm or 62.5/125 µm multimode glass fiber cables with ST/PC type connectors with bayonet catch. Single-mode Simplex patch cables are not suitable.</p>	<p>Kübler offers finished confectioned patch cables adapted to the optical fiber modules as accessories.</p> <p>They ensure the full functionality and high signal quality of our sensors.</p>	Bearings encoders
			Linear measuring technology
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Encoders	Technologies																									
<p>Safety-Lock™</p>  	<p>All Kübler encoders are equipped with the Safety-Lock™ bearing structure.</p> <p><i>Safety-Lock™</i></p> <p>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.</p>	<p><i>Safety-Lockplus™</i></p> <p>The proven Safety-Lock™ construction with additional mechanically protected shaft seal.</p>																								
<p>HD-Safety-Lock™ = Safety-Lock™ + additional engineering</p>	<p>Floating bearing on the cover-side eliminates internal stress ¹⁾</p> <ul style="list-style-type: none"> 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⁾ <p>¹⁾ for Sendix H100 ²⁾ for Sendix H120</p>	<p>Benefits:</p> <p>The resistance against adverse environmental conditions is greatly increased – especially against high bearing loads and high temperatures.</p>																								
		<table border="1"> <thead> <tr> <th></th> <th>Safety-Lock™</th> <th>HD-Safety-Lock™</th> </tr> </thead> <tbody> <tr> <td>Stability with vibration</td> <td style="text-align: center;">+</td> <td style="text-align: center;">++</td> </tr> <tr> <td>Robustness against installation errors</td> <td style="text-align: center;">++</td> <td style="text-align: center;">++</td> </tr> <tr> <td>Radial load</td> <td style="text-align: center;">80 N</td> <td style="text-align: center;">400 N</td> </tr> <tr> <td>Axial load</td> <td style="text-align: center;">40 N</td> <td style="text-align: center;">300 N</td> </tr> <tr> <td>Elimination of internal stresses</td> <td style="text-align: center;">0</td> <td style="text-align: center;">++</td> </tr> <tr> <td>Constant signal quality with extended temperatures</td> <td style="text-align: center;">+</td> <td style="text-align: center;">++</td> </tr> <tr> <td>Mechanical protection of the seal</td> <td style="text-align: center;">0</td> <td style="text-align: center;">++</td> </tr> </tbody> </table>		Safety-Lock™	HD-Safety-Lock™	Stability with vibration	+	++	Robustness against installation errors	++	++	Radial load	80 N	400 N	Axial load	40 N	300 N	Elimination of internal stresses	0	++	Constant signal quality with extended temperatures	+	++	Mechanical protection of the seal	0	++
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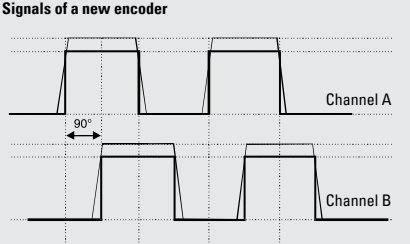
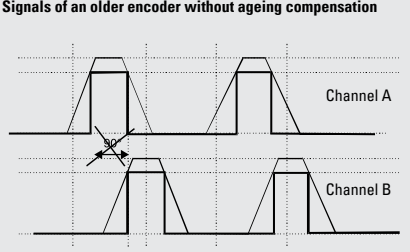

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<p>Ageing compensation (optical encoders)</p>	<p>Every LED loses some of its luminosity over time. Without ageing compensation the excellent quality of the output signals would suffer. The phase shift of 90° necessary to detect the direction of rotation would be lost. This effect however is prevented by means of special electronic circuitry.</p> <p>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.</p>	<p>Signals of a new encoder</p>  <p>Signals of an older encoder without ageing compensation</p> 	<p>Basics</p> <p>Incremental encoders</p> <p>Absolute encoders singleturn</p>
<p>Temperature compensation</p>	<p>This circuit ensures that the signal will remain the same over the whole working temperature range.</p>	<p>Benefit: The positioning accuracy of a machine will not be affected by temperature changes.</p>	<p>Absolute encoders multiturn</p>
<p>Current consumption</p>	<p>The typical values for current consumption given in the catalog apply for ambient temperature (23°C). Because of the temperature compensation, the current consumption of the encoder rises with the temperature.</p>	<p>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.</p>	<p>Bearingless encoders</p>
<p>Short-circuit protection</p>	<p>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.</p>	<p>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.</p>	<p>Linear measuring technology</p>
<p>Environmental conditions</p> 	<p>The environmental conditions in which the encoder operates can have a significant influence on its service life, for example</p> <ul style="list-style-type: none"> • The ambient temperature • The expected shaft load • Soiling and humidity • Noise interference 	<p>Thanks especially to the high-quality technology employed in our encoders, they are particularly suitable for use in harsh environments.</p> <p>Numerous references from our customers, including Bosch, Siemens, Bombardier and from suppliers to the automotive industry, are proof of this.</p>	<p>Inclinometers</p>
<p>Bearing life</p>	<p>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.</p> <p>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.</p>	<p>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.</p>	<p>Connection technology</p> <p>Accessories</p> <p>Addresses</p>

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.

These two tables summarize the most used IP ratings.

Protection against particles (first digit)

The higher the number the smaller the particles.

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

Protection against water (second digit)

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

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

Our encoders have a protection up to IP69k.

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

Designation of colors to DIN IEC 757

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

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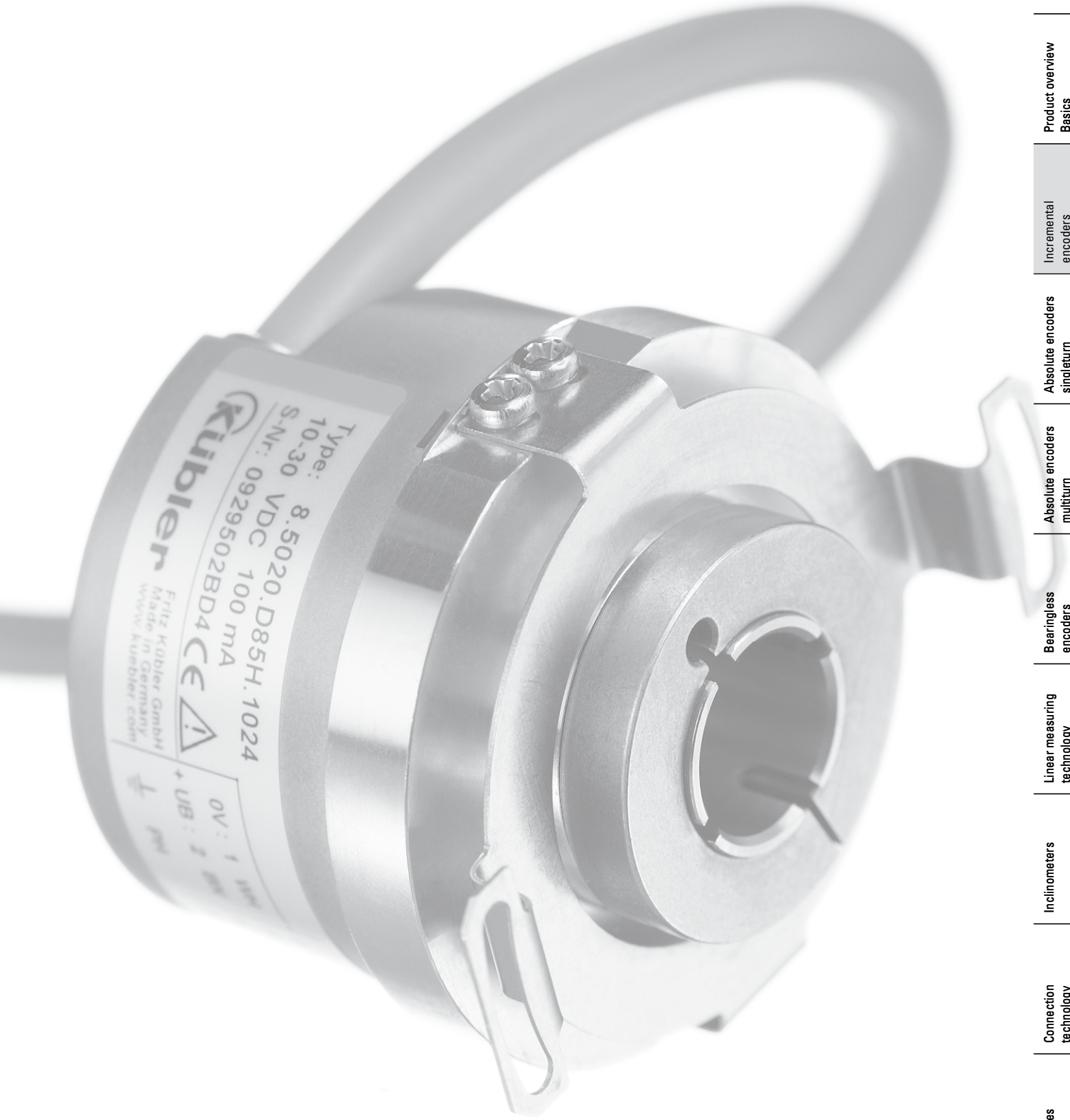
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Series	Type	Output circuit	Page	
Miniature, optical	2400 / 2420 (shaft / hollow shaft)	Push-pull	54	
Miniature, magnetic	2430 / 2440 (shaft / hollow shaft)	RS422	57	
Compact, optical	Sendix Base KIS40 / KIH40 (shaft / hollow s.)	Push-pull / RS422 Open collector	60	
	3610 / 3620 (shaft / hollow shaft)	Push-pull / RS422	64	
	Plastic housing 3700 / 3720 (shaft / hollow shaftHohlwelle)	Push-pull / RS422	68	
Standard, optical	<u>24one</u> ¹⁾ 5000 / 5020 (shaft / hollow shaft)	Push-pull / RS422 open collector	72	
	Sendix Base KIS50 / KIH50 (shaft / hollow s.)	Push-pull / RS422 open collector	85	
	High temperature	5803 / 5823 (shaft / hollow shaft)	Push-pull / RS422	89
	Sine wave output, with zero pulse	5804 / 5824 (shaft / hollow shaft)	SinCos	94
	Sine wave output, highly interpolable	Sendix 5814 / 5834 (shaft / hollow shaft)	SinCos	98
	Motor-Line	Sendix 5834 (tapered shaft)	SinCos	102
	Sine wave output, SIL2 / PLd	Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow s.)	SinCos	105
	Sine wave output, SIL3 / PLe	Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow s.)	SinCos	111
	High resolution	5805 / 5825 (shaft / hollow shaft)	Push-pull / RS422	117
	Stainless steel	Sendix 5006 / 5026 (shaft / hollow shaft)	Push-pull / RS422	121
	Standard, optical	Sendix 7000 / 7020 (shaft / hollow shaft)	Push-pull / RS422	125
	ATEX / IECEx zone 1/21	SIL2 / PLd Sendix SIL 7014FS2 (shaft)	SinCos	130
		SIL3 / PLe Sendix SIL 7014FS3 (shaft)	SinCos	133
Standard, optisch ATEX / IECEx mining	Sendix 7100 / 7120 (shaft / hollow shaft)	Push-pull / RS422	136	
Large hollow shaft, optical	5821 (hollow shaft)	Push-pull / RS422	141	
	A020 (hollow shaft)	Push-pull / RS422 / SinCos	144	
	Robust A02H (hollow shaft)	Push-pull / RS422 / SinCos	148	
Heavy Duty, optical	Shaft Sendix Heavy Duty H100 (shaft)	Push-pull / RS422 / speed switch	155	
	Hollow shaft Sendix Heavy Duty H120 (hollow shaft)	Push-pull / RS422 / optical fiber	160	

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

Incremental encoders

Miniature optical

2400 / 2420 (shaft / hollow shaft)

Push-pull

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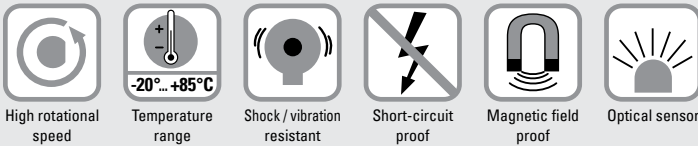
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The incremental miniature encoders type 2400 / 2420 with their optical sensor technology offer a resolution of up to 1024 pulses per revolution.

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



Reliable

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

Versatile

- Ideally suited for use in small devices.

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
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Order code Hollow shaft	05.2420 Type	1 X X X . X X X X a b c d 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

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 ⁴⁾
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 no. E224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

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.
 4) Also for protection level IP64 on the shaft.

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Miniature optical

2400 / 2420 (shaft / hollow shaft)

Push-pull

Terminal assignment

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

Output circuit	Type of connection	Cable (isolate unused cores 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	$\bar{0}$
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD

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

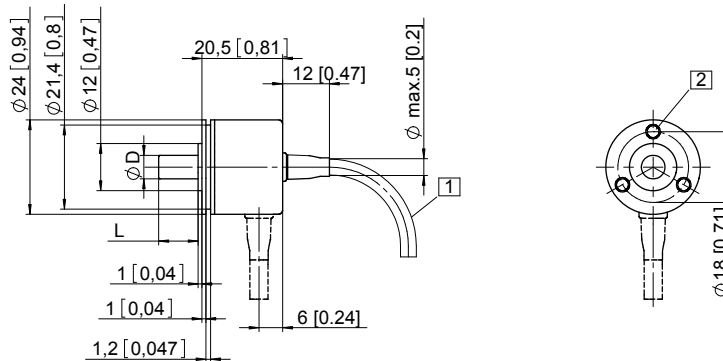
Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

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

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

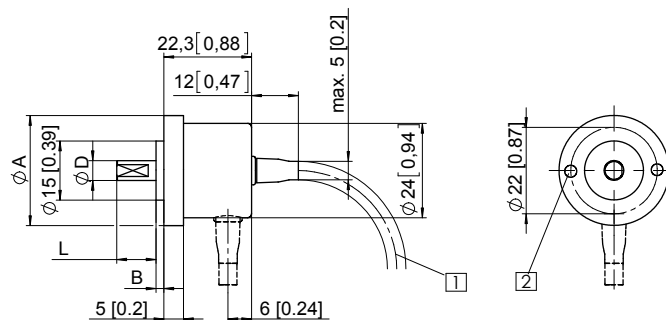


Flange type 2, \varnothing 30 [1.18]

Flange type 3, \varnothing 28 [1.10]

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

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



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

Dimensions hollow shaft version

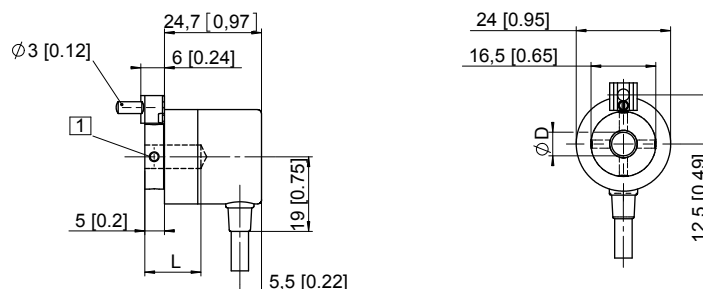
Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5

D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4"	H7	14 [0.55]

L = insertion depth max. blind hollow shaft



Incremental encoders

Miniature magnetic	2430 / 2440 (shaft / hollow shaft)	RS422
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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 -20°...+85°C	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	. XX 6 X . XXXX					
Shaft version	Type	<table border="1"> <tr> <td>a</td> <td>b</td> <td>c</td> <td>d</td> <td>e</td> </tr> </table>	a	b	c	d	e
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 Output circuit / power supply
6 = RS422 (with inverted signal) / 5 V DC</p> | <p>d Type of connection
1 = axial cable, 2 m [5.56'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [5.56'] PVC
B = radial cable, special length PVC *)</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)
256
(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					
Hollow shaft	Type	<table border="1"> <tr> <td>a</td> <td>b</td> <td>c</td> <td>d</td> <td>e</td> </tr> </table>	a	b	c	d	e
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 Output circuit / power supply
6 = RS422 (with inverted signal) / 5 V DC</p> | <p>d Type of connection
1 = axial cable, 2 m [5.56'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 2 m [5.56'] PVC
B = radial cable, special length PVC *)</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)
256
(e.g. 128 pulses => 0128)</p> <p><i>Optional on request</i>
- other pulse rates</p> |
|--|---|--|

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Incremental encoders

Miniature magnetic	2430 / 2440 (shaft / hollow shaft)	RS422
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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 2014/30/EU RoHS guideline 2011/65/EU

Terminal assignment

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

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \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
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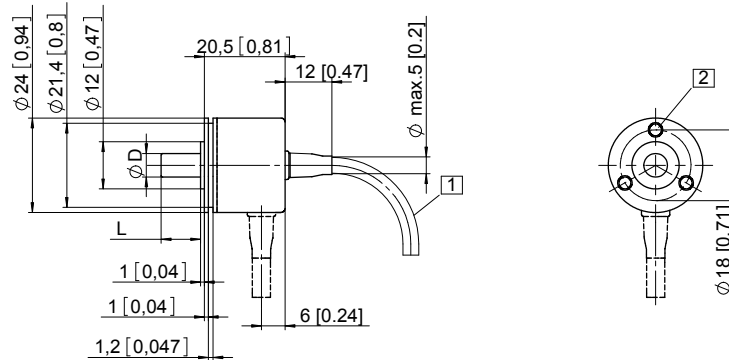
Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

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

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



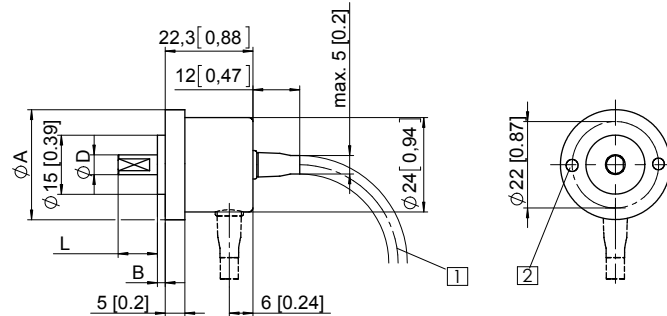
Flange type 2, \varnothing 30 [1.18]

Flange type 3, \varnothing 28 [1.10]

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

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

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



Dimensions hollow shaft version

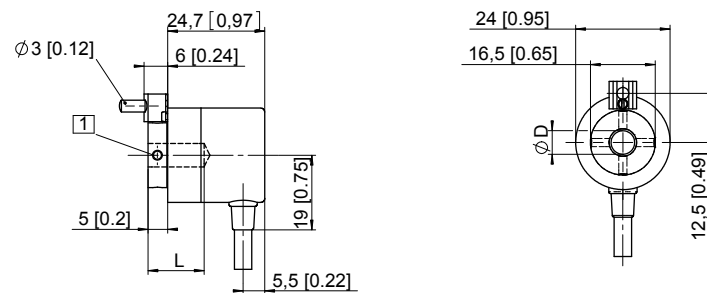
Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5

D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4"	H7	14 [0.55]

L = insertion depth max. blind hollow shaft

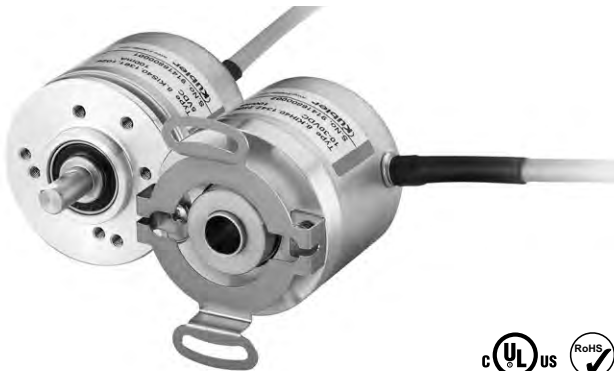


Incremental encoders

Compact optical

Sendix Base KIS40 / KIH40 (shaft / hollow shaft)

Push-pull / RS422 / Open collector



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

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



Safety-Lock™



High rotational speed



Temperature range
-20°...+70°C



Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic field proof



Optical sensor

Compact and robust

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

Flexible

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

Order code Shaft version

8.KIS40 . 1XXX . XXXX . PXX¹⁾

a Flange

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

b Shaft (ø x L)

3 = ø 6 x 12.5 mm [0.24 x 0.49"], with flat
5 = ø 1/4" x 12.5 mm [1/4" x 0.49"], with flat
6 = ø 8 x 12.5 mm [0.32 x 0.49"], with flat

c Output circuit / power supply

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

d Type of connection

1 = axial cable, 2 m [6.56'] PVC
2 = radial cable, 2 m [6.56'] PVC

e Pulse rate

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

f Special signal format

P03 = see page 62

Stock types

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

Optional on request

- other pulse rates

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

Incremental encoders

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

Order code	8.KIH40	. XXXXX	. XXXX	. PXX¹⁾
Hollow shaft	Type	a b c d	e	f

a Flange	d Type of connection	Stock types
2 = with spring element, long 5 = with stator coupling, ø 46 mm [1.81"]	1 = axial cable, 2 m [6.56'] PVC 2 = radial cable, 2 m [6.56'] PVC	8.KIH40.2442.1024 8.KIH40.5442.0360 8.KIH40.2462.1000 8.KIH40.5442.0500 8.KIH40.2462.1024 8.KIH40.5442.1024 8.KIH40.5442.2048 8.KIH40.5442.2500 8.KIH40.5462.0500 8.KIH40.5462.2048
b Blind hollow shaft (insertion depth max. 18 mm [0.71"])	e Pulse rate	
4 = ø 8 mm [0.32"] 3 = ø 1/4"	25, 100, 200, 360, 500, 512, 600, 1000, 1024, 2000, 2048, 2500 (e.g. 500 pulses => 0500)	
c Output circuit / power supply	f Special signal format	Optional on request
3 = open collector (with inverted signal) / 10 ... 30 V DC 4 = push-pull (with inverted signal) / 10 ... 30 V DC 6 = RS422 (with inverted signal) / 5 V DC 7 = open collector (without inverted signal) / 10 ... 30 V DC 8 = push-pull (without inverted signal) / 10 ... 30 V DC	P03 = see page 62	- other pulse rates

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 15 mm [0.59"] for shaft 6 mm [0.24"]	8.0000.1202.0606
Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMBS 8181-0

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

Technical data

Mechanical characteristics		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 40 N axial 20 N	flange	aluminum
Weight	ca. 0.17 kg [6.00 oz]	housing	aluminum
Protection acc. to EN 60529	IP64	cable	PVC
		Shock resistance acc. to EN 60068-2-27	1000 m/s ² , 6 ms
		Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics			
Output circuit	RS422 (TTL comp.)	Push-pull²⁾ (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 outputs³⁾	yes ⁴⁾	yes	yes
Reverse polarity protection of the power supply	no	yes	yes
UL approval	file no. E224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) Is only necessary when a special output signal format is required.
2) Max. recommended cable length 30 m [98.43'].
3) If power supply correctly applied.

4) Only one channel allowed to be shorted-out:
at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Incremental encoders

Compact optical

Sendix Base KIS40 / KIH40 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

Terminal assignment

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

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

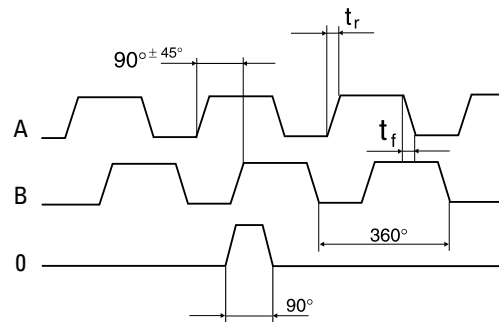
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal

Output signal formats

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

A leads B when the shaft is rotated in the clockwise direction viewing the shaft or collet end. This is the Kübler standard. This format applies to the pin key codes listed below.		
Order code 1		
standard	0 gated with A & B. This is the Kübler standard. 0 is 90° wide.	
P03	0 ungated. 0 is 330° to 360° wide.	

Wave form tolerances



t_r = rising edge time
 t_f = falling edge time

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Incremental encoders

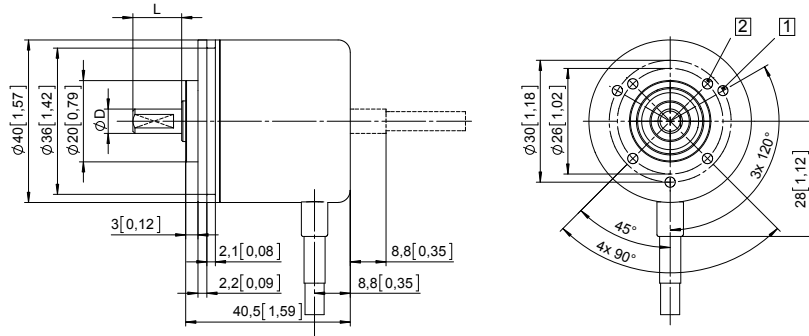
Compact optical Sendix Base KIS40 / KIH40 (shaft / hollow shaft) Push-pull / RS422 / Open collector

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



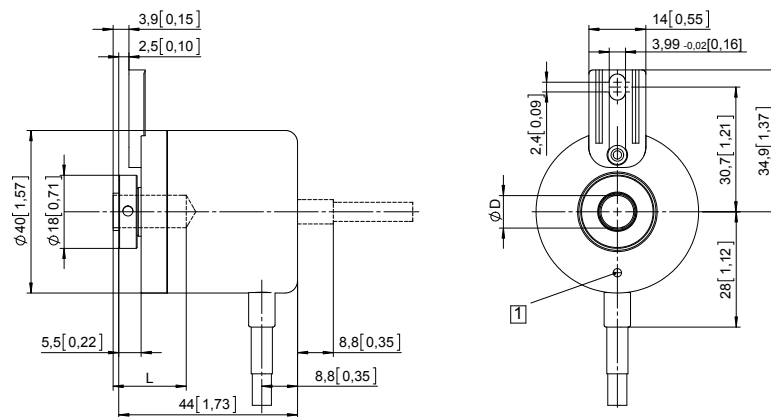
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 2

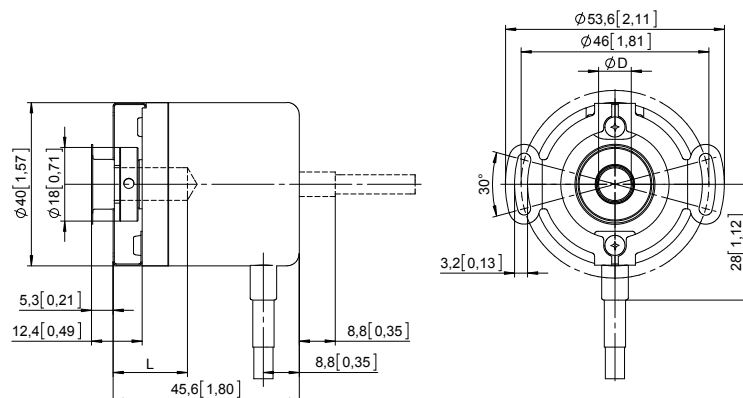
- 1 M2,5, 4 [0.16] deep



D	Fit	L
8 [0.32]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth max. blind hollow shaft

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



D	Fit	L
8 [0.32]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth max. blind hollow shaft
insertion depth min. = 1.5 x D

Incremental encoders

Compact optical

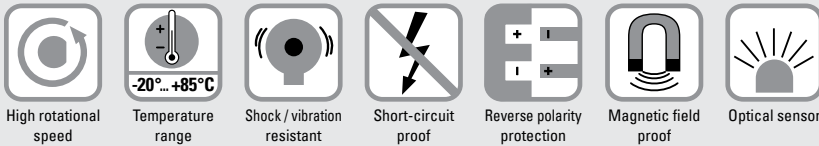
3610 / 3620 (shaft / hollow shaft)

Push-pull / RS422



The compact incremental encoders type 3610 / 3620 with optical sensor technology are available with a resolution of up to 3600 pulses per revolution.

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



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 3600 pulses per revolution.
- Power supply 5 ... 18 V DC or 8 ... 30 V DC.

Order code
Shaft version

8.3610 . **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

- 2 = synchro flange, \varnothing 36.5 mm [1.44"]
- 3 = clamping flange, \varnothing 36.5 mm [1.44"]

b Shaft ($\varnothing \times L$)

- 1 = \varnothing 4 x 10 mm [0.16 x 0.39"]
- 2 = \varnothing 5 x 10 mm [0.20 x 0.39"]
- 3 = \varnothing 6 x 12.5 mm [0.24 x 0.49"], with flat
- 5 = \varnothing 1/4" x 12.5 mm [1/4" x 0.49"], with flat

c Output circuit / power supply

- 2 = push-pull (with inverted signal) / 5 ... 18 V DC
- 4 = push-pull (with inverted signal) / 8 ... 30 V DC
- 3 = push-pull (without inverted signal) / 8 ... 30 V DC
- 6 = RS422 (with inverted signal) / 5 V DC
- 5 = RS422 (with inverted signal) / 8 ... 30 V DC

d Type of connection

- 1 = axial cable, 2 m [5.56'] PVC
- A = axial cable, special length PVC *)
- 2 = radial cable, 2 m [5.56'] PVC
- B = radial cable, special length PVC *)
- 3 = axial M12 connector, 8-pin
- 4 = radial M12 connector, 8-pin
- *) Available special lengths (connection types A, B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.3610.334A.1024.0030 (for cable length 3 m)

e Pulse rate

- 25, 100, 200, 360, 500, 512, 600, 1000, 1024, 1250, 1500, 2000, 2048, 2500, 3600
(e.g. 500 pulses => 0500)

Optional on request
- other pulse rates

Incremental encoders

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

Order code	8.3620	. X X X X . XXXX	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
Hollow shaft	Type	a b c d e		

a Flange 1 = with spring element, short <u>2 = with spring element, long</u> 5 = with stator coupling, ø 46 mm [1.81"]	l Type of connection <u>E = radial cable, 2 m [5.56'] PVC</u> B = radial cable, special length PVC *) 4 = radial M12 connector, 8-pin *) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.3620.224B.1024.0030 (for cable length 3 m)	e Pulse rate 25, 100, <u>200</u> , 360, <u>500</u> , 512, 600, 1000, <u>1024</u> , 1250, 1500, 2000, <u>2048</u> , <u>2500</u> , <u>3600</u> (e.g. 500 pulses => 0500) <i>Optional on request</i> - other pulse rates
b Through hollow shaft <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.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56"] PVC cable	05.00.6041.8211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0

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

Technical data

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

Electrical characteristics			
Output circuit	RS422	Push-pull ¹⁾ (7272 comp.)	Push-pull ¹⁾ (7272 comp.)
Power supply	5 V DC (±5%) or 8 ... 30 V DC	5 ... 18 V DC	8 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 40 mA / max. 90 mA	max. 40 mA	max. 40 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA
Pulse frequency	max. 300 kHz	max. 200 kHz	max. 200 kHz
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.5 V max. 0.5 V	min. +V - 3.0 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	yes	yes
Reverse polarity protection of the power supply	yes	yes	yes
UL approval	file no. E224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

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

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Incremental encoders

Compact optical

3610 / 3620 (shaft / hollow shaft)

Push-pull / RS422

Terminal assignment

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

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

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

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

- +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

Top view of mating side, male contact base



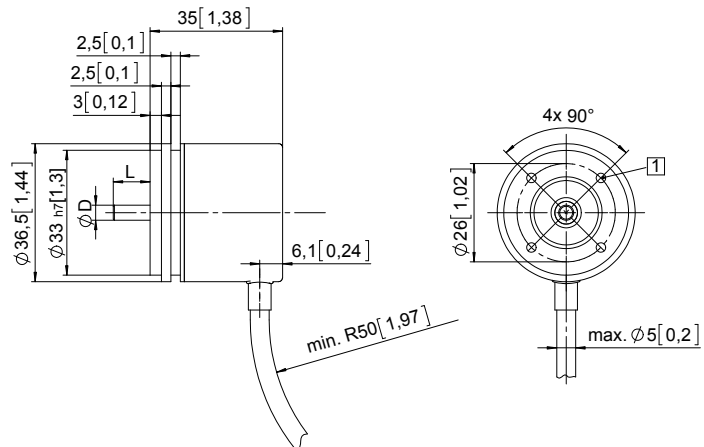
M12 connector, 8-pin

Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, \varnothing 36.5 [1.44] Flange type 2

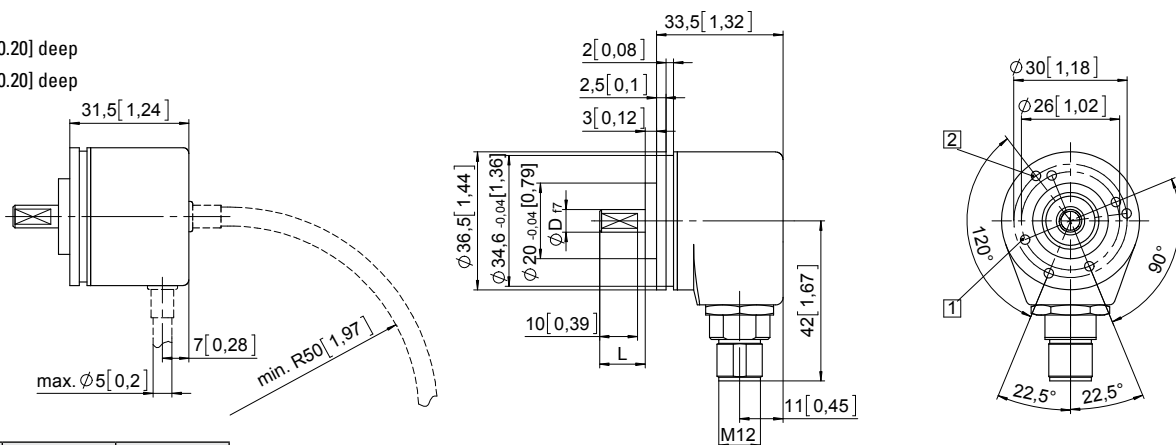
- 1 4 x M3, 5 [0.20] deep



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

Clamping flange, \varnothing 36.5 [1.44] Flange type 3

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



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

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Incremental encoders

Compact optical

3610 / 3620 (shaft / hollow shaft)

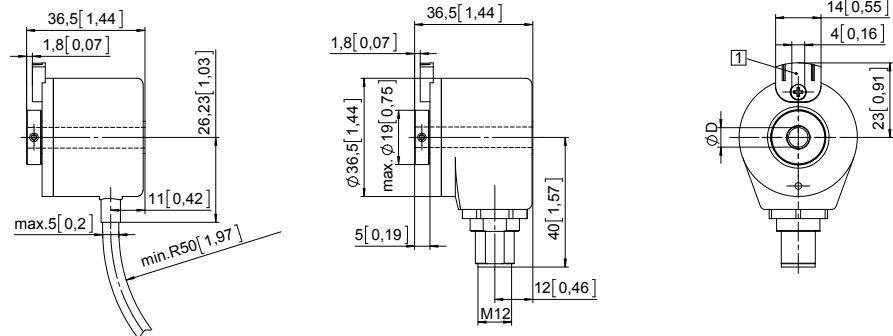
Push-pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

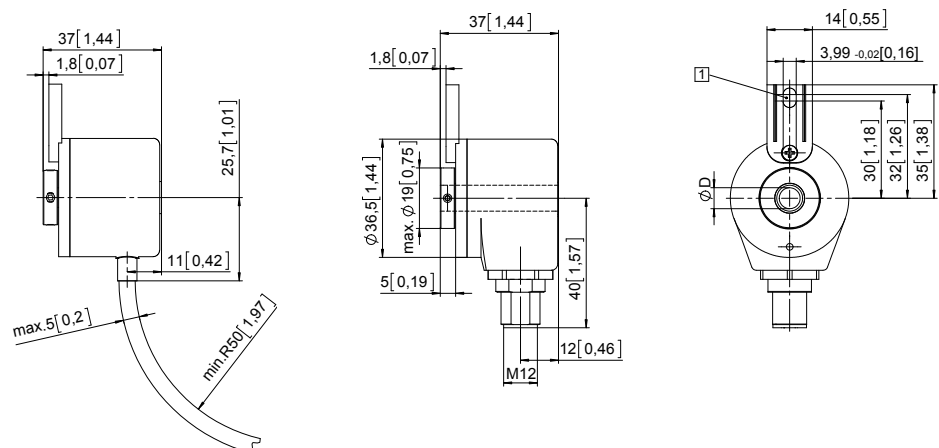
- 1 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]



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

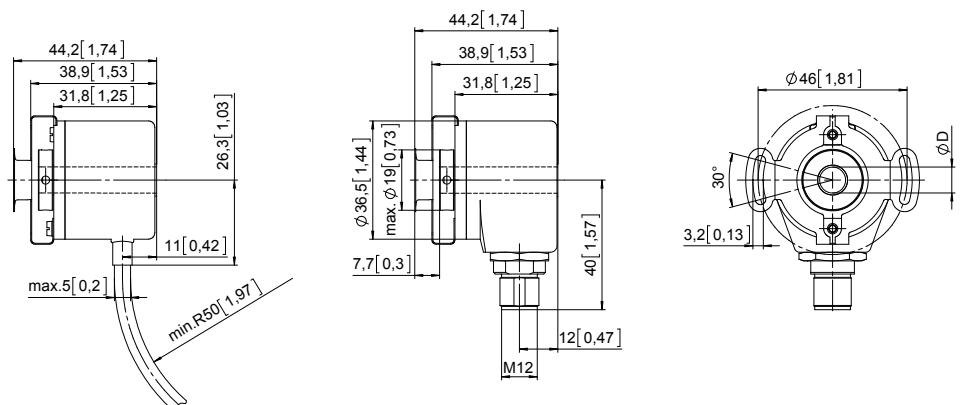
Flange with spring element, long Flange type 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]



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

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



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

Incremental encoders

Compact plastic housing, optical

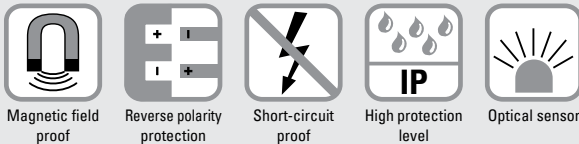
3700 / 3720 (shaft / hollow shaft)

Push-pull / RS422



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

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



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 . XXXXX . XXXX
Shaft version Type a b c d e

a Flange

- 1 = clamping-synchro flange, \varnothing 36.8 mm [1.45"]
- A = flange adapter, mounted, \varnothing 40 mm [1.57"]²⁾

b Shaft with flat, \varnothing x L²⁾

- 1 = \varnothing 4 x 12.5 mm [0.16 x 0.49"]
- 2 = \varnothing 5 x 12.5 mm [0.20 x 0.49"]
- 3 = \varnothing 6 x 12.5 mm [0.24 x 0.49"]
- 6 = \varnothing 8 x 12.5 mm [0.32 x 0.49"]
- 4 = \varnothing 1/4" x 12.5 mm [1/4" x 0.49"]

c Output circuit / power supply

- 1 = RS422 / 5 V DC (\pm 5 %)
- 3 = push-pull (with inverted signal) / 5 ... 30 V DC
- 4 = push-pull (with inverted signal) / 10 ... 30 V DC

d Type of connection¹⁾

- 1 = axial cable, 1 m [3.28'] PVC
- 2 = radial cable, 1 m [3.28'] PVC
- 3 = axial cable, 2 m [6.56'] PVC
- 4 = radial cable, 2 m [6.56'] PVC
- 5 = axial cable, 3 m [9.84'] PVC
- 6 = radial cable, 3 m [9.84'] PVC
- 7 = axial cable, 5 m [16.40'] PVC
- 8 = radial cable, 5 m [16.40'] PVC

e Pulse rate

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

Stock types

- 8.3700.1332.0360
- 8.3700.1332.0500
- 8.3700.1332.1000
- 8.3700.1332.1024

Optional on request

- other pulse rates

Order code 8.3720 . XXXXX . XXXX
Hollow shaft Type a b c d e

a Flange

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

b Through hollow shaft

- 1 = \varnothing 4 mm [0.16"]
- 2 = \varnothing 5 mm [0.20"]
- 3 = \varnothing 6 mm [0.24"]
- 6 = \varnothing 8 mm [0.32"]
- 4 = \varnothing 1/4"

c Output circuit / power supply

- 1 = RS422 / 5 V DC (\pm 5 %)
- 3 = push-pull (with inverted signal) / 5 ... 30 V DC
- 4 = push-pull (with inverted signal) / 10 ... 30 V DC

d Type of connection¹⁾

- 1 = radial cable, 1 m [3.28'] PVC
- 2 = radial cable, 2 m [6.56'] PVC
- 3 = radial cable, 3 m [9.84'] PVC
- 4 = radial cable, 5 m [16.40'] PVC

e Pulse rate

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

Stock types

- 8.3720.5631.0360
- 8.3720.5611.1024

Optional on request

- other pulse rates

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

Incremental encoders

Compact plastic housing, optical	3700 / 3720 (shaft / hollow shaft)	Push-pull / RS422
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Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling \varnothing 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. 0.4×10^{-6} kgm ²
	hollow shaft version	1.4×10^{-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 cable	plastic PPA, 40 % CF (carbon fiber) 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 ($\pm 5\%$)	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 max. 0.5 V	min. +V - 2.0 V max. 0.5 V
	LOW		
Rising edge time t_r	max. 200 ns	max. 1 μ s	max. 1 μ s
Falling edge time t_f	max. 200 ns	max. 1 μ s	max. 1 μ s
Short circuit proof outputs ²⁾	yes ³⁾	yes	yes
Reverse polarity protection of the power supply	no	no	yes
UL approval	file no. E224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Terminal assignment

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

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \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'].

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Incremental encoders

Compact plastic housing, optical

3700 / 3720 (shaft / hollow shaft)

Push-pull / RS422

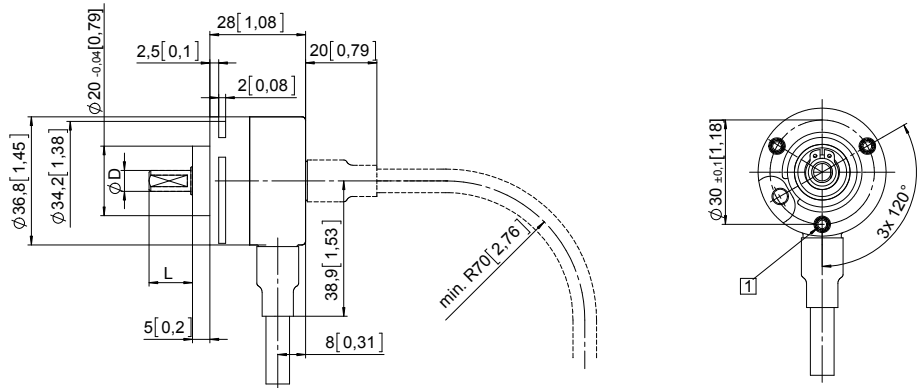
Dimensions shaft version

Dimensions in mm [inch]

Clamping-synchro flange, ø 36.8 [1.45]

Flange type 1

1 3 x M3, 6 [0.24] deep

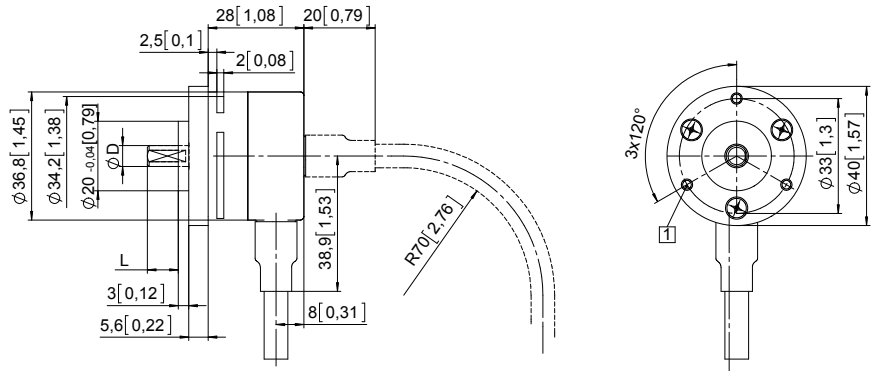


D	Fit	L
4 [0.16]	h7	12.5 [0.49]
5 [0.20]	h7	12.5 [0.49]
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

Flange adapter, ø 40 [1.57]

Flange type A

1 3 x M3, 6 [0.24] deep



D	Fit	L
4 [0.16]	h7	8.9 [0.35]
5 [0.20]	h7	8.9 [0.35]
6 [0.24]	h7	8.9 [0.35]
8 [0.32]	h7	8.9 [0.35]
1/4"	h7	8.9 [0.35]

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Incremental encoders

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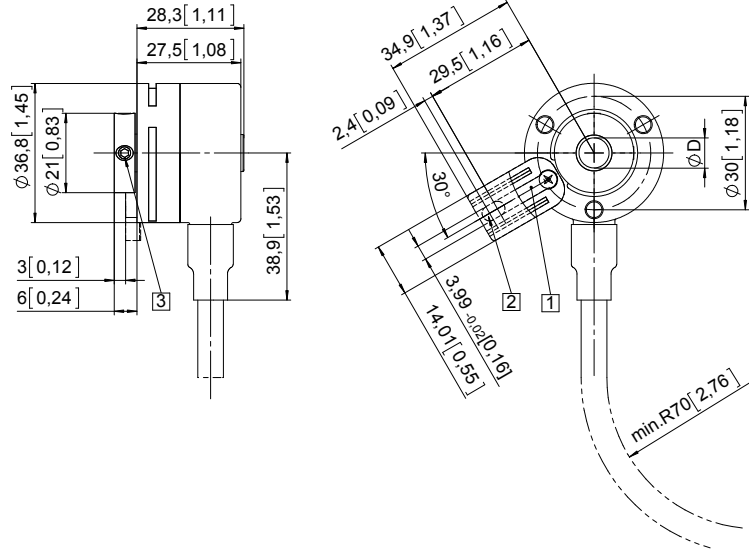
Dimensions hollow shaft version

Dimensions in mm [inch]

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

Flange type 1 (2)

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

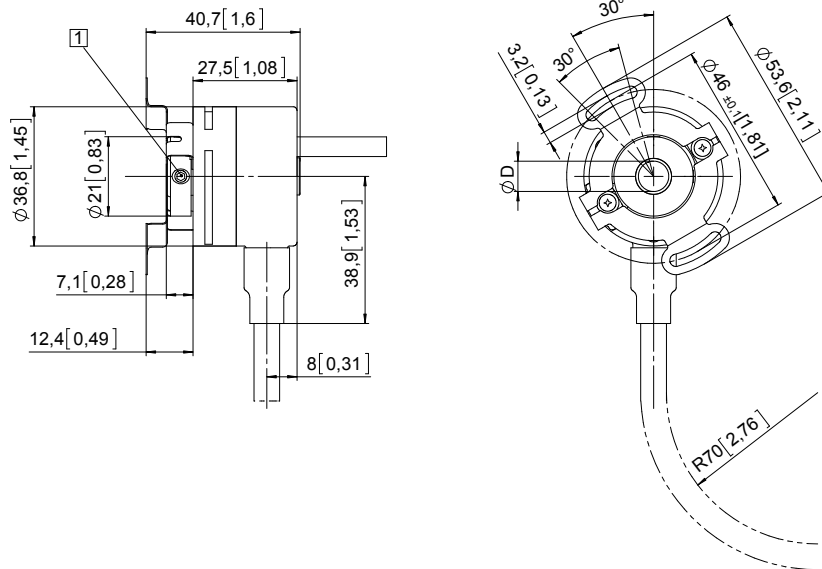


D	Fit
4 [0.16]	H7
5 [0.20]	H7
6 [0.24]	H7
8 [0.32]	H7
1/4"	H7

Flange with stator coupling, \varnothing 46 [1.81]

Flange type 5

- 1 Recommended torque for the clamping ring 1.0 Nm



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

Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

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

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

NEW: 24one delivery promise



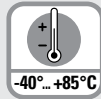
24one



Safety-Lock™



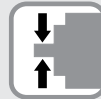
High rotational speed



Temperature range
-40°C...+85°C



High protection level
IP



High shaft load capacity



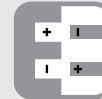
Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor

Robust performance

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

NEW:

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

Many variants

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

NEW:

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

Technology in detail

Robust Safety-Lock™ bearing structure

Cables with fitted connector

Undetachable clamping ring

Slotted clamping ring + slotted shaft

Tangential cable outlet



Incremental encoders

Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-pull / RS422 / Open collector
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Order code	8.5000	. XXXXXX . XXXX	We offer for all encoders configured with the <u>underlined preferential options</u> our free of charge 24one delivery promise.	24one					
Shaft version	Type	<table border="1" style="display: inline-table; border-collapse: collapse;"> <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	Orders placed on working days before 9AM CET are manufactured and ready for dispatch the same day. The 24one delivery promise is limited to 20 pieces per delivery.	
a	b	c	d	e					

<p>a Flange</p> <p>5 = synchro flange, IP66/IP67 \varnothing 50.8 mm [2"]</p> <p>6 = synchro flange, IP65 \varnothing 50.8 mm [2"]</p> <p>7 = clamping flange, IP66/IP67 \varnothing 58 mm [2.28"]</p> <p>8 = clamping flange, IP65 \varnothing 58 mm [2.28"]</p> <p>A = synchro flange, IP66/IP67 \varnothing 58 mm [2.28"]¹⁾</p> <p>B = synchro flange, IP65 \varnothing 58 mm [2.28"]¹⁾</p> <p>C = square flange, IP66/IP67 \square 63.5 mm [2.5"]</p> <p>D = square flange, IP65 \square 63.5 mm [2.5"]</p> <p>G = Euro flange, IP66/IP67 \varnothing 115 mm [4.53"]²⁾</p> <hr/> <p>1 = servo flange, IP66/IP67 \varnothing 50.8 mm [2"]³⁾</p> <p>2 = servo flange, IP65 \varnothing 50.8 mm [2"]³⁾</p> <p>3 = square flange, IP66/IP67 \square 52.3 mm [2.06"]³⁾</p> <p>4 = square flange, IP65 \square 52.3 mm [2.06"]³⁾</p> <p>E = servo flange, IP66/IP67 \varnothing 63.5 mm [2.5"]³⁾</p> <p>F = servo flange, IP65 \varnothing 63.5 mm [2.5"]³⁾</p> <hr/> <p>b Shaft ($\varnothing \times L$), with flat</p> <p>1 = \varnothing 6 x 10 mm [0.24 x 0.39"]</p> <p>2 = \varnothing 1/4 x 5/8" (6.35 x 15.875 mm)</p> <p>6 = \varnothing 8 x 15 mm [0.32 x 0.59"]</p> <p>3 = \varnothing 10 x 20 mm [0.39 x 0.79"]</p> <p>4 = \varnothing 3/8 x 5/8" (9.5 x 15.875 mm)</p> <p>B = \varnothing 11 x 33 mm [0.43 x 1.30"]⁴⁾, with feather key shaft slot⁴⁾</p> <p>5 = \varnothing 12 x 20 mm [0.47 x 0.79"]</p> <hr/> <p>7 = \varnothing 1/4 x 7/8"³⁾</p> <p>8 = \varnothing 3/8 x 7/8"³⁾</p> <hr/> <p>c Output circuit / power supply</p> <p>4 = RS422 (with inverted signal) / 5 V DC</p> <p>1 = RS422 (with inverted signal) / 5 ... 30 V DC</p> <p>2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC</p> <p>5 = push-pull (with inverted signal) / 10 ... 30 V DC</p> <hr/> <p>3 = open collector (with inverted signal) / 5 ... 30 V DC³⁾</p> <p>8 = push-pull (7272 compatible with inverted signal), without capacitor / 5 ... 30 V DC^{1) 3) 6)}</p>	<p>d Type of connection – cable</p> <p>1 = axial cable, 1 m [3.28"] PVC A = axial cable, special length PVC *)</p> <p>2 = radial cable, 1 m [3.28"] PVC B = radial cable, special length PVC *)</p> <p style="text-align: center;"><i>Type of connection – connector</i></p> <p>P = axial M12 connector, 5-pin⁵⁾</p> <p>R = radial M12 connector, 5-pin⁵⁾</p> <p>3 = axial M12 connector, 8-pin</p> <p>4 = radial M12 connector, 8-pin</p> <p>7 = axial M23 connector, 12-pin</p> <p>8 = radial M23 connector, 12-pin</p> <p>Y = radial MIL connector, 10-pin</p> <p>W = radial MIL connector, 7-pin⁵⁾</p> <hr/> <p>9 = radial MIL connector, 6-pin^{3) 5)}</p> <p style="text-align: center;"><i>Type of connection – connector with cable</i></p> <p>L = radial cable with M12 connector, 8-pin, special length PVC *)</p> <p>M = radial cable with M23 connector, 12-pin, special length PVC *)</p> <p>N = radial cable with Sub-D connector, 9-pin, special length PVC *)</p> <hr/> <p>*) Available special lengths (connection types A, B, L, M, N): 0.3, 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20 m [0.98, 1.64, 3.28, 6.56, 9.84, 13.12, 16.40, 19.69, 26.25, 32.80, 39.37, 49.21, 65.62"] order code expansion .XXXX = length in dm ex.: 8.5000.814A.1024.0030 (for cable length 3 m)</p> <hr/> <p>e Pulse rate</p> <p>1, 2, 4, 5, 10, 12, 14, 20, 25, 28, 30, 32, 36, 50, 60, 64, 80, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 100 pulses => 0100)</p> <p style="text-align: center;"><i>Optional on request</i></p> <ul style="list-style-type: none"> - other pulse rates - Ex 2/22⁷⁾ - surface protection salt spray <p style="text-align: center;"><i>Salt spray tested as standard type (deliverable as from 1 unit)</i></p> <p style="text-align: center;"> 8.5000.73X4.XXXX-C</p>
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1) 24one type only in conjunction with shaft type 1.
 2) Only in conjunction with shaft type B.
 3) US version.
 4) Only in conjunction with flange type G.
 5) Without inverted signal.
 6) Attention: no CE types!
 7) For the cable connection type, cable material PUR.

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Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

**Order code
Hollow shaft**

8.5020 . XXXX . XXXX
Type a b c d e

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

24one

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

a Flange

- 1 = with spring element, long, IP66/IP67
 - 2 = with spring element, long, IP65
 - 3 = with torque stop, long, IP66/IP67
 - 4 = with torque stop, long, IP65
 - 7 = with stator coupling, IP66/IP67 ø 65 mm [2.56"]
 - 8 = with stator coupling, IP65 ø 65 mm [2.56"]
 - C = with stator coupling, IP66/IP67 ø 63 mm [2.48"]
 - D = with stator coupling, IP65 ø 63 mm [2.48"]
- 5 = with stator coupling, IP66/IP67 ø 57.2 mm [2.25"] ¹⁾
- 6 = with stator coupling, IP65 ø 57.2 mm [2.25"] ¹⁾

b Through hollow shaft

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

c Output circuit / power supply

- 4 = RS422 (with inverted signal) / 5 V DC
 - 1 = RS422 (with inverted signal) / 5 ... 30 V DC
 - 2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
 - 5 = push-pull (with inverted signal) / 10 ... 30 V DC
- 3 = open collector (with inverted signal) / 5 ... 30 V DC ¹⁾
- 8 = push-pull (7272 compatible with inverted signal), without capacitor / 5 ... 30 V DC ^{1) 2)}

d Type of connection – cable

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

Type of connection – connector

- R = radial M12 connector, 5-pin ³⁾
- 2 = radial M12 connector, 8-pin
- 4 = radial M23 connector, 12-pin
- 6 = radial MIL connector, 7-pin
- 7 = radial MIL connector, 10-pin

Type of connection – connector with cable

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

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

e Pulse rate

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

Optional on request

- other pulse rates
- Ex 2/22 (not for type of connection E, F, H, L, M, N) ⁴⁾
- surface protection salt spray

Salt spray tested as standard type (deliverable as from 1 unit)



8.5020.18X2.XXXX-C
8.5020.1AX2.XXXX-C

1) US version.
2) Attention: no CE types!
3) Without inverted signal.
4) For the cable connection type, cable material PUR.

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Incremental encoders

Standard optical	Sendix 5000 / 5020 (shaft / hollow shaft)	Push-pull / RS422 / Open collector	Order no.
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 flange with spring element (flange type 1 + 2)	Dimensions in mm [inch]		Order no.
	with fixing thread		8.0010.4700.0000
Isolation / adapter inserts for hollow shaft encoders order code 8.5020.X8XX.XXXX			Order no.
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.		D1	Isolation insert
		6 mm [0.24"]	8.0010.4021.0000
		8 mm [0.32"]	8.0010.4020.0000
		10 mm [0.39"]	8.0010.4023.0000
		12 mm [0.47"]	8.0010.4025.0000
		1/4"	8.0010.4022.0000
3/8"	8.0010.4024.0000		
1/2"	8.0010.4026.0000		
Connection technology			Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable		05.00.6041.8211.002M
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable		8.0000.6901.0002
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin		05.CMB 8181-0
	M23 female connector with coupling nut, 12-pin		8.0000.5012.0000
	MIL female connector with coupling nut, 10-pin		8.0000.5062.0000

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

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

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Incremental encoders

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

Mechanical characteristics

Maximum speed	IP65	12000 min ⁻¹ 6000 min ⁻¹ (continuous)	Weight	approx. 0.4 kg [14.11 oz]	
	IP66/IP67	6000 min ⁻¹ 3000 min ⁻¹ (continuous)		Protection acc. to EN 60529	without shaft seal
Mass moment of inertia	shaft version	approx. 1.8 x 10 ⁻⁶ kgm ²	with shaft seal		IP66/IP67
	hollow shaft version	approx. 6 x 10 ⁻⁶ kgm ²	Working temperature range	-40°C ¹⁾ ... +85°C [-40°F ¹⁾ ... +185°F]	
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm	Material	shaft stainless steel	
	IP66/IP67	< 0.05 Nm	Shock resistance acc. to EN 60068-2-27	3000 m/s ² , 6 ms ²⁾	
Shaft load capacity	radial	100 N	Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz ³⁾	
	axial	50 N			

Electrical characteristics

Output circuit	RS422 (TTL compatible)	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)	Push-pull (7272 compatible, without capacitor)	Open collector (7273)
Order code	1	4	5, 7	2	8	3
Power supply	5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC	5 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA	100 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	20 mA sink at 30 V DC
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz ⁴⁾	max. 300 kHz	max. 300 kHz
Signal level	HIGH	min. 2.5 V	min. +V - 1.0 V	min. +V - 2.0 V	min. +V - 2.0 V	min. +V - 2.0 V
	LOW	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	max. 1 µs	
Falling edge time t_f	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	max. 1 µs	
Short circuit proof outputs⁵⁾	yes ⁶⁾	yes ⁶⁾	yes	yes	yes ⁶⁾	yes
Reverse polarity protection of the power supply	yes	no	yes	no	no	no
UL approval	file no. E224618					
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU					

1) With connector: -40°C [-40°F], cable fixed: -30°C [-22°F], cable moved: -20°C [-4°F].
 2) For MIL connectors: 2500 m/s²
 3) For MIL connectors: 100 m/s²
 4) Max. recommended cable length 30 m [98.43'].
 5) If power supply correctly applied.
 6) Only one channel allowed to be shorted-out:
 at +V= 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
 at +V= 5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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Incremental encoders

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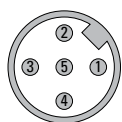
Terminal assignment

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

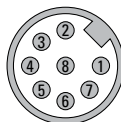
+V: Encoder power supply +V DC
 0 V: Encoder power supply ground GND (0 V)
 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.

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

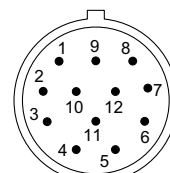
Top view of mating side, male contact base



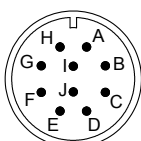
M12 connector, 5-pin



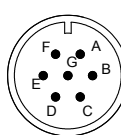
M12 connector, 8-pin



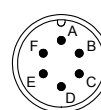
M23 connector, 12-pin



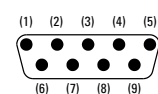
MIL connector, 10-pin



MIL connector, 7-pin



MIL connector, 6-pin



Sub-D connector, 9-pin

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

Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

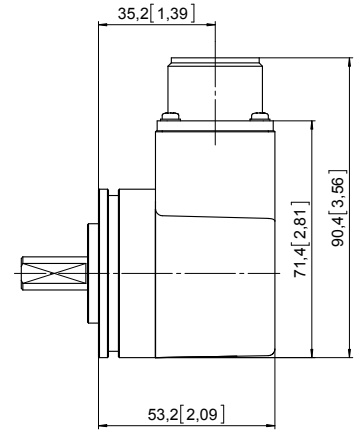
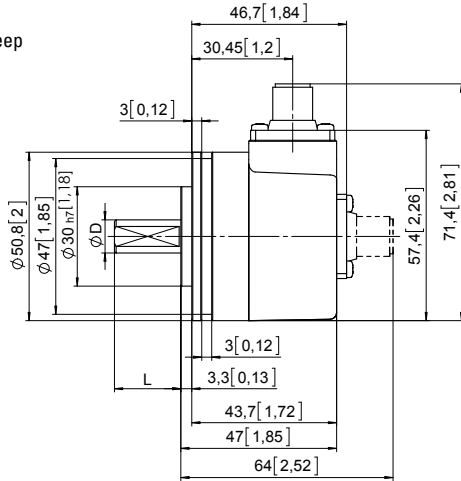
Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, \varnothing 50.8 [2]

Flange type 5 and 6

1 3 x M3, 6 [0.24] deep



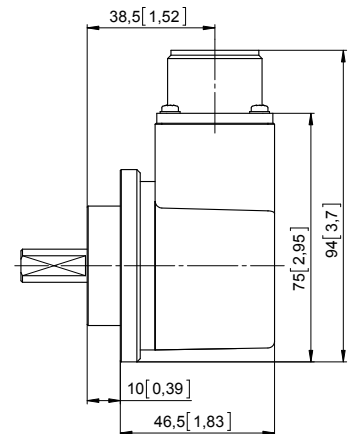
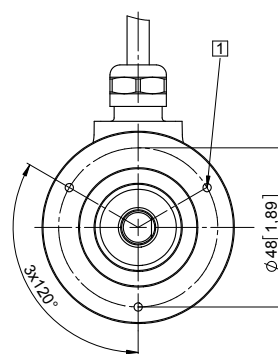
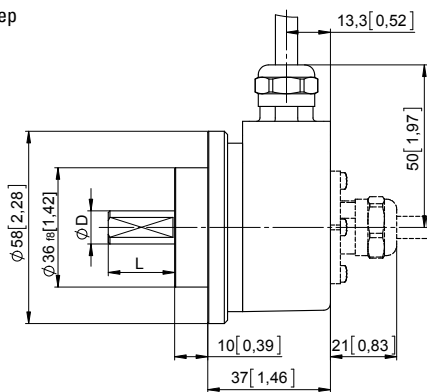
MIL-connector version

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

Clamping flange, \varnothing 58 [2.28]

Flange type 7 and 8

1 3 x M3, 6 [0.24] deep



MIL-connector version

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

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

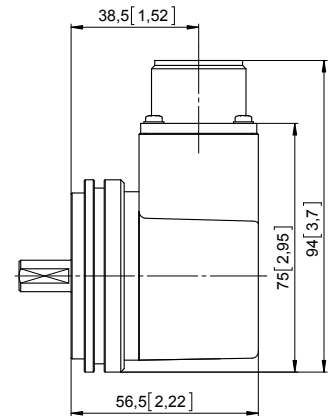
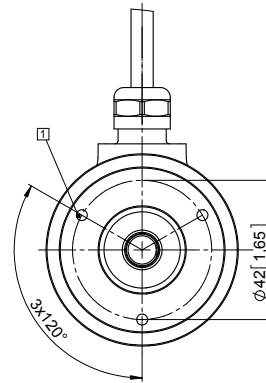
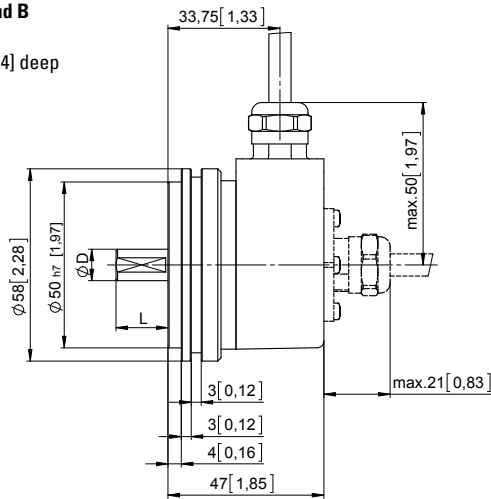
Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, σ 58 [2.28]

Flange type A and B

1 3 x M4, 6 [0.24] deep

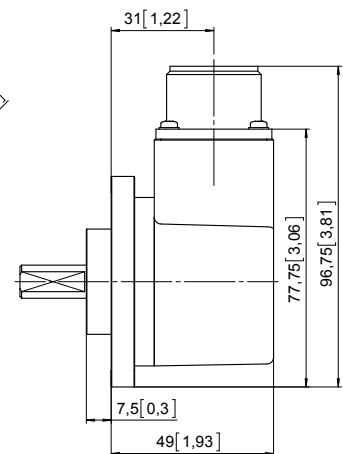
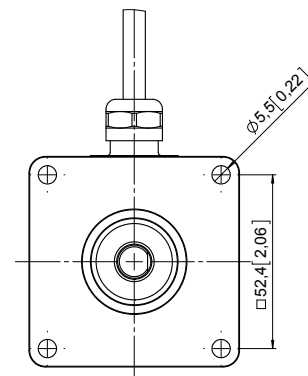
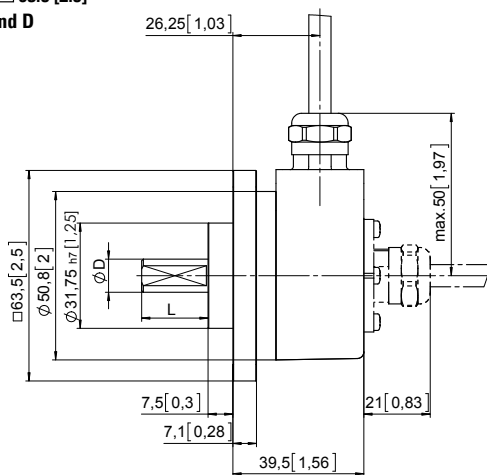


MIL-connector version

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

Square flange, \square 63.5 [2.5]

Flange type C and D



MIL-connector version

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

Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

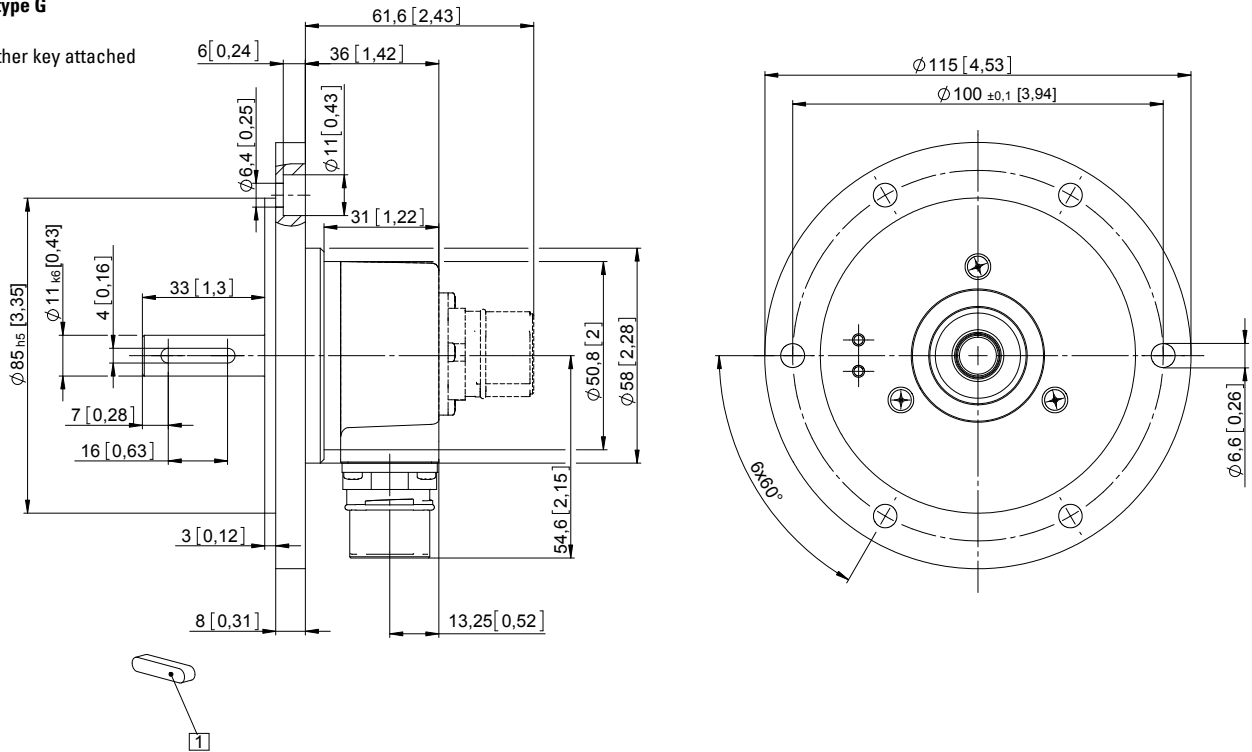
Dimensions shaft version

Dimensions in mm [inch]

Euro flange, ø 115 [4.53]

Flange type G

1 Feather key attached

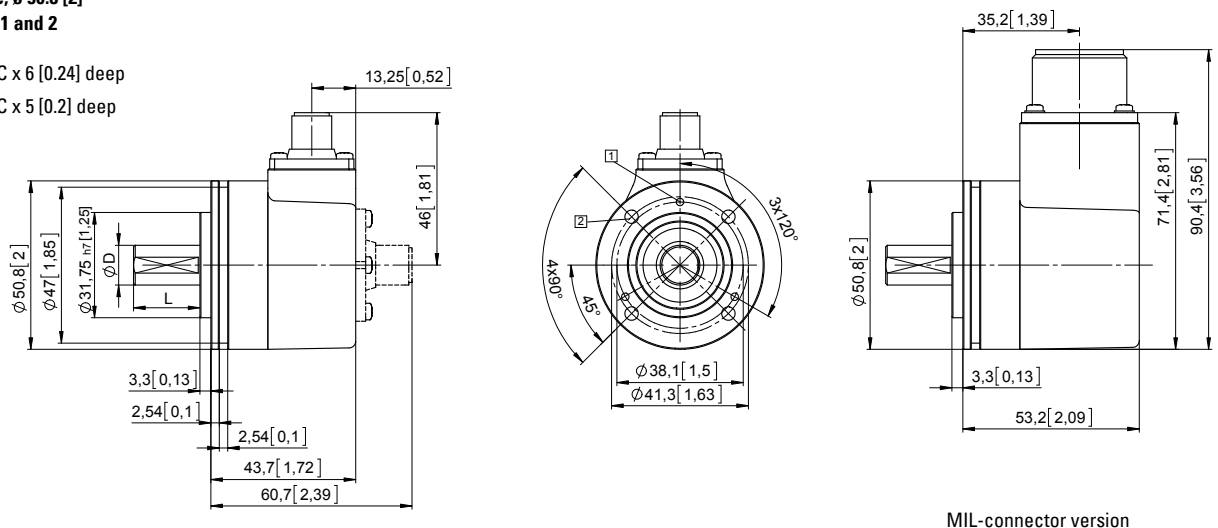


Servo flange, ø 50.8 [2]

Flange type 1 and 2

1 4-40 UNC x 6 [0.24] deep

2 6-32 UNC x 5 [0.2] deep



MIL-connector version

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

Incremental encoders

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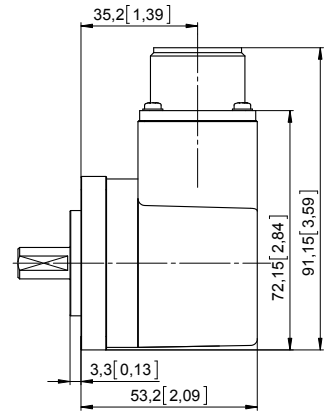
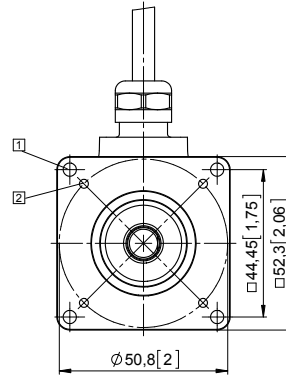
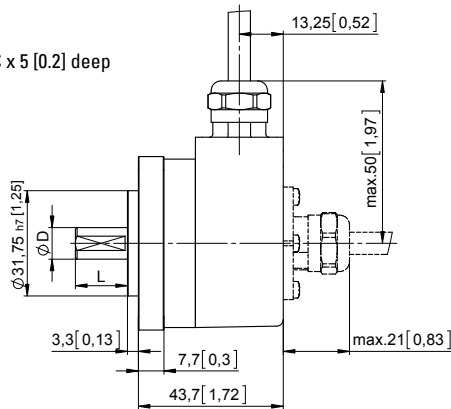
Dimensions shaft version

Dimensions in mm [inch]

Square flange, □ 52.3 [2.06]

Flange type 3 and 4

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



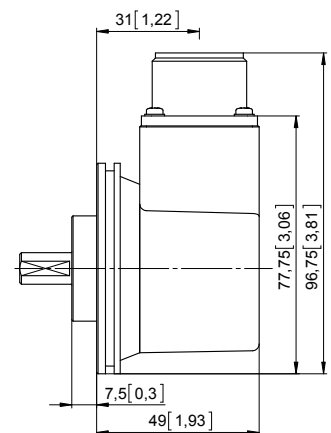
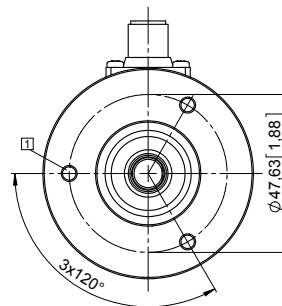
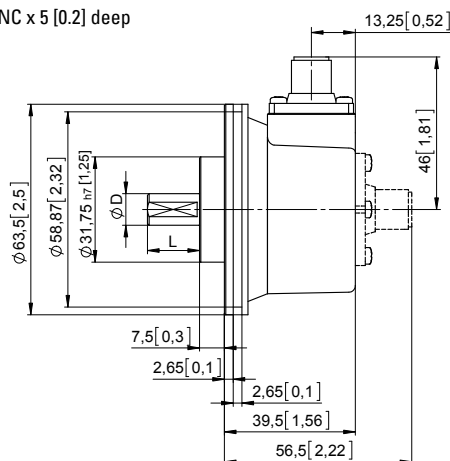
MIL-connector version

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

Servo flange, \varnothing 63.5 [2.5]

Flange type E and F

- 1 6-32 UNC x 5 [0.2] deep



MIL-connector version

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

Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

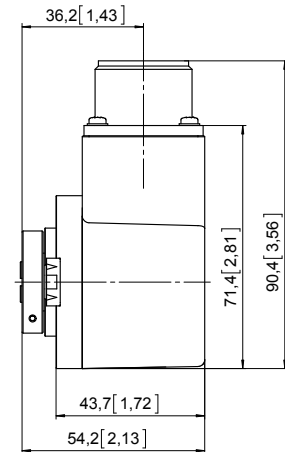
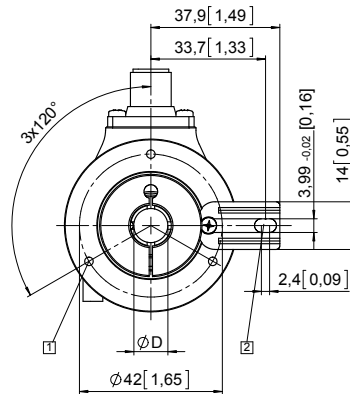
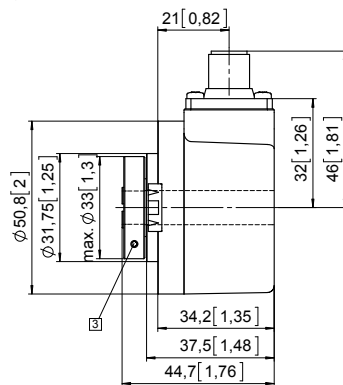
Push-pull / RS422 / Open collector

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

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

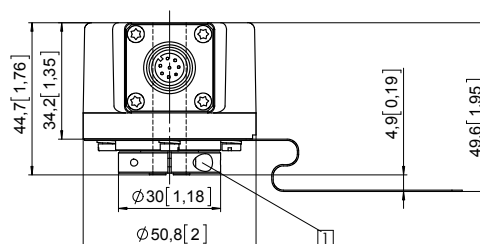
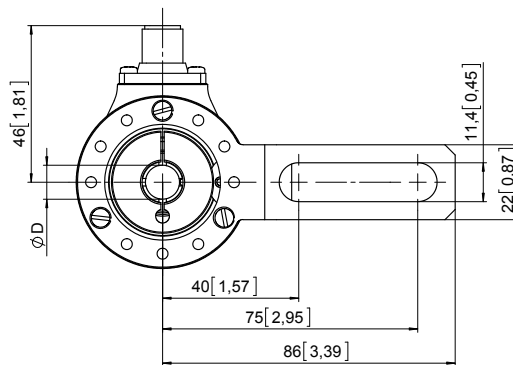


MIL-connector version

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

Flange with torque stop, long Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



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

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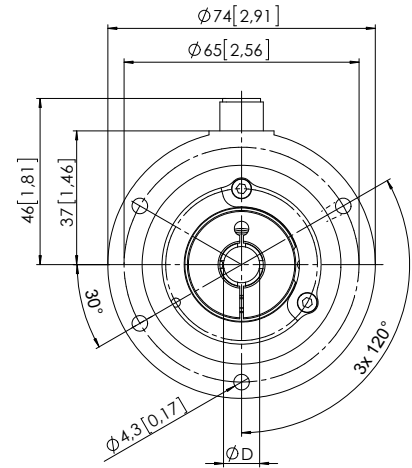
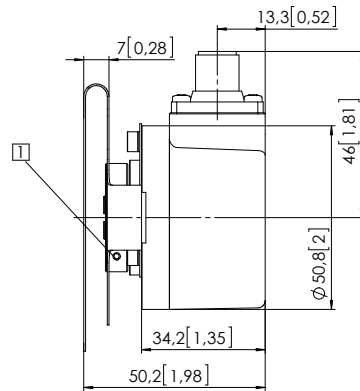
Dimensions hollow shaft version

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

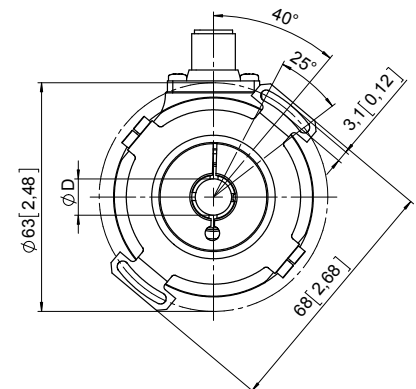
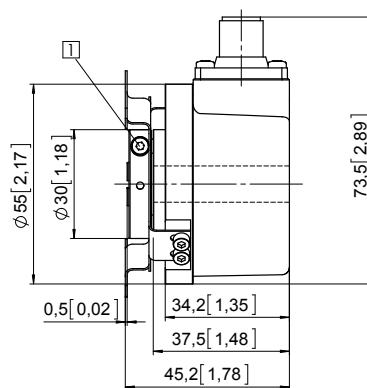
D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4"	H7
3/8"	H7
1/2"	H7
5/8"	H7



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

1 Recommended torque for the clamping ring 0.6 Nm

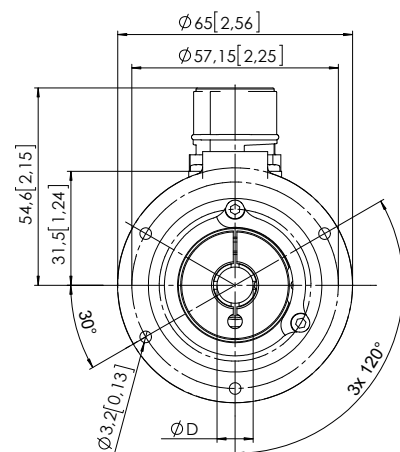
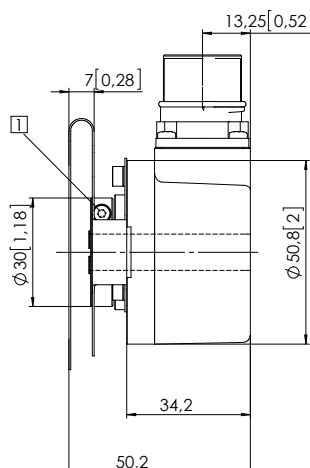
D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/4"	H7
3/8"	H7
1/2"	H7
5/8"	H7



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

1 Recommended torque for the clamping ring 0.6 Nm

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



Incremental encoders

Standard optical

Sendix 5000 / 5020 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

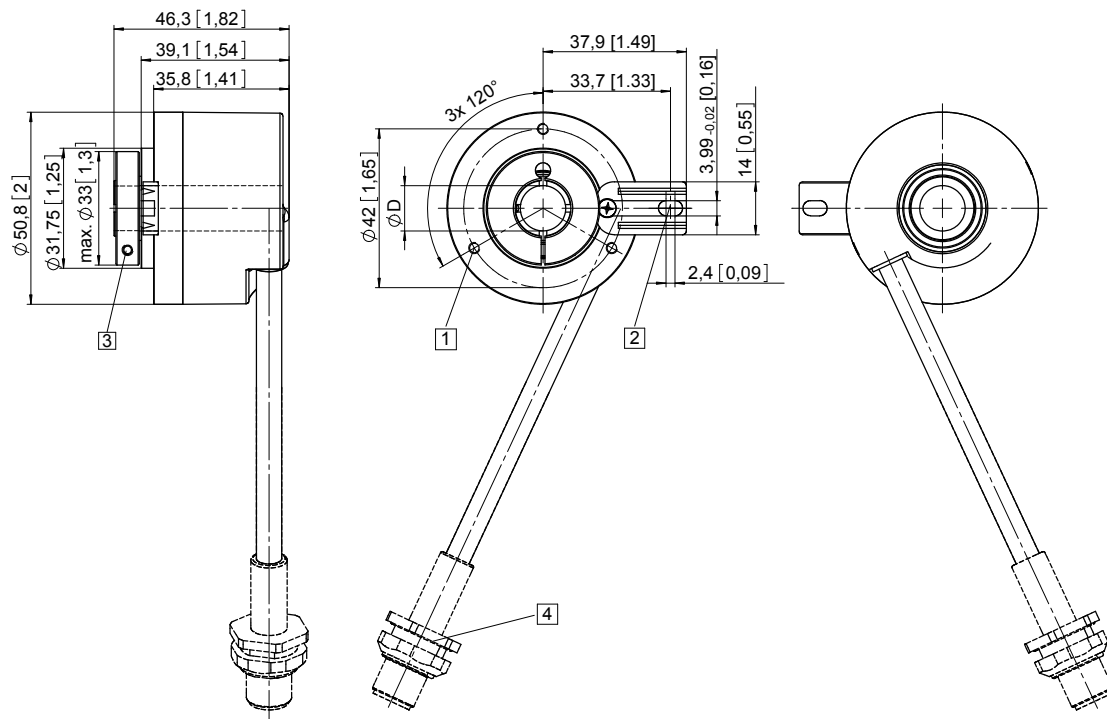
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long and tangential cable outlet

Type of connection E, F and H

- 1 3 x M3, 6 [0.24] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm
- 4 Shield is not applied on connector



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

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Standard optical	Sendix Base KIS50 / KIH50 (shaft / hollow shaft)	Push-pull / RS422 / Open collector
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The encoders Sendix Base KIS50 / KIH50 offer a protection level up to IP65 and can be used with temperatures from -20°C up to +70°C. They are ideal for use in standard applications and in simple machines.

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



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

Robust

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

Flexible

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

Order code	8.KIS50	. XXXX .	XXXX
Shaft version	Type	a b c d	e

a Flange

- 8 = clamping flange, IP65 ø 58 mm [2.28"]
- B = synchro flange, IP65 ø 58 mm [2.28"]

b Shaft (ø x L), with flat

- 1 = ø 6 x 10 mm [0.24 x 0.39"]
- 6 = ø 8 x 15 mm [0.32 x 0.59"]
- 3 = ø 10 x 20 mm [0.39 x 0.79"]
- 5 = ø 12 x 20 mm [0.47 x 0.79"]

c Output circuit / power supply

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

d Type of connection

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

e Pulse rate

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

Order code	8.KIH50	. XXXX .	XXXX
Hollow shaft	Type	a b c d	e

a Flange

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

b Through hollow shaft

- 9 = ø 8 mm [0.32"]
- 3 = ø 10 mm [0.39"]
- 5 = ø 12 mm [0.47"]
- A = ø 14 mm [0.55"]
- 8 = ø 15 mm [0.59"]

c Output circuit / power supply

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

d Type of connection

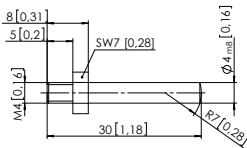
- 1 = radial cable, 1 m [3.28'] PVC
- 2 = radial M12 connector, 8-pin
- 4 = radial M23 connector, 12-pin
- E = tangential cable, 1 m [3.28'] PVC

e Pulse rate

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

Incremental encoders

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

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.1010
Mounting accessory for hollow shaft encoders		Order no.
Cylindrical pin, long for flange with spring element (flange type 2)	with fixing thread 	8.0010.4700.0000
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6041.8211.002M
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	8.0000.6901.0002
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0
	M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

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

Technical data

Mechanical characteristics			
Maximum speed	6000 min ⁻¹ 3000 min ⁻¹ (continuous)		Weight approx. 0.4 kg [14.11 oz]
Mass moment of inertia	shaft version	approx. 1.8 x 10 ⁻⁶ kgm ²	Protection acc. to EN 60529 IP65
	hollow shaft version	approx. 6 x 10 ⁻⁶ kgm ²	Working temperature range -20°C ... +70°C [-4°F ... +158°F]
Starting torque at 20°C [68°F]	< 0.01 Nm		Material shaft stainless steel
Shaft load capacity	radial	80 N	Shock resistance acc. to EN 60068-2-27 1000 m/s ² , 6 ms
	axial	40 N	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)	Open collector (7273)	Order code
	1	4	5	2	3	
Power supply	5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC	5 ... 30 V DC	
Power consumption (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA	100 mA	
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	20 mA sink at 30 V DC	
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz ¹⁾	max. 300 kHz	
Signal level	HIGH 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 2014/30/EU RoHS guideline 2011/65/EU					

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

3) Only one channel allowed to be shorted-out:
at +V=5 V DC, short-circuit to channel, 0 V, or +V is permitted.
at +V=5 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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Incremental encoders

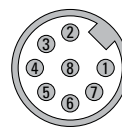
Standard optical Sendix Base KIS50 / KIH50 (shaft / hollow shaft) Push-pull / RS422 / Open collector

Terminal assignment

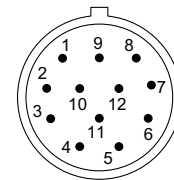
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)											
1, 2, 3, 4, 5	KIS50: 1, 2	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	KIH50: 1, E	Core color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield
Output circuit	Type of connection	M12 connector, 8-pin											
1, 2, 3, 4, 5	KIS50: 3, 4	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	KIH50: 2	Pin:	1	2			3	4	5	6	7	8	PH ¹⁾
Output circuit	Type of connection	M23 connector, 12-pin											
1, 2, 3, 4, 5	KIS50: 7, 8	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	KIH50: 4	Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾

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

Dimensions shaft version

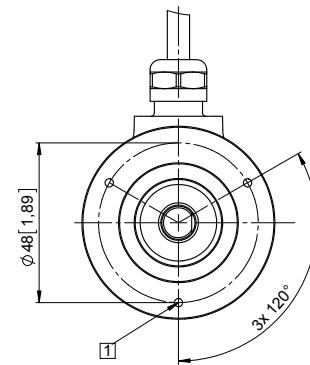
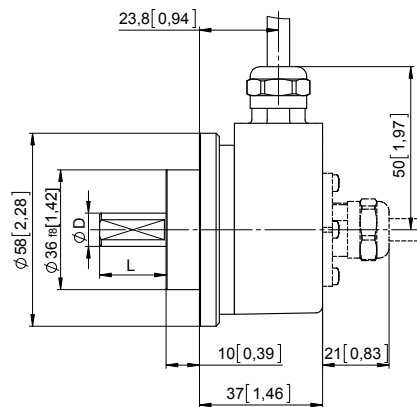
Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 8

1) 3 x M3, 6 [0.24] deep

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

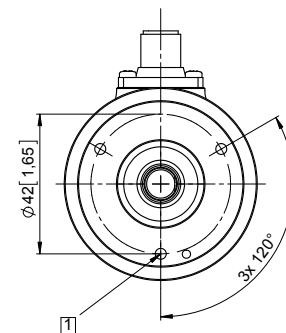
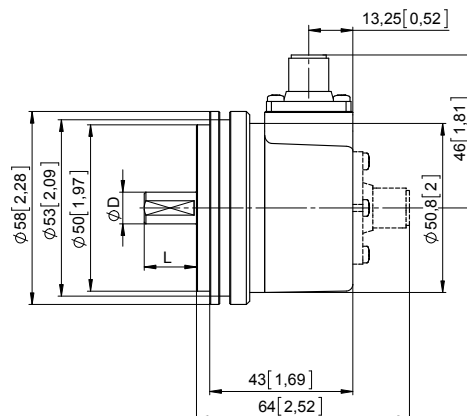


Synchro flange, \varnothing 58 [2.28]

Flange type B

1) 3 x M4, 6 [0.24] deep

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



1) PH = shield is attached to connector housing.

Incremental encoders

Standard optical

Sendix Base KIS50 / KIH50 (shaft / hollow shaft)

Push-pull / RS422 / Open collector

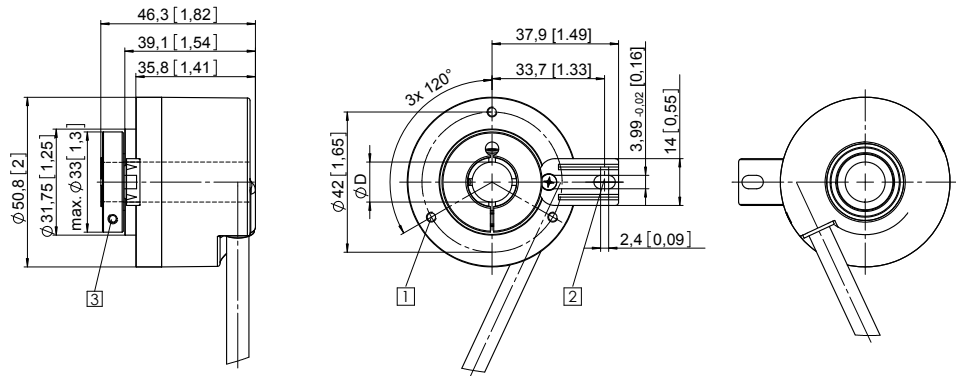
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 2

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

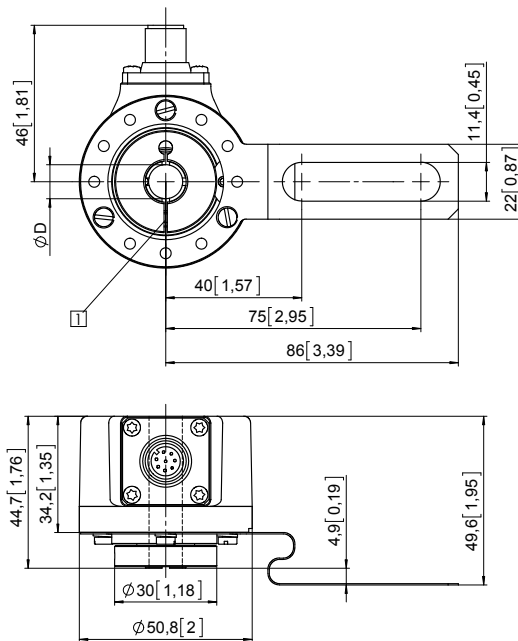
D	Fit
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7



Flange with torque stop, long Flange type 4

- 1 Recommended torque for the clamping ring 0.6 Nm

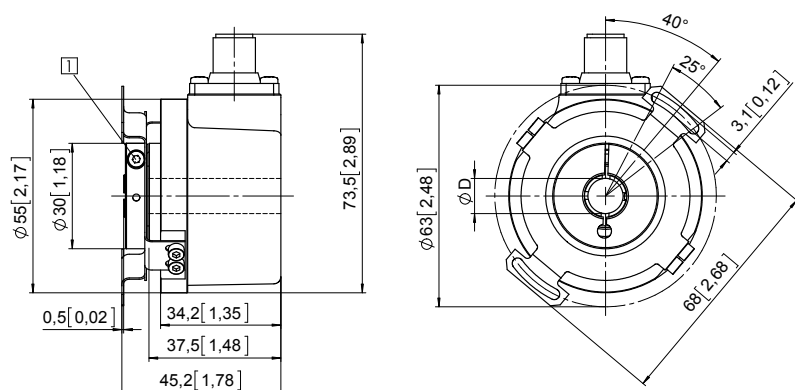
D	Fit
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7



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

- 1 Recommended torque for the clamping ring 0.6 Nm

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



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Incremental encoders

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



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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"]

b Shaft (ø x L), with flat

- 1 = ø 6 x 10 mm [0.24 x 0.39"]
- 2 = ø 10 x 20 mm [0.39 x 0.79"]
- P = ø 3/8" x 7/8" ¹⁾

c Output circuit / power supply

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

d Type of connection

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

e Pulse rate

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

Optional on request
- other pulse rates

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

Incremental encoders

Standard high temperature, optical	5803 / 5823 (shaft / hollow shaft)	Push-pull / RS422
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Order code Hollow shaft	8.5823 Type	.XXXXX a b c d e	.XXXX e
a Flange	1 = with hollow shaft and spring element, short 2 = with blind hollow shaft and spring element, short 3 = with hollow shaft and stator coupling, ϕ 65 mm [2.56"] 4 = with blind hollow shaft and stator coupling, ϕ 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
b Hollow shaft (insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])	1 = ϕ 6 mm [0.24"], IP40 2 = ϕ 6 mm [0.24"], IP66 3 = ϕ 8 mm [0.32"], IP40 4 = ϕ 8 mm [0.32"], IP66 5 = ϕ 10 mm [0.39"], IP40 6 = ϕ 10 mm [0.39"], IP66 7 = ϕ 12 mm [0.47"], IP40 8 = ϕ 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
		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)
			<i>Optional on request</i> - other pulse rates

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ϕ 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606
	bellows coupling ϕ 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 flange with spring element (flange type 1 + 2)	Dimensions in mm [inch] with fixing thread	8.0010.4700.0000

Stator coupling, ϕ 63 mm		8.0010.4D00.0000
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Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	8.0000.6E01.0002
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
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Standard high temperature, optical	5803 / 5823 (shaft / hollow shaft)	Push-pull / RS422
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Technical data

Mechanical characteristics			Electrical characteristics		
Maximum speed	shaft IP65	12000 min ⁻¹	Output circuit	RS422 (TTL compatible)	Push-pull
	hollow shaft IP40	12000 min ⁻¹	Power supply	5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC
	hollow shaft IP66 ¹⁾	6000 min ⁻¹	Power consumption (no load)	without inverted signal – typ. 55 mA / max. 125 mA with inverted signal typ. 40 mA / max. 100 mA typ. 80 mA / max. 150 mA	
Mass moment of inertia	shaft	approx. 1.8 x 10 ⁻⁶ kgm ²	Permissible load / channel	max. +/- 20 mA	max. +/- 30 mA
	hollow shaft	approx. 6.0 x 10 ⁻⁶ kgm ²	Pulse frequency	max. 300 kHz	max. 300 kHz
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	Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.5 V max. 2.0 V
	axial	40 N	Rising edge time t_r	max. 200 ns	max. 1 µs
Weight	approx. 0.4 kg [14.11 oz]				
Protection acc. to EN 60529	shaft	IP65	Falling edge time t_f	max. 200 ns	max. 1 µs
	hollow shaft without seal	IP40	Short circuit proof outputs ²⁾	yes ³⁾	yes
	hollow shaft with seal	IP66	Reverse polarity protection of the power supply	no; 10 ... 30 V DC: yes	yes
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	UL approval	file no. E224618	
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				
CE compliant acc. to			EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

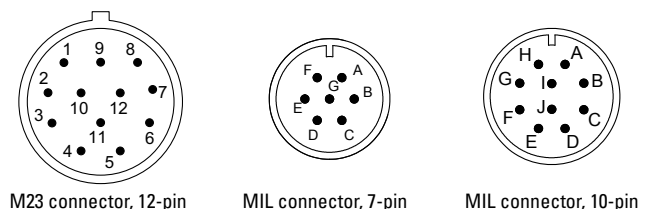
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)											
1, 2, 3, 4, 5, 6, 7	5803: 1, 2	Signal:	0 V	+V	0Vsens ⁵⁾	+Vsens ⁵⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5823: 1	Core color:	WH 0.5 mm ²	BN 0.5 mm ²	WH	BN	GN	YE	GY	PK	BU	RD	shield
1, 2, 3, 4, 5, 6, 7	5803: 3, 5	M23 connector, 12-pin											
	5823: 2	Signal:	0 V	+V	0Vsens ⁵⁾	+Vsens ⁵⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ⁴⁾
7	5803: W	MIL connector, 7-pin											
	5823: –	Signal:	0 V	+V	0Vsens ⁵⁾	+Vsens ⁵⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Pin:	F	D	–	E	A	–	B	–	C	–	G
1, 2, 3, 4, 5, 6, 7	5803: Y	MIL connector, 10-pin											
	5823: –	Signal:	0 V	+V	0Vsens ⁵⁾	+Vsens ⁵⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		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



1) For continuous operation max. 3000 min⁻¹, ventilated.
 2) If power supply correctly applied.
 3) Only one channel allowed to be shorted-out:
 if +V = 5 V DC, short-circuit to channel, 0 V, or +V is permitted.
 if +V = 10 ... 30 V DC, short-circuit to channel or 0 V is permitted.

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

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Incremental encoders

Standard
high temperature, optical

5803 / 5823 (shaft / hollow shaft)

Push-pull / RS422

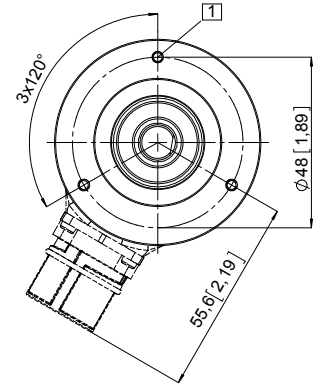
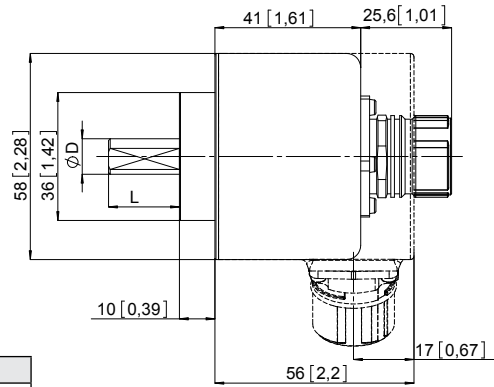
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1

1 3 x M3, 5 [0.2] deep



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

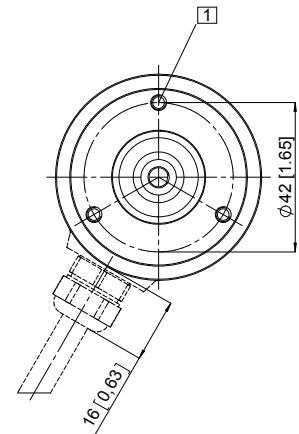
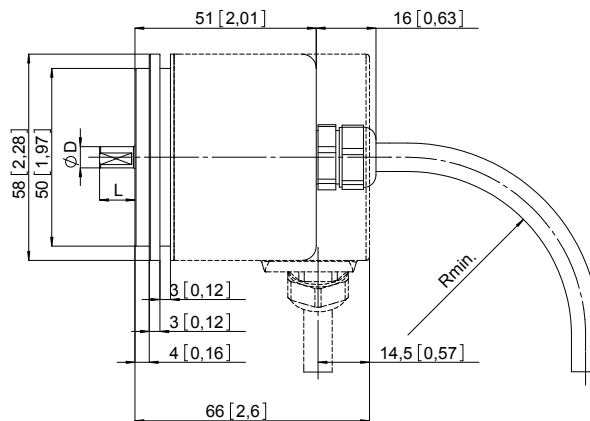
Synchro flange, \varnothing 58 [2.28]

Flange type 2

1 3 x M4, 5 [0.2] deep

R_{min}:

- securely installed: 55 [2.17]
- flexibly installed: 70 [2.76]



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

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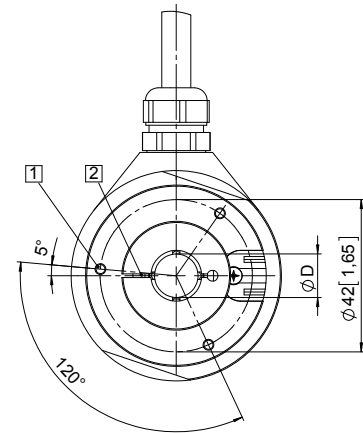
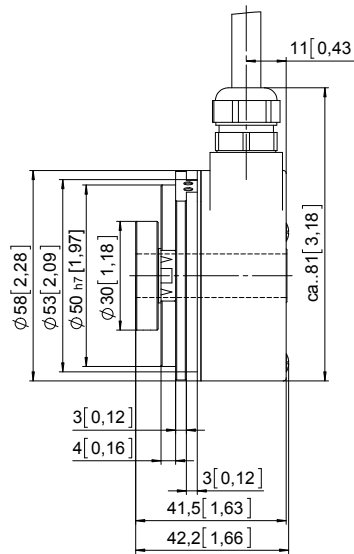
Standard high temperature, optical	5803 / 5823 (shaft / hollow shaft)	Push-pull / RS422
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1 and 2

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

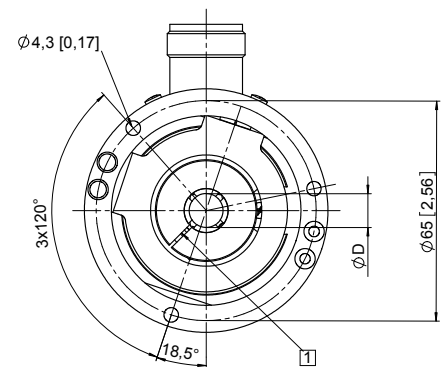
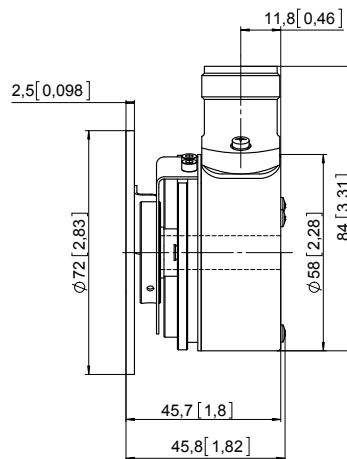


D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7

Insertion depth blind hollow shaft with flange 2:
max. 30 mm [1.18"]

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

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7

Min. insertion depth = 1.5 x D
Insertion depth blind hollow shaft with flange 4:
max. 30 mm [1.18"]

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Incremental encoders

Standard
sine wave output, with zero pulse, optical

5804 / 5824 (shaft / hollow shaft)

SinCos

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

They are ideal for use in drive engineering.

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



High rotational speed



Temperature range
-20°...+85°C



High protection level
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Optical sensor

High performance

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

Adaptable

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

Order code Shaft version

8.5804 . XXXXX . XXXX
Type a b c d e

a Flange

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

b Shaft (ø x L), with flat

- 1 = ø 6 x 10 mm [0.24 x 0.39"]
- 2 = ø 10 x 20 mm [0.39 x 0.79"]

c Output circuit / power supply

- 1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
- 2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC

d Type of connection

- 1 = axial cable, 1 m [3.28'] TPE
- 2 = radial cable, 1 m [3.28'] TPE
- 3 = axial M23 connector, 12-pin, without mating connector
- 5 = radial M23 connector, 12-pin, without mating connector

e Pulse rate

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

Optional on request
- other pulse rates

Order code Hollow shaft

8.5824 . XXXXX . XXXX
Type a b c d e

a Flange

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

b Hollow shaft

(insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])

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

c Output circuit / power supply

- 1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
- 2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC

d Type of connection

- 1 = radial cable, 1 m [3.28'] TPE
- 2 = radial M23 connector, 12-pin, without mating connector

e Pulse rate

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

Optional on request
- other pulse rates

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 \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 flange with spring element (flange type 1 + 2)	with fixing thread		8.0010.4700.0000
Stator coupling, \varnothing 63 mm [2.48"]			8.0010.4D00.0000
Connection technology			Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin		8.0000.6E01.0002
	2 m [6.56'] PVC cable		
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin		8.0000.5012.0000

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

Technical data			
Mechanical characteristics			
Maximum Speed	shaft IP65	12000 min ⁻¹	
	hollow shaft IP40	12000 min ⁻¹	
	hollow shaft IP66 ¹⁾	6000 min ⁻¹	
Mass moment of inertia	shaft	approx. 1.8 x 10 ⁻⁶ kgm ²	
	hollow shaft	approx. 6.0 x 10 ⁻⁶ kgm ²	
Starting torque – at 20°C [68°F]	shaft IP65 / hollow shaft IP40	< 0.01 Nm	
	hollow shaft IP66	< 0.05 Nm	
Load capacity of shaft	radial	80 N	
	axial	40 N	
Weight		approx. 0.4 kg [14.11 oz]	
Protection acc. to EN 60529	shaft	IP65	
	hollow shaft without seal	IP40	
	hollow shaft with seal	IP66	
Working temperature range	shaft IP65 / hollow shaft IP40	-20°C ... +85°C [-4°F ... +185°F] ²⁾	
	hollow shaft IP66	-20°C ... +80°C [-4°F ... +176°F] ²⁾	
Material	shaft	stainless steel H7	
Shock resistance acc. EN 60068-2-27		1000 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz	
Electrical characteristics			
Output circuit		SinCos, U = 1 Vpp	SinCos, U = 1 Vpp
Power supply		5 V DC ($\pm 5\%$)	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 ($\pm 20\%$)	1 Vpp ($\pm 20\%$)
	channel 0	0.1 ... 1.2 V	0.1 ... 1.2 V
Short circuit proof outputs ³⁾		yes	yes
Reverse polarity protection of the power supply		no	yes
UL approval		file no. E224618	
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

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

Incremental encoders

Standard sine wave output, with zero pulse, optical

5804 / 5824 (shaft / hollow shaft)

SinCos

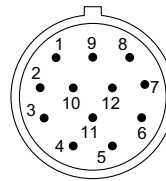
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores 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	Core color:	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	5804: 3, 5	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
	5824: 2	Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾	

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

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

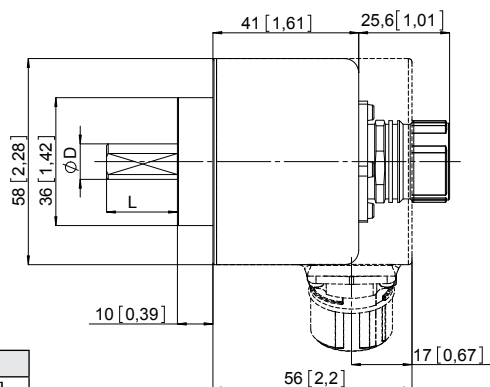
Dimensions shaft version

Dimensions in mm [inch]

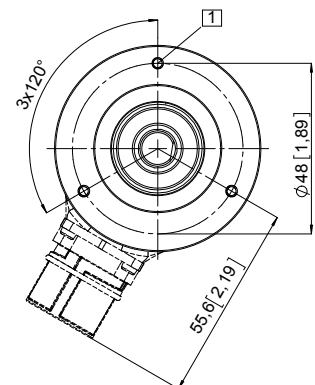
Clamping flange, \varnothing 58 [2.28]

Flange type 1

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



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

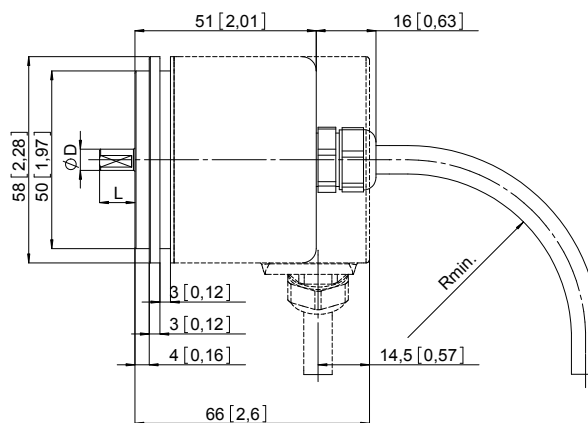


Synchro flange, \varnothing 58 [2.28]

Flange type 2

- 1) 3 x M4, 5 [0.2] deep

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



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

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

Incremental encoders

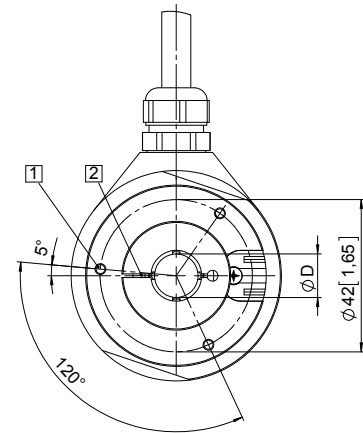
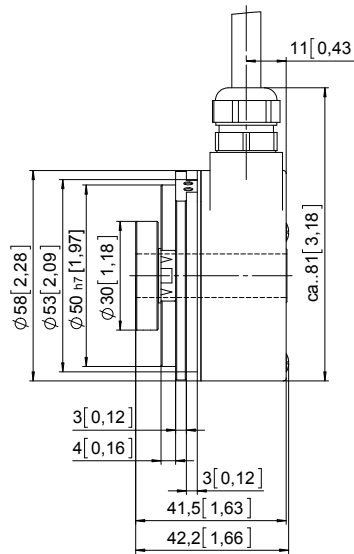
Standard sine wave output, with zero pulse, optical	5804 / 5824 (shaft / hollow shaft)	SinCos
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1 and 2

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

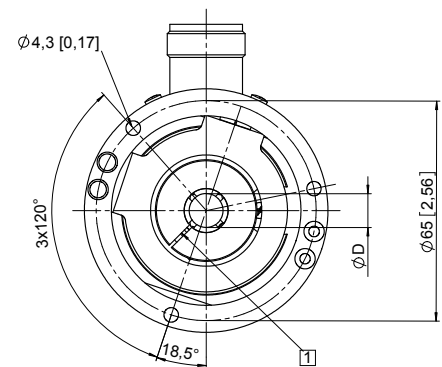
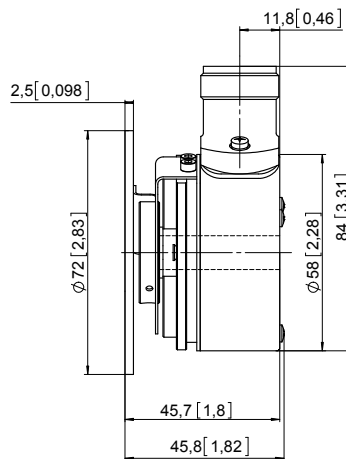


D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7

Insertion depth blind hollow shaft with flange 2:
max. 30 mm [1.18"]

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

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7

Min. insertion depth = 1.5 x D
Insertion depth blind hollow shaft with flange 4:
max. 30 mm [1.18"]

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

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 . XXXX
Shaft version Type a b c d e

- | | | |
|---|---|--|
| <p>a Flange
1 = clamping flange, IP65, \varnothing 58 mm [2.28"]</p> <p>b Shaft ($\varnothing \times L$)
2 = 10 x 20 mm [0.39 x 0.79"], with flat</p> <p>c Output circuit / power supply
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC</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 *)
5 = axial M12 connector, 8-pin
6 = radial M12 connector, 8-pin</p> <p>*) 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)</p> | <p>e Pulse rate
1024, 2048</p> <p><i>Optional on request</i>
- Ex 2/22 ¹⁾
- surface protection salt spray tested</p> |
|---|---|--|

Order code 8.5834 . X X X X . XXXX
Hollow shaft Type a b c d e

- | | | |
|--|--|--|
| <p>a Flange
1 = with spring element, long, IP65
5 = with stator coupling, IP65, \varnothing 63 mm [2.48"]</p> <p>b Through hollow shaft
3 = \varnothing 10 mm [0.39"]
4 = \varnothing 12 mm [0.47"]
5 = \varnothing 14 mm [0.55"]
6 = \varnothing 15 mm [0.59"]
8 = \varnothing 3/8"
9 = \varnothing 1/2"
<i>Tapered shaft</i>
K = \varnothing 10 mm [0.39"]</p> | <p>c Output circuit / power supply
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC</p> <p>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</p> <p>*) 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)</p> | <p>e Pulse rate
1024, 2048</p> <p><i>Optional on request</i>
- Ex 2/22
(not for type of connection E, F) ¹⁾
- surface protection salt spray tested</p> |
|--|--|--|

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

Incremental encoders

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

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

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

Technical data

Mechanical characteristics		
Maximum speed	IP65	12000 min ⁻¹ , 5000 min ⁻¹ (continuous)
	IP67	8000 min ⁻¹ , 2000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft	4.0 x 10 ⁻⁶ kgm ²
	hollow shaft	7.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	approx. 0.45 kg [15.85 oz]	
Protection acc. to EN 60529	IP65	
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ¹⁾	
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27	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 no. E224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

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

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)							
1, 2	1, 2, A, B, E, F	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Core color:	WH	BN	GN	YE	GY	PK	shield
Output circuit	Type of connection	M12 connector, 8-pin							
1, 2	5, 6	Signal:	0 V	+V	A	\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.

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Incremental encoders

Standard
sine wave output, highly interpolable, optical

Sendix 5814 / 5834 (shaft / hollow shaft)

SinCos

Dimensions shaft version

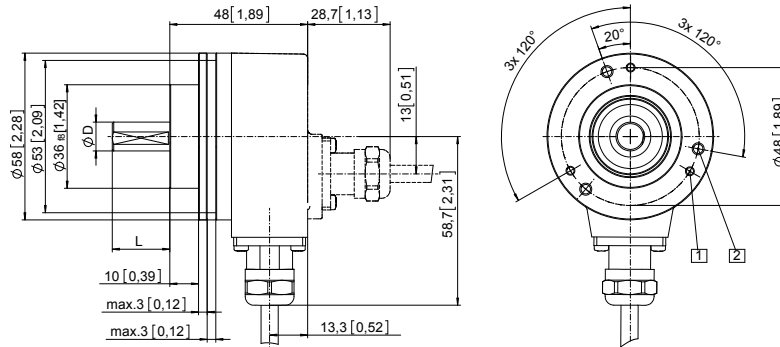
Dimensions in mm [inch]

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	Fit	L
10 [0.39]	f7	20 [0.79]

Dimensions hollow shaft version

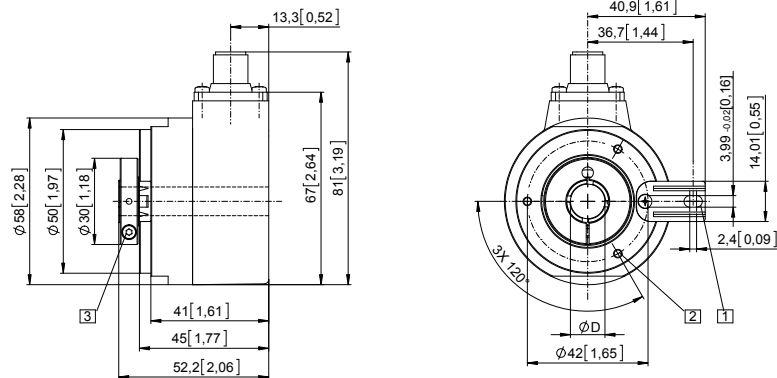
Dimensions in mm [inch]

Flange with spring element, long

Flange type 1

(drawing with M12 connector)

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



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

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Incremental encoders

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

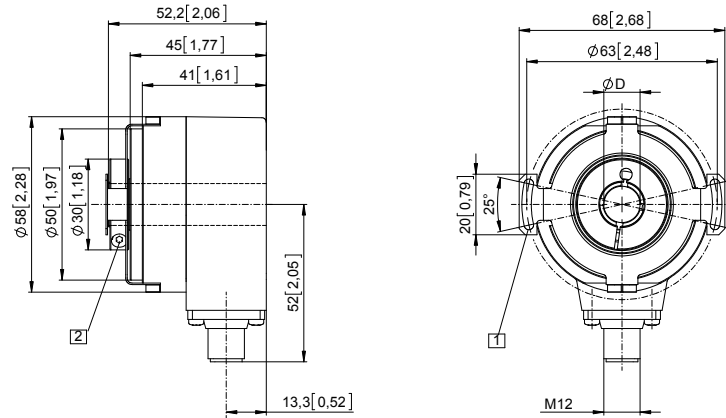
Dimensions in mm [inch]

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

Flange type 5

(drawing with M12 connector)

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



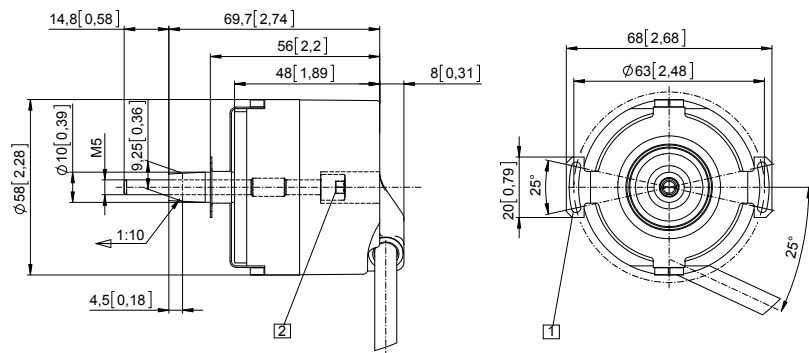
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7

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

Flange type 5

(drawing with tangential cable outlet)

- 1 For (4x) M3 screw
- 2 SW 4



Incremental encoders

**Standard
Motor-Line, optical**

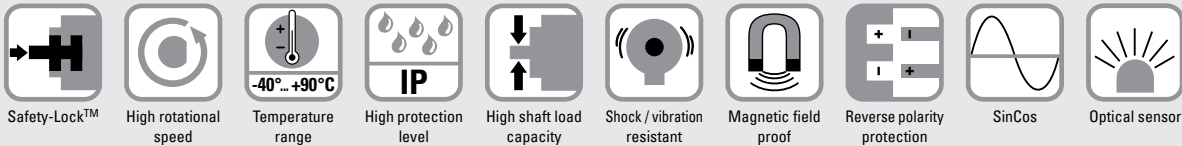
Sendix 5834 (tapered shaft)

SinCos



The incremental encoder Sendix 5834 with SinCos interface is particularly suited for applications in the field of Drive and Elevator Technology.

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



Powerful

- With incremental SinCos tracks.
- Very high signal quality.
- Encoder specially designed for mounting on direct drives in the elevator technology.

Flexible

- Stator coupling or expanding coupling.
- Cable or PCB-conductor.
- 1024 or 2048 ppr.

**Order code
Tapered shaft**

8.5834
Type

. X K X X . XXXX
a b c d e

a Flange
G = with stator coupling, IP65, ø 72 mm [2.83"]
H = with expanding coupling, IP65, ø 65 mm [2.56"]

b Tapered shaft
K = ø 10 mm [0.39"]

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

d Type of connection
E = tangential cable, 1 m PVC
F = tangential cable, length PVC see below *)
L = with PCB connector
(without cable, including sealing cap for tangential cable outlet)

*) Available lengths (connection type F):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5834.GK2F.1024.0030 (for cable length 3 m)

e Pulse rate
1024, 2048

Connection technology

Order no.

Cordset, pre-assembled
(suitable for type of connection L)

PCB connector (female contacts), 12-pin
2 m [6.56'] PVC cable

8.0000.6D91.0002.0097

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.

Product overview
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Linear measuring technology

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Accessories

Addresses

Incremental encoders

Standard Motor-Line, optical	Sendix 5834 (tapered shaft)	SinCos
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Technical data

Mechanical characteristics		
Maximum speed	12000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
Starting torque – at 20°C [68°F]	< 0.01 Nm	
Mass moment of inertia	3.0 x 10 ⁻⁶ kgm ²	
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	approx. 0.45 kg [15.85 oz]	
Protection acc. to EN 60529	IP65	
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ¹⁾	
Materials	tapered shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6	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 no. E224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

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

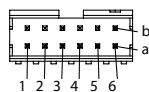
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)							
1, 2	E, F	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Core color:	WH	BN	GN	YE	GY	PK	shield

Output circuit	Type of connection	PCB connector (male contact), 12-pin													
1, 2	L	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	d.n.c.	d.n.c.	d.n.c.	d.n.c.	d.n.c.	d.n.c.	
		Pin:	4b	1b	2a	5b	4a	3b	1a	2b	3a	5a	6a	6b	

- +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
- d.n.c.: do not connect (used internally)

Top view of mating side, male contact base

Type of connection L
FCI Minitek connector (male contact),
double-row, 12-pin (98424-F52-12-LF)



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

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Incremental encoders

**Standard
Motor-Line, optical**

Sendix 5834 (tapered shaft)

SinCos

Dimensions tapered shaft version

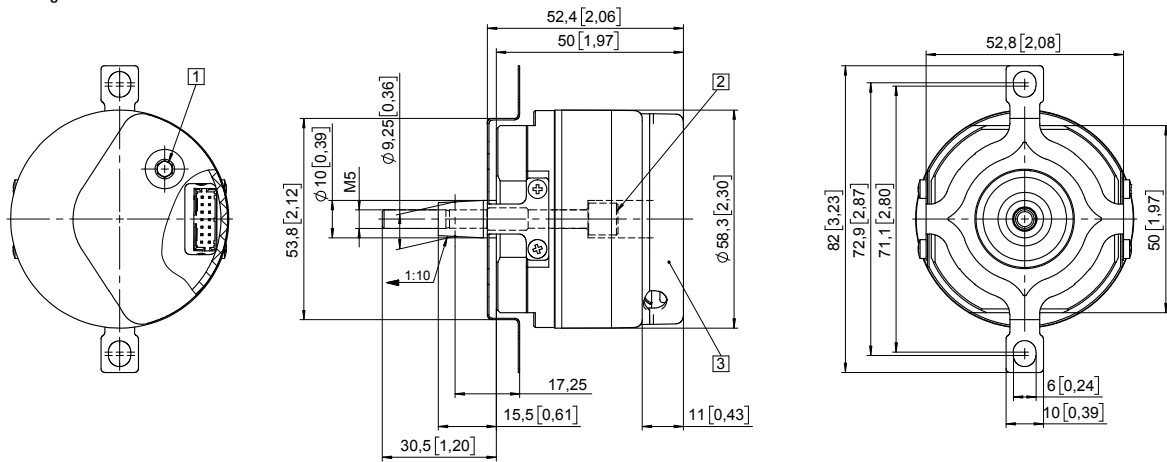
Dimensions in mm [inch]

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

Flange type G

(with tapered shaft K and PCB connector)

- 1 Recommended torque for screw M6 (SW 4) $2.0^{+0.5}$ Nm
- 2 Recommended torque for tightening screw M6 (SW 4) $3.0^{+0.5}$ Nm
- 3 Sealing cap for tangential cable outlet



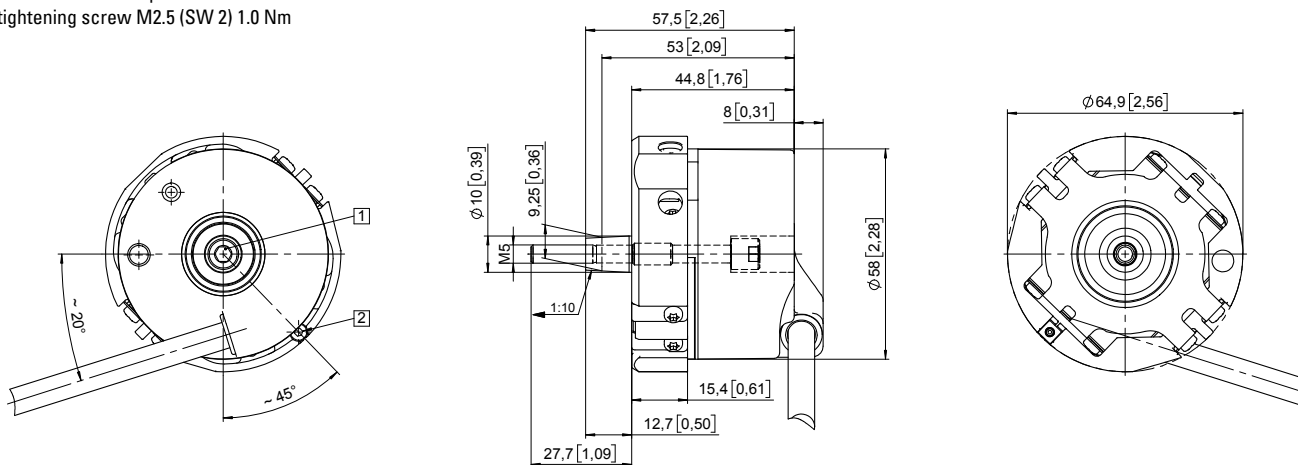
Flange with expanding coupling,

$\varnothing 65$ [2.56"]

Flange type H

(with tapered shaft K and tangential cable)

- 1 Recommended torque for tightening screw M6 (SW 4) $3.0^{+0.5}$ Nm
- 2 Recommended torque for tightening screw M2.5 (SW 2) 1.0 Nm



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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.



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	8.5814FS2	. 1 XXX . XXXX
Shaft version	Type	a b c d e

- a Flange**
1 = clamping flange, IP65, ø 58 mm [2.28"]
- b Shaft (ø x L)**
2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key
- c Output circuit / power supply**
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

- d Type of connection**
1 = axial cable, 1 m [3.28'] PVC
A = axial cable, special length PVC *)
2 = radial cable, 1 m [3.28'] PVC
B = radial cable, special length PVC *)
3 = axial M23 connector, 12-pin
4 = radial M23 connector, 12-pin
5 = axial M12 connector, 8-pin
6 = radial M12 connector, 8-pin
- *) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5814FS2.122A.2048.0030 (for cable length 3 m)

- e Pulse rate**
1024, 2048
- Optional on request*
- Ex 2/22 ¹⁾

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

Incremental encoders

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

Order code Hollow shaft	8.5834FS2 Type	.XXXXX a b c d e	.XXXX e
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"]	i Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12-pin 6 = radial M12 connector, 8-pin *) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5834FS2.B42B.2048.0030 (for cable length 3 m)	e Pulse rate 1024, 2048 <i>Optional on request</i> - Ex 2/22 (not for connection type E + F) ¹⁾	
b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] <i>Tapered shaft</i> K = ø 10 mm [0.39"]			
c Output circuit / power supply 1 = SinCos / 5 V DC 2 = SinCos / 10 ... 30 V DC			

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

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

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

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

Technical data

Notes regarding "Functional Safety"
These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.

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

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

Incremental encoders

Standard sine wave output, SIL2/PLd, optical	Sendix SIL 5814FS2 / 5834FS2 (shaft / hollow shaft)	SinCos
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Mechanical characteristics	
Maximum speed, shaft version	
up to 70°C [158°F]	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)
up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed, hollow shaft version	
up to 70°C [158°F]	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)
up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	
shaft version	< 0.01 Nm
hollow shaft version	< 0.03 Nm
Mass moment of inertia	
shaft version	4.0 x 10 ⁻⁶ kgm ²
hollow shaft version	7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft	
hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	
radial	80 N
axial	40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ¹⁾
Materials	
shaft / hollow shaft	stainless steel
flange	aluminum
housing	zinc die-cast
cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Power consumption (no load)	5 V DC max. 70 mA 10 ... 30 V DC max. 45 mA
Reverse polarity protection of the power supply	yes
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

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

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±10 %)
Short circuit proof	yes ²⁾
Pulse rate	1024 / 2048 ppr

Terminal assignment

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

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

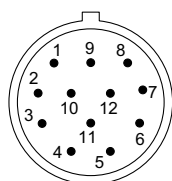
Output circuit	Type of connection	M12 connector, 8-pin							
1, 2	5, 6	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Pin:	1	2	3	4	5	6	PH ³⁾

- +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



M23 connector, 12-pin

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

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Incremental encoders

Standard
sine wave output, SIL2/PLd, optical

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

SinCos

Dimensions shaft version

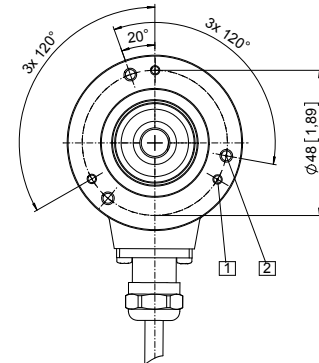
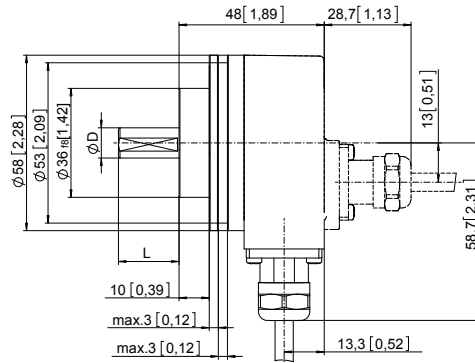
Dimensions in mm [inch]

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



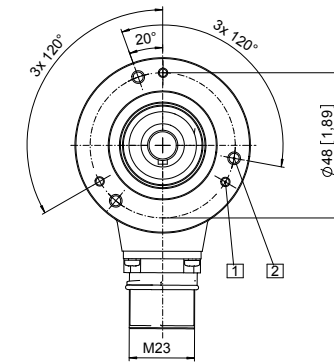
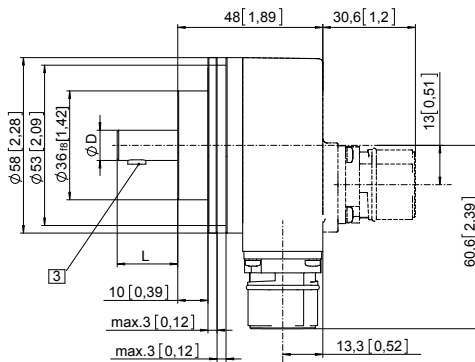
D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 with shaft type A

(drawing with M23 connector)

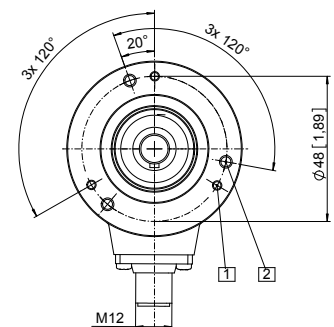
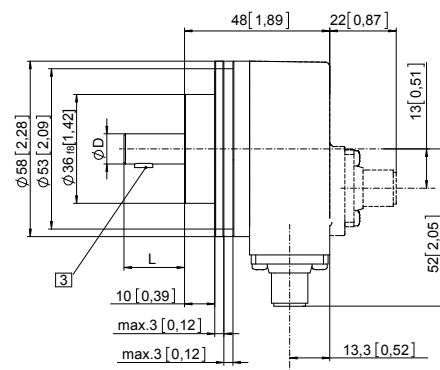
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



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

(drawing with M12 connector)

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



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

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

Dimensions in mm [inch]

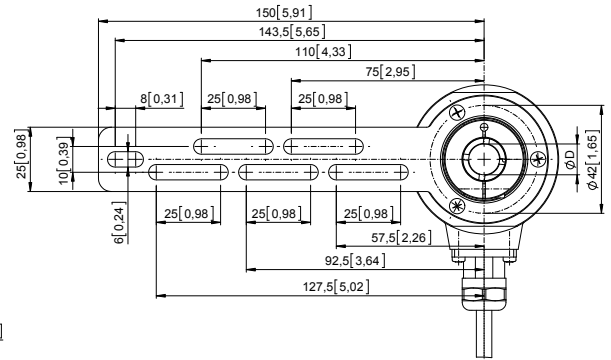
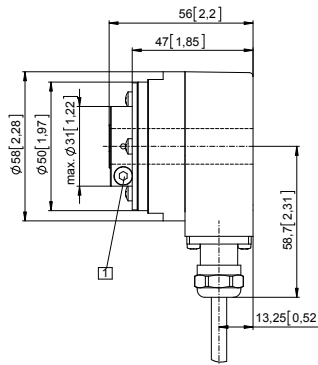
Flange with torque stop set, rigid

Flange type A

Through hollow shaft

(drawing with cable)

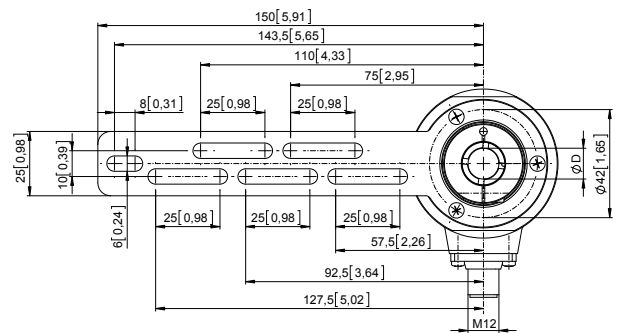
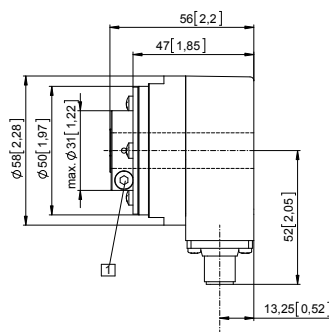
- SW 3, recommended torque for the clamping ring 2.5 Nm



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

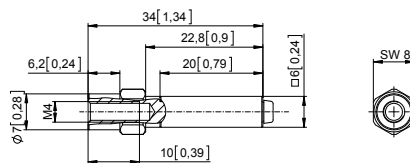
(drawing with M12 connector)

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



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

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



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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]

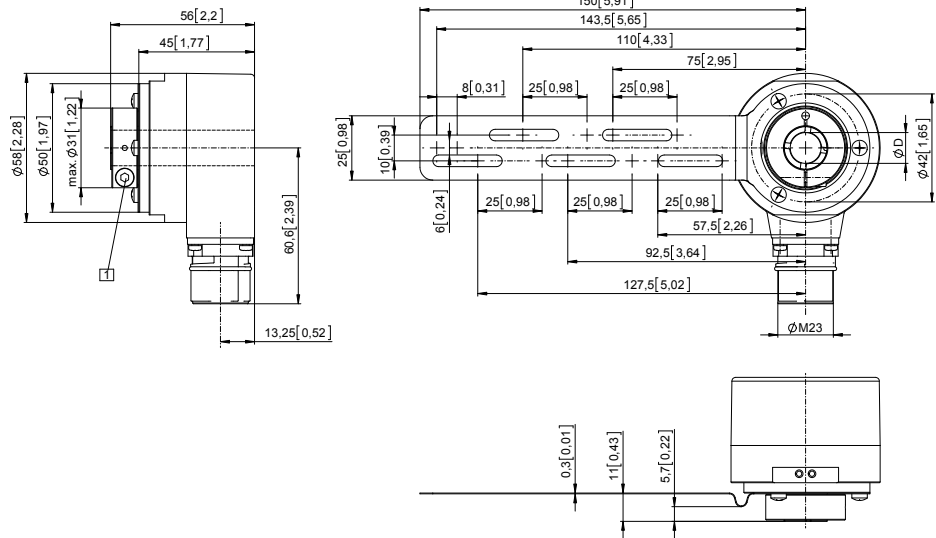
Flange with torque stop, flexible

Flange type 9

Through hollow shaft

(drawing with M23 connector)

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



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

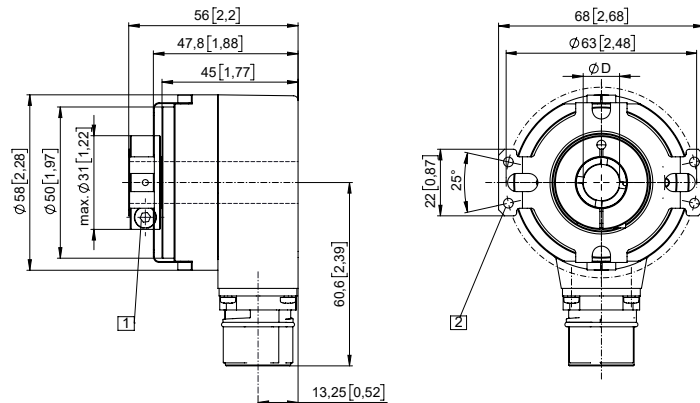
Flange with stator coupling, ø 63 [2.48]

Flange type B

Through hollow shaft

(drawing with M23 connector)

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



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

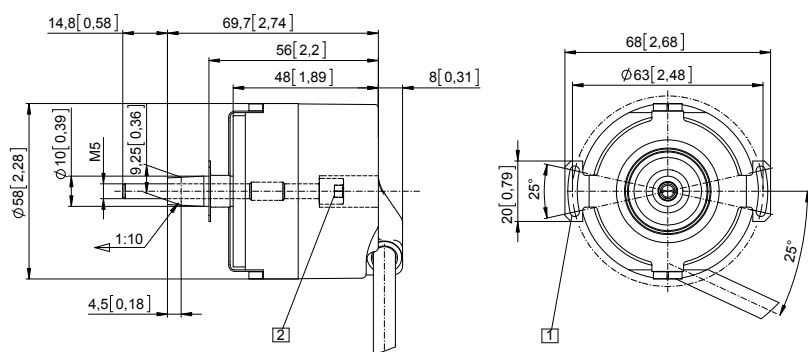
Flange with stator coupling, ø 63 [2.48]

Flange type B

Tapered shaft

(drawing with tangential cable outlet)

- 1 For (4x) M3 screw
- 2 Recommended torque for (SW 4) tightening screw 3^{+0.5} Nm



Incremental encoders

Standard sine wave output, SIL3/PLe, optical	Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)	SinCos
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The incremental encoders 5814FS3 and 5834FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

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



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

Functional Safety

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

Flexible

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

Order code	8.5814FS3	. 1 XXX . XXXX
Shaft version	Type	a b c d e

a Flange

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

b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat
A = 10 x 20 mm [0.39 x 0.79"], with feather key

c Output circuit / power supply

1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

d Type of connection

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

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

e Pulse rate

1024, 2048

Optional on request
- Ex 2/22 ¹⁾

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

Incremental encoders

Standard sine wave output, SIL3/PLe, optical	Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)	SinCos
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Order code Hollow shaft	8.5834FS3 Type	.XXXX a b c d e	.XXXX e
a Flange 9 = with torque stop, flexible, IP65 A = with torque stop set, rigid, IP65 B = with stator coupling, IP65, ø 63 mm [2.48"]	b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] <i>Tapered shaft</i> K = ø 10 mm [0.39"]	c Output circuit / power supply 1 = SinCos / 5 V DC 2 = SinCos / 10 ... 30 V DC	d Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12-pin 6 = radial M12 connector, 8-pin *) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5834FS3.B42B.2048.0030 (for cable length 3 m)
			e Pulse rate 1024, 2048 <i>Optional on request</i> - Ex 2/22 (not for connection type E + F) ¹⁾

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

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

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

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

Technical data	
Notes regarding "Functional Safety"	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)
	PFH_d value ³⁾ 1.09 x 10 ⁻⁸ h ⁻¹
	Mission time / Proof test interval 20 years
	Relevant standards EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

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

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Addresses

Incremental encoders

Standard sine wave output, SIL3/PLe, optical	Sendix SIL 5814FS3 / 5834FS3 (shaft / hollow shaft)	SinCos
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Mechanical characteristics	
Maximum speed, shaft version	
up to 70°C [158°F]	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)
up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed, hollow shaft version	
up to 70°C [158°F]	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)
up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	
shaft version	< 0.01 Nm
hollow shaft version	< 0.03 Nm
Mass moment of inertia	
shaft version	4.0 x 10 ⁻⁶ kgm ²
hollow shaft version	7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft	
hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft	
radial	80 N
axial	40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ¹⁾
Materials	
shaft / hollow shaft	stainless steel
flange	aluminum
housing	zinc die-cast
cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Power consumption (no load)	5 V DC max. 70 mA 10 ... 30 V DC max. 45 mA
Reverse polarity protection of the power supply	yes
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

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

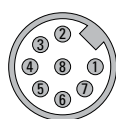
SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (±10 %)
Short circuit proof	yes ²⁾
Pulse rate	1024 / 2048 ppr

Terminal assignment

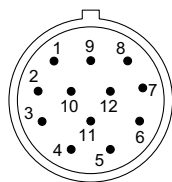
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)							
1, 2	1, 2, A, B, E, F	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Core color:	WH	BN	GN	YE	GY	PK	shield
Output circuit	Type of connection	M23 connector, 12-pin							
1, 2	3, 4	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Pin:	10	12	5	6	8	1	PH ³⁾
Output circuit	Type of connection	M12 connector, 8-pin							
1, 2	5, 6	Signal:	0 V	+V	A	\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



M23 connector, 12-pin

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

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclinoimeters
 Connection technology
 Accessories
 Addresses

Incremental encoders

Standard
sine wave output, SIL3/PLe, optical

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

SinCos

Dimensions shaft version

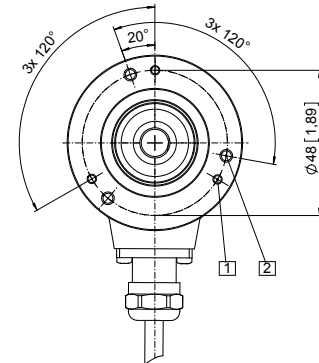
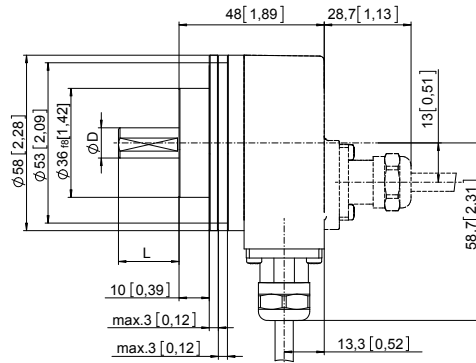
Dimensions in mm [inch]

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



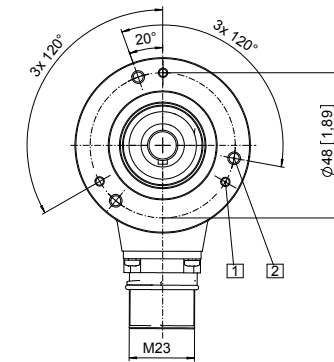
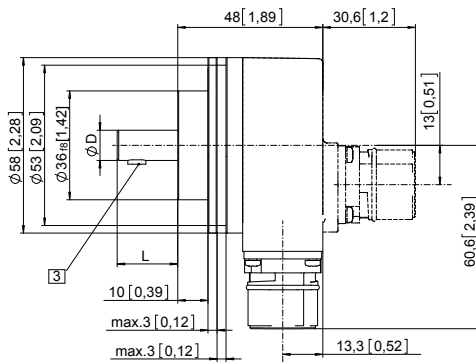
D	Fit	L
10 [0.39]	f7	20 [0.79]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 with shaft type A

(drawing with M23 connector)

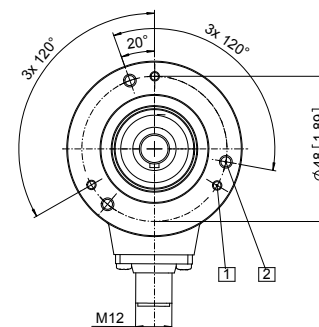
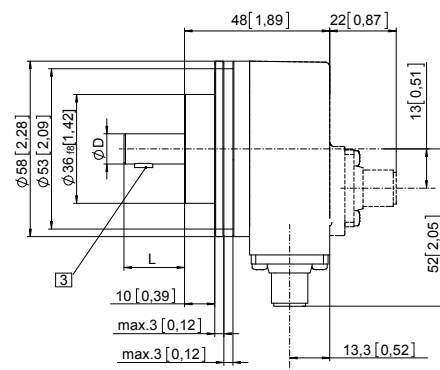
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



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

(drawing with M12 connector)

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



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

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

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Incremental encoders

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

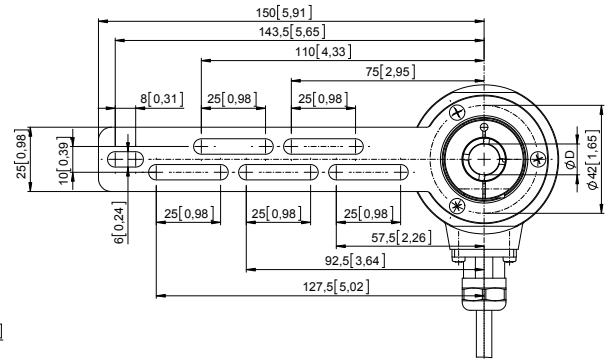
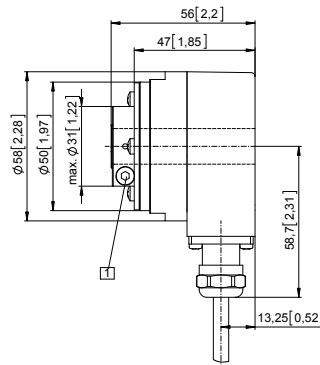
Dimensions in mm [inch]

Flange with torque stop set, rigid

Flange type A

Through hollow shaft
(drawing with cable)

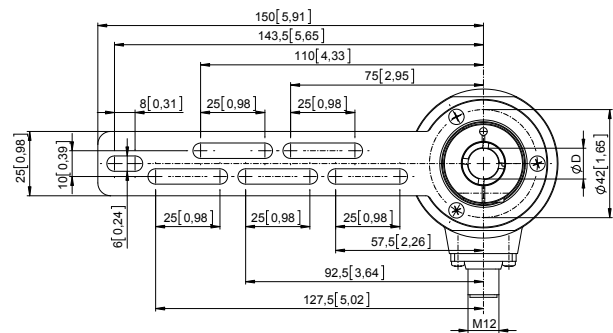
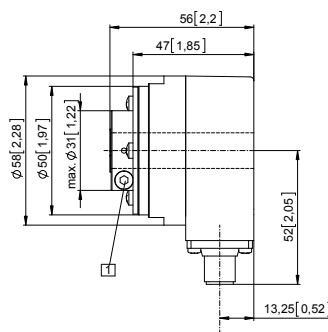
SW 3, recommended torque for the clamping ring 2.5 Nm



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

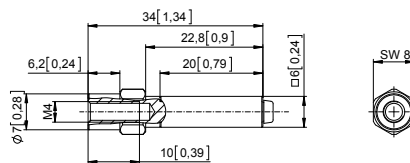
(drawing with M12 connector)

SW 3, recommended torque for the clamping ring 2.5 Nm



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

Torque pin with rectangular sleeve with M4 thread



Product overview
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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]

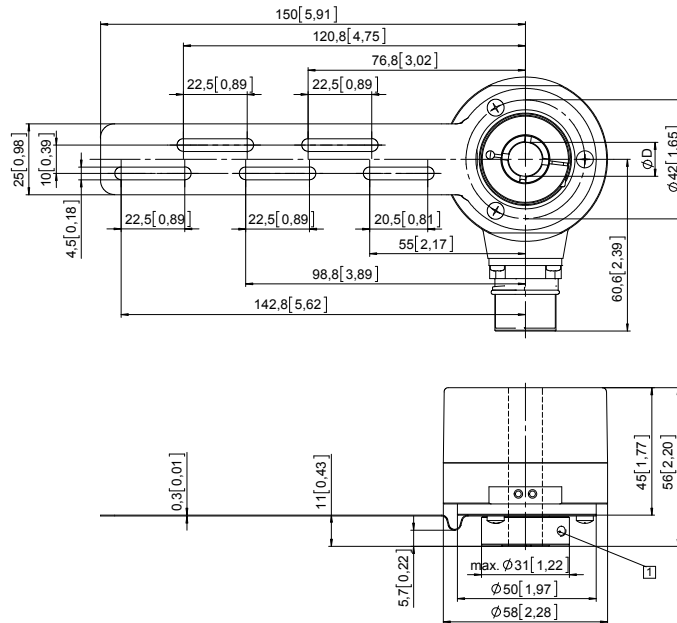
Flange with torque stop, flexible

Flange type 9

Through hollow shaft

(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm



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

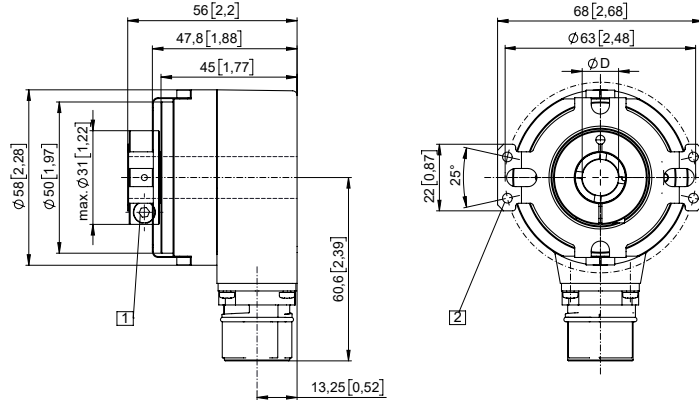
Flange with stator coupling, Ø 63 [2.48]

Flange type B

Through hollow shaft

(drawing with M23 connector)

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



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

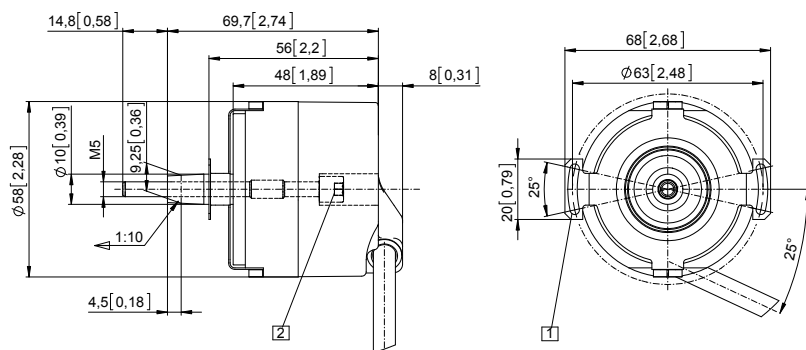
Flange with stator coupling, Ø 63 [2.48]

Flange type B

Tapered shaft

(drawing with tangential cable outlet)

- 1 For (4x) M3 screw
- 2 Recommended torque for (SW 4) tightening screw 3^{+0.5} Nm



Incremental encoders

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

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

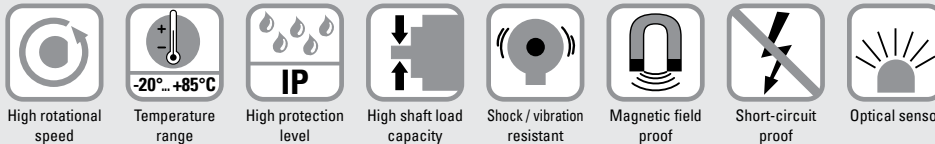
Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses



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.

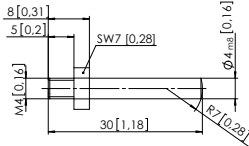
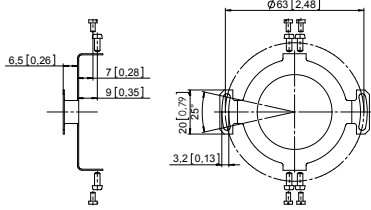
Order code	8.5805	.	X	X	X	X	.	X	X	X	X	X
Shaft version	Type		a	b	c	d		e				

- | | | |
|---|--|--|
| <p>a Flange</p> <p>1 = clamping flange ø 58 mm [2.28"]</p> <p>2 = synchro flange ø 58 mm [2.28"]</p> <p>b Shaft (ø x L), with flat</p> <p>1 = ø 6 x 10 mm [0.24 x 0.39"]</p> <p>2 = ø 10 x 20 mm [0.39 x 0.79"]</p> | <p>c Output circuit / power supply</p> <p>4 = RS422 (with inverted signal) / 5 V DC</p> <p>5 = RS422 (with inverted signal) / 10 ... 30 V DC</p> <p>6 = push-pull (with inverted signal) / 10 ... 30 V DC</p> <p>7 = push-pull (without inverted signal) / 10 ... 30 V DC</p> <p>d Type of connection</p> <p>1 = axial cable, 1 m [3.28'] PUR</p> <p>2 = radial cable, 1 m [3.28'] PUR</p> <p>3 = axial M23 connector, 12-pin, without mating connector</p> <p>5 = radial M23 connector, 12-pin, without mating connector</p> <p>T = axial M12 connector, 8-pin</p> <p>G = radial M12 connector, 8-pin</p> | <p>e Pulse rate</p> <p>6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 (e.g. 18000 pulses => 18000)</p> <p><i>Optional on request</i></p> <p>- other pulse rates</p> |
|---|--|--|

Order code	8.5825	.	X	X	X	X	.	X	X	X	X	X
Hollow shaft	Type		a	b	c	d		e				

- | | | |
|---|---|--|
| <p>a Flange</p> <p>1 = with hollow shaft and spring element, short</p> <p>2 = with blind hollow shaft and spring element, short</p> <p>3 = with hollow shaft and stator coupling, ø 65 mm [2.56"]</p> <p>4 = with blind hollow shaft and stator coupling, ø 65 mm [2.56"]</p> <p>b Hollow shaft (insertion depth blind hollow shaft with flange 2 and 4 max. 30 mm [1.18"])</p> <p>1 = ø 6 mm [0.24"], IP40</p> <p>2 = ø 6 mm [0.24"], IP66</p> <p>3 = ø 8 mm [0.32"], IP40</p> <p>4 = ø 8 mm [0.32"], IP66</p> <p>5 = ø 10 mm [0.39"], IP40</p> <p>6 = ø 10 mm [0.39"], IP66</p> <p>7 = ø 12 mm [0.47"], IP40</p> <p>8 = ø 12 mm [0.47"], IP66</p> | <p>c Output circuit / power supply</p> <p>1 = RS422 (with inverted signal) / 5 V DC</p> <p>4 = RS422 (with inverted signal) / 10 ... 30 V DC</p> <p>2 = push-pull (without inverted signal) / 10 ... 30 V DC</p> <p>3 = push-pull (with inverted signal) / 10 ... 30 V DC</p> <p>d Type of connection</p> <p>1 = radial cable, 1 m [3.28'] PVC</p> <p>2 = radial M23 connector, 12-pin, without mating connector</p> <p>C = radial M12 connector, 8-pin</p> | <p>e Pulse rate</p> <p>6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 (e.g. 18000 pulses => 18000)</p> <p><i>Optional on request</i></p> <p>- other pulse rates</p> |
|---|---|--|

Incremental encoders

Standard high resolution, optical		5805 / 5825 (shaft / hollow shaft)	Push-pull / RS422
Mounting accessory for shaft encoders			Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1102.0606
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]		8.0000.1102.1010
Mounting accessory for hollow shaft encoders			Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	Dimensions in mm [inch]		8.0010.4700.0000
	with fixing thread 		
Stator coupling, ø 63 mm [2.48"]			8.0010.4D00.0000
Connection technology			Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable		05.00.6041.8211.002M
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	for 5805	8.0000.6101.0002
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	for 5825	8.0000.6901.0002
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin		05.CMB 8181-0
	M23 female connector with coupling nut, 12-pin		8.0000.5012.0000

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

Technical data			
Mechanical characteristics			
Speed	shaft IP65	12000 min ⁻¹	
	hollow shaft IP40	12000 min ⁻¹	
	hollow shaft IP66 ¹⁾	6000 min ⁻¹	
Mass moment of inertia	shaft	approx. 1.8 x 10 ⁻⁶ kgm ²	
	hollow shaft	approx. 6.0 x 10 ⁻⁶ kgm ²	
Starting torque – at 20°C [68°F]	shaft IP65 / hollow shaft IP40	< 0.01 Nm	
	hollow shaft IP66	< 0.05 Nm	
Load capacity of shaft	radial	80 N	
	axial	40 N	
Weight		approx. 0.4 kg [14.11 oz]	
Protection acc. to EN 60529	shaft	IP65	
	hollow shaft without seal	IP40	
	hollow shaft with seal	IP66	
Working temperature range	shaft IP65 / hollow shaft IP40	-20°C ... +105°C [-4°F ... +221°F]	
	hollow shaft IP66	-20°C ... +90°C [-4°F ... +194°F]	
Material	shaft	stainless steel H7	
Shock resistance acc. to EN 60068-2-27		1000 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz	
Electrical characteristics			
Output circuit	RS422 (TTL compatible)	Push-pull	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC	
Power consumption (no load)	without inverted signal	–	typ. 90 mA / max. 135 mA
	with inverted signal	typ. 70 mA / max. 120 mA	typ. 115 mA / max. 160 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 30 mA	
Pulse frequency	max. 800 kHz	max. 600 kHz	
Signal level	HIGH	min. 2.5 V	min. +V - 2.5 V
	LOW	max. 0.5 V	max. 2.0 V
Rising edge time t_r	max. 200 ns	max. 1 µs	
Falling edge time t_f	max. 200 ns	max. 1 µs	
Short circuit proof outputs ²⁾	yes ³⁾	yes	
Reverse polarity protection of the power supply	no; 10 ... 30 V DC: yes	yes	
UL approval	file no. E224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) For continuous operation max. 3000 min⁻¹, ventilated.
2) If power supply correctly applied.

3) Only one channel allowed to be shorted-out at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted. at +V = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

Incremental encoders

Standard high resolution, optical	5805 / 5825 (shaft / hollow shaft)	Push-pull / RS422
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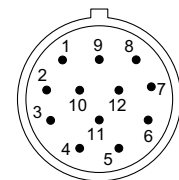
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores 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	Core color:	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⁾
Output circuit	Type of connection	M12 connector, 8-pin											
1, 2, 3, 4, 5, 6, 7	5805: G, T	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5825: C	Pin:	1	2			3	4	5	6	7	8	PH ¹⁾

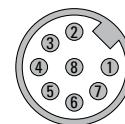
Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

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



M12 connector, 8-pin

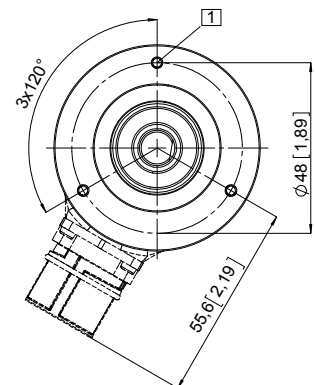
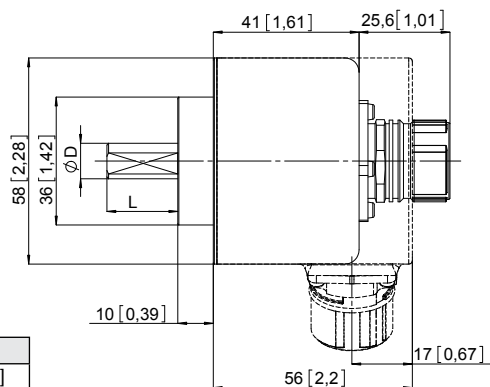
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1

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



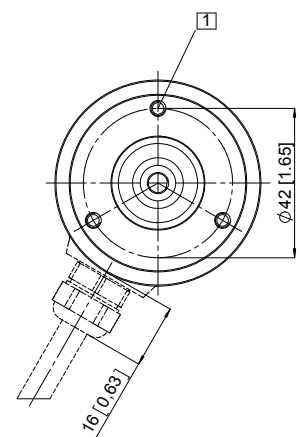
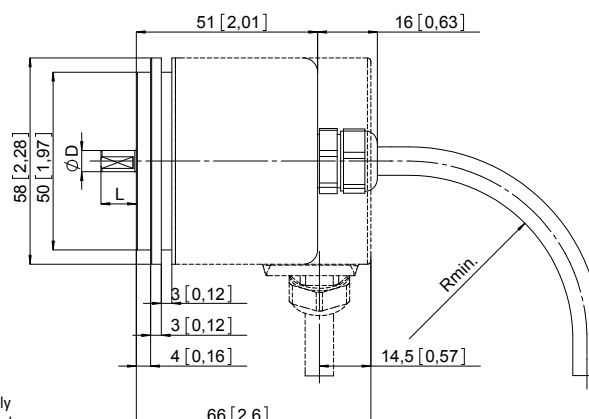
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]

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]



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

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

Incremental encoders

**Standard
high resolution, optical**

5805 / 5825 (shaft / hollow shaft)

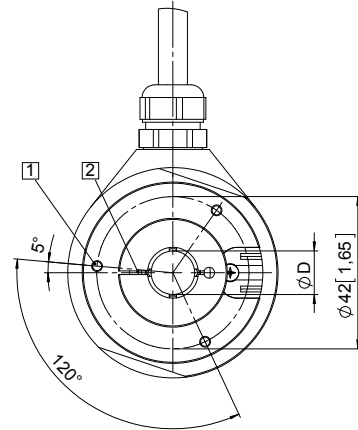
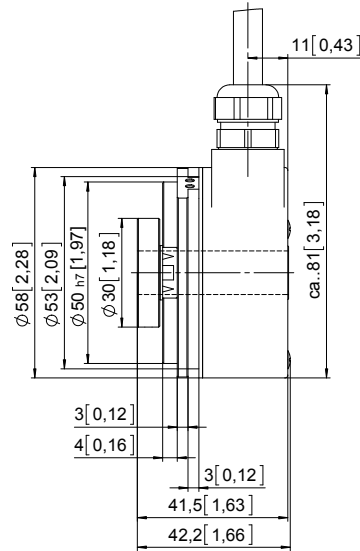
Push-pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1 and 2

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

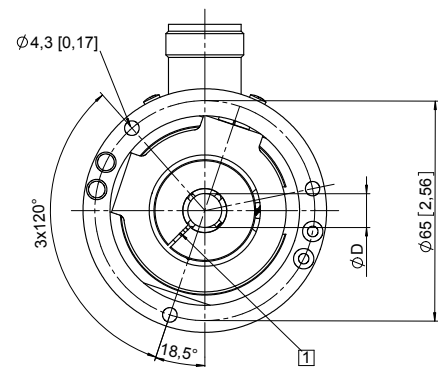
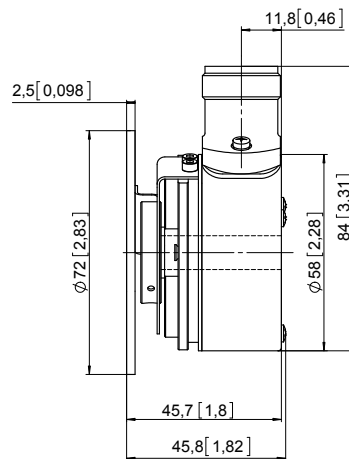


D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7

Insertion depth blind hollow shaft with flange 2:
max. 30 mm [1.18"]

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

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit
6 [0.24]	H7
8 [0.32]	H7
10 [0.39]	H7
12 [0.47]	H7

Min. insertion depth = 1.5 x D
Insertion depth blind hollow shaft with flange 4:
max. 30 mm [1.18"]

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Standard stainless steel, optical	Sendix 5006 / 5026 (shaft / hollow shaft)	Push-pull / RS422
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The incremental Sendix encoders 5006 / 5026 in stainless steel offers optimum material resistance and thus virtually unlimited durability.

The high-grade seals, the IP66/IP67 level of protection as well as the wide temperature range additionally ensure impermeability and ruggedness.



Safety-Lock™	High rotational speed	Temperature range -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 . XXXX4 . XXXX
Shaft version Type

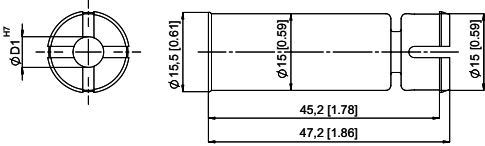

- | | | |
|---|--|---|
| <p>a Flange</p> <p>7 = clamping flange ø 58 mm [2.28"]
 A = synchro flange ø 58 mm [2.28"]
 C = square flange □ 63.5 mm [2.5"]</p> <p>b Shaft (ø x L), with flat</p> <p>1 = ø 6 x 10 mm [0.24 x 0.39"]
 3 = ø 10 x 20 mm [0.39 x 0.79"]
 8 = ø 3/8" x 7/8"</p> | <p>c Output circuit / power supply</p> <p>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</p> <p>d Type of connection</p> <p>4 = radial M12 connector, 8-pin</p> <p>e Pulse rate</p> <p>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)</p> | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - other pulse rates - Ex 2/22 - seawater resistant (stainless steel V4A) <p><i>Stainless steel V4A as standard types (deliverable as from 1 unit)</i></p> <p>V4A 8.5006.73X4.XXXX-V4A
1.4404</p> |
|---|--|---|

Order code 8.5026 . XXXX2 . XXXX
Hollow shaft Type

- | | | |
|--|---|---|
| <p>a Flange</p> <p>1 = with spring element, long
 C = with stator coupling, ø 63 mm</p> <p>b Through hollow shaft</p> <p>2 = ø 1/4"
 4 = ø 3/8"
 3 = ø 10 mm [0.39"]
 5 = ø 12 mm [0.47"]
 6 = ø 1/2"
 8 = ø 15 mm [0.59"]</p> | <p>c Output circuit / power supply</p> <p>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</p> <p>d Type of connection</p> <p>2 = radial M12 connector, 8-pin</p> <p>e Pulse rate</p> <p>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)</p> | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - other pulse rates - Ex 2/22 - seawater resistant (stainless steel V4A) <p><i>Stainless steel V4A as standard types (deliverable as from 1 unit)</i></p> <p>V4A 8.5026.18X2.XXXX-V4A
1.4404</p> |
|--|---|---|

Incremental encoders

Standard stainless steel, optical	Sendix 5006 / 5026 (shaft / hollow shaft)	Push-pull / RS422
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Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Isolation / adapter inserts for hollow shaft encoders		
<p>Thermal and electrical isolation of the encoders (Temperature range -40 ... +115°C [-40°F ... +239°F])</p> <p>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.</p> 	 <p>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.</p>	D1 Isolation insert 6 mm [0.24"] 8.0010.4021.0000 8 mm [0.32"] 8.0010.4020.0000 10 mm [0.39"] 8.0010.4023.0000 12 mm [0.47"] 8.0010.4025.0000 1/4" 8.0010.4022.0000 3/8" 8.0010.4024.0000 1/2" 8.0010.4026.0000

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 no. E224618		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Mechanical characteristics		Working temperature	
Maximum speed ³⁾	6000 min ⁻¹	Material	housing, flange, shaft stainless steel, 1.4305 (V2A) connector stainless steel
Mass moment of inertia	approx. 1.8 x 10 ⁻⁶ kgm ²	Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Starting torque – at 20°C [68°F]	< 0.05 Nm	Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz
Weight	approx. 0.4 kg [14.11 oz]		
Load capacity of shaft	radial 80 N axial 40 N		
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.

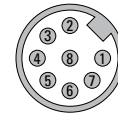
Incremental encoders

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

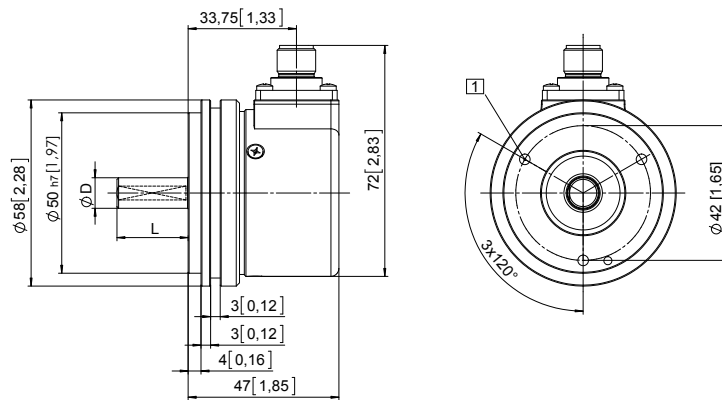
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- 0, $\bar{0}$: Reference signal
- PH \pm : Plug connector housing (shield)

Dimensions shaft version

Dimensions in mm [inch]

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

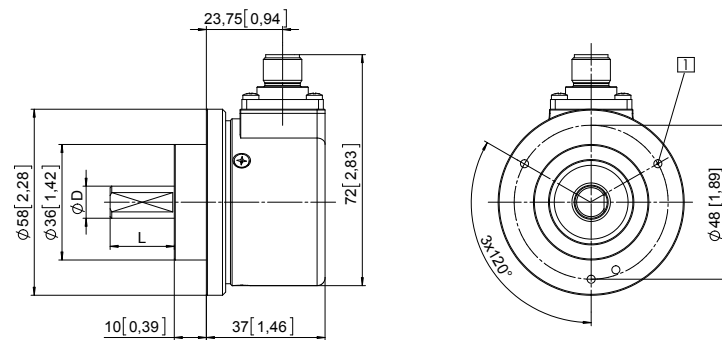
1) 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h8	7/8"

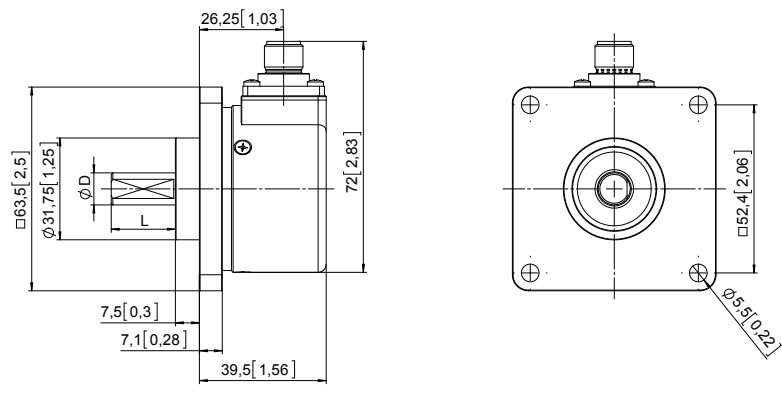
Clamping flange, \varnothing 58 [2.28] Flange type 7

1) 3 x M3, 5.5 [0.22] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h8	7/8"

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



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
3/8"	h8	7/8"

1) PH = shield is attached to connector housing.

Incremental encoders

Standard stainless steel, optical

Sendix 5006 / 5026 (shaft / hollow shaft)

Push-pull / RS422

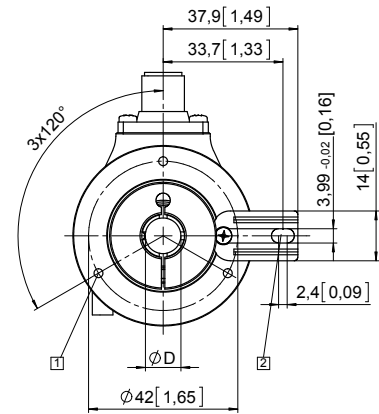
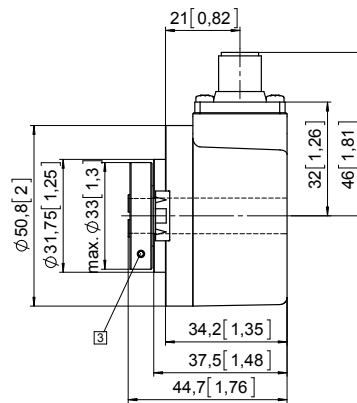
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1

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

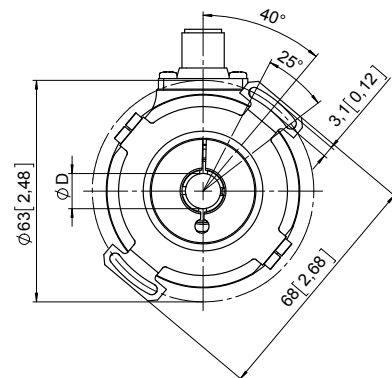
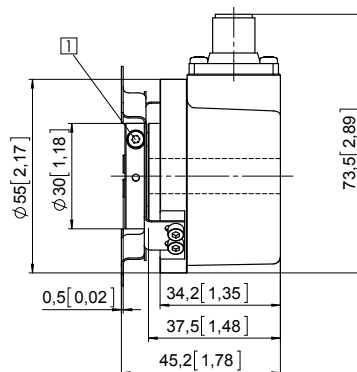
D	Fit
10 [0.39]	H7
12 [0.47]	H7
15 [0.99]	H7
1/4"	H7
3/8"	H7
1/2"	H7



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

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit
10 [0.39]	H7
12 [0.47]	H7
15 [0.99]	H7
1/4"	H7
3/8"	H7
1/2"	H7



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Standard, ATEX/IECEX – zone 1/21 optical **Sendix 7000 / 7020 (shaft / hollow shaft)** **Push-pull / RS422**



The Sendix 7000 / 7020 incremental encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing.

These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 pulses per rotation; they are also available with axial and radial cable outlets.



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code **8.7000** . **1** **X** **X** **X** . **XXXX** . **XXXX**
Shaft version Type **a** **b** **c** **d** **e** **f**

<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 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, 50, 100, 200, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 100 pulses => 0100)</p>	<p>f Cable length in dm¹⁾ 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 - IP65 version for T6 - seawater resistant (stainless steel V4A)</p> <p><i>Stainless steel V4A as standard types (deliverable as from 1 unit)</i></p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> V4A 1.4404 </div> <p>8.7000.22X1.XXXX-V4A 8.7000.22XA.XXXX.XXXX-V4A</p>
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1) Not applicable with connection types 1 and 2.

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**Standard, ATEX/IECEX – zone 1/21
optical**

Sendix 7000 / 7020 (shaft / hollow shaft)

Push-pull / RS422

**Order code
Hollow shaft**

8.7020 . **XXXXX** . **XXXX** . **XXXX**
Type **a** **b** **c** **d** **e** **f**

a Flange

- 1 = with spring element, short
- 5 = with stator coupling, IP67, ø 65 mm [2.56"]

b Blind hollow shaft

(insertion depth max. 41.5 mm [1.63"])

- 1 = ø 12 mm [0.47"]
- 2 = ø 14 mm [0.55"]

c Output circuit / power supply

- 4 = RS422 (with inverted signal) / 5 V DC
- 1 = RS422 (with inverted signal) / 5 ... 30 V DC
- 2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC
- 5 = push-pull (with inverted signal) / 10 ... 30 V DC

d Type of connection

- 1 = axial cable, 2 m [6.56'] PUR
- 2 = radial cable, 2 m [6.56'] PUR
- A = axial cable, length > 2 m [6.56']
- B = radial cable, length > 2 m [6.56']

e Pulse rate

- 1, 5, 10, 12, 36, 50, 100, 200, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5
- (e.g. 100 pulses => 0100)

f Cable length in dm ¹⁾

- 0050 = 5 m [16.40']
- 0100 = 10 m [32.81']
- 0150 = 15 m [49.21']

Optional on request

- other pulse rates
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)

- 8.7020.22X1.XXXX-V4A
- 8.7020.22XA.XXXX.XXXX-V4A



Mounting accessory for shaft encoders

Order no.

Coupling

bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]

8.0000.1102.1010

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

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

Technical data

Explosion protection Sendix 7000	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7020	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014; EN 60079-31:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0020 X
Category (gas)	Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

1) Not applicable with connection types 1 and 2.

Incremental encoders

Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7000 / 7020 (shaft / hollow shaft)	Push-pull / RS422
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Mechanical characteristics		
Maximum speed	shaft	6000 min ⁻¹ (continuous)
	hollow shaft	3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F] < 0.05 Nm		
Mass moment of inertia 4.0 x 10 ⁻⁶ kgm ²		
Load capacity of shaft	radial	80 N
	axial	40 N
Weight approx. 1.5 kg [52.91 oz]		
Protection acc. to EN 60529 IP67		
Ambient temperature -40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!		
Materials	shaft	stainless steel
	flange / housing	seawater durable Al, type AlSiMgMn (EN AW-6082)
	cable	PUR
Shock resistance acc. to EN/IEC 60068-2-27 2500 m/s ² , 6 ms		
Vibration resistance acc. to EN/IEC 60068-2-6 100 m/s ² , 55 ... 2000 Hz		

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Electrical characteristics				
Output circuit	RS422 (TTL compatible)	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)
	Order code 1	Order code 4	Order code 5	Order code 2
Power supply	5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz ¹⁾
Signal level	HIGH	min. 2.5 V	min. +V - 1.0 V	min. +V - 2.0 V
	LOW	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs²⁾	yes ³⁾	yes ³⁾	yes	yes
Reverse polarity protection of the power supply	yes	no	yes	no
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU			

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores 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 V _{sens}	+V _{sens}	\perp	
		Core marking:	1	2	3	4	5	6	7	8	9	10	shield	

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

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Incremental encoders

**Standard, ATEX/IECEX – zone 1/21
optical**

Sendix 7000 / 7020 (shaft / hollow shaft)

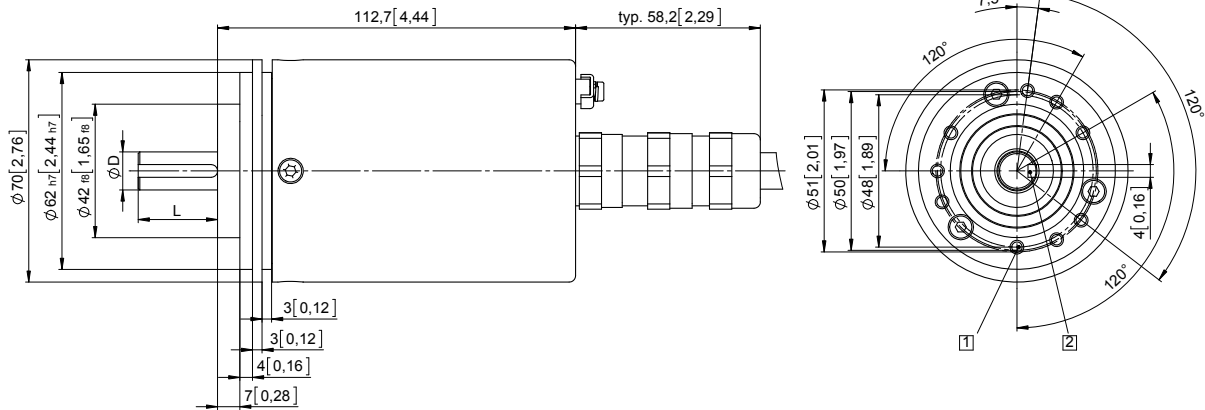
Push-pull / RS422

Dimensions shaft version

Dimensions in mm [inch]

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

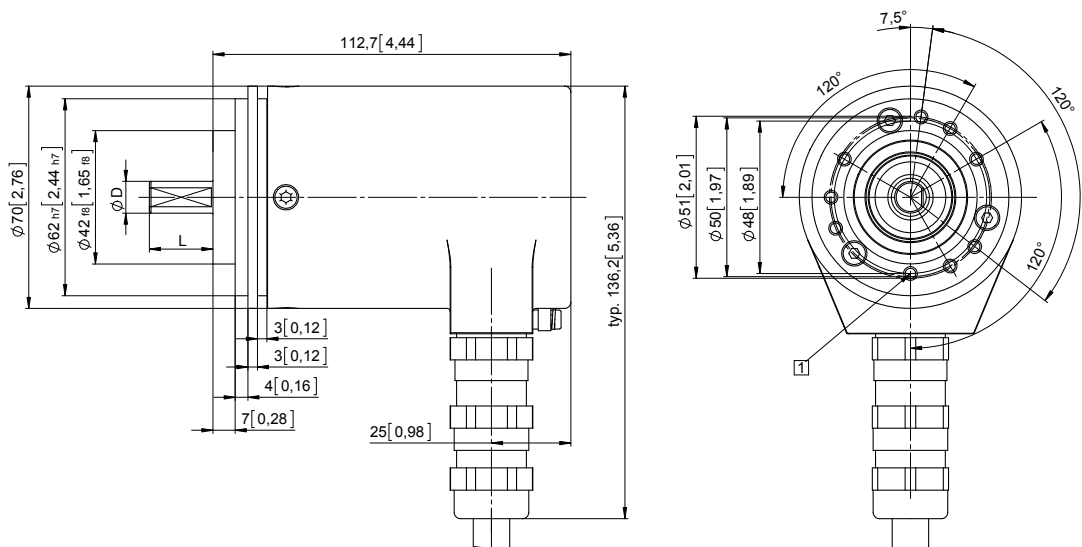
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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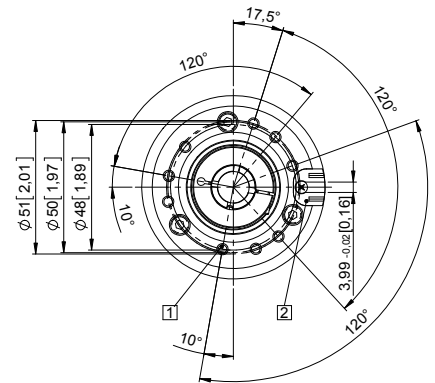
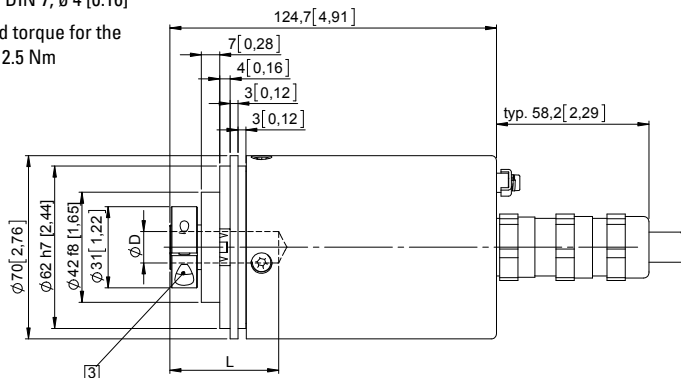
Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7000 / 7020 (shaft / hollow shaft)	Push-pull / RS422
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



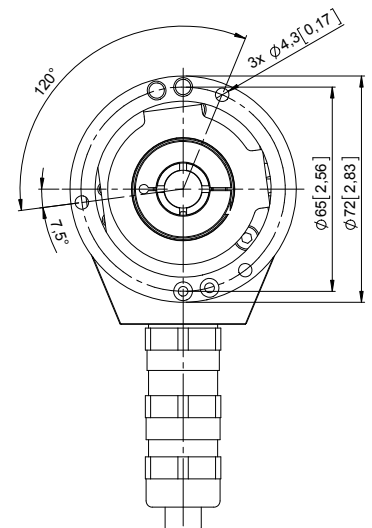
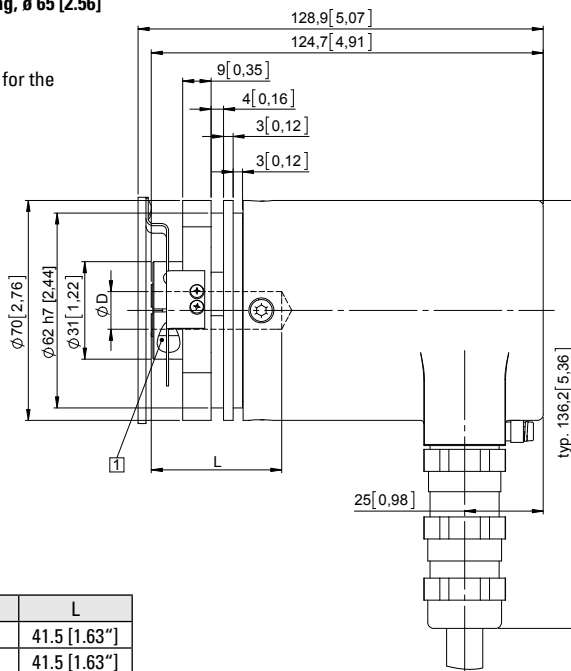
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Incremental encoders

**Standard, ATEX/IECEx – zone 1/21
SIL2/PLd, optical**

Sendix SIL 7014FS2 (shaft)

SinCos



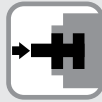
Ex protection and Functional Safety in one device.

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 aluminum.



Ex approval



Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater durable

Functional Safety

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

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7014 FS2 . 1 XXXX . XXXX . XXXX

Type a b c d e f

- a Flange**
1 = clamping / synchronous flange, IP67
ø 70 mm [2.76"]
- b Shaft (ø x L)**
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"],
with keyway for 4 x 4 mm [0.16 x 0.16"] key
- c Output circuit / power supply**
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

- d Type of connection**
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
- e Pulse rate**
1024, 2048
- f Cable length in dm ¹⁾**
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- seawater resistant (stainless steel V4A)

*Stainless steel V4A as standard types
(deliverable as from 1 unit)*

V4A
1.4404
8.7014FS2.22X1.XXXX-V4A
8.7014FS2.22XA.XXXX.XXXX-V4A

Accessories

		Order no.
EMC shield terminal	for top-hat rail mounting	8.0000.4G06.0000
Screw retention	Loctite 243, 5 ml	8.0000.4G05.0000

Bellows coupling, safety-oriented You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories.

Safety modules Safety-M compact / modular You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety.

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

1) Not applicable with connection types 1 and 2.

Incremental encoders

Standard, ATEX/IECEX – zone 1/21 SIL2/PLd, optical	Sendix SIL 7014FS2 (shaft)	SinCos
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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
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

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

Additional functions can be found in the operating manual.

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)							
1, 2	1, 2, A, B	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Core 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	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft stainless steel flange / housing seawater durable Al, type 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 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.

Product overview
Basics
Incremental encoders
Absolute encoders
singleturn
Absolute encoders
multiturn
Bearingsless encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Incremental encoders

**Standard, ATEX/IECEX – zone 1/21
SIL2/PLd, optical**

Sendix SIL 7014FS2 (shaft)

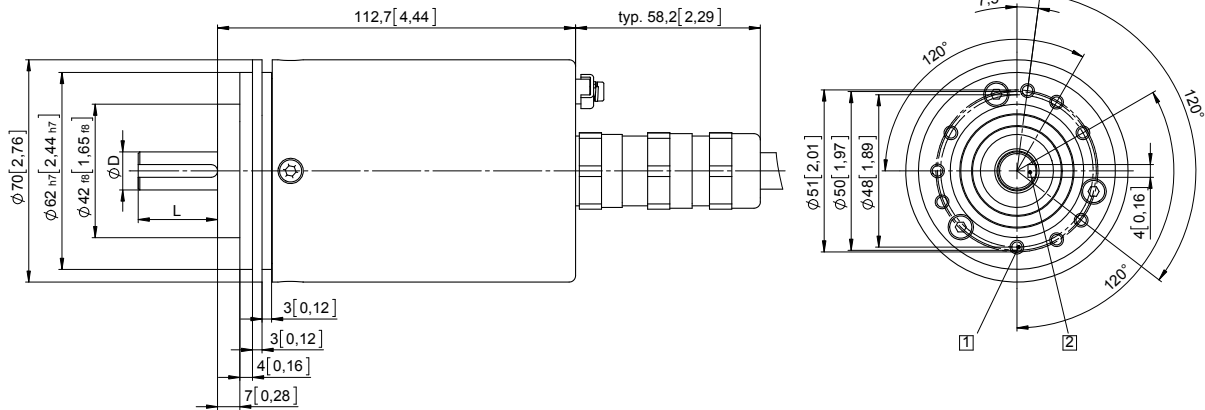
SinCos

Dimensions shaft version

Dimensions in mm [inch]

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

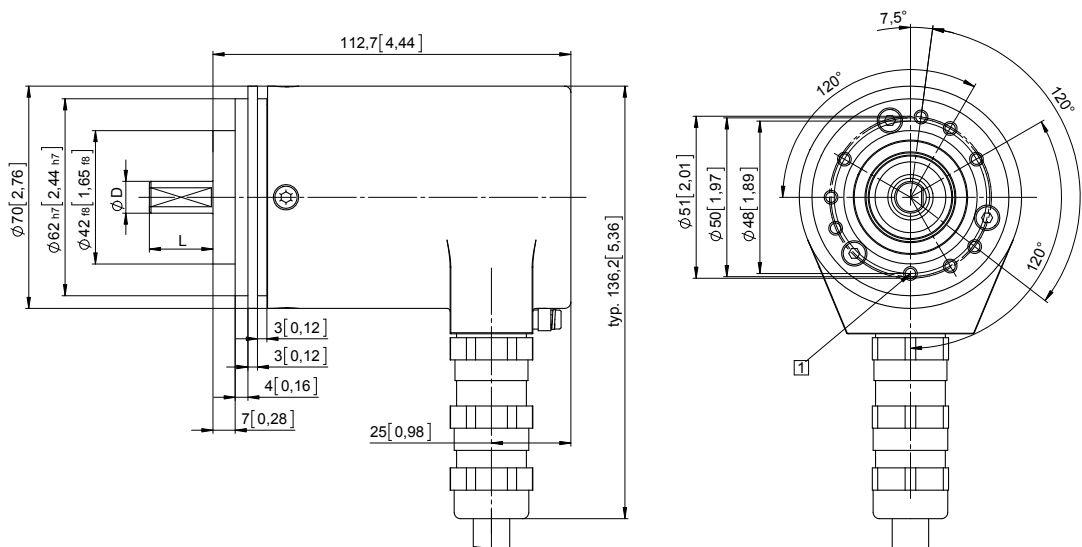
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

Incremental encoders

Standard, ATEX/IECEX – zone 1/21 SIL3/PLe, optical	Sendix SIL 7014FS3 (shaft)	SinCos
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Ex protection and Functional Safety in one device.

The incremental encoders 7014FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



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	X	X	X	. XXXX	. XXXX
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**
1 = SinCos / 5 V DC
2 = SinCos / 10 ... 30 V DC

- d Type of connection**
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
- e Pulse rate**
1024, 2048
- f Cable length in dm ¹⁾**
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)

V4A 1.4404	8.7014FS3.22X1.XXXX-V4A
	8.7014FS3.22XA.XXXX.XXXX-V4A

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

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

1) Not applicable with connection types 1 and 2.

Product overview Basics
Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Incremental encoders

Standard, ATEX/IECEX – zone 1/21 SIL3/PLe, optical	Sendix SIL 7014FS3 (shaft)	SinCos
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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
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"

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

Additional functions can be found in the operating manual.

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)							
		Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
1, 2	1, 2, A, B	Core 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)
PFH_d value ¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 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.

Product overview
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Addresses

Incremental encoders

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

Sendix SIL 7014FS3 (shaft)

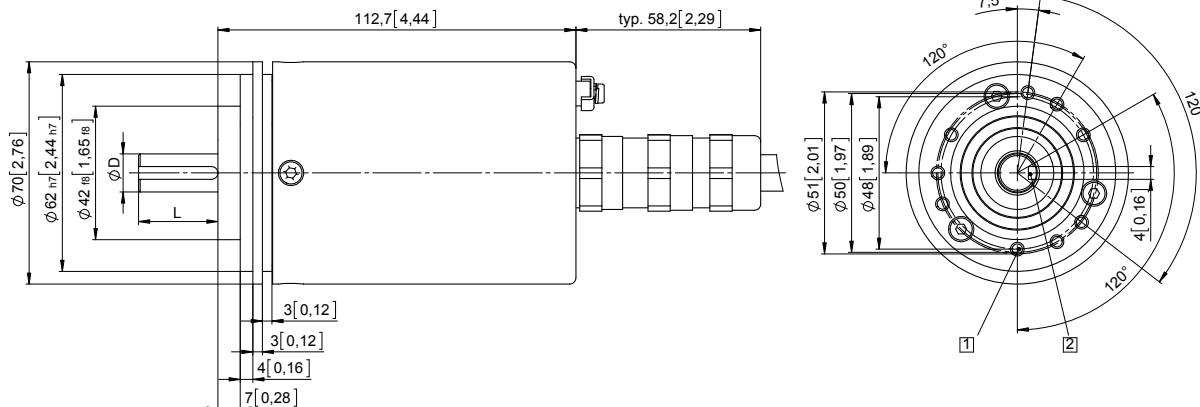
SinCos

Dimensions shaft version

Dimensions in mm [inch]

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

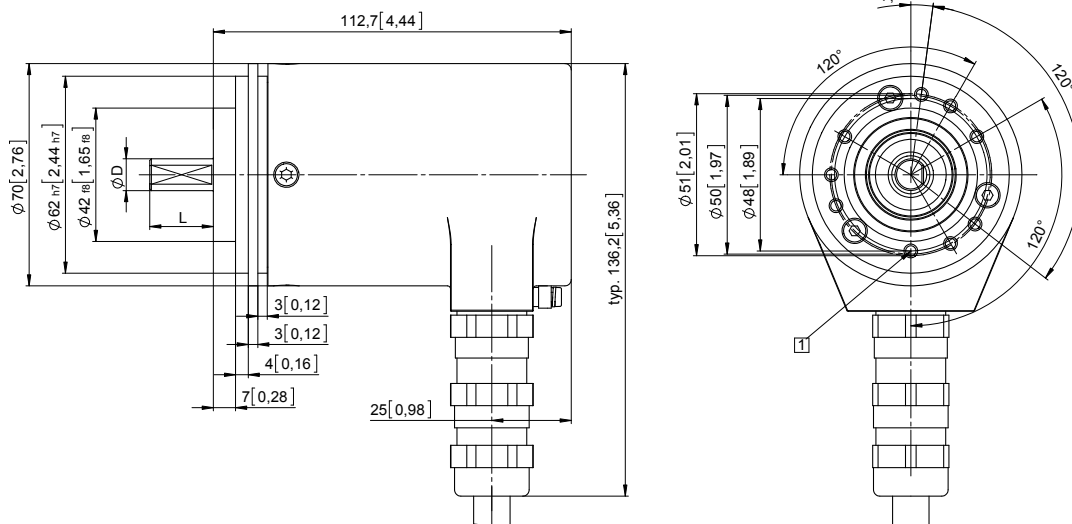
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

Incremental encoders

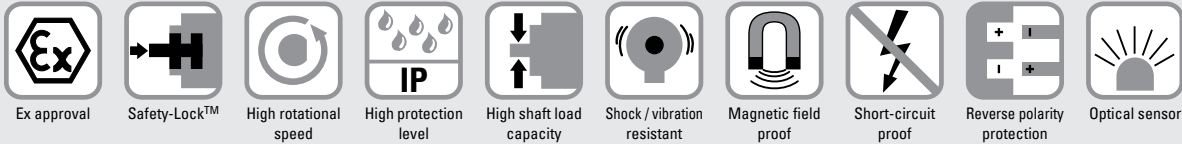
Standard, ATEX/IECEX – mining optical

Sendix 7100 / 7120 (shaft / hollow shaft)

Push-pull / RS422



The incremental encoders Sendix 7100 / 7120 in a compact 70 mm stainless steel housing have an ATEX/IECEX mining approval. These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 pulses per revolution; they are also available with axial and radial cable outlets.



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7100 . 2XXX . XXXX . XXXX
Type a b c d e f

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 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, 50, 100, 200, 250, 256,
300, 360, 400, 500, 512, 600, 800, 1000,
1024, 1200, 2000, 2048, 2500, 3600,
4096, 5

(e.g. 100 pulses => 0100)

f Cable length in dm ¹⁾

0050 = 5 m [16.40']

0100 = 10 m [32.81']

0150 = 15 m [49.21']

Optional on request

- other pulse rates

- special cable length

1) Not applicable with connection types 1 and 2.

Incremental encoders

Standard, ATEX/IECEX – mining optical	Sendix 7100 / 7120 (shaft / hollow shaft)	Push-pull / RS422
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Order code	8.7120	.XXXXX	.XXXX	.XXXX							
Hollow shaft	Type	a	b	c	d	e	f				
a Flange 2 = with spring element, short 6 = with stator coupling, IP67, ø 65 mm [2.56"]		b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]		c Output circuit / power supply 4 = RS422 (with inverted signal) / 5 V DC 1 = RS422 (with inverted signal) / 5 ... 30 V DC 2 = push-pull (7272 compatible with inverted signal) / 5 ... 30 V DC 5 = push-pull (with inverted signal) / 10 ... 30 V DC		d Type of connection 1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length > 2 m [6.56'] B = radial cable, length > 2 m [6.56']		e Pulse rate 1, 5, 10, 12, 36, 50, 100, 200, 250, 256, 300, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5 (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'] <i>Optional on request</i> - other pulse rates - special cable length	

Technical data

Explosion protection 7100	
ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; ATEX guideline 94/9/EC EN 60079-1:2007
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 14.0023 X
Category	Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7120	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1057 X
Category	I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	EN 60079-0:2012 + A11:2013; ATEX guideline 2014/34/EU EN 60079-1:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0019 X
Category	Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics		
Maximum speed	shaft	6000 min ⁻¹ (continuous)
	hollow shaft	3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm	
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²	
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	approx. 2.8 kg [98.77 oz]	
Protection acc. to EN 60529	IP67	
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!	
Materials	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance	acc. to EN/IEC 60068-2-27 1000 m/s ² , 6 ms	
Vibration resistance	acc. to EN/IEC 60068-2-6 100 m/s ² , 55 ... 2000 Hz	

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclinoimeters
 Connection technology
 Accessories
 Addresses

Incremental encoders

Standard, ATEX/IECEX – mining optical	Sendix 7100 / 7120 (shaft / hollow shaft)	Push-pull / RS422
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Electrical characteristics				
Output circuit	RS422 (TTL compatible)	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)
Order code	1	4	5	2
Power supply	5 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA	max. +/- 20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz ¹⁾
Signal level	HIGH min. 2.5 V 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 2014/30/EU RoHS guideline 2011/65/EU			

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)												
		Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	0 V _{sens}	+V _{sens}	⊥	
1, 2, 4, 5	1, 2, A, B	Core marking:	1	2	3	4	5	6	7	8	9	10	shield	

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

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Incremental encoders

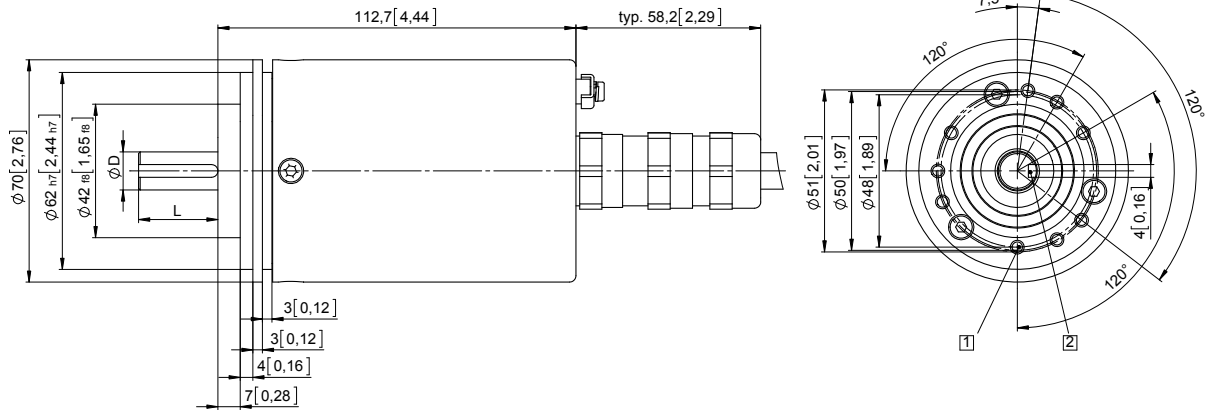
Standard, ATEX/IECEX – mining optical	Sendix 7100 / 7120 (shaft / hollow shaft)	Push-pull / RS422
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Dimensions shaft version

Dimensions in mm [inch]

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

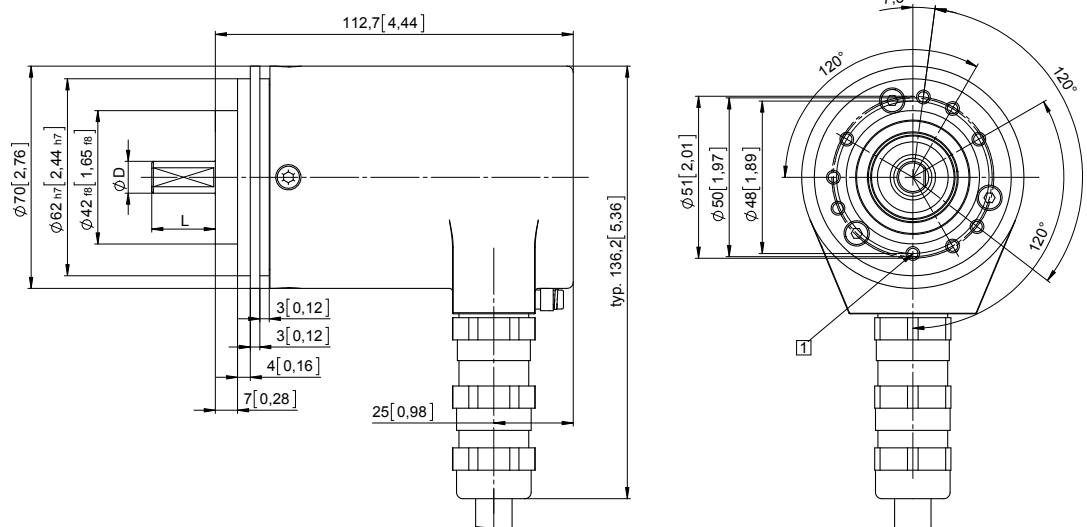
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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Standard, ATEX/IECEx – mining optical

Sendix 7100 / 7120 (shaft / hollow shaft)

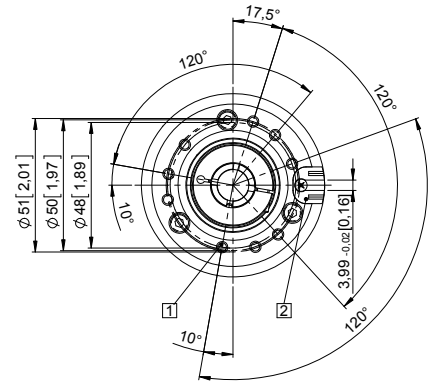
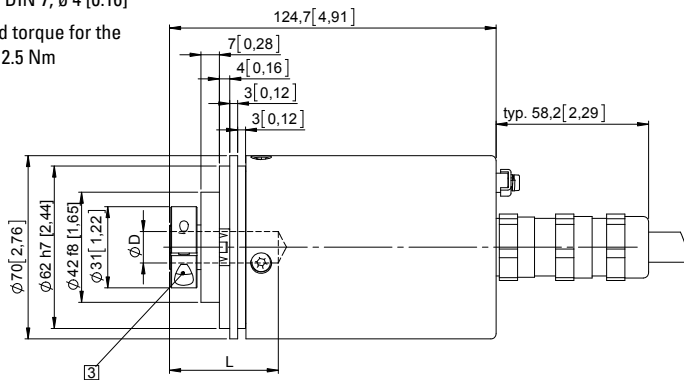
Push-pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



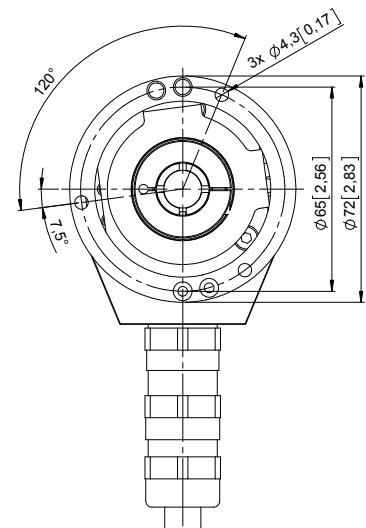
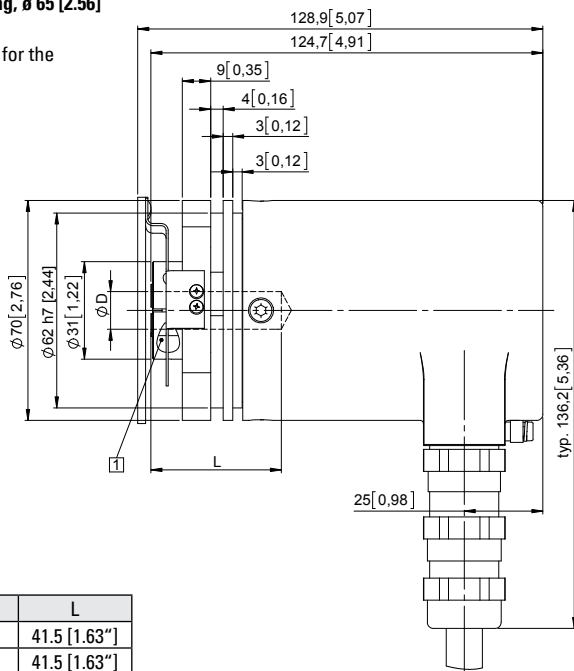
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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

Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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Large hollow shaft optical	5821 (hollow shaft)	Push-pull / RS422
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Optimized proportions, optimized costs:

With an overall diameter of just 58 millimeters the series 5821 boasts a hollow shaft of up to 28 millimeters diameter.

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

Adaptable

- Through hollow shaft from 16 mm up to 28 mm.
- With cable connection or M12 connector.
- High resolution up to 5000 pulses per revolution.

Order code **8.5821** . **1XXX** . **XXXX**
Hollow shaft Type **a b c d e**

<p>a Flange 1 = with spring element, ø 58 mm [2.28"]</p> <p>b Through hollow shaft K = ø 16 mm [0.63"] C = ø 20 mm [0.79"] 8 = ø 22 mm [0.87"] 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, 1 m [3.28'] 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>
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Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6041.8211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0

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

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Large hollow shaft optical	5821 (hollow shaft)	Push-pull / RS422
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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 2014/30/EU RoHS guideline 2011/65/EU	

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)									
1, 3, 4	1	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield
Output circuit	Type of connection	M12 connector, 8-pin									
1, 3, 4	E	Signal:	0 V	+V	A	\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.

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Incremental encoders

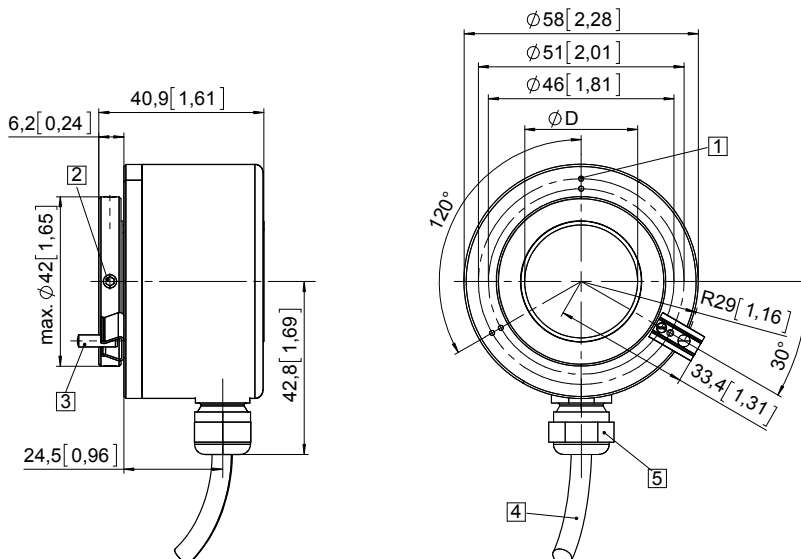
Large hollow shaft optical	5821 (hollow shaft)	Push-pull / RS422
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Dimensions

Dimensions in mm [inch]

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

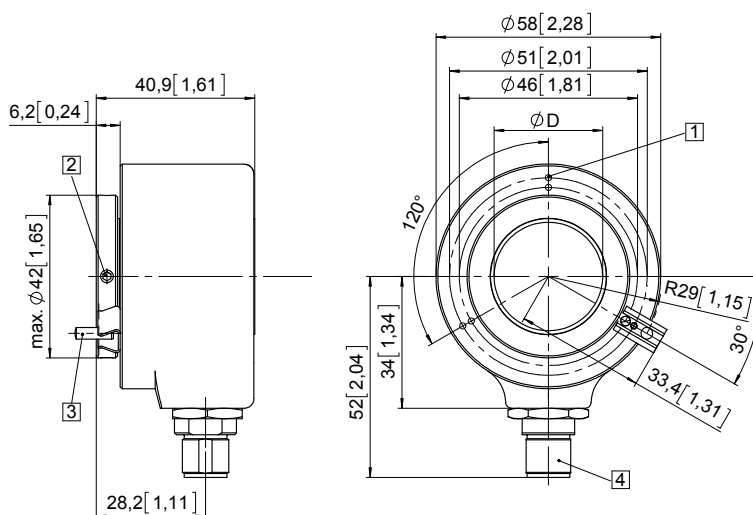
- 1 M1.6 / 5 [0.2] deep
- 2 4 x socket set screw M4x6 DIN 913
- 3 Cylindrical pin 3m6x12 DIN 6325 included
- 4 Cable length 1 m [3.28']
- 5 Cable gland PG7



D	Fit
16 [0.63]	F7
20 [0.79]	F7
24 [0.94]	F7
25 [0.98]	F7
28 [1.10]	F7

Flange with spring element, $\varnothing 58$ [2.28] M12 connector version, connection type E

- 1 M1.6 / 5 [0.2] deep
- 2 4 x socket set screw M4x6 DIN 913
- 3 Cylindrical pin 3m6x12 DIN 6325 included
- 4 Connector M12



D	Fit
16 [0.63]	F7
20 [0.79]	F7
24 [0.94]	F7
25 [0.98]	F7
28 [1.10]	F7

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Large hollow shaft optical

A020 (hollow shaft)

Push-pull / RS422 / SinCos



The incremental encoder type A020 with optical sensor technology is available with a through hollow shaft up to max. 42 mm diameter.

With an installation depth of just 43 mm it is optimally suited for mounting on large shafts, even where space is tight.



High rotational speed



High protection level



Shock / vibration resistant



Magnetic field proof



Optical sensor

Compact

- Minimal installation depth but large hollow shaft.
- Available with compact M12 connector.
- Torque stop can be implemented even with small radius.

Flexible

- With push-pull, RS422 or SinCos interface.
- Hollow shaft from 20 mm up to 42 mm as standard.
- With cable connection, M12 or M23 connectors.

Order code Hollow shaft

8.A020 . XXXX . XXXX
Type a b c d e

a Flange

- 2 = with spring element, short
- 3 = with spring element, long
- 5 = with torque stop, long

b Through hollow shaft

- C = \varnothing 20 mm [0.79"]
- 6 = \varnothing 24 mm [0.94"]
- 5 = \varnothing 25 mm [0.98"]
- 3 = \varnothing 28 mm [1.10"]
- A = \varnothing 30 mm [1.18"]
- 2 = \varnothing 38 mm [1.50"]
- B = \varnothing 40 mm [1.57"]
- 1 = \varnothing 42 mm [1.65"]
- 4 = \varnothing 1"

c Output circuit / power supply

- 1 = RS422 (with inverted signal) / 5 V DC
- 4 = RS422 (with inverted signal) / 10 ... 30 V DC
- 2 = Push-pull (without inverted signal) / 10 ... 30 V DC
- 5 = Push-pull (with inverted signal) / 5 ... 30 V DC
- 3 = Push-pull (with inverted signal) / 10 ... 30 V DC
- A = Push-pull (7272 compatible) / 5 ... 30 V DC
- 8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
- 9 = SinCos, 1 Vpp (with inverted signal) / 10 .. 30 V DC

d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
- A = radial cable, special length PVC *)
- 2 = radial M23 connector, 12-pin, without mating connector
- E = radial M12 connector, 8-pin

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.A020.351A.2048.0030 (for cable length 3 m)

e Pulse rate

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

SinCos version only available with pulses \geq 1024

Optional on request
- other pulse rates

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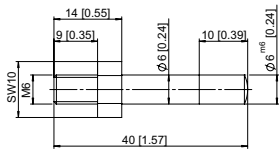
Accessories

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Incremental encoders

Large hollow shaft optical	A020 (hollow shaft)	Push-pull / RS422 / SinCos	Product overview Basics
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Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.	
--	-------------------------	-----------	--

Cylindrical pin, long for flange with spring element (flange type 2 + 3)	with fixing thread 	8.0010.4700.0003	Incremental encoders
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Connection technology	Order no.	
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Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6041.8211.002M	Absolute encoders singleturn
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	8.0000.6201.0002	
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0	Absolute encoders multiturn
	M23 female connector with coupling nut, 12-pin	8.0000.5012.0000	

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

Technical data

Mechanical characteristics	
Maximum speed	3000 min ⁻¹ 1)
Mass moment of inertia 2)	< 150 x 10 ⁻⁶ kgm ²
Starting torque with sealing at 20°C [68°F]	< 0.2 Nm
Weight	approx. 0.7 kg [24.69 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C 3) ... +70°C [-40°F 3) ... +158°F]
Material	shaft stainless steel H7
Shock resistance acc. to EN 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz

Electrical characteristics SinCos output		
Output circuit	SinCos U = 1 Vpp	SinCos U = 1 Vpp
Power supply	5 V DC (±5 %)	10 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 65 mA max. 110 mA	typ. 65 mA max. 110 mA
-3 dB frequency	≤180 kHz	≤180 kHz
Signal level	channels A/B 1 Vpp (±20 %) channel 0 0.1 ... 1.2 V	1 Vpp (±20 %) 0.1 ... 1.2 V
Short circuit proof outputs 4)	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	file no. E224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

1) Short term (app. 15 min. range) up to 3500 min⁻¹.
2) Depending on shaft diameter.
3) With connector: -40°C [-40°F], securely installed: -30°C [-22°F], flexibly installed: -20°C [-4°F].
4) If power supply correctly applied.

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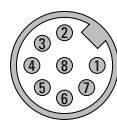
Large hollow shaft optical		A020 (hollow shaft)		Push-pull / RS422 / SinCos	
Electrical characteristics					
Output circuit	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)		
Power supply	5 V DC (±5 %) 10 ... 30 V DC	5 ... 30 V DC 10 ... 30 V DC	5 ... 30 V DC		
Power consumption (no load)					
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 ¹⁾	yes ²⁾	yes	yes		
Reverse polarity protection of the power supply	no, 10 ... 30 V DC: yes	yes	no		
UL approval	file no. E224618				
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU				

Terminal assignment

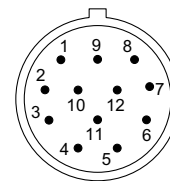
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)											
1 ... A	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Core color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield
		M23 connector, 12-pin											
1 ... A	2	Signal:	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 ³⁾
		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 ³⁾

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

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

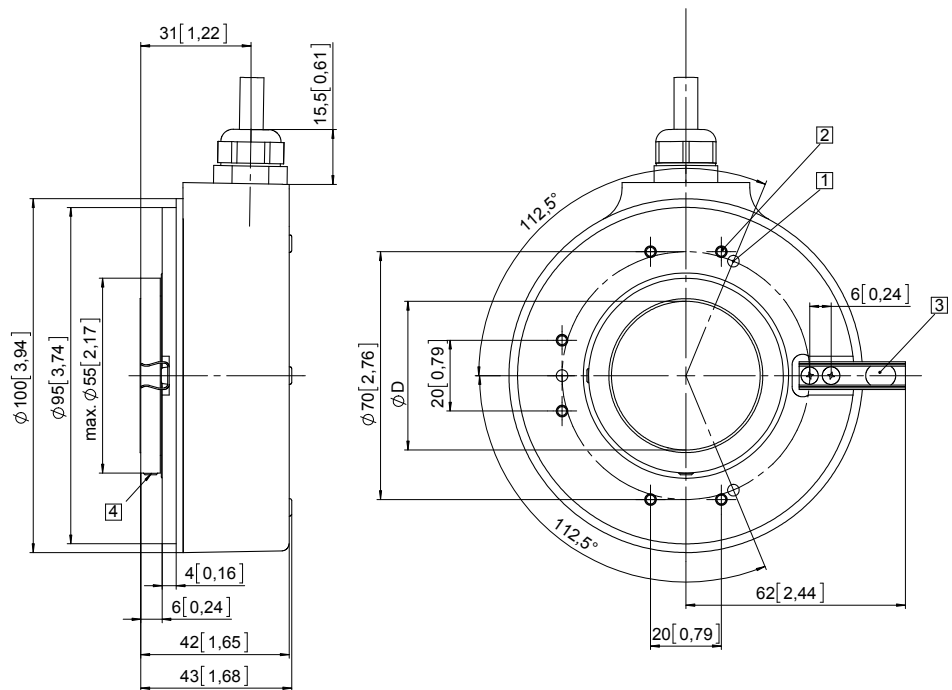
Dimensions in mm [inch]

Flange with 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

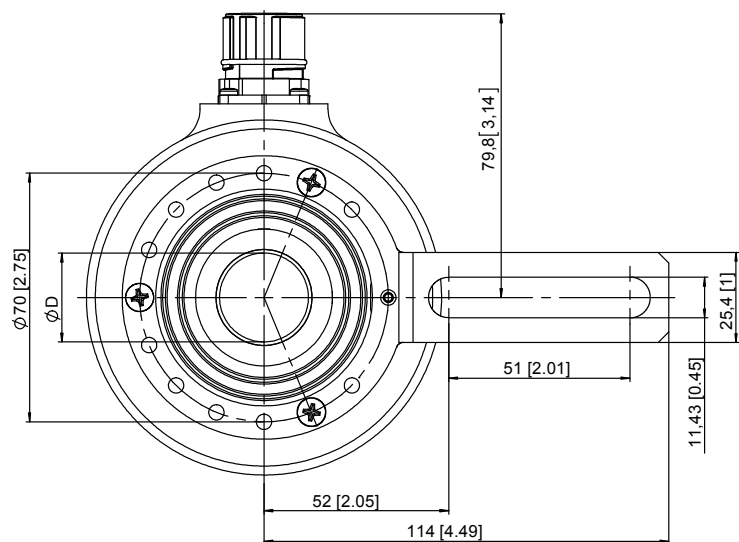
D	Fit
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
1"	H7

Typ. insertion depth: 1.5 x D
up to L hollow shaft max.



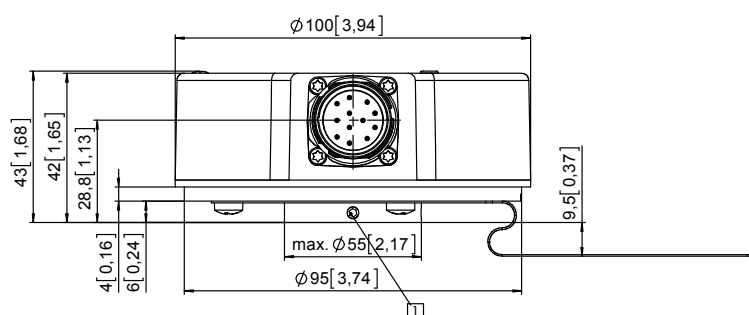
Flange with torque stop, long Flange type 5

- 1 Recommended torque for the clamping ring 1.0 Nm



D	Fit
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
1"	H7

Typ. insertion depth: 1.5 x D
up to L hollow shaft max.



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 torque stop, long
- 6 = with torque stop, short, 4.5" ¹⁾

b Through hollow shaft

- C = ø 20 mm [0.79"]
- 5 = ø 25 mm [0.98"]
- 3 = ø 28 mm [1.10"]
- A = ø 30 mm [1.18"]
- 2 = ø 38 mm [1.50"]
- B = ø 40 mm [1.57"]
- 1 = ø 42 mm [1.65"]
- 4 = ø 1"

- E = ø 5/8" ¹⁾
- N = ø 1 1/4" ¹⁾

c Output circuit / power supply

- 1 = RS422 (with inverted signal) / 5 V DC
- 4 = RS422 (with inverted signal) / 10 ... 30 V DC
- 2 = Push-pull (without inverted signal) / 10 ... 30 V DC
- 5 = Push-pull (with inverted signal) / 5 ... 30 V DC
- 3 = Push-pull (with inverted signal) / 10 ... 30 V DC
- 8 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
- 9 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC
- A = Push-pull (7272 compatible) / 5 ... 30 V DC

D = RS422 (with inverted signal) / 5 ... 30 V DC ¹⁾

d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC
- A = radial cable, special length PVC *)
- 2 = radial M23 connector, 12-pin, without mating connector
- E = radial M12 connector, 8-pin

D = MIL connector, 10-pin ¹⁾

*) Available special lengths (connection type A):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.A02H.111A.2048.0030 (for cable length 3 m)

e Pulse rate

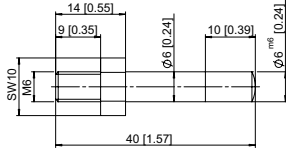

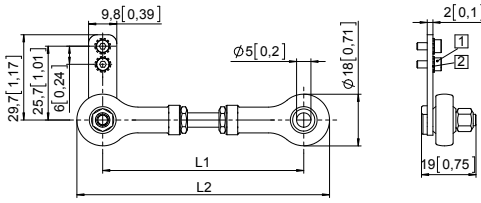

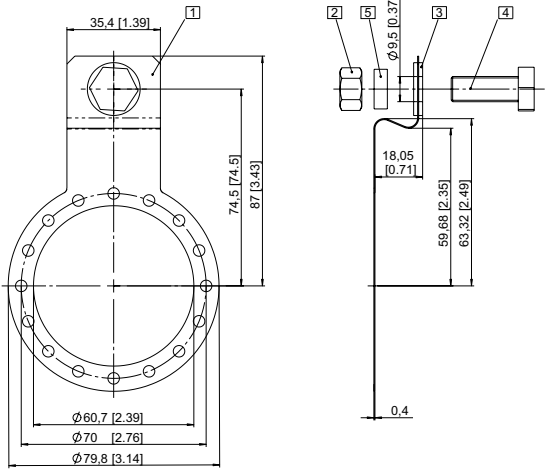

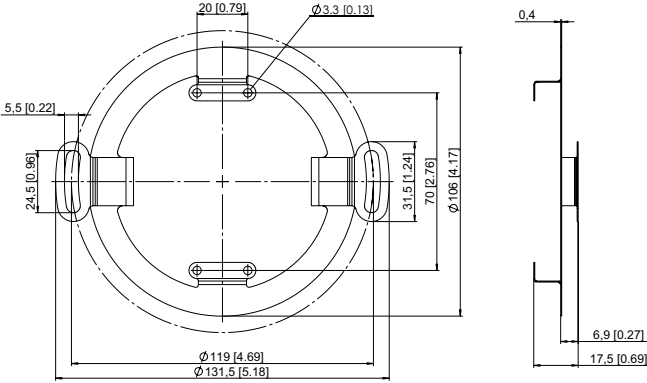
- 50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000 (e.g. 360 pulses => 0360)

SinCos version only available with pulses ≥ 1024



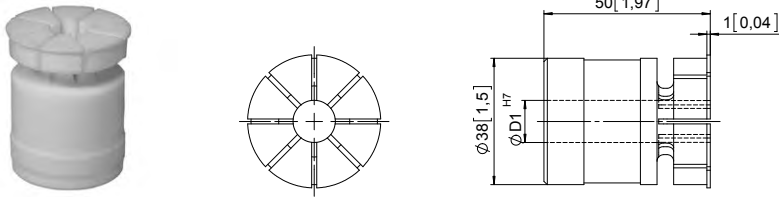
Optional on request
- other pulse rates on request
- Ex 2/22 ²⁾

1) US version.
2) For the cable connection type, cable material PUR.

Incremental encoders

Large hollow shaft robust, optical	A02H (hollow shaft)	Push-pull / RS422 / SinCos	Product overview Basics												
Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.													
Cylindrical pin, long for flange with spring element (flange type 2 + 3)	with fixing thread 	8.0010.4700.0003	Incremental encoders												
Tether arm, flexible 	 <table border="1"> <thead> <tr> <th>Tether arm</th> <th>L1</th> <th>L2</th> </tr> </thead> <tbody> <tr> <td>70 mm [2.76"]</td> <td>64 ... 74 [2.51 ... 2.91]</td> <td>82 ... 92 [3.23 ... 3.62]</td> </tr> <tr> <td>100 mm [3.94"]</td> <td>94 ... 104 [3.70 ... 4.09]</td> <td>112 ... 122 [4.41 ... 4.80]</td> </tr> <tr> <td>150 mm [5.91"]</td> <td>144 ... 154 [5.67 ... 6.06]</td> <td>162 ... 172 [6.38 ... 6.77]</td> </tr> </tbody> </table>	Tether arm	L1	L2	70 mm [2.76"]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]	100 mm [3.94"]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]	150 mm [5.91"]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]	70 mm [2.76"] 100 mm [3.94"] 150 mm [5.91"] 8.0010.40S0.0000 8.0010.40T0.0000 8.0010.40U0.0000	Absolute encoders singleturn Absolute encoders multiturn
Tether arm	L1	L2													
70 mm [2.76"]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]													
100 mm [3.94"]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]													
150 mm [5.91"]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]													
Torque stop, short 		8.0010.4T00.0000	Bearingless encoders Linear measuring technology Inclinometers												
Stator coupling 		8.0010.40V0.0000	Connection technology Accessories Addresses												

Incremental encoders

Large hollow shaft robust, optical		A02H (hollow shaft)	Push-pull / RS422 / SinCos	Order no.	Product overview Basics
Mounting accessory for hollow shaft encoders					
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 Torque stop (8.0010.4T00.0000) 3 screws for fixing to the encoder 		8.0010.40Y0.0001	Incremental encoders
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	Absolute encoders singleturn
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 vector motors and considerably shorten the service life of the encoder bearings. For more details please call our technical hotline (+49 7720 3903 952) or send us an email (info@kuebler.com)	\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	Absolute encoders multiturn Bearingless encoders Linear measuring technology
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					
Cordset, pre-assembled					
		M12 female connector with coupling nut, 8-pin 2 m [6.56"] PVC cable		05.00.6041.8211.002M	Accessories
		M23 female connector with coupling nut, 12-pin 2 m [6.56"] PVC cable		8.0000.6201.0002	
Connector, self-assembly (straight)					
		M12 female connector with coupling nut, 8-pin M23 female connector with coupling nut, 12-pin		05.CMB 8181-0 8.0000.5012.0000	Addresses

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
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Technical data

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

Electrical characteristics SinCos output		
Output circuit	SinCos U = 1 Vpp	SinCos U = 1 Vpp
Power supply	5 V DC (±5 %)	10 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 65 mA max. 110 mA	typ. 65 mA max. 110 mA
-3 dB frequency	< 180 kHz	< 180 kHz
Signal level	channels A/B channel 0	1 Vpp (±20 %) 0.1 ... 1.2 V 1 Vpp (±20 %) 0.1 ... 1.2 V
Short circuit proof outputs 4)	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	file no. E224618	
GL approval	letter of conformity No. 74130	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Electrical characteristics RS422 / Push-pull			
Output circuit	RS422 (TTL compatible)	Push-pull	Push-pull (7272 compatible)
Power supply	5 V DC (±5 %) 5 ... 30 V DC 10 ... 30 V DC	5 ... 30 V DC 10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)			
without inverted signal	–	typ. 55 mA/max. 125 mA	–
with inverted signal	typ. 40 mA/max. 90 mA	typ. 80 mA/max. 150 mA	typ. 50 mA/max. 100 mA
Permissible load / channel	max. +/- 20 mA	max. +/- 30 mA	max. +/- 20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz 5)
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V – 3 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	yes	yes
Reverse polarity protection of the power supply	no, 10 ... 30 V DC: yes	yes	no
UL approval	file no. E224618		
GL approval	letter of conformity No. 74130		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

1) During the run-in-phase of approx. 2 hours, reduce the limits for working temperature_{max} or speed max by 1/3.
2) Depending on shaft diameter.
3) With connector: -40°C [-40°F], securely installed: -30°C [-22°F], flexibly installed: -20°C [-4°F].
4) If power supply correctly applied.
5) Max. recommended cable length 30 m [98.43’].

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 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclometers
 Connection technology
 Accessories
 Addresses

Incremental encoders

Large hollow shaft robust, optical	A02H (hollow shaft)	Push-pull / RS422 / SinCos
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Terminal assignment

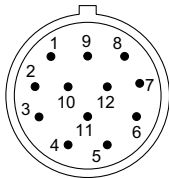
Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)											
1 ... D	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Core color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield
M23 connector, 12-pin													
1 ... D	2	Signal:	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)

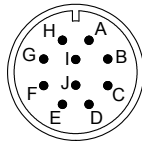
Top view of mating side, male contact base



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
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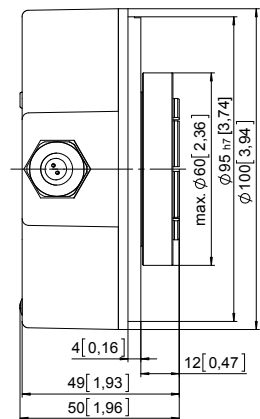
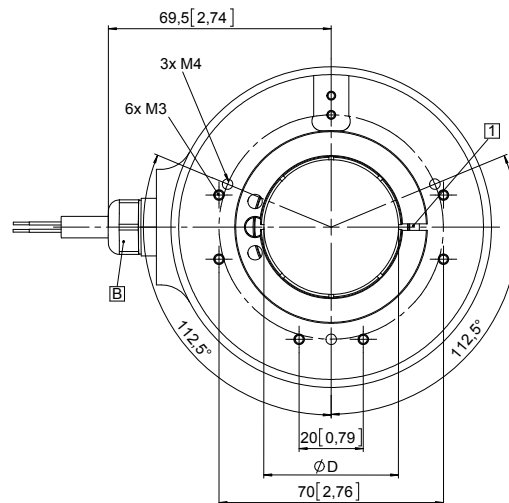
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange without mounting aid Flange type 1

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

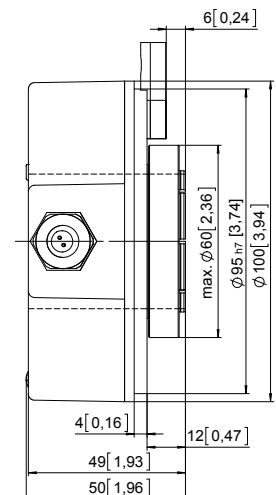
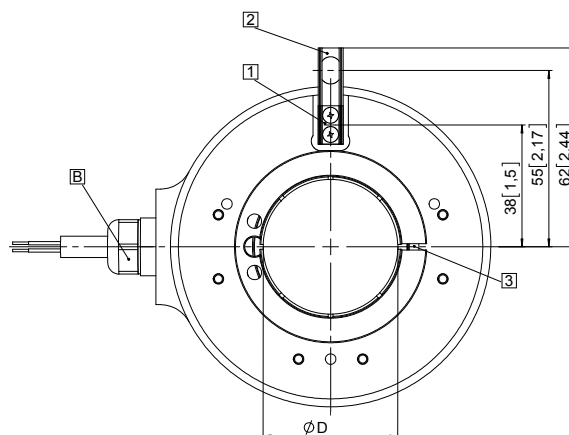
D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7



Flange with spring element Flange type 2 and 3

- 1 Spring element, short (flange type 2)
- 2 Spring element, long (flange type 3)
- 3 Recommended torque for the clamping ring
flange type 2: 1.0 Nm
flange type 3: 2.0 Nm
- B Cable version

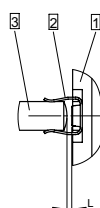
D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7



Mounting using the spring element, short

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

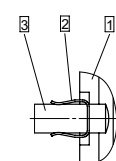
- 1 Flange
- 2 Spring element, short
- 3 Cylindrical pin



Mounting using the spring element, long

Cylindrical pin fed through the bore of the spring

- 1 Flange
- 2 Spring element, long
- 3 Cylindrical pin



Incremental encoders

Large hollow shaft robust, optical

A02H (hollow shaft)

Push-pull / RS422 / SinCos

Dimensions hollow shaft version

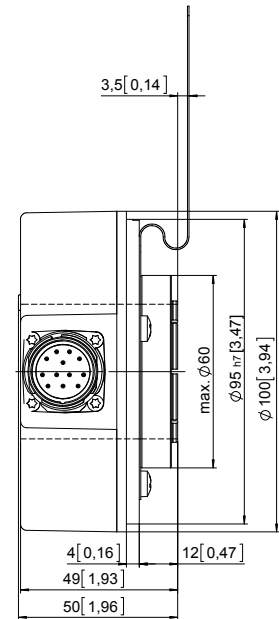
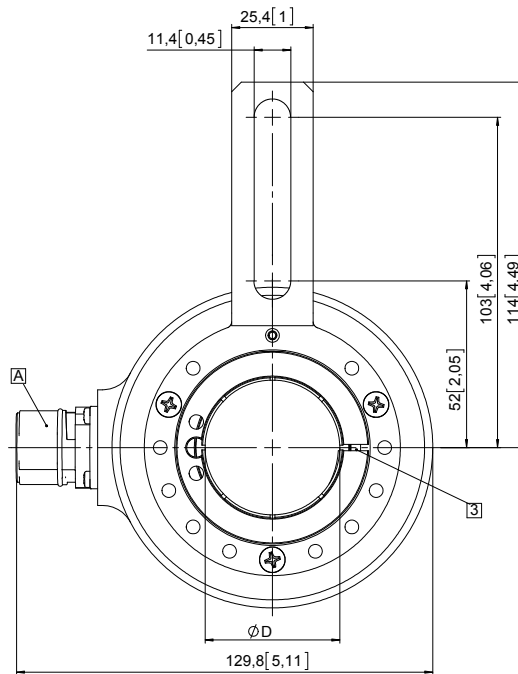
Dimensions in mm [inch]

Flange with torque stop, long Flange type 5

③ Recommended torque for the clamping ring 2.0 Nm

Ⓐ Plug version

D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7

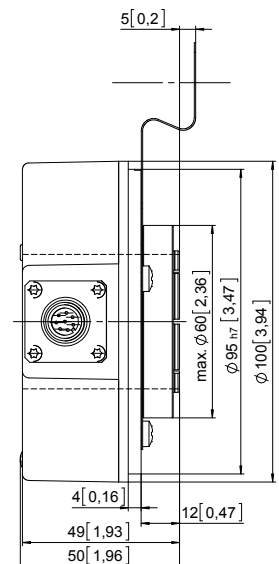
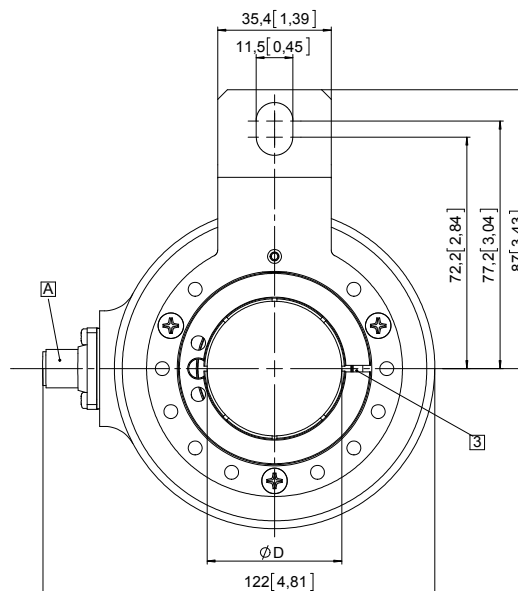


Flange with torque stop, short 4.5" Flange type 6

③ Recommended torque for the clamping ring 2.0 Nm

Ⓐ Plug version

D	Fit
20 [0.79]	H7
25 [0.98]	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
40 [1.57]	H7
42 [1.65]	H7
5/8"	H7
1"	H7
1 1/4"	H7



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singleturn

Absolute encoders
multiturn

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Linear measuring technology

Inclinometers

Connection technology

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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.

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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	8.H100 . 1 1 3 X . XXXX . XXXX	
	Type	
a Flange 1 = Euro RE0444	i Output circuit / power supply 1 = RS422 (with inverted signal) / 5 ... 30 V DC 2 = Push-pull (with inverted signal) / 10 ... 30 V DC	i 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)
b Shaft ($\varnothing \times L$), with feather key shaft slot 1 = $\varnothing 11 \times 30$ mm [0.43 x 1.18"]	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)	<i>Optional on request</i> - other pulse rates - Ex 2/22
c Version 3 = 2 x incremental encoder		

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 aluminum die-cast (EN AC-44300), seawater durable coating flange seawater durable aluminum type Al Si Mg Mn (EN AW-6082)
Shock resistance acc. to EN 60068-2-27	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 max. +/- 20 mA peak 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 min. 2.5 V LOW max. 0.5 V min. +V - 2.5 V max. 0.5 V
Rising edge time t_r	max. 200 ns max. 1 μs
Falling edge time t_f	max. 200 ns max. 1 μs
Short circuit proof outputs ²⁾	yes ³⁾ yes
Reverse polarity protection of the power supply	yes yes
CE-compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

1) XXXX = cable length in meters.
2) If power supply +V correctly applied.
3) Only one channel allowed to be shorted-out:
At +V short circuit to channel or 0 V is permitted.

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Absolute encoders multiturn
Bearings encoders
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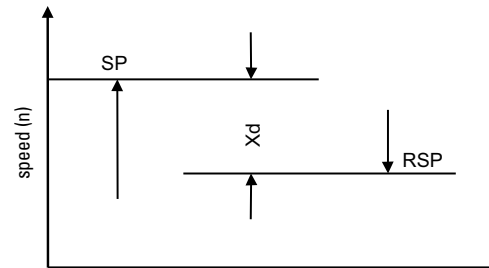
Incremental encoders

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 / max. 50 V AC 1 A / max. 75 V DC

(more details see manual)

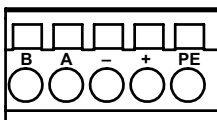
Definition switching hysteresis (Xd)



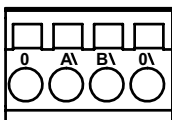
SP = switching point (for switching speed ns)
RSP = reset point
Xd = switching difference (hysteresis)

Terminal assignment terminal connections

Incremental encoders

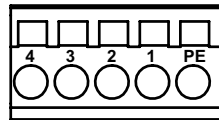


B incremental track B
A incremental track A
- 0 V
+ +V
PE shield

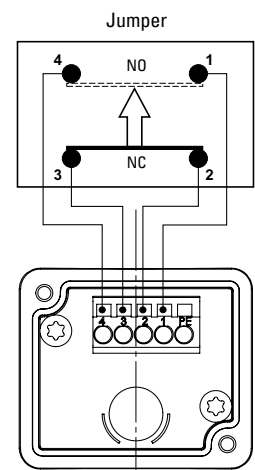


0 incremental track 0
 \bar{A} incremental track \bar{A}
 \bar{B} incremental track \bar{B}
 $\bar{0}$ incremental track $\bar{0}$

Speed switch



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



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Absolute encoders
multiturn

Bearingless encoders

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Incremental encoders

Heavy Duty shaft, optical

Sendix Heavy Duty H100 (shaft)

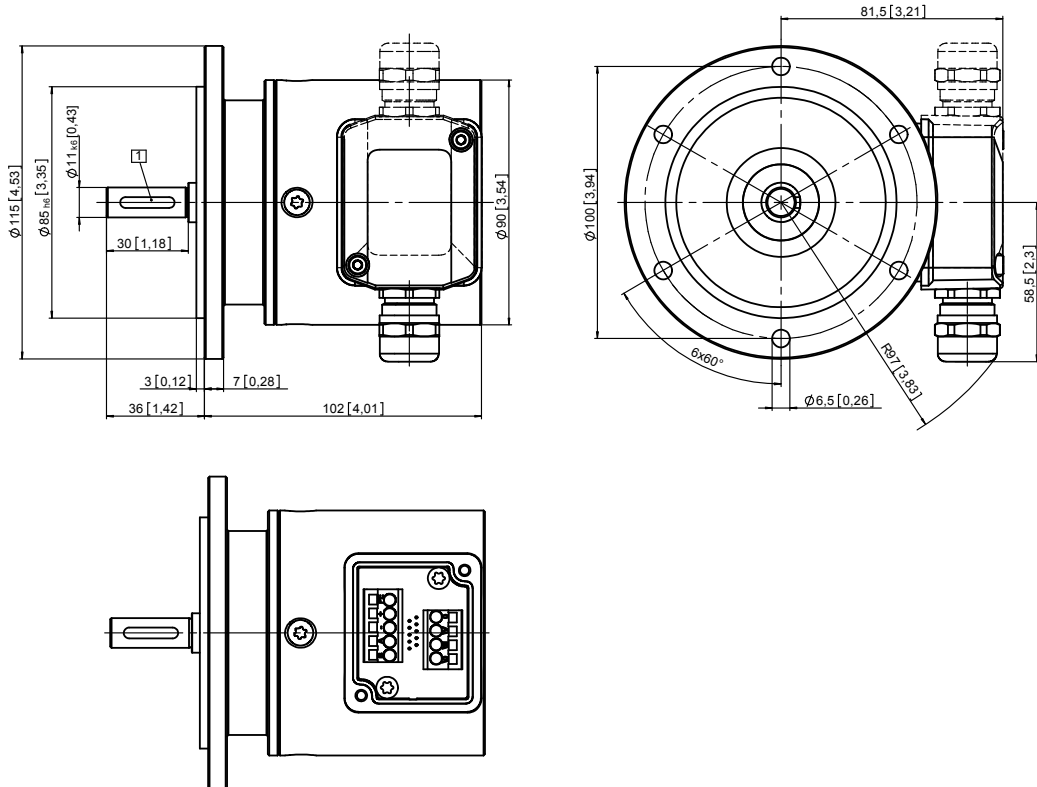
Push-pull / RS422 / speed switch

Dimensions

Dimensions in mm [inch]

Incremental encoder Version 1

- 1 Feather key acc. to ISO 773 4 x 4 x 20 [0.16 x 0.16 x 0.79]



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Incremental encoders

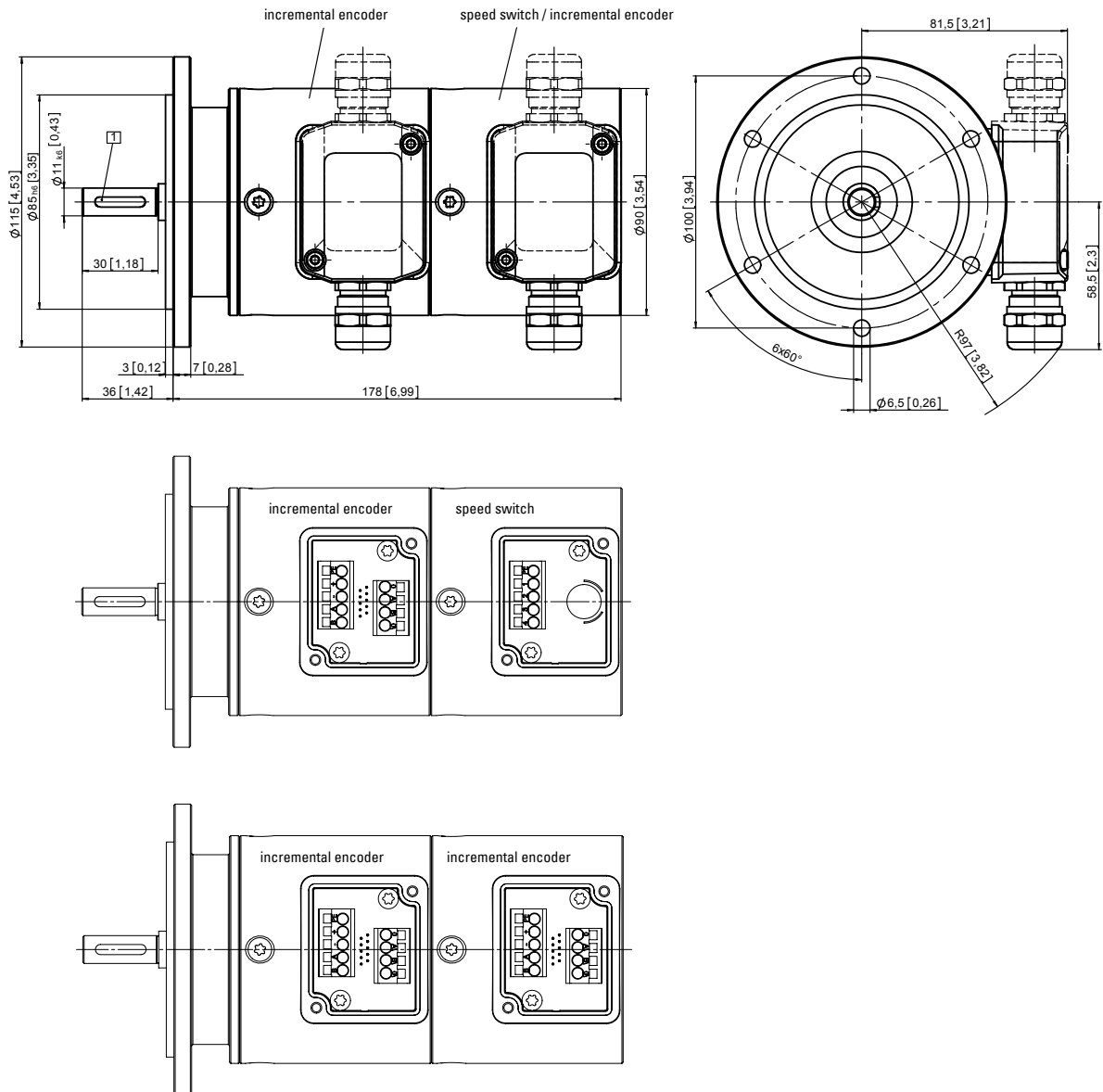
Heavy Duty shaft, optical	Sendix Heavy Duty H100 (shaft)	Push-pull / RS422 / speed switch
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Dimensions

Dimensions in mm [inch]

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

- 1 Feather key acc. to ISO 773
4 x 4 x 20 [0.16 x 0.16 x 0.79]



- Product overview Basics
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Incremental encoders

Heavy Duty hollow shaft, optical

Sendix Heavy Duty H120 (hollow shaft)

Push-pull / RS422 / optical fiber



The Sendix Heavy Duty H120 were especially developed for large motors and generators. They are highly accurate and extremely robust thanks to HD-Safety-Lock™ – the Heavy Duty hollow shaft design of the latest generation with sturdy bearing construction and integrated bearing isolation. The dual protection of the shaft, the wide temperature range and the high protection level allow for use even under the harshest conditions.

The very large hollow shaft up to 28 mm plus the wide variety of mounting solutions and connection options offer the very highest degree of flexibility during installation.



Robust

- Integrated bearing isolation up to 2.5 kV for reliable shaft connection. ¹⁾
- Extremely high resilience as a result of dual protection of the shaft (shielding cover disk and radial shaft seal), protection levels IP66 and IP67 as well as a seawater durable housing.
- High shock (200 g) and vibration (15 g) resistance.
- High level of resistance to interference as a result of optical fiber technology.

Flexible

- 3 fixing solutions: conical central fastening, cylindrical central fastening or through hollow shaft.
- Connection via cable, M12 or M23 connector, terminal box or optical fiber.
- Torque stop on the flange or the cover – allows the device to be rotated as required during mounting.
- Through hollow shaft up to ø 28 mm.

Order code Hollow shaft version

8.H120.XXXX.XXXX
Type a b c d e

- a Flange**
 1 = without mounting aid
 2 = with fastening arm 70 mm [2.76"] ²⁾
 3 = with fastening arm 100 mm [3.93"] ²⁾
 4 = with fastening arm 150 mm [5.91"] ²⁾
 5 = with stator coupling, ø 119 mm [4.69"]

- b Through hollow shaft**
 2 = ø 16 mm [0.63"]
 3 = ø 20 mm [0.79"]
 5 = ø 25 mm [0.98"]
 7 = ø 28 mm [1.10"]
 6 = ø 1"
Blind hollow shaft, with central fastening
 insertion depth max. 53 mm [2.09"]
 A = ø 12 mm [0.47"]
 B = ø 16 mm [0.63"]
Blind hollow shaft, cone with central fastening
 insertion depth max. 22.5 mm [0.89"]
 K = ø 17 mm [0.67"], 1 : 10

- c Output circuit / power supply**
 4 = RS422 (with inverted signal) / 5 V DC
 1 = RS422 (with inverted signal) / 10 ... 30 V DC
 5 = push-pull (with inverted signal) / 10 ... 30 V DC
 6 = push-pull (with inverted signal) / 10 ... 30 V DC, power version up to 350 m
 B = optical fiber + RS422 (with inverted signal) / 5 V DC ³⁾
 A = optical fiber + RS422 (with inverted signal) / 10 ... 30 V DC ³⁾
 C = optical fiber + push-pull (with inverted signal) / 10 ... 30 V DC ³⁾

- d Type of connection**
 1 = radial cable, 1 m [3.28'] PVC
 A = radial cable, special length PVC *)
 2 = radial M12 connector, 8-pin, ccw
 4 = radial M23 connector, 12-pin, ccw
 D = radial M23 connector, 12-pin, cw
 K = terminal box with plug-in spring terminal connectors, rotatable through 180°
 L = optical fiber connector + radial M23 connector, 12-pin, cw ⁴⁾
 *) Available special lengths (connection type A):
 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
 order code expansion .XXXX = length in dm
 ex.: 8.H120.121A.2048.0030 (for cable length 3 m)

- e Pulse rate**
 50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000
 (e.g. 360 pulses => 0360)
Optional on request
 - other pulse rates
 - Ex 2/22 (not for type of connection L) ⁵⁾

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

3) Can only be ordered with connection type L.
 4) Can only be ordered with output circuits A, B or C.
 5) For the cable connection type, cable material PUR.

Incremental encoders

Heavy Duty hollow shaft, optical	Sendix Heavy Duty H120 (hollow shaft)	Push-pull / RS422 / optical fiber
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Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6041.8211.002M
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable ¹⁾	8.0000.6201.0002
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0
	M23 female connector with coupling nut, 12-pin ¹⁾	8.0000.5012.0000
Simplex patch cable, ST-ST-multimode	optical fiber, length 5 m [16.40']	05.B09-B09-821-0005
Cable gland for optical fiber version	for achieving protection IP66 and IP67 at the optical fiber connector	8.0000.5000.0007
Optical fiber receiver	HTL / 10 ... 30 V DC, plug-in connector HD-Sub D15	6.LWLE.51

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

Technical data

Mechanical characteristics		
Maximum speed		6000 min ⁻¹
	at 60°C [140°F]	3500 min ⁻¹
Starting torque – at 20°C [68°F]		0.05 Nm
Load capacity of shaft	radial	475 N
	axial	375 N
Weight		1.6 ... 2.0 kg [56.44 ... 70.55 oz] (depending on version)
Protection acc. to EN 60529		IP66 + IP67
Working temperature range		-40°C ²⁾ ... +100°C ³⁾ [-40°F ³⁾ ... +212°F ³⁾
Materials	shaft	stainless steel, bore tolerance H7
	housing, flange	seawater durable
Shock resistance acc. to EN 60068-2-27		2000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		150 m/s ² , 10 ... 2000 Hz

Technical data for optical fiber connection	
Power consumption per module	< 2 W
Input level optical fiber transmitter	10 ... 30 V DC or RS422
Optical wavelength	850 nm
Optical transmission rate	120 Mbit/s
Optical fiber synchronization display	LED on the receiver
Optical fiber connection	ST connector, ø 9 mm [0.35"]
Glass fiber	multimode fiber, 50/125 µm, 62.5/125 µm
Optical fiber transmission distance	max. 2000 m [6561.68']

Electrical characteristics				
Output circuit		RS422 (TTL-compatible)	Push-pull	Push-pull (power version)
Power supply		5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC	10 ... 30 V DC
Power consumption (no load)		max. 90 mA	max. 80 mA	max. 90 mA
Permissible load per channel	DC	max. +/- 20 mA	max. +/- 30 mA	max. +/- 150 mA
	peak	max. +/- 30 mA	max. +/- 70 mA	max. +/- 200 mA
Pulse frequency		max. 300 kHz	max. 300 kHz	max. 300 kHz
Max. cable length		550 m at 100 kHz	150 m at 80 kHz	350 m at 100 kHz
Signal level	HIGH	min. 2.5 V	min. +V - 3.0 V	min. +V - 4.0 V
	LOW	max. 0.5 V	max. 2.5 V	max. 3.0 V
Rising edge time t_r		max. 200 ns	max. 1 µs	max. 1 µs
Falling edge time t_f		max. 200 ns	max. 1 µs	max. 1 µs
Short circuit proof outputs ⁴⁾		yes	yes	yes
Reverse polarity protection of the power supply		yes	yes	yes
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

- 1) Suitable for connection type 4.
- 2) With connector: -40°C [-40°F], with securely installed cable: -30°C [-22°F], with flexibly installed cable: -20°C [-4°F].
- 3) Measured at the flange.
- 4) If power supply correctly applied.

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Incremental encoders

Heavy Duty hollow shaft, optical

Sendix Heavy Duty H120 (hollow shaft)

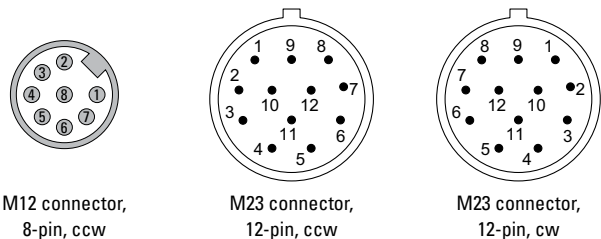
Push-pull / RS422 / optical fiber

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)												
1, 4, 5, 6	1, A	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Core color:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	Shield	
Output circuit	Type of connection	M12 connector, 8-pin												
1, 4, 5, 6	2	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Pin:	1	2	-	-	3	4	5	6	7	8	PH ¹⁾	
Output circuit	Type of connection	M23 connector, 12-pin												
1, 4, 5, 6, A, B, C	4, D, L	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾	
Output circuit	Type of connection	Terminal connections												
1, 4, 5, 6	K	Signal:	B	A	0 V	+V	\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



M12 connector, 8-pin, ccw

M23 connector, 12-pin, ccw

M23 connector, 12-pin, cw

¹⁾ PH = shield is attached to connector housing.

Incremental encoders

Heavy Duty hollow shaft, optical Sendix Heavy Duty H120 (hollow shaft) Push-pull / RS422 / optical fiber

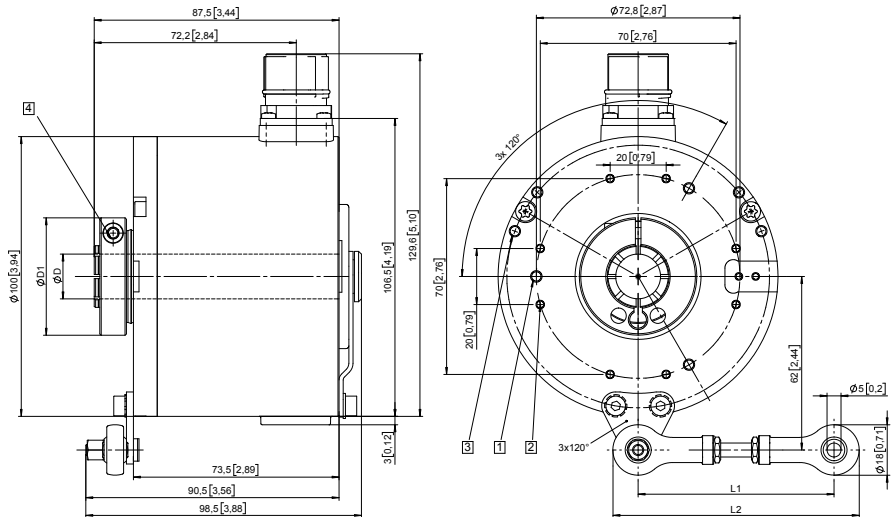
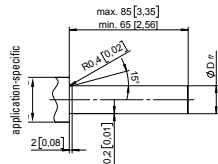
Dimensions

Dimensions in mm [inch]

Flange with fastening arm Through hollow shaft

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)

Shaft connection to the application



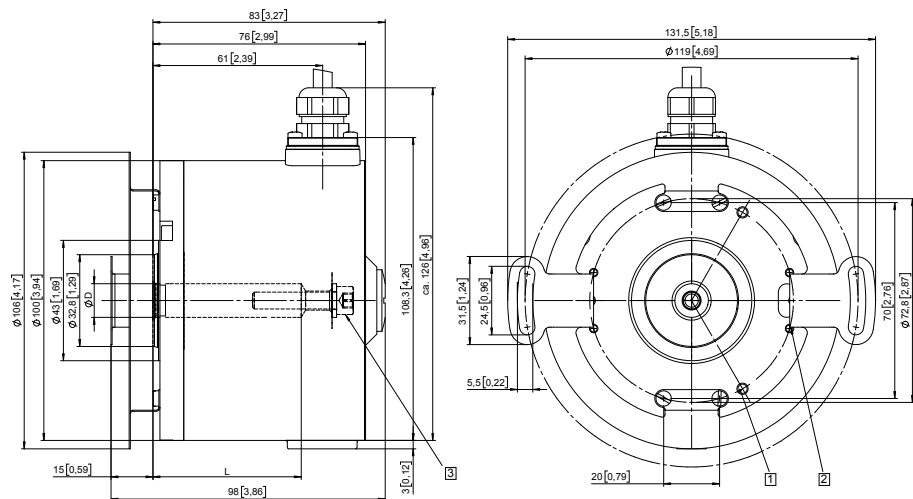
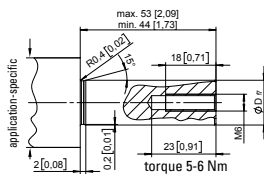
D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1"	H7	47.5 [1.87]

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

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

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 Recommended torque for M6 (SW5) 5 - 6 Nm

Shaft connection to the application



D	Fit	L
12 [0.47]	H7	53 [2.09]
16 [0.63]	H7	53 [2.09]

L = insertion depth blind hollow shaft

Incremental encoders

Heavy Duty hollow shaft, optical

Sendix Heavy Duty H120 (hollow shaft)

Push-pull / RS422 / optical fiber

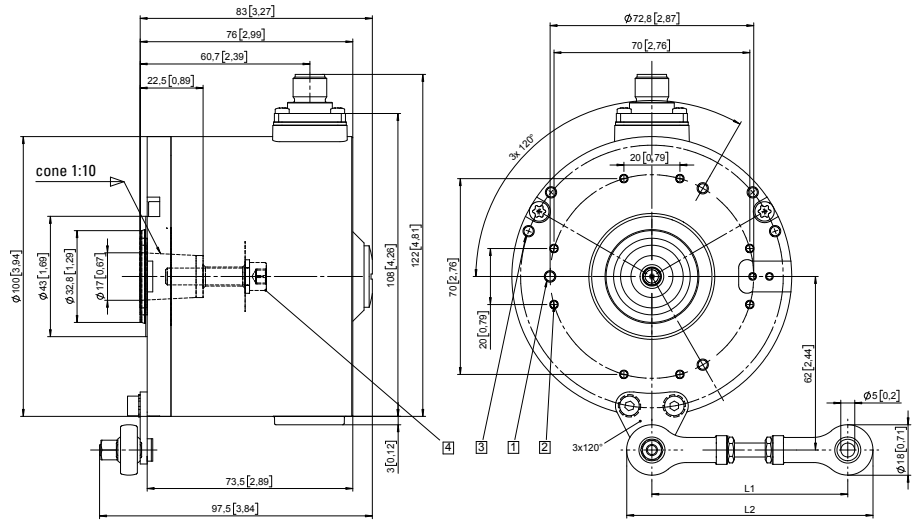
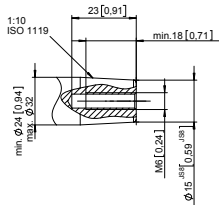
Dimensions

Dimensions in mm [inch]

Flange with fastening arm
Blind hollow shaft with central fastening,
cone, ϕ 17 [0.67], 1 : 10
(blind hollow shaft, cone type K)

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for M6 (SW5) 5 - 6 Nm

Shaft connection to the application

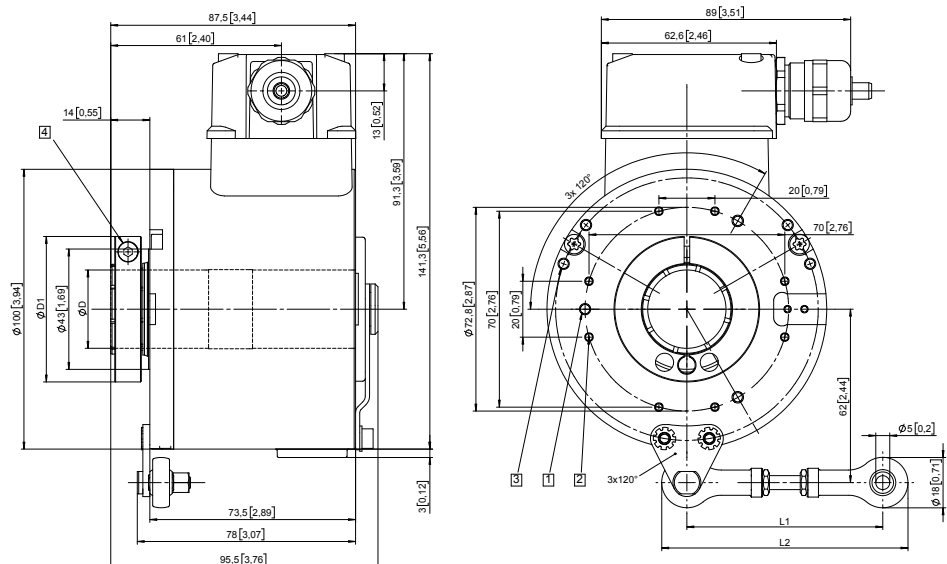
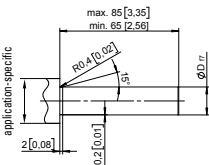


Fastening arm	L1	L2
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

Flange with fastening arm
Through hollow shaft and
terminal box

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)

Shaft connection to the application



D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1"	H7	47.5 [1.87]

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

Incremental encoders

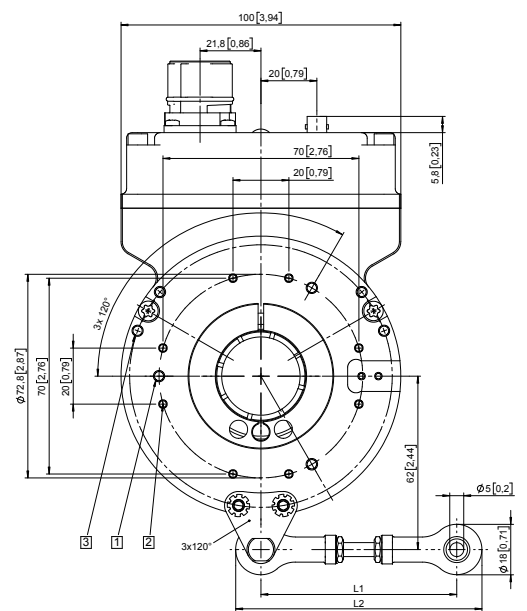
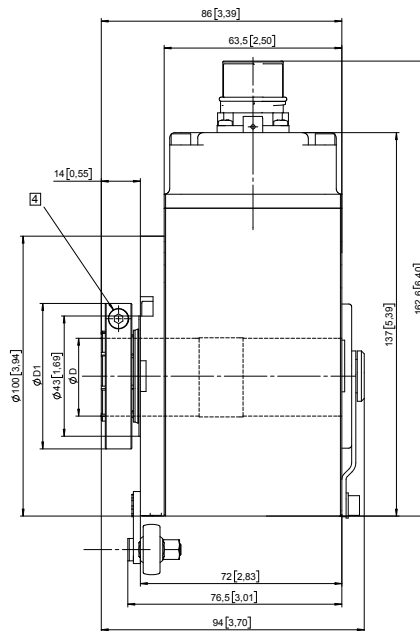
Heavy Duty hollow shaft, optical	Sendix Heavy Duty H120 (hollow shaft)	Push-pull / RS422 / optical fiber
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Dimensions

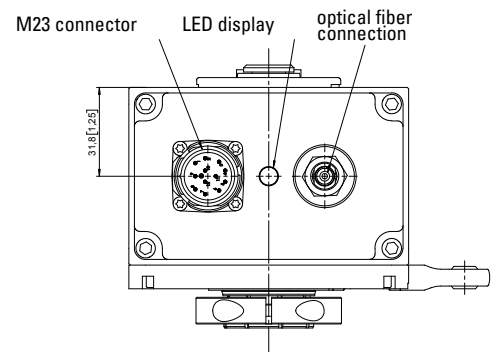
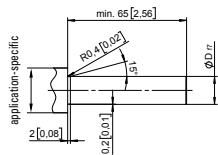
Dimensions in mm [inch]

Flange with fastening arm through hollow shaft and optical fiber connection (type of connection L)

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)



Shaft connection to the application



D	Fit	D1
16 [0.63]	H7	42.0 [1.65]
20 [0.79]	H7	42.0 [1.65]
25 [0.98]	H7	47.5 [1.87]
28 [1.10]	H7	52.0 [2.05]
1"	H7	47.5 [1.87]

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



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Absolute encoders - singleturn

Series	Type	Interface	Page	
Miniature, magnetic	2450 / 2470 (shaft / hollow shaft)	SSI	168	
Compact, magnetic	Sendix 3651 / 3671 (shaft / hollow shaft)	Analog	171	
	Sendix M3658 / M3678 (shaft / hollow shaft)	CANopen	176	
	Sendix M3658 / M3678 (shaft / hollow shaft)	SAE J1939	181	
Compact, optical	Sendix F3653 / F3673 (shaft / hollow shaft)	SSI / BiSS + incremental	186	
	Sendix F3658 / F3678 (shaft / hollow shaft)	CANopen	192	
Standard, optical	5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed	197	
	Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental	201	
Motor-Line	 Sendix 5873 (tapered shaft)	SSI / BiSS + incremental	209	
SIL2/PLd	Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow s.)	SSI / BiSS + SinCos	214	
SIL3/PLe	Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow s.)	SSI / BiSS + SinCos	221	
	Sendix 5858 / 5878 (shaft / hollow shaft)	PROFIBUS DP	228	
	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen	233	
	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT	241	
	Sendix 5858 / 5878 (shaft / hollow shaft)	PROFINET IO	246	
	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP	251	
	Stainless steel	5876 (hollow shaft)	SSI, parallel	256
Standard, optical	Sendix 7053 / 7073 (shaft / hollow shaft)	SSI / BiSS	260	
ATEX / IECEx – zone 1/21	SIL2/PLd	Sendix SIL 7053FS2 (shaft)	SSI / BiSS + SinCos	265
	SIL3/PLe	Sendix SIL 7053FS3 (shaft)	SSI / BiSS + SinCos	269
	Sendix 7058 / 7078 (shaft / hollow shaft)	PROFIBUS DP	273	
	Sendix 7058 / 7078 (shaft / hollow shaft)	CANopen	278	
Standard, optical ATEX / IECEx – mining	Sendix 7153 / 7173 (shaft / hollow shaft)	SSI / BiSS	283	
	Sendix 7158 / 7178 (shaft / hollow shaft)	PROFIBUS DP	288	
	Sendix 7158 / 7178 (shaft / hollow shaft)	CANopen	292	

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Miniature magnetic	2450 / 2470 (shaft / hollow shaft)	SSI
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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>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>e Gray-code
12 bit resolution</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)

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>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>e Gray-code
12 bit resolution</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)

Absolute encoders - singleturn

Miniature magnetic	2450 / 2470 (shaft / hollow shaft)	SSI
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Mounting accessory for shaft encoders	Order no.
Coupling	8.0000.1202.0404

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

Technical data

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

Electrical characteristics	
Power supply	5 (+0.4) V DC ¹⁾
Power consumption (no load)	< 40 mA
Reverse polarity protection of the power supply	yes
Short circuit proof output	yes ²⁾
Measuring range	360°
Linearity, 25°C [77°F]	< 1.5°
Repeat accuracy	≤ 0.4°
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface	
Output driver	RS485
Permissible load / channel	typ. 60 Ohm (acc. to RS485)
Resolution	12 bit
Code	gray
SSI clock speed	100 kHz ... 750 kHz
Monoflop time	typ. / max. 16 μs / 20 μs
Data refresh rate	typ. 100 μs

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)						
		Signal:	0 V	+V	C+	C-	D+	D-
2	1, 2, A, B	Core color:	WH	BN	GN	YE	GY	PK

+V: Encoder power supply +V DC
 0 V: Encoder power supply ground GND (0 V)
 C+, C-: Clock signal
 D+, D-: Data signal

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

Product overview
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 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclometers
 Connection technology
 Accessories
 Addresses

Absolute encoders - singleturn

Miniature magnetic

2450 / 2470 (shaft / hollow shaft)

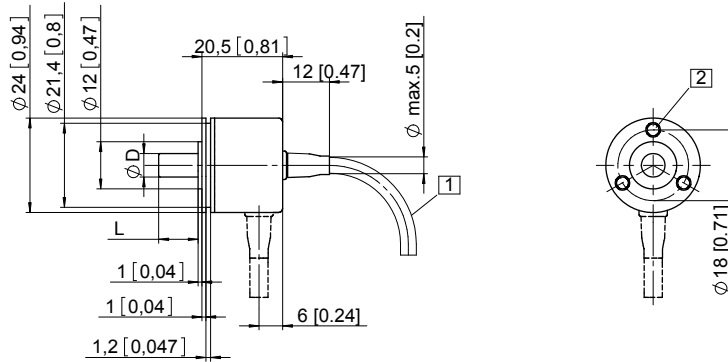
SSI

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

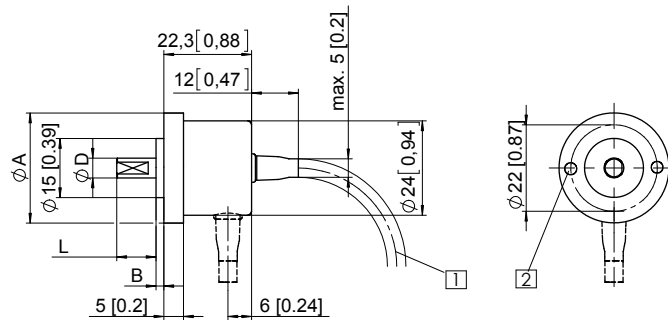


D	Fit	L
4 [0.16]	f7	10 [0.39]
5 [0.20]	f7	10 [0.39]
6 [0.24]	f7	10 [0.39]
1/4"	f7	10 [0.39]

Flange type 2, \varnothing 30 [1.18]

Flange type 3, \varnothing 28 [1.10]

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



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

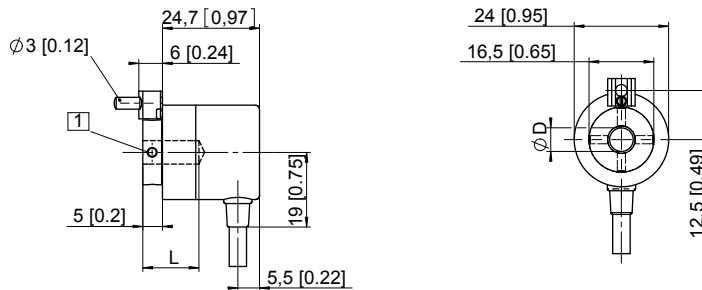
Flange type	A	B
2	\varnothing 30 [1.18]	3 [0.12]
3	\varnothing 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5



D	Fit	L
4 [0.16]	H7	14 [0.55]
6 [0.24]	H7	14 [0.55]
1/4"	H7	14 [0.55]

L = insertion depth max. blind hollow shaft

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singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

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Absolute encoders - singleturn

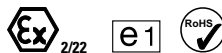
Compact magnetic	Sendix 3651 / 3671 (shaft / hollow shaft)	Analog
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Thanks to their different interfaces and measurement ranges, the Sendix 3651 and Sendix 3671 singleturn encoders with analog interface, in shaft and hollow shaft versions, are particularly flexible in use. A green and a red LED, acting as reference point and fault indicators, ensure easy installation and troubleshooting.

Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix are suitable even for demanding outdoor applications.

These encoders have an **e1**-approval from the German Federal Motor Transport Authority.



Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

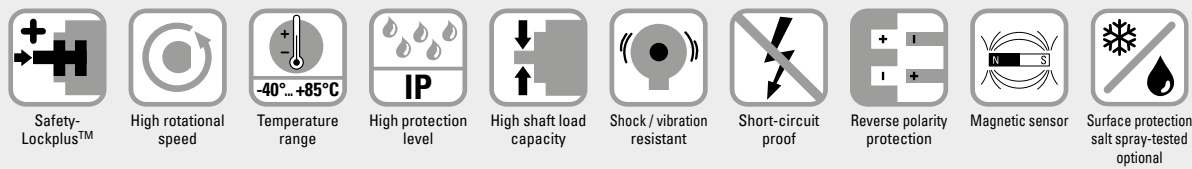
Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses



Safe operation

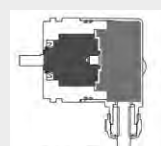
- Non-contact measuring system for long-life non-wear applications.
- Rugged die-cast-housing and protection up to IP69k for an exceptional tightness.
- High shock and vibration resistance for an exceptional robustness.

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.

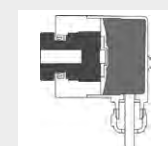
Safety-Lockplus™

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

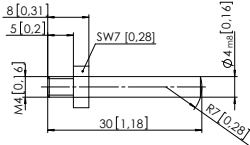
8.3651 Type	. 2XXXX . XXXXX a b c d e f g h
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<p>a Flange 2 = synchro flange, \varnothing 36 mm [1.42"]</p> <p>b Shaft ($\varnothing \times L$), with flat 3 = \varnothing 6 x 12.5 mm [0.24 x 0.49"] 6 = \varnothing 8 x 12.5 mm [0.32 x 0.49"] 5 = \varnothing 1/4" x 12.5 mm [0.49"]</p> <p>c Output circuit ¹⁾ 3 = current output 4 = voltage output</p>	<p>d Type of connection 1 = axial cable, 1 m [3.28'] PUR A = axial cable, special length PUR *) 2 = radial cable, 1 m [3.28'] PUR B = radial cable, special length PUR *) 3 = axial M12 connector, 5-pin 4 = radial M12 connector, 5-pin</p> <p>*) 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)</p> <p>e Measuring range 1 = 1 x 360° 2 = 1 x 180° 3 = 1 x 90° 4 = 1 x 45°</p>	<p>f Interface / power supply 3 = 4 ... 20 mA / 10 ... 30 V DC 4 = 0 ... 10 V / 15 ... 30 V DC 5 = 0 ... 5 V / 10 ... 30 V DC</p> <p>g Option 1 1 = count direction cw ²⁾ 2 = count direction ccw ³⁾</p> <p>h Option 2 1 = IP67 2 = IP69k</p> <p style="text-align: right;"><i>Optional on request</i> - Ex 2/22 (only for type of connection 3 + 4) - surface protection salt spray tested</p>
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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)	Analog	Product overview Basics
Order code Hollow shaft	8.3671 Type	.XXXXX.XXXXX a b c d e f g h	Incremental encoders
a Flange 2 = with spring element, long 5 = with stator coupling, ø 46 mm [1.81"]	d Type of connection 1 = axial cable, 1 m [3.28'] PUR A = axial cable, special length PUR *) 2 = radial cable, 1 m [3.28'] PUR B = radial cable, special length PUR *) 3 = axial M12 connector, 5-pin 4 = radial M12 connector, 5-pin *) Available special lengths (connection types A, B): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.3671.523A.1311.0030 (for cable length 3 m)	i Interface / power supply 3 = 4 ... 20 mA / 10 ... 30 V DC 4 = 0 ... 10 V / 15 ... 30 V DC 5 = 0 ... 5 V / 10 ... 30 V DC l Option 1 1 = count direction cw ²⁾ 2 = count direction ccw ³⁾ h Option 2 1 = IP67 2 = IP69k <i>Optional on request</i> - Ex 2/22 (only for type of connection 3 + 4) - surface protection salt spray tested	Absolute encoders singleturn
b Blind hollow shaft (insertion depth max. 18 mm [0.71"]) 2 = ø 6 mm [0.24"] 4 = ø 8 mm [0.32"] 6 = ø 10 mm [0.39"] 3 = ø 1/4"	e Measuring range 1 = 1 x 360° 2 = 1 x 180° 3 = 1 x 90° 4 = 1 x 45°		Absolute encoders multiturn
c Output circuit¹⁾ 3 = current output 4 = voltage output			Bearingless encoders

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 flange with spring element (flange type 2)	with fixing thread 	8.0010.4700.0000
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	05.00.6081.2211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

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

Technical data	
Mechanical characteristics	
Maximum speed	6000 min ⁻¹
Starting torque at 20°C [68°F]	< 0.06 Nm
Shaft load capacity	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	IP67 / IP69k
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PUR
General electrical characteristics	
e1 compliant acc. to	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
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.

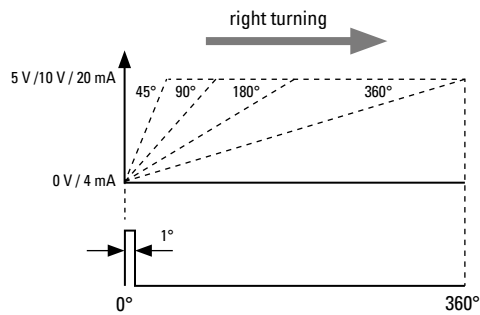
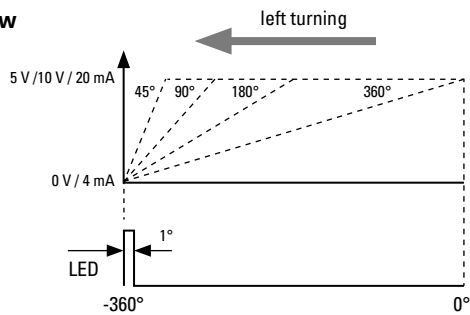
Absolute encoders - singleturn

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

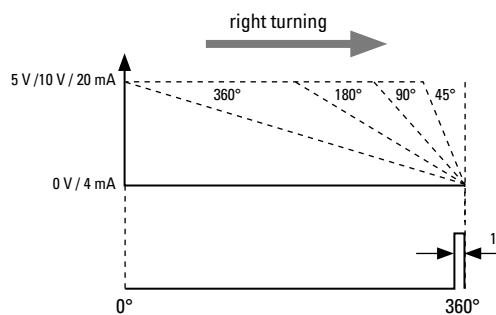
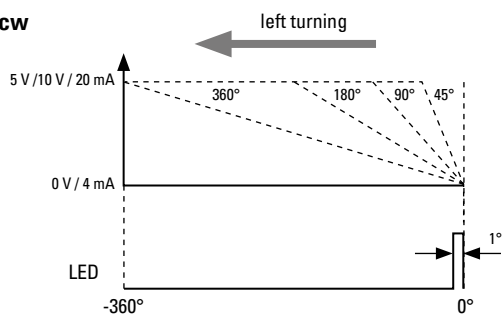
Example (output signal profile)

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

Version cw



Version ccw



Absolute encoders - singleturn

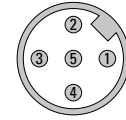
Compact magnetic	Sendix 3651 / 3671 (shaft / hollow shaft)	Analog
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Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)				
3 (current)	1, 2, A, B	Signal:	0 V	+V	+I	-I
		Core color:	WH	BN	GN	YE
Interface	Type of connection	M12 connector, 5-pin				
3 (current)	3, 4	Signal:	0 V	+V	+I	-I
		Pin:	3	2	4	5
Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)				
4, 5 (voltage)	1, 2, A, B	Signal:	0 V	+V	+U	-U
		Core color:	WH	BN	GN	YE
Interface	Type of connection	M12 connector, 5-pin				
4, 5 (voltage)	3, 4	Signal:	0 V	+V	+U	-U
		Pin:	3	2	4	5

+V : Encoder power supply +V DC
 0 V : Encoder power supply ground GND (0 V)
 +U / -U : Voltage + / voltage -
 +I / -I : Current + / current -

Top view of mating side, male contact base



M12 connector, 5-pin

Dimensions shaft version

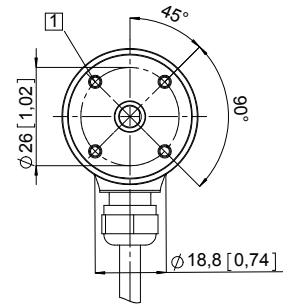
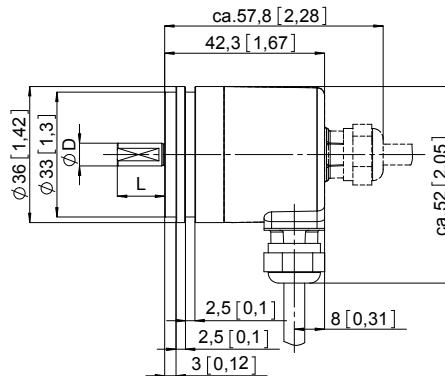
Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]

Flange type 2

(drawing with cable)

□ 4 x M3, 6 [0.24] deep



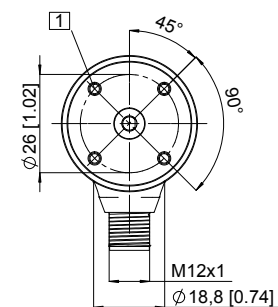
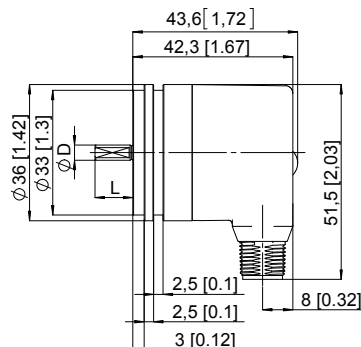
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]

Flange type 2

(drawing with M12 connector)

□ 4 x M3, 6 [0.24] deep



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

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Absolute encoders - singleturn

Compact magnetic

Sendix 3651 / 3671 (shaft / hollow shaft)

Analog

Dimensions hollow shaft version

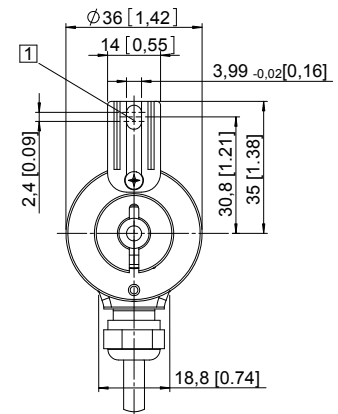
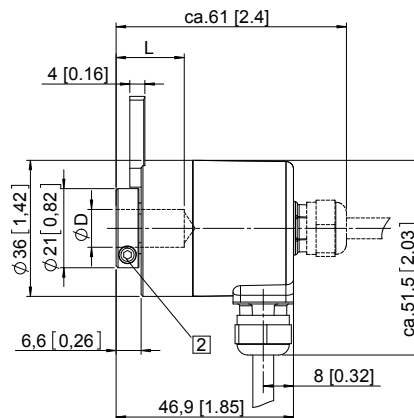
Dimensions in mm [inch]

Flange with spring element, long Flange type 2

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

D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth blind hollow shaft

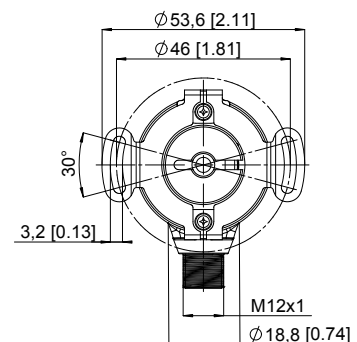
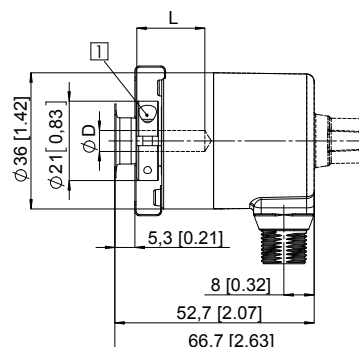


Flange with stator coupling, \varnothing 46 [1.81] Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth blind hollow shaft



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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.



Safety-Lockplus™



High rotational speed



Temperature range
-40°... +85°C



High protection level



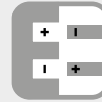
High shaft load capacity



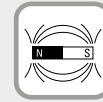
Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic sensor



Surface protection salt spray-tested optional

Robust technology

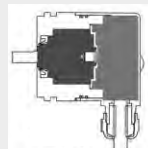
- Increased resistance against vibration and installation errors.
- Sturdy bearing construction in Safety-Lockplus™ design.
- Resistant die-cast-housing and protection up to IP69k.

Versatile applications

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

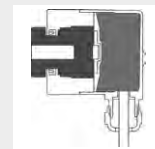
Safety-Lockplus™

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



Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly.



Order code shaft version

8.M3658 . 2XCX . 21 1X
Type a b c d e f

a Flange
2 = synchro flange, ø 36 mm [1.42"]

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

c Interface / power supply
C = CANopen DS301 V4.02 / 8 ... 30 V DC

d Type of connection
2 = radial cable, 1 m [3.28] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 5-pin
*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3658.23CB.2111.0030 (for cable length 3 m)

e Fieldbus profile
21 = CANopen

f Protection
1 = IP67
2 = IP69k

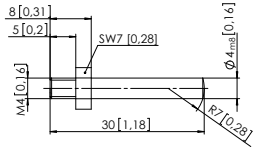
Optional on request
- Ex 2/22 (only for type of connection 4)
- surface protection salt spray tested

Absolute encoders - singleturn

Compact magnetic	Sendix M3658 / M3678 (shaft / hollow shaft)	CANopen
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Order code hollow shaft	8.M3678 Type	.XXCX.211X a b c d e f
a Flange 2 = with spring element, long 5 = with stator coupling, \varnothing 46 mm [1.81"]	d Type of connection 2 = radial cable, 1 m [3.28] PUR B = radial cable, special length PUR *) 4 = radial M12 connector, 5-pin	e Fieldbus profile 21 = CANopen
b Blind hollow shaft (insertion depth max. 18 mm [0.71"]) 2 = \varnothing 6 mm [0.24"] 4 = \varnothing 8 mm [0.32"] 6 = \varnothing 10 mm [0.39"] 3 = \varnothing 1/4"	f Protection 1 = IP67 2 = IP69k	i Protection 1 = IP67 2 = IP69k
c Interface / power supply C = CANopen DS301 V4.02 / 8 ... 30 V DC	*) Available special lengths (connection type B): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21"] order code expansion .XXXX = length in dm ex.: 8.M3678.52CB.2111.0030 (for cable length 3 m)	Optional on request - Ex 2/22 (only for type of connection 4) - surface protection salt spray tested

Mounting accessory for shaft encoders	Order no.
Coupling bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606

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

Connection technology	Order no.
Cordset, pre-assembled M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A211.005M
Connector, self-assembly (straight) M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

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

Technical data

Mechanical characteristics	
Maximum speed	6000 min ⁻¹
Starting torque at 20°C [68°F]	< 0.06 Nm
Shaft load capacity	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9	IP67 / IP69k
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PUR
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz
Permanent shock resistance acc. to EN 60068-2-27	1000 m/s ² , 2 ms
Vibration (broad-band random) acc. to EN 60068-2-64	5 ... 2500 Hz, 100 m/s ² - rms

Electrical characteristics	
Power supply	8 ... 30 V DC
Current consumption (no load)	max. 25 mA
Reverse polarity protection of the power supply	yes
Measuring range	360°
Absolute accuracy , 25°C [77°F]	±1°
Repeat accuracy , 25°C [77°F]	±0.2°
Data refresh rate	400 μ s
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

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

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 color LED located on the back indicates the operating or fault status of the CANbus, as well as the status of the internal diagnostics.

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated.

Class C2 functionality:

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 sending PDO's.
- Node address, baud rate and CAN bus / programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

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

LSS protocol profile DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length 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.

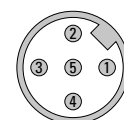
When used as a drop line, the termination resistor should not be activated.

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 cores individually before initial start-up)					
C	2, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Core color:	BN	WH	GY	GN	YE
Interface	Type of connection	M12 connector, 5-pin					
C	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

Absolute encoders - singleturn

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

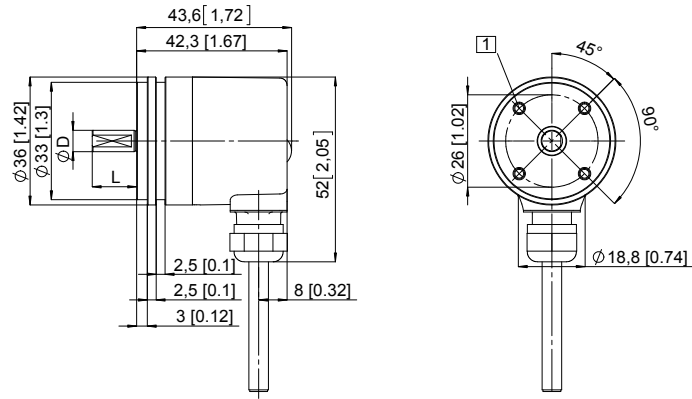
Dimensions in mm [inch]

Synchro flange, \varnothing 36 [1.42]

Flange type 2

(drawing with cable)

1 4 x M3, 6 [0.24] deep



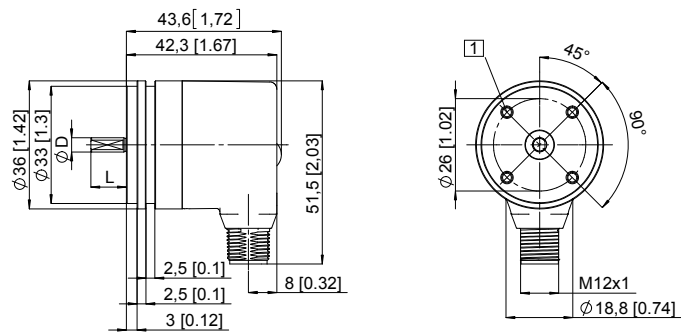
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

Synchro flange, \varnothing 36 [1.42]

Flange type 2

(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



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

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Absolute encoders - singleturn

Compact magnetic

Sendix M3658 / M3678 (shaft / hollow shaft)

CANopen

Dimensions hollow shaft version

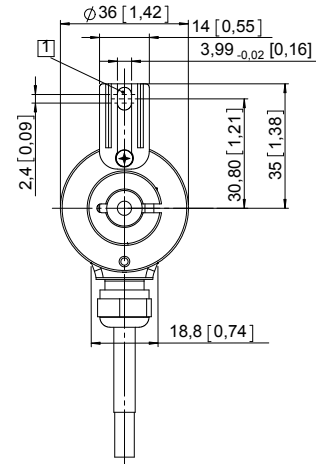
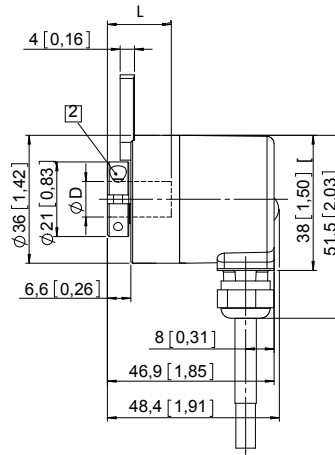
Dimensions in mm [inch]

Flange with spring element, long Flange type 2

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

D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth blind hollow shaft

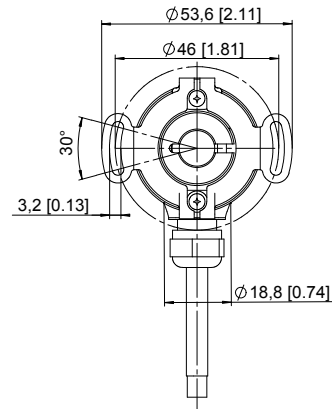
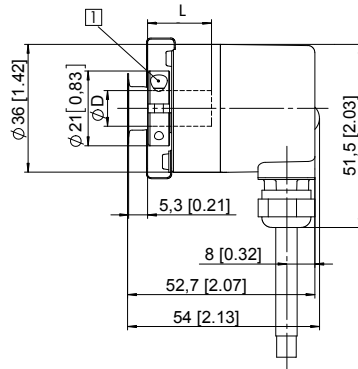


Flange with stator coupling, \varnothing 46 [1.81] Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth blind hollow shaft



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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 localization.

The encoders offer fast, error-free start-up with no need to set switches; the encoder address is assigned automatically via Address Claiming (ACL).



SAE J1939



Safety-Lockplus™



High rotational speed



Temperature range
-40°... +85°C



High protection level
IP



High shaft load capacity



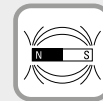
Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic sensor



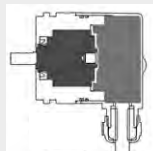
Surface protection salt spray-tested optional

Robust technology

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

Safety-Lockplus™

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

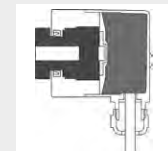


Versatile applications

- Up-to-the-minute fieldbus performance in the application: SAE J1939 with CAN-highspeed to ISO 11898.
- Fast determination of the operating status via two-color LED.
- Fast, error-free start up with no need to set switches; with automatic address claiming (ACL).

Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly.



Order code

Shaft version

8.M3658 . 2XCX . 32 1X
Type a b c d e f

a Flange

2 = synchro flange, ø 36 mm [1.42"]

b Shaft (ø x L), with flat

3 = ø 6 x 12.5 mm [0.24 x 0.49"]
6 = ø 8 x 12.5 mm [0.32 x 0.49"]
5 = ø 1/4" x 12.5 mm [0.49"]

c Interface / Power supply

C = CAN Highspeed / 8 ... 30 V DC

d Type of connection

2 = radial cable, 1 m [3.28] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 5-pin

*) Available special lengths (connection type B):
2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3658.23CB.3211.0030 (for cable length 3 m)

e Fieldbus profile

32 = J1939

f Protection

1 = IP67
2 = IP69k

Optional on request

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

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multiturn

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Linear measuring
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Connection
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Accessories

Addresses

Absolute encoders - singleturn

Compact magnetic	Sendix M3658 / M3678 (shaft / hollow shaft)	SAE J1939
Order code	8.M3678	XXCX.321X
Hollow shaft	Type	a b c d e i
a Flange	2 = with spring element, long 5 = with stator coupling, ø 46 mm [1.81"]	c Interface / Power supply C = CAN Highspeed / 8 ... 30 V DC
b Blind hollow shaft (insertion depth max. 18 mm [0.71"])	2 = ø 6 mm [0.24"] 4 = ø 8 mm [0.32"] 6 = ø 10 mm [0.39"] 3 = ø 1/4"	d Type of connection 2 = radial cable, 1 m [3.28] PUR B = radial cable, special length PUR *) 4 = radial M12 connector, 5-pin *) Available special lengths (connection type B): 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.M3678.52CB.3211.0030 (for cable length 3 m)
		e Fieldbus profile 32 = J1939
		i Protection 1 = IP67 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	with fixing thread	8.0010.4700.0000
for flange with spring element (flange type 2)		
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A211.005M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

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

Technical data	
Mechanical characteristics	
Maximum speed	6000 min ⁻¹
Starting torque at 20°C [68°F]	< 0.06 Nm
Shaft load capacity	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9	IP67 / IP69k
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PUR
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz
Permanent shock resistance acc. to EN 60068-2-27	1000 m/s ² , 2 ms
Vibration (broad-band random) acc. to EN 60068-2-64	5 ... 2500 Hz, 100 m/s ² - rms
Electrical characteristics	
Power supply	8 ... 30 V DC
Current consumption (no load)	max. 25 mA
Reverse polarity protection of the power supply	yes
Measuring range	360°
Absolute accuracy, 25°C [77°F]	±1°
Repeat accuracy, 25°C [77°F]	±0.2°
Data refresh rate	400 µs
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
Diagnostic LED (two-color, red/green)	
LED ON or blinking	red error display green status display

Absolute encoders - singleturn

Compact magnetic	Sendix M3658 / M3678 (shaft / hollow shaft)	SAE J1939
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Interface characteristics CANopen	
Resolution	1 ... 16384 (14 bit), scalable default: 16384 (14 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	SAE J1939
Node address	1 ... 255 via address claiming
Baud rate	250 kbit/s
Termination	software configurable

General information concerning SAE J1939

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

This protocol is a multimaster system with decentralized network management that does not involve channel-based communication.

It supports up to 254 logic nodes and 30 physical control devices per segment. The information is described as parameters (signals) and combined on 4 memory pages (data pages) into parameter groups (PGs). Each parameter group can be identified via a unique number, the parameter group number (PGN). Independently of this, each signal is assigned a unique SPN (suspect parameter number).

The major part of the communication occurs cyclically and can be received by all control devices without the explicit request for data (Broadcast). Furthermore the parameter groups are optimized to a length of 8 data bytes. This enables very efficient utilization of the CAN protocol. If greater amounts of data need to be transferred, then transport protocols (TP) can be used: BAM (broadcast announce message) and CDMT (connection mode data transfer). With BAM TP the transfer of data occurs as a broadcast.

Encoder implementation SAE J1939

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

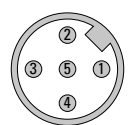
A two-color LED, located on the rear of the encoder, signals the operating and fault status of the J1939 protocol, as well as the status of the internal sensor diagnostics.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
C	2, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Core color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
C	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

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Absolute encoders - singleturn

Compact magnetic

Sendix M3658 / M3678 (shaft / hollow shaft)

SAE J1939

Dimensions shaft version

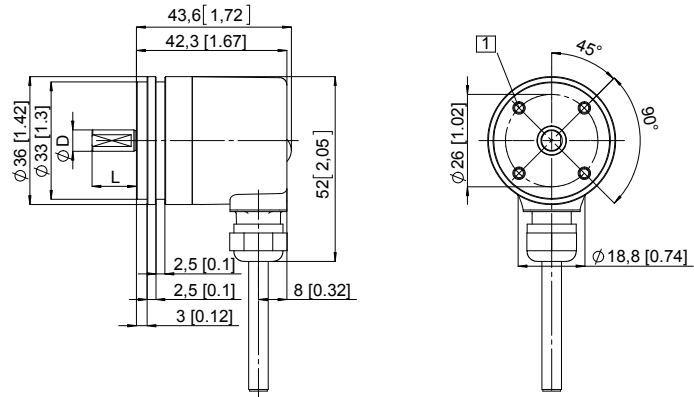
Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]

Flange type 2

(drawing with cable)

1 4 x M3, 6 [0.24] deep



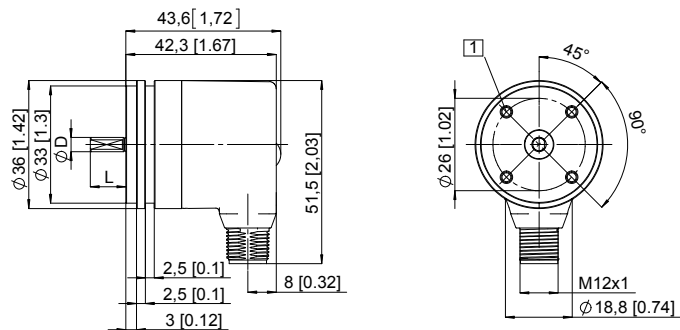
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	12.5 [0.49]
1/4"	h7	12.5 [0.49]

Synchro flange, ø 36 [1.42]

Flange type 2

(drawing with M12 connector)

1 4 x M3, 6 [0.24] deep



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

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

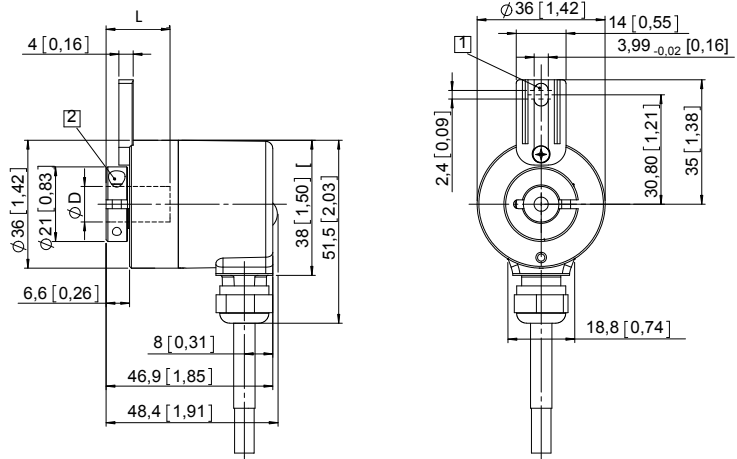
Dimensions in mm [inch]

Flange with spring element, long Flange type 2

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

D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth blind hollow shaft

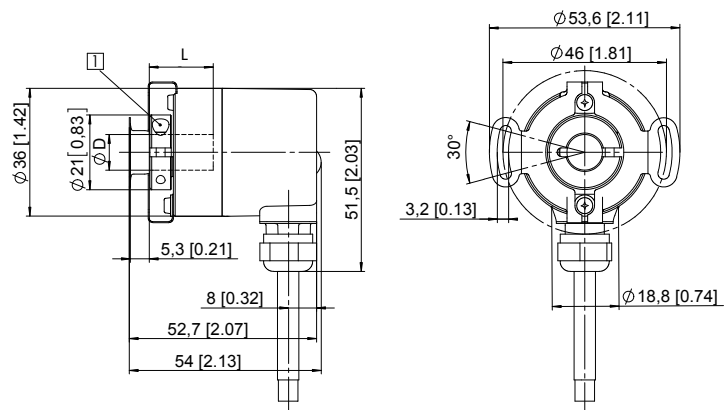


Flange with stator coupling, \varnothing 46 [1.81] Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L
6 [0.24]	H7	18 [0.71]
8 [0.32]	H7	18 [0.71]
10 [0.39]	H7	18 [0.71]
1/4"	H7	18 [0.71]

L = insertion depth blind hollow shaft



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Compact optical

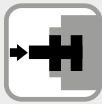
Sendix F3653 / F3673 (shaft / hollow shaft)

SSI / BiSS + incremental



The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS interface boasts exceptional ruggedness and compact dimensions.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm. Its high-precision optical sensor technology can achieve a resolution of up to 17 bits.



Safety-Lock™



Temperature range
-40°...+90°C



High protection level
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



SinCos



Intelligent Scan Technology™



Surface protection salt spray-tested optional

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +90°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 17 bits and 100 % magnetic field insensitivity.

Optimized performance

- High-precision with a data refresh rate of the position value ≤ 1µs.
- High-resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code
Shaft version

8.F3653 . **XXXX** . **XX** **12**
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, 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 + incremental
------------------------	--	---------------------------------

Order code	8.F3673	.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.	
Hollow shaft	Type	a b c d	e i		

<p>a Flange</p> <p>1 = with spring element, short, IP65 3 = with spring element, long, IP65 <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u></p> <p>b Through hollow shaft</p> <p>1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] 2 = ø 1/4" <i>Blind hollow shaft</i> <i>(insertion depth max. 14.5 mm [0.57"])</i> <u>4 = ø 10 mm [0.39"]</u></p>	<p>c Interface / power supply</p> <p>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</p> <p>d Type of connection</p> <p><u>1 = 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⁾</p> <p>*) 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)</p>	<p>e Code</p> <p>B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u></p> <p>i Resolution</p> <p>A = 10 bit 2 = 12 bit <u>3 = 13 bit</u> 4 = 14 bit 7 = 17 bit</p> <p style="text-align: right;"><i>Optional on request</i></p> <ul style="list-style-type: none"> - surface protection salt spray tested - other resolutions
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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	with fixing thread	8.0010.4700.0000
for flange with spring element (flange type 1 + 3)		
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PUR cable	05.00.6051.8211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0

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

Technical data

Mechanical characteristics	
Maximum speed	shaft version without shaft seal (IP65) 12000 min ⁻¹ or blind hollow shaft version 10000 min ⁻¹ (continuous)
	shaft version with shaft seal (IP67) 10000 min ⁻¹ or hollow shaft version 8000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	without shaft seal < 0.007 Nm with shaft seal (IP67) < 0.01 Nm
Shaft load capacity	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]

Protection	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 aluminum housing zinc die-cast cable PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

1) Only with interfaces 1 and 2 in combination with blind hollow shaft 10 mm [0.39"].

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Absolute encoders - singleturn

Compact optical		Sendix F3653 / F3673 (shaft / hollow shaft)		SSI / BiSS + incremental	
Electrical characteristics					
Power supply	5 V DC (±5 %) or 10 ... 30 V DC				
Current consumption (no load)	5 V DC	max. 60 mA			
	10 ... 30 V DC	max. 30 mA			
Reverse polarity protection of the power supply	yes (only with 10 ... 30 V DC)				
Short-circuit proof outputs	yes ¹⁾				
UL approval	file no. E224618				
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU				
SSI interface					
Output driver	RS485 transceiver type				
Permissible load / channel	max. +/- 30 mA				
Signal level	HIGH	typ. 3.8 V			
	LOW with $I_{Load} = 20\text{ mA}$	typ. 1.3 V			
Resolution	10 ... 17 bit				
Code	binary or gray				
SSI clock rate	50 kHz ... 2 MHz				
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs			
	ST resolution ≥ 15 bit	4 μs			
Monoflop time	≤ 15 μs				
Note:	If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.				
BiSS interface					
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				
BiSS clock rate	50 kHz ... 10 MHz				
Max. update rate	< 10 μs, depends on the clock rate and the data length				
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs			
	ST resolution 17 bit	2.4 μs			
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} (±20 %)	HIGH: min. 2.5 V LOW: max. 0.5 V			
Short circuit proof	yes ¹⁾	yes ¹⁾			
Pulse rate	2048 ppr	2048 ppr			
Status output					
Output driver	open collector, internal pull up resistor 22 kOhm				
Permissible load	max. 20 mA				
Signal level	HIGH	+V			
	LOW	< 1 V			
Active	LOW				
The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).					
An active status output (LOW) displays: LED fault (failure or ageing) – over-temperature – undervoltage In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.					
SET input					
Input	active HIGH				
Input type	comparator				
Signal level	HIGH	min. 60 % of +V, max: +V			
	LOW (+V = power supply)	max. 30 % of +V			
Input current	< 0.5 mA				
Min. pulse duration (SET)	10 ms				
Input delay	1 ms				
New position data readable after	1 ms				
Internal processing time	200 ms				
The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.					
The SET function should be carried out whilst the encoder is at rest.					
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.					
DIR input					
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.					
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.					
Response time (DIR input)	1 ms				
Power-ON					
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.					
Hot plugging of the encoder should be avoided.					

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

Absolute encoders - singleturn

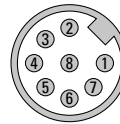
Compact optical	Sendix F3653 / F3673 (shaft / hollow shaft)	SSI / BiSS + incremental
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Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)													
1, 2	1, 3, F	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥			
			Core color:	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 cores individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	⊥
			Core color:	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 cores individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 V _{sens}	+V _{sens}	⊥		
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	shield		
6	1, 3, F	2048 SinCos, Sensor output	Cable (isolate unused cores individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	0 V _{sens}	+V _{sens}	A	\bar{A}	B	\bar{B}	⊥
			Core color:	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 cores individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{B}	⊥		
			Core color:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	shield		

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

Top view of mating side, male contact base



M12 connector, 8-pin

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Absolute encoders - singleturn

Compact optical

Sendix F3653 / F3673 (shaft / hollow shaft)

SSI / BiSS + incremental

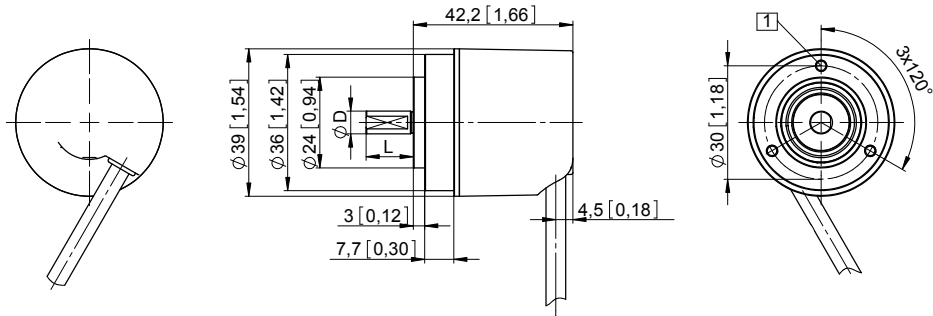
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 36 [1.42]

Flange type 1 and 3

1 3 x M3, 6 [0.24] deep



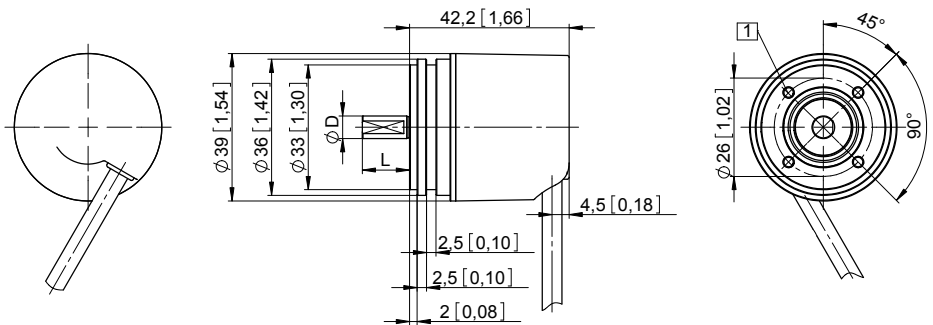
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Synchro flange, \varnothing 36 [1.42]

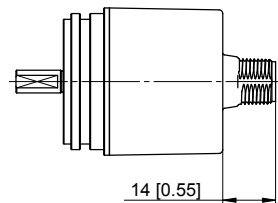
Flange type 2 and 4

(drawing with cable)

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"



Drawing with M12 connector and type of connection 8

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Compact optical	Sendix F3653 / F3673 (shaft / hollow shaft)	SSI / BiSS + incremental
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Dimensions hollow shaft version

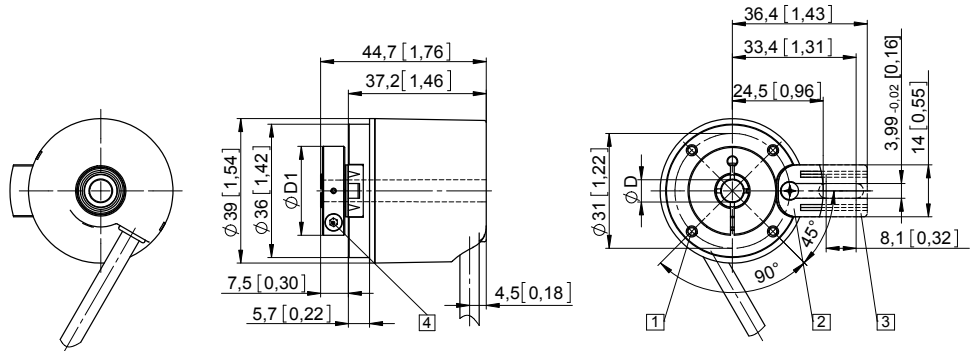
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

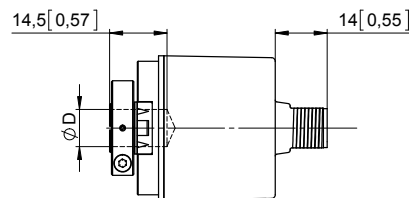
(drawing with spring element short, spring element long is shown dashed)

- 1 4 x M2.5, 5 [0.2] deep
- 2 Spring element, short recommendation: cylindrical pin DIN 7, \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



D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

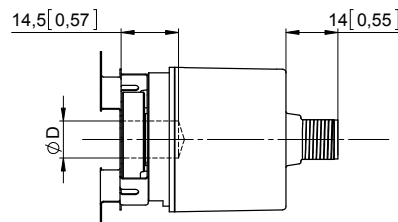
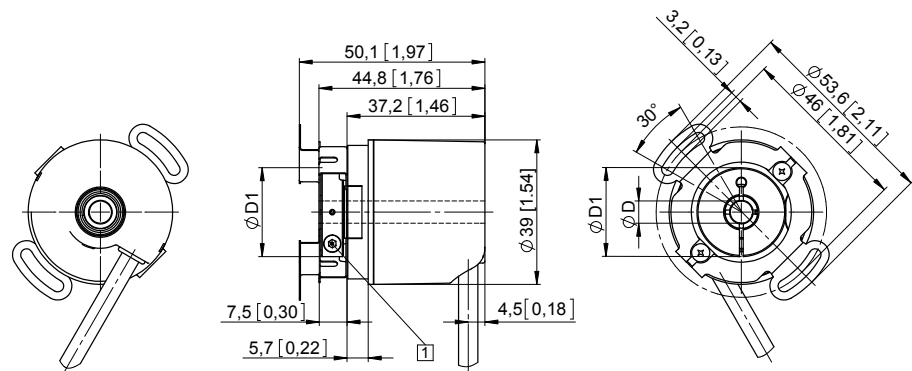


Blind hollow shaft for D = 10
drawing with M12 connector and type of connection 8

Flange with stator coupling, \varnothing 46 [1.81"]

Flange type 2

- 1 Recommended torque for the clamping ring 0.7 Nm



Blind hollow shaft for D = 10
drawing with M12 connector and type of connection 8

D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

Absolute encoders - singleturn

Compact optical

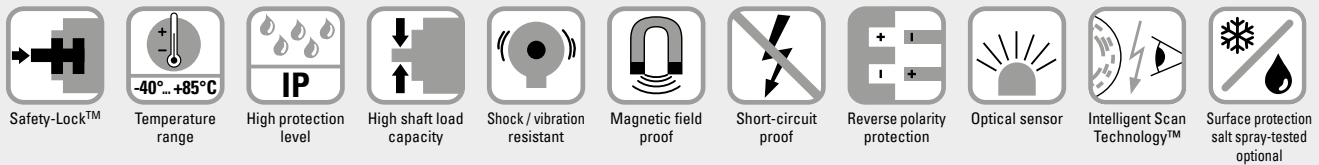
Sendix F3658 / F3678 (shaft / hollow shaft)

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**

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.F3658.432F2112.0030 (for cable length 3 m)

e Fieldbus profile

- 21 = CANopen**

Optional on request

- surface protection salt spray tested

Order code
Hollow shaft

8.F3678 . **XX** **2** **X** . **21** **1** **2**

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

- (insertion depth max. 14.5 mm [0.57"])
- 5 = ø 6 mm [0.24"]
- 7 = ø 8 mm [0.32"]
- 4 = ø 10 mm [0.39"]**
- 6 = ø 1/4"

c Interface / power supply

- 2 = CANopen DS301 V4.02 / 10 ... 30 V DC**

d Type of connection

- 1 = tangential cable, 1 m [3.28'] PUR**
- 3 = tangential cable, 5 m [16.40'] PUR
- F = tangential cable, special length PUR *)

*) Available special lengths (connection type F):
2, 3, 8, 10, 15 m [6.56, 9.84, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.F3678.242F2112.0030 (for cable length 3 m)

e Fieldbus profile

- 21 = CANopen**

Optional on request

- surface protection salt spray tested

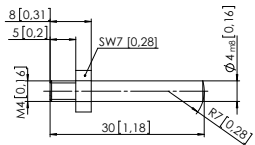
Absolute encoders - singleturn

Compact optical	Sendix F3658 / F3678 (shaft / hollow shaft)	CANopen
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Mounting accessory for shaft encoders	Order no.
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Coupling	bellows coupling \varnothing 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1102.0808
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Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
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Cylindrical pin, long for flange with spring element (flange type 1 + 3)	with fixing thread 	8.0010.4700.0000
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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	aluminum	
housing	zinc die-cast	
cable	PUR	
Shock resistance acc. to EN 60068-2-27		
	2500 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6		
	100 m/s ² , 55 ... 2000 Hz	

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply	ja
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen

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

Diagnostic LED (two-color, red/green)

LED ON or blinking	red error display green status display
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Compact optical	Sendix F3658 / F3678 (shaft / hollow shaft)	CANopen
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General information about CANopen

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

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

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

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

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

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated. Class C2 functionality:

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (Power on to operational), 3 sending PDO's.
- Node address, baud rate and CANbus / Programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

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

LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

CANbus connection

The CANopen encoders are equipped with a Bus trunk line in various lengths and can be terminated in the device. The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length Lu.

Lu < 5 m [16.40'] cable length for 125 Kbit

Lu < 2 m [6.56'] cable length for 250 Kbit

Lu < 1 m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

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

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	1, 3, F	Core color:	BN	WH	GY	GN	YE

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technology

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 Connection
technology

Accessories

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Absolute encoders - singleturn

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

Dimensions shaft version

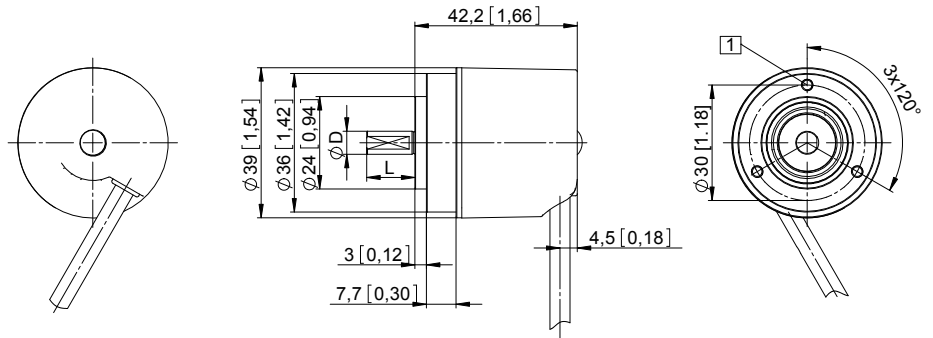
Dimensions in mm [inch]

Clamping flange, \varnothing 36 [1.42]

Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

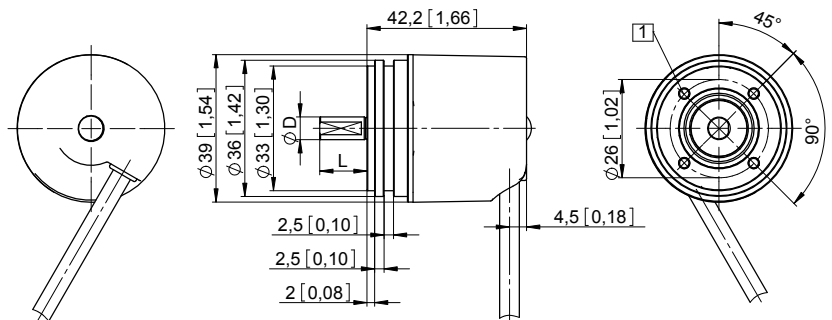


Synchro flange, \varnothing 36 [1.42]

Flange type 2 and 4

1 4 x M3, 6 [0.24] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"



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Absolute encoders - singleturn

Compact optical

Sendix F3658 / F3678 (shaft / hollow shaft)

CANopen

Dimensions hollow shaft version

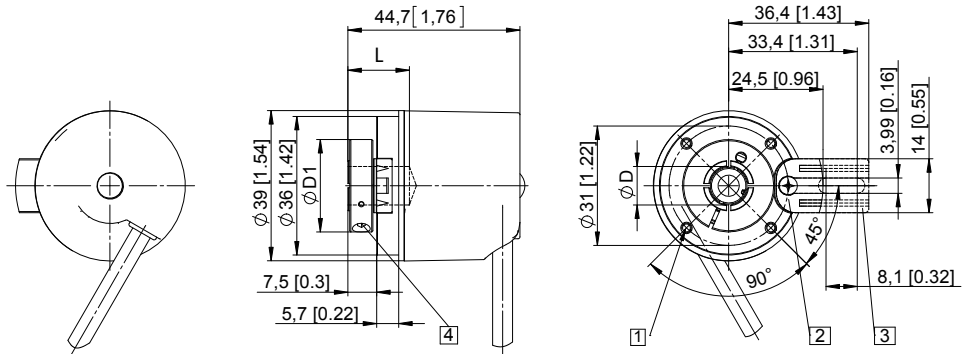
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

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

- 1 4 x M2.5, 5 [0.2] deep
- 2 Slot spring element, short recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Slot spring element, long recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 4 Recommended torque for the clamping ring 0.7 Nm



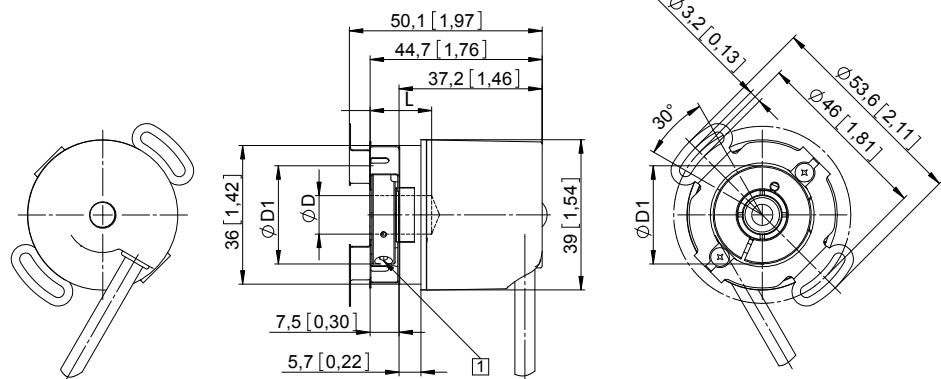
D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 46 [1.81"]

Flange type 2

- 1 Recommended torque for the clamping ring 0.7 Nm



D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]

L = insertion depth max. blind hollow shaft

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Absolute encoders - singleturn

Standard optical	5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed
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The singleturn encoders 5852 and 5872 with parallel interface and optical technology achieve a very high refresh rate of the position data of 40 kHz with a resolution of max. 14 bits.



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

Adaptable

- Power supply 5 V DC or 10 ... 30 V DC.
- Cable or connector M23.

Fast

- Refresh rate of the position data 40 kHz.

Order code	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			

<p>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"]</p>	<p>b Interface / power supply 1 = parallel (CMOS-TTL) / 5 V DC 3 = parallel / 10 ... 30 V DC</p> <p>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</p>	<p>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</p>	<p><i>Optional on request</i> - other code types - other divisions</p>
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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			

<p>a Flange 1 = with spring element, short 3 = with stator coupling, ø 65 mm [2.56"]</p> <p>b Through hollow shaft 6 = ø 10 mm [0.39"] 8 = ø 12 mm [0.47"]</p>	<p>c Interface / power supply 1 = parallel (CMOS-TTL) / 5 V DC 3 = parallel / 10 ... 30 V DC</p> <p>d Type of connection 1 = radial cable, 1 m [3.28'] PVC 2 = radial M23 connector, 17-pin, without mating connector</p>	<p>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</p>	<p><i>Optional on request</i> - other code types - other divisions</p>
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Reverse count direction

(Only with output type 3 and up to 13 bit gray code available)

Normal operation:

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

Reverse operation:

Output MSB inverted (pin 16) instead of output MSB (pin 3) connected. Falling code values when shaft turning clockwise (cw). Rising code values when shaft turning counterclockwise (ccw), top view of shaft.

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Absolute encoders - singleturn

Standard optical	5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed
Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling \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	Dimensions in mm [inch]	8.0010.4700.0000
for flange with spring element (flange type 1)	with fixing thread	
Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 17-pin 2 m [6.56'] PVC cable	8.0000.6741.0002
Connector, self-assembly (straight)	M23 female connector with coupling nut, 17-pin	8.0000.5042.0000

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

Technical data		
Mechanical characteristics		
Maximum speed	shaft version	12000 min ⁻¹
	hollow shaft version	6000 min ⁻¹ 1)
Mass moment of inertia	shaft version	approx. 1.8 x 10 ⁻⁶ kgm ²
	hollow shaft version	approx. 6 x 10 ⁻⁶ kgm ²
Starting torque at 20°C [68°F]	shaft version	< 0.01 Nm
	hollow shaft version	< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	shaft version	IP65
	hollow shaft version	IP66
Working temperature range		-20°C ... +85°C 2)
		[-4°F ... +185°F] 2)
Material	shaft / hollow shaft	stainless steel
Shock resistance acc. EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz
Electrical characteristics (parallel interface)		
Power supply (+V)	5 V DC (±5 %)	10 ... 30 V DC
Output driver	CMOS-TTL	Push-pull
Power consumption (no load)	typ.	40 mA
	max.	75 mA
Permissible load / channel	max. +0.5 / -2.0 mA	max. +/- 10 mA
Refresh rate of the position data	40000/s	40000/s
Signal level	HIGH	min. 3.4 V
	LOW	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 3)	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	file no. E224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

1) For continuous operation max. 1500 min⁻¹.
2) 70°C [158°F] for 14 bit version.
3) If power supply +V correctly applied.

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Absolute encoders - singleturn

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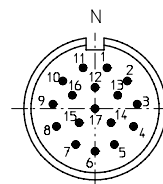
Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)																
		Signal	0 V	+V	1	2	3	4	5	6	7	8	9	10	11	12	13	14 (V/R) ⁴⁾
1, 3	5852: 1, 2	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY	RD	WH	BN	WH	YE
	5872: 1												PK	BU	GN	GN	YE	BN

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	14 (V/R) ⁴⁾	15	16
1, 3	5852: 3, 5	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	PH
	5872: 2																			

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- Signal : 1 = MSB; 2 = MSB-1; 3 = MSB-2 usw.
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



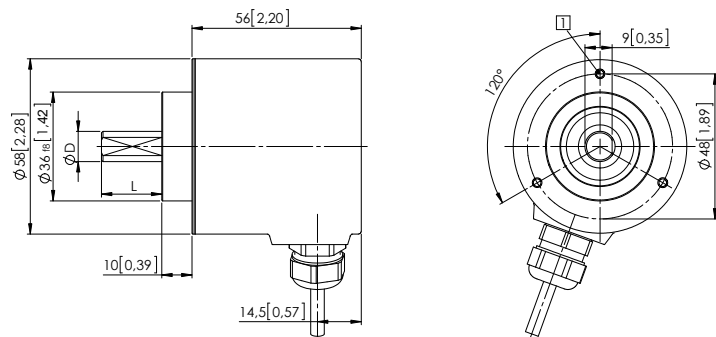
M23 connector, 17-pin (parallel)

Dimensions shaft version

Dimensions in mm [inch]

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

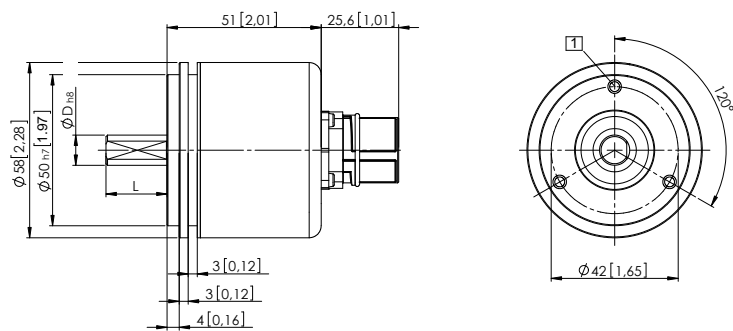
- 1) 3 x M3, 5 [0.20] deep



D	Fit	L
6 [0.24]	h8	10 [0.39]
10 [0.39]	f7	20 [0.79]

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

- 1) 3 x M4, 10 [0.39] deep



D	Fit	L
6 [0.24]	h8	10 [0.39]
10 [0.39]	f7	20 [0.79]

1) V/R only with output circuit 3 up to max. 13 bit. MSB to change the count direction.

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Absolute encoders - singleturn

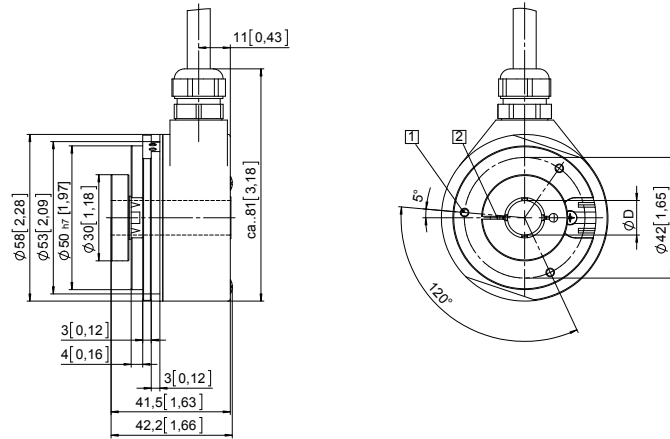
Standard optical	5852 / 5872 (shaft / hollow shaft)	Parallel, highspeed
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

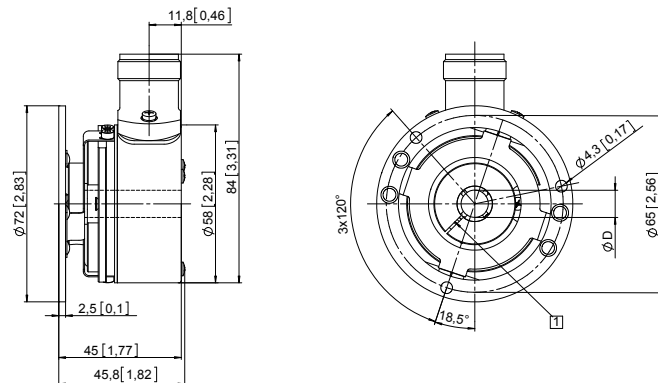
- 1 3 x M3, 5 [0.20] deep
- 2 Recommended torque for the clamping ring 0.6 Nm



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

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

- 1 Recommended torque for the clamping ring 0.6 Nm



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

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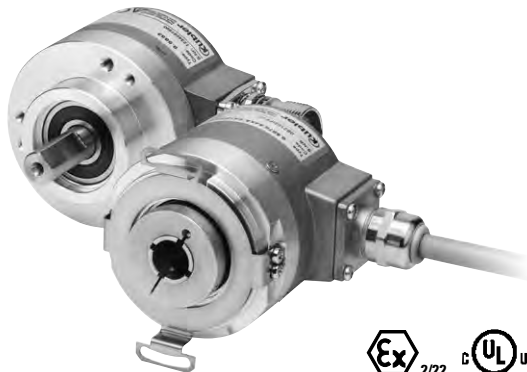
Connection technology

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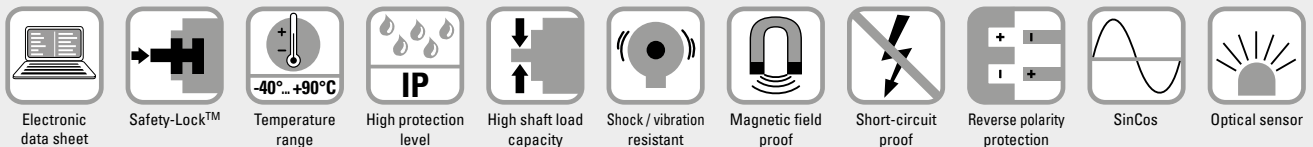
Standard optical	Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental
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The Sendix 5853 and Sendix 5873 singleturn encoders with optical sensor technology can achieve a resolution of max. 21 bits.

Easy integration in the application thanks to the BiSS interface, with electronic data sheet.

This series offers special versions for use on direct drives for the lift technology.



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 $\leq 1\mu s$.
- High-resolution feedback in real-time via 21 bit fully digital or incremental outputs SinCos and RS422.
- BiSS-C BP3 encoder profile.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code

Shaft version

8.5853

Type

. XXXX . XX2X

a b c d e f g

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



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 Options (service)

- 1 = no option
- 2 = status LED
- 3 = **SET button and status LED**

Optional on request

- Ex 2/22⁶⁾
- surface protection salt spray tested
- other resolutions

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.
3) Can be combined only with interface 1 and 2.

4) Resolution, preset value and counting direction factory-programmable.
5) Only in conjunction with interface 1 or 2 and code C.
6) For the cable connection type, cable material PUR.

Absolute encoders - singleturn

Standard optical	Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental
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Order code Hollow shaft	8.5873 Type	<table border="1" style="font-size: small; 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	c Interface / power supply	d Type of connection	e Code	h 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"] <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⁾ H = with expanding coupling, IP65 ø 65 mm [2.56"] ¹⁾	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	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⁾	B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u>	1 = no option 2 = status LED <u>3 = SET button and status LED</u>																
b Through hollow shaft	f Resolution ³⁾	*) Available special lengths (connection types B, F):	Optional on request																	
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" <i>Tapered shaft</i> K = ø 10 mm [0.39"]	A = 10 bit 1 = 11 bit 2 = 12 bit <u>3 = 13 bit</u> 4 = 14 bit 7 = 17 bit C = 21 bit ⁴⁾	2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5873.542B.G323.0030 (for cable length 3 m)	- Ex 2/22 (not with type of connection E or F) ⁵⁾ - surface protection salt spray tested - other resolutions																	

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

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

Connection technology	Order no.
Cordset, pre-assembled	
M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6041.8211.002M
M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	8.0000.6901.0002.0031
Connector, self-assembly (straight)	
M12 female connector with coupling nut, 8-pin	05.CMB 8181-0
M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

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

1) Can be combined only with shaft K and type of connection E or F.
2) Can be combined only with interface 1 and 2.
3) Resolution, preset value and counting direction factory-programmable.

4) Only in conjunction with interface 1 or 2 and code C.
5) For the cable connection type, cable material PUR.

Absolute encoders - singleturn

Standard optical	Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental
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Technical data

Mechanical characteristics		
Maximum speed shaft version		
IP65 up to 70°C [158°F]	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)	
IP65 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
IP67 up to 70°C [158°F]	11000 min ⁻¹ , 9000 min ⁻¹ (continuous)	
IP67 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
Maximum speed hollow shaft version		
IP65 up to 70°C [158°F]	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)	
IP65 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)	
IP67 up to 70°C [158°F]	8000 min ⁻¹ , 4000 min ⁻¹ (continuous)	
IP67 up to T _{max}	4000 min ⁻¹ , 2000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft version	3.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.35 kg [12.35 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] ¹⁾
Materials	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics		
Power supply		5 V DC (+5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes
Short circuit proof outputs		yes ²⁾
UL approval		file no. E224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I _{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs
	ST resolution ≥ 15 bit	4 μs
Monoflop time		≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.		

BiSS interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I _{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit; 17, 19 and 21 bit
Code		binary
Clock rate		50 kHz ... 10 MHz
Max. update rate		< 15 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs
	ST resolution 17 bit	2.4 μs
	ST resolution 21 bit	4 μs
Protocol		BiSS-C BP3 encoder profile
Note:	<ul style="list-style-type: none"> - Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification - EDS (electronic data sheet) 	

Status output and LED		
Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level	HIGH	+V
	LOW	< 1 V
Active		LOW
The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (Open Collector with int. pull-up 22 kOhm).		
An active status output (LOW) displays:		
<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.		

Incremental outputs (A/B)		
	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⁾
Pulse rate	2048 ppr	2048 ppr

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.

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclinoimeters
 Connection technology
 Accessories
 Addresses

Absolute encoders - singleturn

Standard optical		Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental	Product overview Basics
SET input or SET button				Incremental encoders
Input	active HIGH			
Input type	comparator			
Signal level	HIGH	min: 60 % of +V (power supply) max: +V		Absolute encoders singleturn
	LOW	max: 25 % of +V (power supply)		
Input current	< 0.5 mA			Absolute encoders multiturn
Min. pulse duration (SET)	10 ms			
Timeout after SET signal	14 ms			Bearingless encoders
<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> <p>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.</p>				
DIR input				Linear measuring technology
<p>Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.</p> <p>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.</p>				
Response time (DIR input)		1 ms		Inclinometers
Power-ON				
<p>After Power-ON the device requires a time of approx. 150 ms before valid data can be read.</p>				Connection technology
<p>Hot plugging of the encoder should be avoided.</p>				
				Accessories
				Addresses

Absolute encoders - singleturn

Standard optical	Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental
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Terminal assignment

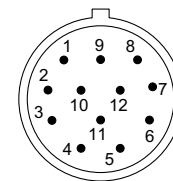
Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Core color: WH BN GN YE GY PK BU RD BK - - - shield
1, 2	3, 4	SET, DIR, Status	M23 connector, 12-pin
			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
5	1, 2, A, B, E, F	SET, DIR, Status sensor output	Cable (isolate unused cores individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
			Core color: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield
5	3, 4	SET, DIR, Status sensor output	M23 connector, 12-pin
			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
3, 4, 7, 8	1, 2, A, B, E, F	SET, DIR, SinCos or incr. RS422	Cable (isolate unused cores individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
			Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
3, 4, 7, 8	3, 4	SET, DIR, SinCos or incr. RS422	M23 connector, 12-pin
			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
6, 9	1, 2, A, B, E, F	SinCos o. incr. RS422 sensor output	Cable (isolate unused cores individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
6, 9	3, 4	SinCos o. incr. RS422 sensor output	M23 connector, 12-pin
			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
1, 2	5, 6	SET, DIR	M12 connector, 8-pin
			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
- DIR: Direction input
- 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

Standard optical	Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental
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Dimensions shaft version

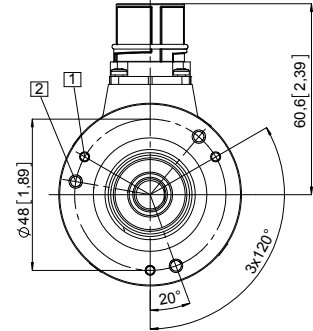
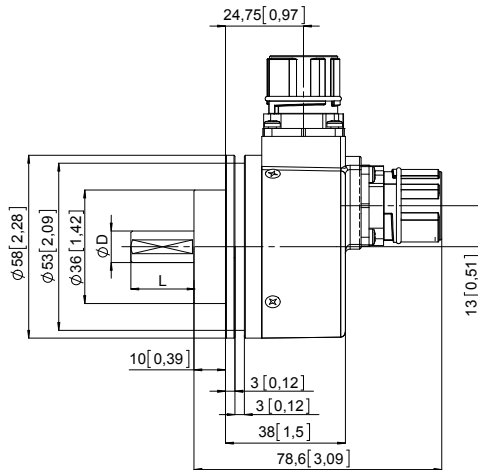
Dimensions in mm [inch]

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



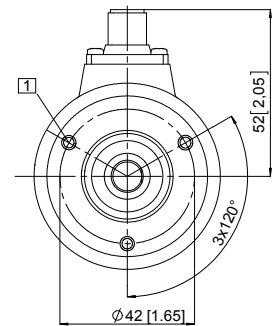
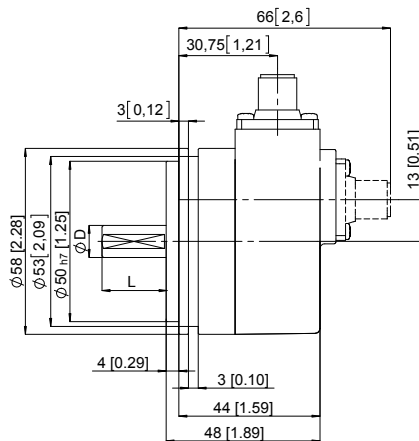
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Synchro flange, $\varnothing 58$ [2.28]

Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep

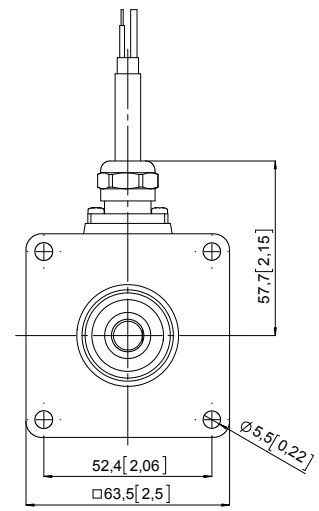
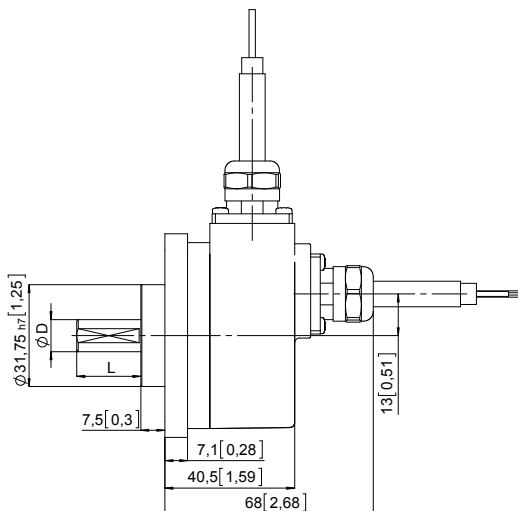


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Square flange, $\square 63.5$ [2.5]

Flange type 5 and 7

(drawing with cable)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Absolute encoders - singleturn

Standard optical	Sendix 5853 / 5873 (shaft / hollow shaft)	SSI / BiSS + incremental
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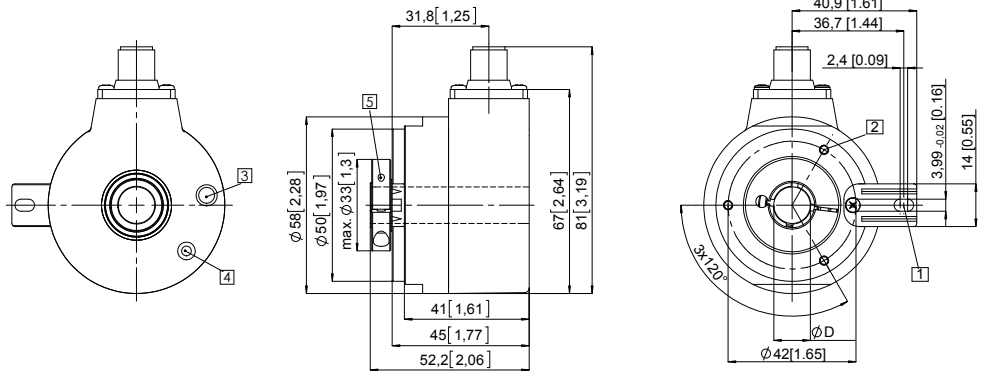
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Status-LED
- 4 SET button
- 5 Recommended torque for the clamping ring 0.6 Nm



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

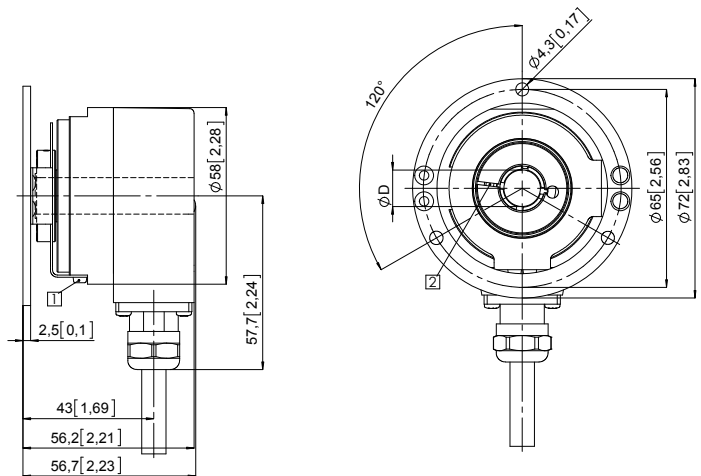
Flange with stator coupling, \varnothing 65 [2.56]

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



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

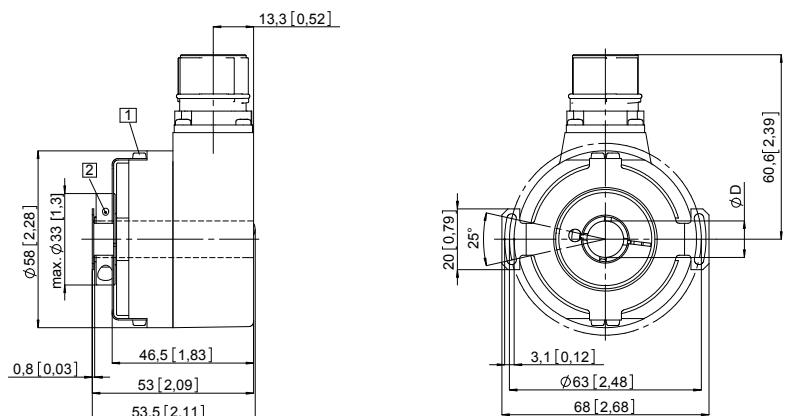
Flange with stator coupling, \varnothing 63 [2.48]

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



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

Absolute encoders - singleturn

Standard optical

Sendix 5853 / 5873 (shaft / hollow shaft)

SSI / BiSS + incremental

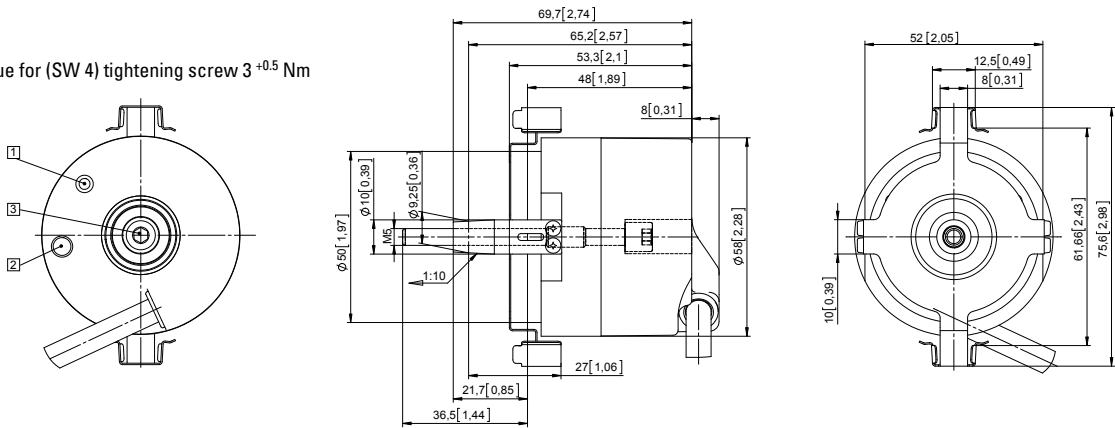
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, mounting without screws Flange type E and F

(with tapered shaft K and tangential cable)

- 1 Status LED
- 2 SET button
- 3 Recommended torque for (SW 4) tightening screw 3 +0.5 Nm

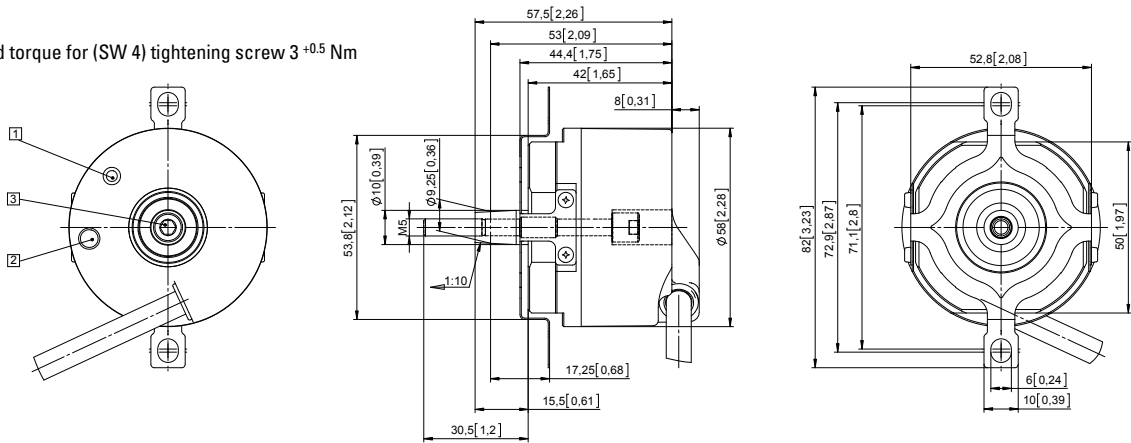


Flange with stator coupling, ø 72 [2.83]

Flange type G

(with tapered shaft K and tangential cable)

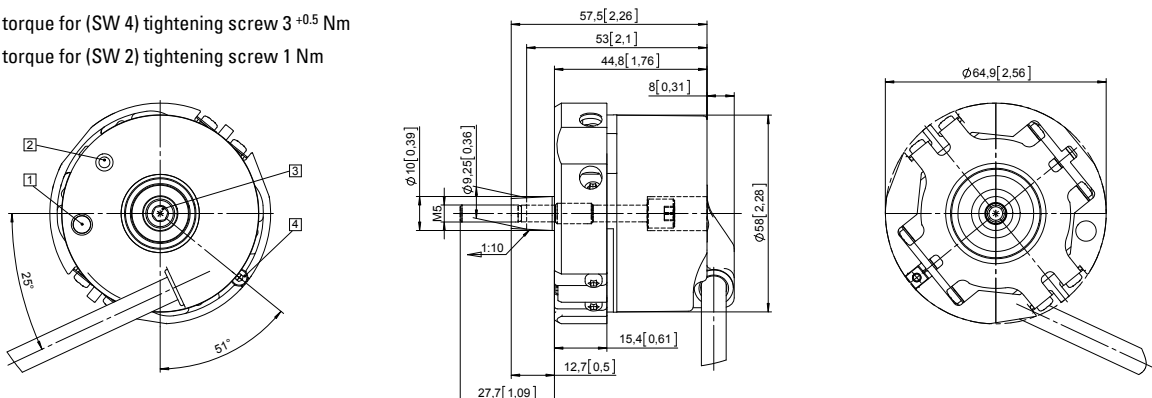
- 1 Status LED
- 2 SET Button
- 3 Recommended torque for (SW 4) tightening screw 3 +0.5 Nm



Flange with expanding coupling, ø 65 [2.56"]

Flange type H

- 1 Status-LED
- 2 SET button
- 3 Recommended torque for (SW 4) tightening screw 3 +0.5 Nm
- 4 Recommended torque for (SW 2) tightening screw 1 Nm



Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

Absolute encoders - singleturn

Standard Motor-Line, optical	Sendix 5873 (tapered shaft)	SSI / BiSS + incremental
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The optical Sendix 5873 singleturn encoders with SSI or BiSS interface and optional 2048 ppr SinCos incremental track reach a resolution of up to 21 bits.

Advantages: Plug-and-Play for commissioning, including electronic data sheet and possibility to set the absolute measuring system to a predefined position value.

Specially designed for mounting on direct drives in the elevator technology.



Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Encoder specially designed for mounting on direct drives in the elevator technology.

Versatile

- High-precision with a data refresh rate of the position value $\leq 1 \mu s$.
- High-resolution feedback in real-time via 21 bit fully digital or incremental outputs SinCos and RS422.
- BiSS-C BP3 encoder profile.
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Tapered shaft

8.5873	. X K X X . X X 2 X
Type	a b c d e f g

<p>a Flange G = with stator coupling, IP65, \varnothing 72 mm [2.83"] H = with expanding coupling, IP65, \varnothing 65 mm [2.56"]</p> <p>b Tapered shaft K = \varnothing 10 mm [0.39"]</p> <p>c Interface / power supply 1 = SSI, BiSS / 5 V DC 2 = SSI, BiSS / 10 ... 30 V DC 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC 5 = SSI, BiSS / 5 V DC, with sensor output 6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output 9 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC, with sensor output E = SSI, BiSS + 2048 ppr. SinCos / 4.5 ... 5.5 V DC, with sensor output ¹⁾</p>	<p>d Type of connection E = tangential cable, 1 m PVC F = tangential cable, length PVC see below *) G = tangential cable, with Sub-D connector (male contact, 15-pin, double-row), length PVC s. below *)²⁾ H = tangential cable, with Phoenix Contact connector (MC1.5/16-STF-3.81), length PVC s. below *)²⁾ L = with PCB connector ³⁾ (without cable, including sealing cap for tangential cable outlet)</p> <p>*) Available lengths (connection types F, G, H): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21"] order code expansion .XXXX = length in dm ex.: 8.5873.GK2E.G323.0030 (for cable length 3 m)</p>	<p>e Code B = SSI, binary C = BiSS, binary G = SSI, gray</p>	<p>f Resolution ⁴⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit C = 21 bit ⁵⁾</p>	<p>g Options (service) 1 = no option 2 = status LED 3 = SET button and status LED</p>
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1) Without reverse polarity protection.
2) Can be combined as a standard only with interface E (other variants on request).
3) IP40, only available without SET button and status LED, not available with interface 9, see the Accessories for the suitable connection cable.
4) Resolution, preset value and counting direction factory-programmable.
5) Only in conjunction with interface 1 or 2 and code C.

Product overview Basics
Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Absolute encoders - singleturn

Standard Motor-Line, optical	Sendix 5873 (tapered shaft)	SSI / BiSS + incremental
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Connection technology		Order no.
Cordset, pre-assembled (suitable for type of connection L)	PCB connector (female contacts), 12-pin single-ended, 2 m [6.56'] PVC cable	8.0000.6D91.0002
	PCB connector (female contacts), 12-pin single-ended, 8 m [26.25'] PVC cable	8.0000.6D91.0008

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

Technical data

Mechanical characteristics		
Maximum speed	IP65 up to 70°C [158°F]	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)
	IP65 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Mass moment of inertia		3.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.35 kg [12.35 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] (+105°C [+212°F] with interface E) ¹⁾
Materials	tapered shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC
Shock resistance acc. EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics		
Power supply	5 V DC (+5 %)	
	4.5 ... 5.5 V DC	
	or 10 ... 30 V DC	
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply		yes (not for interface E)
Short circuit proof outputs		yes ²⁾
UL approval		file no. E224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I _{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit and 17 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs
	ST resolution ≥ 15 bit	4 μs
Monoflop time		≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.		

BiSS interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I _{Load} = 20 mA	typ. 1.3 V
Resolution		10 ... 14 bit; 17, 19 and 21 bit
Code		binary
Clock rate		50 kHz ... 10 MHz
Max. update rate		< 15 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs
	ST resolution 17 bit	2.4 μs
	ST resolution 21 bit	4 μs
Protocol		BiSS-C BP3 encoder profile
Note:		
– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings		
– CRC data verification		
– EDS (electronic data sheet)		

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Absolute encoders - singleturn

Standard Motor-Line, optical		Sendix 5873 (tapered shaft)		SSI / BiSS + incremental		Product overview Basics	
Status output and LED							Incremental encoders
Output driver	open collector, internal pull up resistor 22 kOhm						
Permissible load	max. 20 mA						
Signal level	HIGH	+V					
	LOW	< 1 V					
Active	LOW						Absolute encoders singleturn
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:							Absolute encoders multiturn
<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.						Absolute encoders multiturn	
Incremental outputs (A/B)							
	SinCos	RS422 TTL compatible					
Max. frequency -3dB	400 kHz	400 kHz					
Signal level	1 Vpp (±20 %)	HIGH: min. 2.5 V LOW: max. 0.5 V					
Short circuit proof	yes ¹⁾	yes ¹⁾					
Pulse rate	2048 ppr	2048 ppr					
SET input or SET button							Absolute encoders singleturn
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					Absolute encoders singleturn	
Min. pulse duration (SET)	10 ms						
Timeout after SET signal	14 ms					Absolute encoders multiturn	
The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar).							
Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.							
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.							
Note: In case of use of the BiSS interface, the SET function is carried out through BiSS.							
DIR input							
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error.							
The LED will come ON and the status output will switch to LOW.							
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.							
Response time (DIR input)	1 ms						
Power-ON						Linear measuring technology	
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.						Inclinometers	
						Accessories	
						Addresses	

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

Absolute encoders - singleturn

**Standard
Motor-Line, optical**

Sendix 5873 (tapered shaft)

SSI / BiSS + incremental

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)
1, 2	E, F	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Core color: WH BN GN YE GY PK BU RD BK - - - shield
5	E, F	SET, DIR, Status sensor output	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
			Core color: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield
3, 4	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
			Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
6, 9, E	E, F	SinCos or incr. RS422 sensor output	Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
E	H	SinCos sensor output	Tangential cable, with Phoenix Contact connector (MC1.5/16-STF-3.81), 16-pin
			Signal: +V +Vsens 0 V 0Vsens N/C A \bar{A} B \bar{B} C+ C- D+ D- N/C N/C N/C Pin: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E	G	SinCos sensor output	Tangential cable, with Sub-D connector (male contact), 15-pin
			Signal: A 0 V B +V D+ - - C+ \bar{A} 0Vsens \bar{B} +Vsens D- - C- \perp Pin: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
6, E	L	SinCos sensor output	PCB connector (male contact), 12-pin
			Signal: D- +V A C+ 0Vsens \bar{B} B 0 V C- \bar{A} +Vsens D+ Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b
1, 2	L	SET, DIR	PCB connector (male contact), 12-pin
			Signal: D- +V - C+ DIR - - 0 V C- - SET D+ Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b
3, 4	L	SET, DIR, SinCos	PCB connector (male contact), 12-pin
			Signal: D- +V A C+ DIR \bar{B} B 0 V C- \bar{A} SET D+ Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b
5	L	sensor output	PCB connector (male contact), 12-pin
			Signal: D- +V - C+ 0Vsens - - 0 V C- - +Vsens D+ Pin: 1a 1b 2a 2b 3a 3b 4a 4b 5a 5b 6a 6b

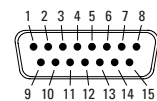
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A, \bar{A} : Incremental output channel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

Top view of mating side, male contact base

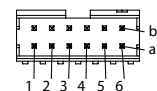
Type of connection H
Phoenix Contact connector (MC1.5/16-STF-3.81), 16-pin



Type of connection G
Sub-D connector (male contact), double-row, 15-pin



Type of connection L
FCI Minitek connector (male contact), double-row, 12-pin (98424-F52-12-LF)



Terminal assignment cordset 8.0000.6D91.0002 or 8.0000.6D91.0008

PCB connector (female contacts), 12-pin / single-ended												
Pin:	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Core color:	PK	BN	BU	GN	GY-PK	VT	BK	WH	YE	RD	RD-BU	GY

Absolute encoders - singleturn

Standard Motor-Line, optical	Sendix 5873 (tapered shaft)	SSI / BiSS + incremental
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Dimensions tapered shaft version

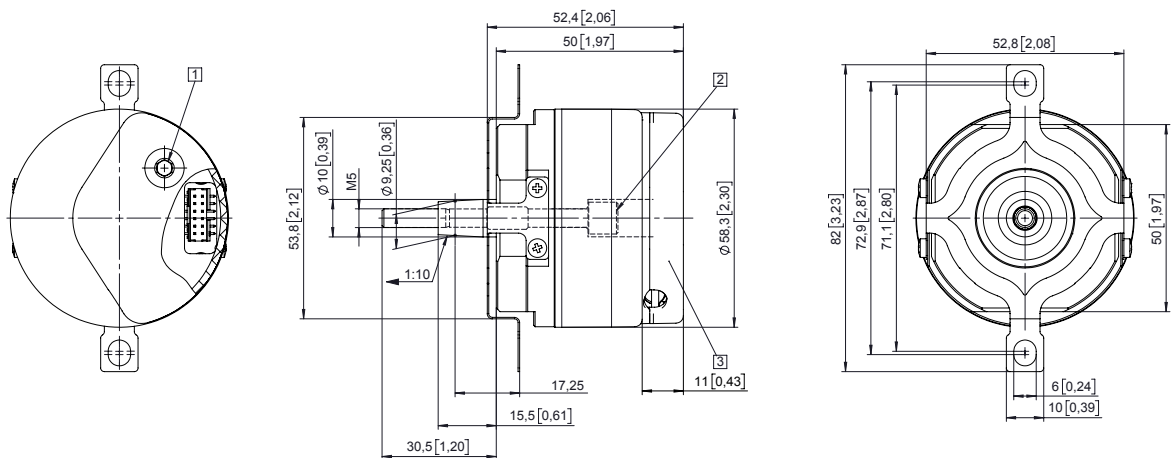
Dimensions in mm [inch]

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

Flange type G

(with tapered shaft K and PCB connector)

- 1 Recommended torque for screw M6 (SW 4) 2.0 ± 0.5 Nm
- 2 Recommended torque for tightening screw M6 (SW 4) 3.0 ± 0.5 Nm
- 3 Sealing cap for tangential cable outlet

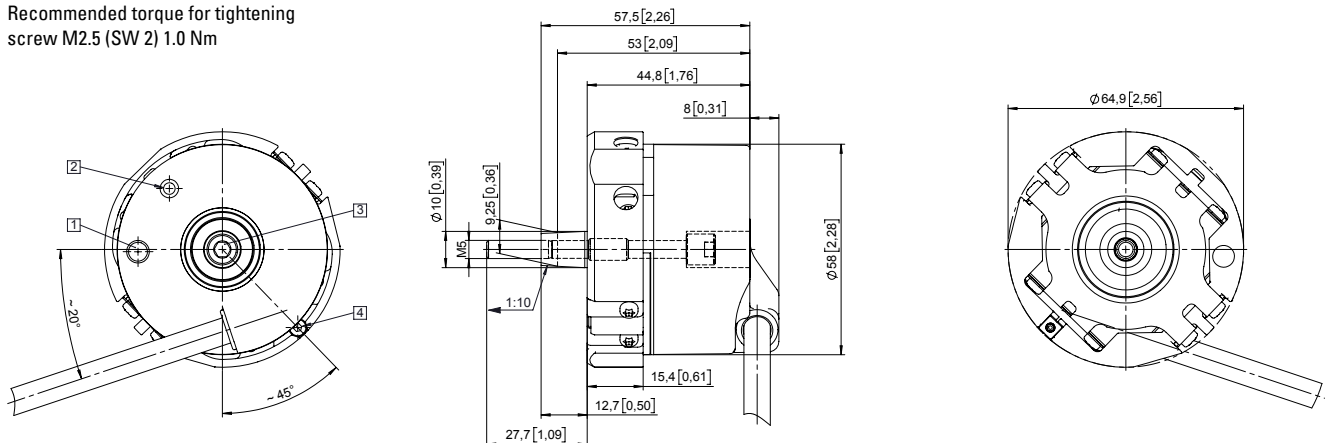


Flange with expanding coupling, $\varnothing 65$ [2.56"]

Flange type H

(with tapered shaft K and tangential cable)

- 1 Status-LED
- 2 SET button
- 3 Recommended torque for tightening screw M6 (SW 4) 3.0 ± 0.5 Nm
- 4 Recommended torque for tightening screw M2.5 (SW 2) 1.0 Nm



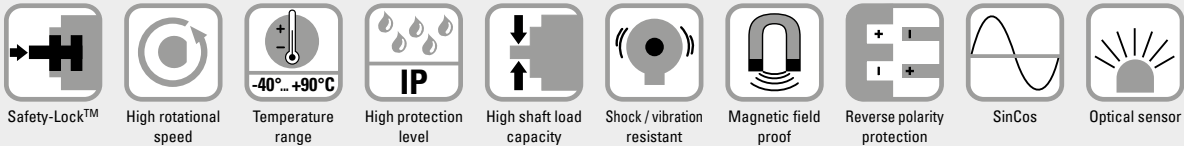
Absolute encoders - singleturn

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



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 . 1XXX . XX2X
Shaft version Type

<p>a Flange 1 = clamping flange, IP65, ø 58 mm [2.28"]</p> <p>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</p> <p>c Interface / power supply 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</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 M23 connector, 12-pin 4 = radial M23 connector, 12-pin</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.: 8.5853FS2.124A.G322.0030 (for cable length 3 m)</p> <p>e Code B = SSI, binary C = BiSS, binary G = SSI, gray</p>	<p>f Resolution ¹⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit</p> <p>g Options (service) 1 = no option 2 = status LED 3 = SET button and status LED</p> <p><i>Optional on request</i> - Ex 2/22 ²⁾ - other resolutions</p>
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1) Resolution, preset value and count direction are factory-programmable.
 2) For the cable connection type, cable material PUR.

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 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclimeters
 Connection technology
 Accessories
 Addresses

Absolute encoders - singleturn

Standard SIL2/PLd, optical	Sendix SIL 5853FS2 / 5873FS2 (shaft / hollow shaft)	SSI/BiSS + SinCos
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Order code	8.5873FS2	. X X X X . X X 2 X
Hollow shaft	Type	a b c d e f g

<p>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"]</p> <p>b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] <i>Tapered shaft</i> K = ø 10 mm [0.39"]</p> <p>c Interface / power supply 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p>	<p>d Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12-pin *) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5873FS3.B44B.G322.0030 (for cable length 3 m)</p> <p>e Code B = SSI, binary C = BiSS, binary G = SSI, gray</p>	<p>f Resolution ¹⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit</p> <p>g Options (service) 1 = no option 2 = status LED 3 = SET button and status LED</p> <p><i>Optional on request</i> - Ex 2/22 (not for type of connection E, F) ²⁾ - other resolutions</p>
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Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	8.0000.4G06.0000
Screw retention	Loctite 243, 5 ml	8.0000.4G05.0000
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display .	

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

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable ³⁾	8.0000.6901.0002.0031
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable ³⁾	8.0000.6905.0002.0032
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

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

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

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Absolute encoders - singleturn

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

Notes regarding "Functional Safety"

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

Additional functions can be found in the operating manual.

Safety characteristics	
Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 70 mA 10 ... 30 V DC max. 45 mA
Reverse polarity protection of the power supply	yes
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics	
Maximum speed shaft version	up to 70°C [158°F] 12000 min ⁻¹ , 10000 min ⁻¹ (continuous) up to T _{max} 8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed hollow shaft version	up to 70°C [158°F] 9000 min ⁻¹ , 6000 min ⁻¹ (continuous) up to T _{max} 6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	shaft version < 0.01 Nm hollow shaft version < 0.03 Nm
Mass moment of inertia	shaft version 4.0 x 10 ⁻⁶ kgm ² hollow shaft version 7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft	hollow shaft version min. 34 mm [1.34"]
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ³⁾
Material	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

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

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ. 3.8 V LOW at I _{Load} = 20 mA typ. 1.3 V
Resolution	10 ... 14 bit and 17 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 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 ²⁾
Pulse rate	2048 ppr

LED

The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.

If the LED is ON (status output LOW) this indicates:

- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or ageing
- Over- or under-temperature

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

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.

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

Absolute encoders - singleturn

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

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.	
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

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

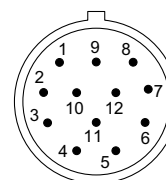
Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core color:	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
- DIR: Direction input
- 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

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Absolute encoders - singleturn

**Standard
SIL2/PLd, optical**

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

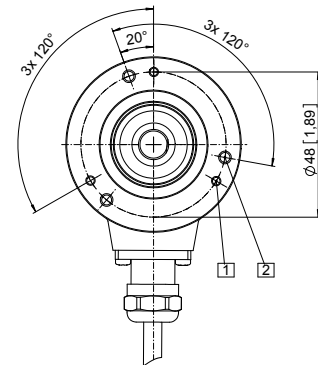
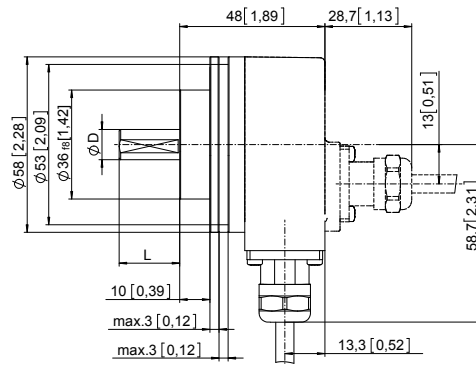
SSI/BiSS + SinCos

Dimensions shaft version

Dimensions in mm [inch]

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

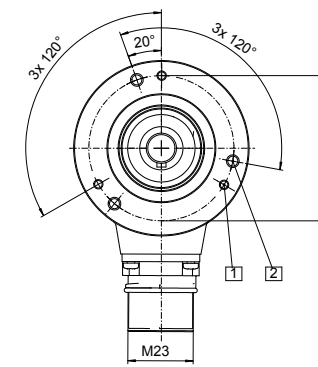
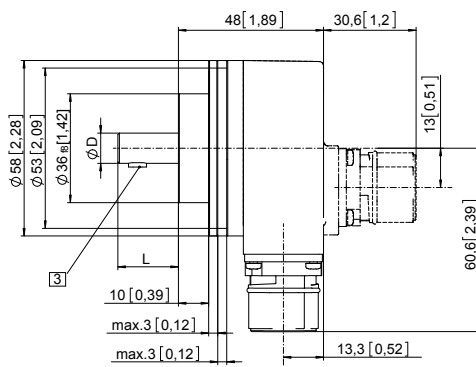
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



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

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

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



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

Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

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Inclinometers

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Absolute encoders - singleturn

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

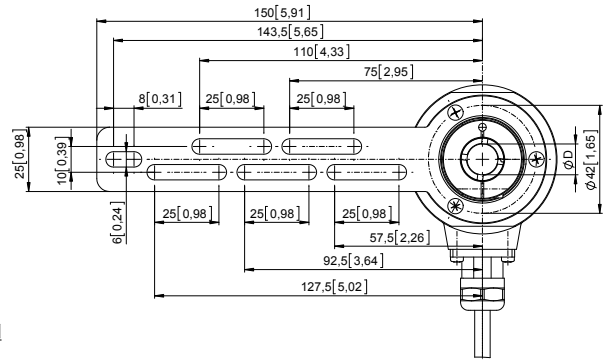
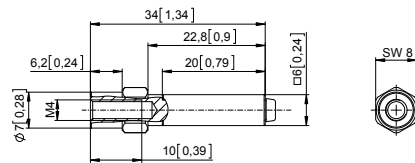
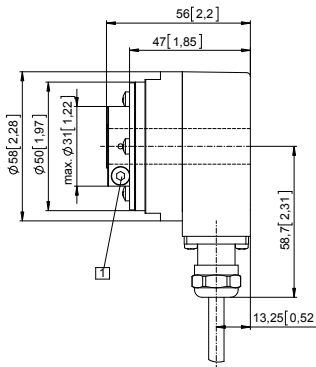
Dimensions in mm [inch]

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

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

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

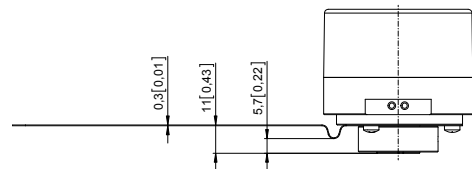
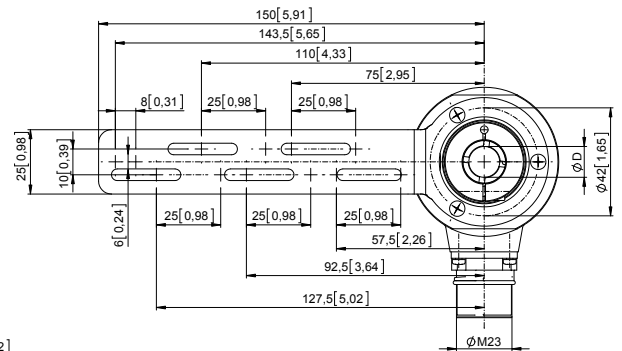
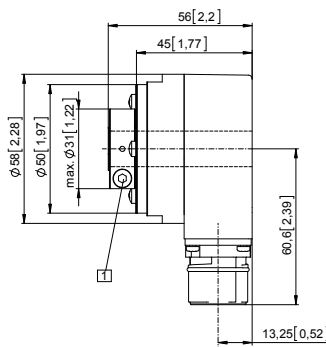
Torque pin with rectangular sleeve with M4 thread



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

- 1 Recommended torque for the clamping ring 2.5 Nm

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



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]

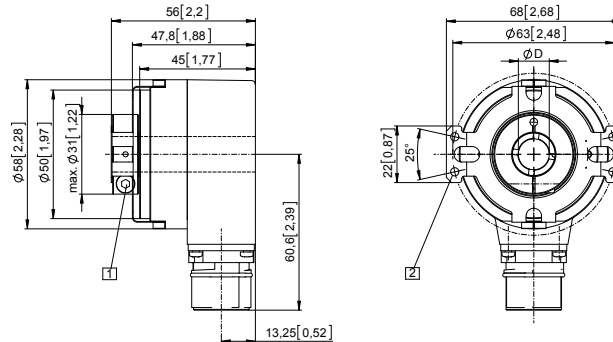
Flange type B

Through hollow shaft

(drawing with M23 connector)

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

2 For (4x) M3 screw



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

Flange with stator coupling, \varnothing 63 [2.48]

Flange type B

Tapered shaft

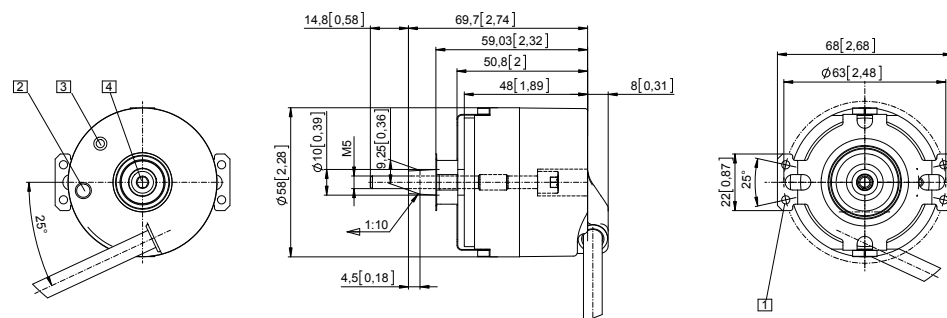
(drawing with tangential cable outlet)

1 For (4x) M3 screw

2 Status LED

3 SET button

4 SW 4



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Absolute encoders - singleturn

Standard 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	High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	SinCos	Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Flexible

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

Order code **8.5853FS3** . **1**X**X**X . **X**X**2**X
Shaft version Type a b c d e f g

- | | | |
|---|--|--|
| <p>a Flange
1 = clamping flange, IP65, ø 58 mm [2.28"]</p> <p>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</p> <p>c Interface / power supply
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</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 M23 connector, 12-pin
4 = radial M23 connector, 12-pin</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.: 8.5853FS2.124A.G322.0030 (for cable length 3 m)</p> <p>e Code
B = SSI, binary
C = BiSS, binary
G = SSI, gray</p> | <p>f Resolution ¹⁾
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit</p> <p>g Options (service)
1 = no option
2 = status LED
3 = SET button and status LED</p> <p style="text-align: right;"><i>Optional on request</i>
- Ex 2/22 ²⁾
- other resolutions</p> |
|---|--|--|

1) Resolution, preset value and count direction are factory-programmable.
 2) For the cable connection type, cable material PUR.

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Absolute encoders - singleturn

Standard SIL3/PLe, optical	Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)	SSI/BiSS + SinCos
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Order code Hollow shaft	8.5873FS3 Type	.XXXX.XX2X a b c d e f g
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"]	d Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12-pin *) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5873FS3.B44B.G322.0030 (for cable length 3 m)	f Resolution ¹⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit
b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] Tapered shaft K = ø 10 mm [0.39"]	e Code B = SSI, binary C = BiSS, binary G = SSI, gray	g 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) ²⁾ - other resolutions
c Interface / power supply 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC		

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	8.0000.4G06.0000
Screw retention	Loctite 243, 5 ml	8.0000.4G05.0000
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display .	

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

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable ³⁾	8.0000.6901.0002.0031
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable ³⁾	8.0000.6905.0002.0032
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

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

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

Absolute encoders - singleturn

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

Notes regarding "Functional Safety"

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

Additional functions can be found in the operating manual.

Safety characteristics	
Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 70 mA 10 ... 30 V DC max. 45 mA
Reverse polarity protection of the power supply	yes
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics	
Maximum speed shaft version	up to 70°C [158°F] 12000 min ⁻¹ , 10000 min ⁻¹ (continuous) up to T _{max} 8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed hollow shaft version	up to 70°C [158°F] 9000 min ⁻¹ , 6000 min ⁻¹ (continuous) up to T _{max} 6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	shaft version < 0.01 Nm hollow shaft version < 0.03 Nm
Mass moment of inertia	shaft version 4.0 x 10 ⁻⁶ kgm ² hollow shaft version 7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft	hollow shaft version min. 34 mm [1.34"]
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ³⁾
Material	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

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

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ. 3.8 V LOW at I _{Load} = 20 mA typ. 1.3 V
Resolution	10 ... 14 bit and 17 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs

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

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 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 ²⁾
Pulse rate	2048 ppr

LED

The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.

If the LED is ON (status output LOW) this indicates:

- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, failure or ageing
- Over- or under-temperature

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

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.

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

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Absolute encoders - singleturn

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

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.	
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

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

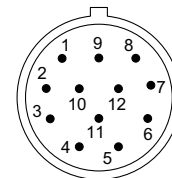
Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core color:	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
- DIR: Direction input
- 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

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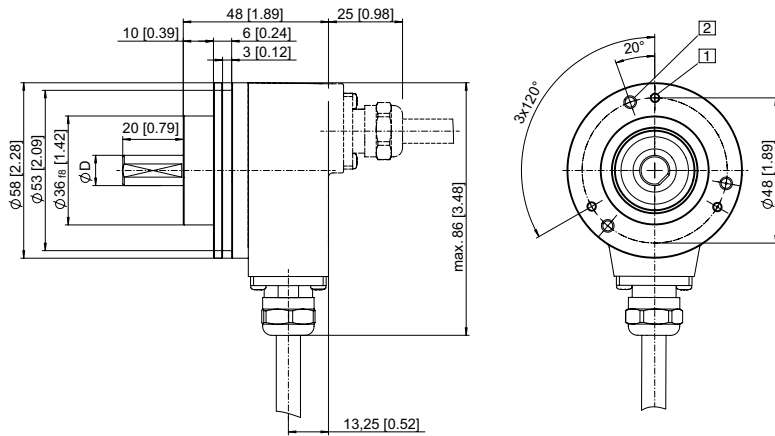
Standard SIL3/PLe, optical	Sendix SIL 5853FS3 / 5873FS3 (shaft / hollow shaft)	SSI/BiSS + SinCos
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Dimensions shaft version

Dimensions in mm [inch]

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

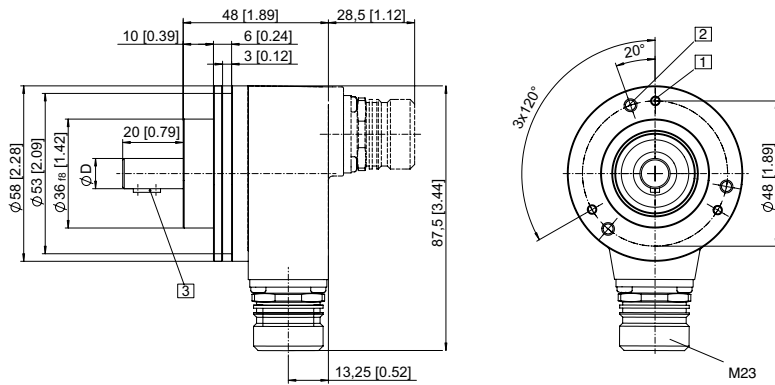
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



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

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

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



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

Absolute encoders - singleturn

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

Dimensions hollow shaft version

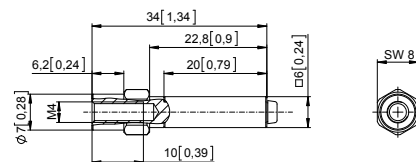
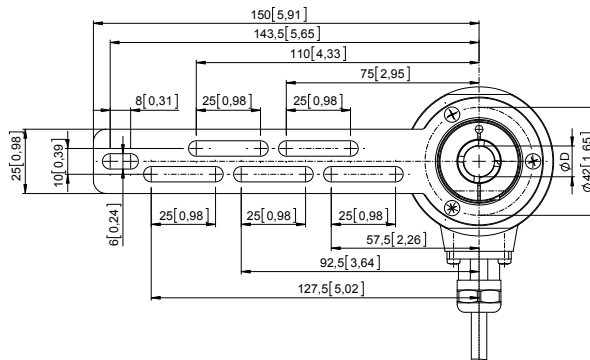
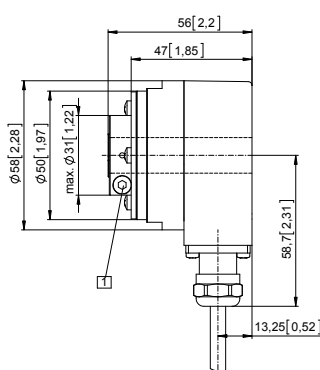
Dimensions in mm [inch]

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

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

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

Torque pin with rectangular sleeve with M4 thread



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Absolute encoders
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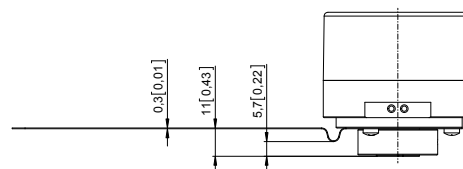
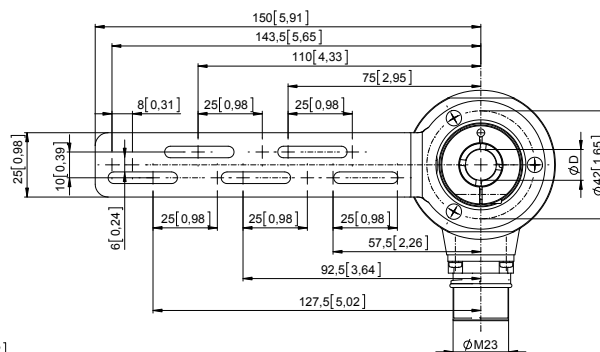
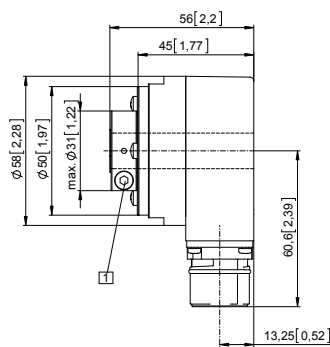
Absolute encoders
multiturn

Bearingsless
encoders

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

- 1 Recommended torque for the clamping ring 2.5 Nm

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



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Absolute encoders - singleturn

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

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]

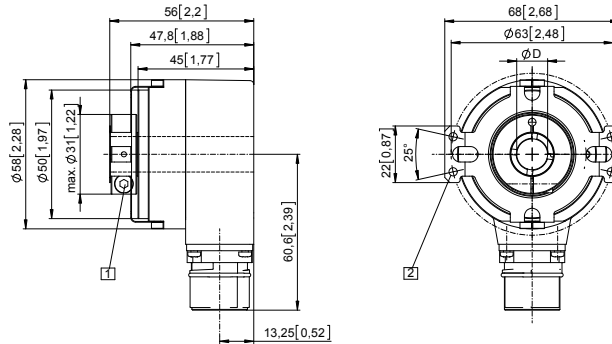
Flange type B

Through hollow shaft

(drawing with M23 connector)

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

- 2 For (4x) M3 screw



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

Flange with stator coupling, ø 63 [2.48]

Flange type B

Tapered shaft

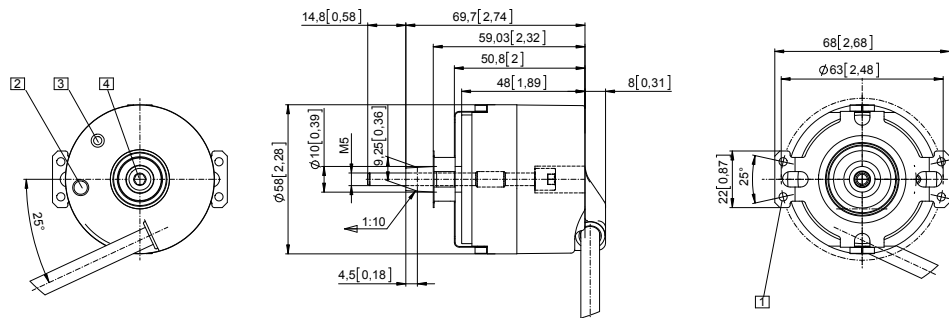
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



Absolute encoders - singleturn

Standard optical

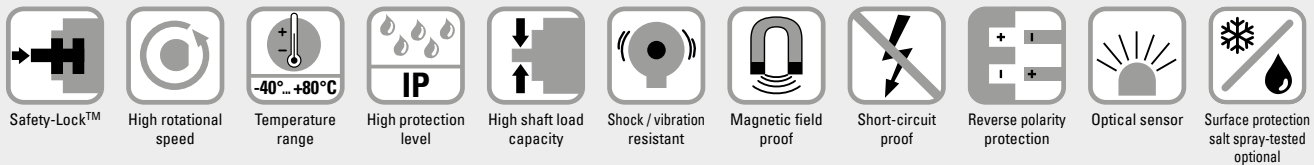
Sendix 5858 / 5878 (shaft / hollow shaft)

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.



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 . XX3X . 311X

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><u>1</u> = clamping flange, IP65 ø 58 mm [2.28"]</p> <p>3 = clamping flange, IP67 ø 58 mm [2.28"]</p> <p><u>2</u> = synchro flange, IP65 ø 58 mm [2.28"]</p> <p>4 = synchro flange, IP67 ø 58 mm [2.28"]</p> <p>5 = square flange, IP65 □ 63.5 mm [2.5"]</p> <p>7 = square flange, IP67 □ 63.5 mm [2.5"]</p> | <p>b Shaft (ø x L), with flat</p> <p><u>1</u> = 6 x 10 mm [0.24 x 0.39"]¹⁾</p> <p><u>2</u> = 10 x 20 mm [0.39 x 0.79"]²⁾</p> <p>3 = 1/4" x 7/8"</p> <p>4 = 3/8" x 7/8"</p> <p>c Interface / power supply</p> <p><u>3</u> = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC</p> | <p>d Type of connection removable bus terminal cover</p> <p>1 = with radial cable gland fitting</p> <p><u>2</u> = with 3 x radial M12 connectors</p> <p>e Fieldbus profile</p> <p><u>31</u> = PROFIBUS DP V0 encoder profile class 2</p> | <p>f Options (Service)</p> <p>2 = no option</p> <p><u>3</u> = SET button</p> <p>Optional on request</p> <ul style="list-style-type: none"> - Ex 2/22 - surface protection salt spray tested |
|--|---|--|--|

Order code Hollow shaft

8.5878 . XX3X . 311X

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, long, IP65</p> <p>2 = with spring element, long, IP67</p> <p>3 = with stator coupling, IP65 ø 65 mm [2.56"]</p> <p>4 = with stator coupling, IP67 ø 65 mm [2.56"]</p> <p><u>5</u> = with stator coupling, IP65 ø 63 mm [2.48"]</p> <p>6 = with stator coupling, IP67 ø 63 mm [2.48"]</p> | <p>b Blind hollow shaft (insertion depth max. 30 mm [1.18"])</p> <p>3 = ø 10 mm [0.39"]</p> <p><u>4</u> = ø 12 mm [0.47"]</p> <p>5 = ø 14 mm [0.55"]</p> <p>6 = ø 15 mm [0.59"]</p> <p>8 = ø 3/8"</p> <p>9 = ø 1/2"</p> <p>c Interface / power supply</p> <p><u>3</u> = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC</p> | <p>d Type of connection removable bus terminal cover</p> <p>1 = with radial cable gland fitting</p> <p><u>2</u> = with 3 x radial M12 connectors</p> <p>e Fieldbus profile</p> <p><u>31</u> = PROFIBUS DP V0 encoder profile class 2</p> | <p>f Options (Service)</p> <p>2 = no option</p> <p><u>3</u> = SET button</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)	PROFIBUS DP	Order no.
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	with fixing thread		8.0010.4700.0000
for flange with spring element (flange type 1 + 2)			
Connection technology			Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in , 5-pin 5 m [16.40'] PUR cable		05.00.6011.3211.005M
	M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PUR cable		05.00.6011.3411.005M
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable		05.00.6061.6211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in , 5-pin		05.BMWS 8151-8.5
	M12 male connector with external thread for bus out, 5-pin		05.BMSWS 8151-8.5
	M12 female connector with coupling nut for power supply, 4-pin		05.B8141-0

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

Technical data	
Mechanical characteristics	
Maximum speed	
IP65 up to 70°C [158°F]	9000 min ⁻¹ , 7000 min ⁻¹ (continuous)
IP65 up to T _{max}	7000 min ⁻¹ , 4000 min ⁻¹ (continuous)
IP67 up to 70°C [158°F]	8000 min ⁻¹ , 6000 min ⁻¹ (continuous)
IP67 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65 < 0.01 Nm IP67 < 0,05 Nm
Mass moment of inertia	shaft version 3,0 x 10 ⁻⁶ kgm ² hollow shaft version 6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	with bus terminal cover approx. 0.53 kg [18.69 oz] with fixed connection approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529	housing side IP67 shaft side IP65, opt. IP67
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft stainless steel flange aluminum housing zinc die-cast
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz
Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 110 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
SET button (zero or defined value, option)	
Protection against accidental activation. Button can only be operated with a ball-pen or pencil.	
Diagnostic LED (yellow)	
LED is ON with following errors	sensor error (Profibus error)

Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	PROFIBUS DP
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Interface characteristics PROFIBUS DP	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	interface specification acc. to PROFIBUS DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated
Protocol	Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons
Baud rate	max. 12 Mbit/s
Device address	1 ... 127 set by rotary switches
Termination switchable	set by DIP switches

Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the user-specific component within the Profibus field bus system. For encoders, the encoder profile is definitive. Here the individual objects are defined independent of the manufacturer. Furthermore, the profiles offer space for additional manufacturer-specific functions; this means that Profibus-compliant device systems can be used now with the guarantee that they are ready for the future too.

The following parameters can be programmed

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

The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter .
- Line driver acc. to RS485 max. 12 MB.
- Address programmable via DIP switches.
- Diagnostics LED.
- Full Class 1 and Class 2 functionality.

Terminal assignment terminal box

Interface	Type of connection	BUS IN				BUS OUT				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

Interface	Type of connection	Funktion	3 x M12 connector					Diagram	
			Signal:						
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
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Dimensions shaft version, with removable bus terminal cover

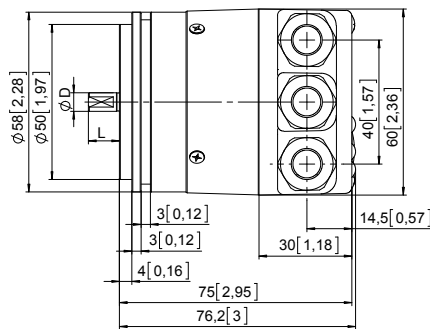
Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28]

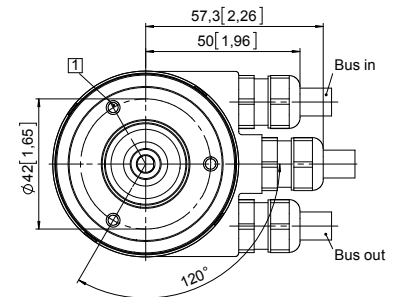
Flange type 2 and 4

(drawing with cable)

- 1 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

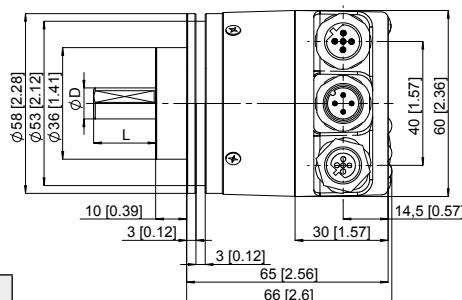


Clamping flange, \varnothing 58 [2.28]

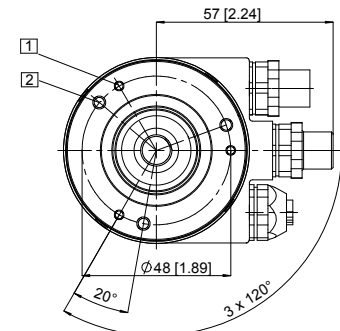
Flange type 1 and 3

(drawing with 3 x M12 connector)

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



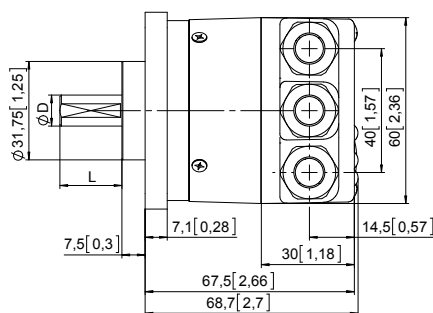
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



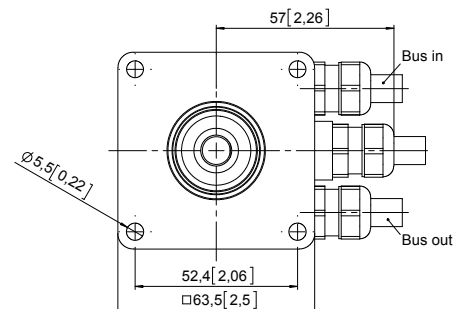
Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(drawing with cable)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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Absolute encoders - singleturn

Standard optical

Sendix 5858 / 5878 (shaft / hollow shaft)

PROFIBUS DP

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

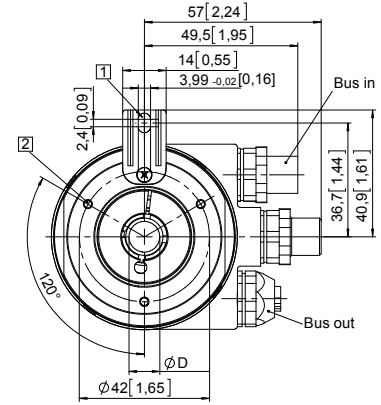
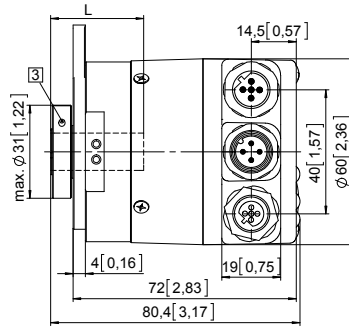
Dimensions in mm [inch]

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

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

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



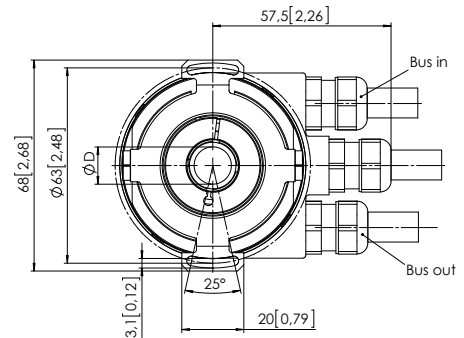
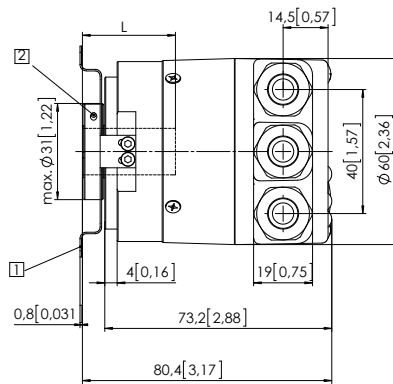
Flange with stator coupling, $\varnothing 63$ [2.48]
Flange type 5 and 6

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

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



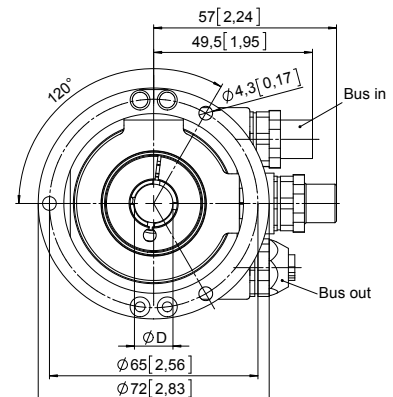
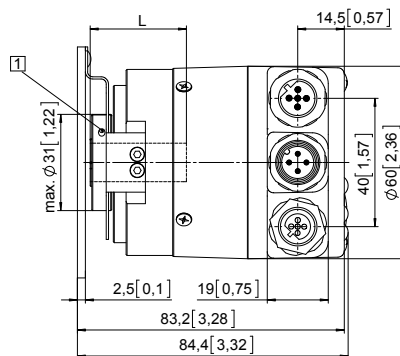
Flange with stator coupling, $\varnothing 65$ [2.56]
Flange type 3 and 4

Pitch circle diameter for fixing screws, 65 [2.56]
 (drawing 3 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



Absolute encoders - singleturn

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



Safety-Lock™	High rotational speed	Temperature range -40°.. +80°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Magnetic field proof	Reverse polarity protection	Optical sensor	Surface protection salt spray-tested optional

Reliable

- Tried-and-tested in applications with the highest demands, such as in mobile automation or medical technology.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.

Flexible

- Node address can be set via rotary switches or software.
- Baud rate and termination can be set via DIP switches or software.
- With bus terminal cover or fixed connection, as well as M12 connectors or cable connection.

Order code

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, 5-pin**
Fixed connection without bus terminal cover
 - A = radial cable, 2 m [6.56'] PVC
 - B = radial cable, special length PVC *)
 - E = 1 x radial M12 connector, 5-pin
 - F = 2 x radial M12 connector, 5-pin
 - I = 1 x radial M23 connector, 12-pin
 - J = 2 x radial M23 connector, 12-pin
- *) Available special lengths (connection type B):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.5858.112B.2113.0030 (for cable length 3 m)

- e Fieldbus profile**
- 21 = CANopen**

- f Options (service)**
- 2 = no options
 - 3 = SET button**
- Optional on request*
- Ex 2/22³⁾
 - surface protection salt spray tested

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

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

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Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen
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Order code	8.5878	.XX2X.211X	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	<div style="display: flex; justify-content: space-around;"> a b c d e f </div>		
a Flange				
1 = with spring element, long, IP65				
2 = with spring element, long, IP67				
3 = with stator coupling, IP65 ø 65 mm [2.56"]				
4 = with stator coupling, IP67 ø 65 mm [2.56"]				
5 = with stator coupling, IP65 ø 63 mm [2.48"]				
6 = with stator coupling, IP67 ø 63 mm [2.48"]				
b Blind hollow shaft				
(insertion depth max. 30 mm [1.18"])				
3 = ø 10 mm [0.39"]				
4 = ø 12 mm [0.47"]				
5 = ø 14 mm [0.55"]				
6 = ø 15 mm [0.59"]				
8 = ø 3/8"				
9 = ø 1/2"				
c Interface / power supply				
2 = CANopen DS301 V4.02 / 10 ... 30 V DC				
d Type of connection				
removable bus terminal cover				
1 = radial cable gland				
2 = 2 x M12 connector, 5-pin				
Fixed connection without bus terminal cover				
A = radial cable, 2 m [6.56'] PVC				
B = radial cable, special length PVC *)				
E = 1 x radial M12 connector, 5-pin				
F = 2 x radial M12 connector, 5-pin				
I = 1 x radial M23 connector, 12-pin				
J = 2 x radial M23 connector, 12-pin				
*) Available special lengths (connection type B):				
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']				
order code expansion .XXXX = length in dm				
ex.: 8.5878.542B.2113.0030 (for cable length 3 m)				
e Fieldbus profile				
21 = CANopen				
f Options (service)				
2 = no options				
3 = SET button				
Optional on request				
- Ex 2/22 ¹⁾				
- surface protection				
salt spray tested				

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

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

Connection technology	Order no.
-----------------------	-----------

Cordset, pre-assembled	M12 female connector with coupling nut for bus in , 5-pin 5 m [16.40'] PVC cable	05.00.6091.A211.005M
	M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A411.005M
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in , 5-pin	8.0000.5116.0000
	M12 male connector with external thread for bus out, 5-pin	8.0000.5111.0000

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

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

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Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen
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Technical data

Mechanical characteristics		
Maximum speed	IP65 up to 70°C [158°F]	9000 min ⁻¹ , 7000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7000 min ⁻¹ , 4000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8000 min ⁻¹ , 6000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia		
	shaft version	3.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft		
	radial	80 N
	axial	40 N
Weight	with bus terminal cover	approx. 0.53 kg [18.69 oz]
	with fixed connection	approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		
		-40°C ... +80°C [-40°F ... +176°F] ¹⁾
Material		
	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		
		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		
		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 90 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s can be set via DIP switches, software configurable
Node address	1 ... 127 can be set via rotary switches, software configurable
Termination switchable	can be set via DIP switches, software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device specific profiles such as encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

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

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

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated.

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus.
- Programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min⁻¹).
- Factor for speed calculation (e.g. circumference of measuring wheel).
- Integration time for the speed value from 1 ... 32.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.
- "Watchdog controlled" device.

All profiles stated here: key-features

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

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

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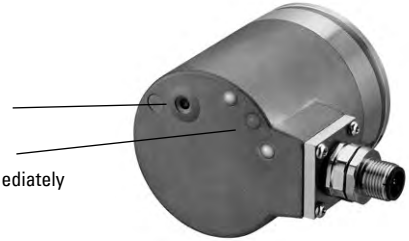
Absolute encoders - singleturn

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

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

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



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 cores individually before initial start-up)					
2	A, B	Bus IN					
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Core color:	WH	BN	YE	GN	GY

Interface	Type of connection	2 x M12 connector, 5-pin					
2	2, F	Bus OUT					
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	
		Pin:	3	2	5	4	1
		Bus IN					
Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND		
Pin:	3	2	5	4	1		

Interface	Type of connection	1 x M12 connector, 5-pin						
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, 12-pin						
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, 12-pin						
2	I	Bus IN						
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H		CAN_GND
		Pin:	10	12	2	7		3

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Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen
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Dimensions shaft version, with removable bus terminal cover

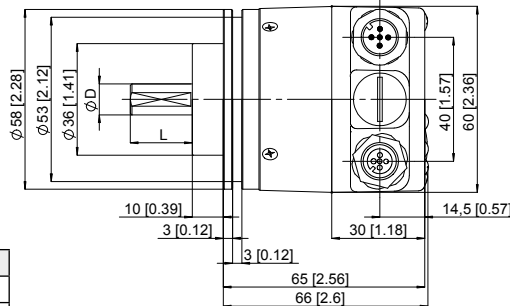
Dimensions in mm [inch]

Clamping flange, $\varnothing 58$ [2.28]

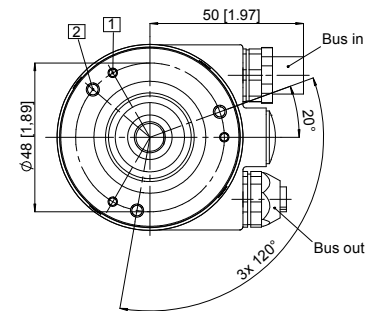
Flange type 1 and 3

(drawing with 2 x M12 connector)

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



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

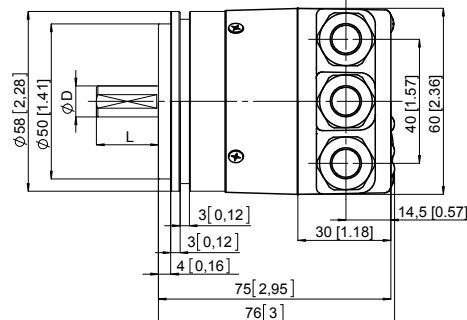


Synchro flange, $\varnothing 58$ [2.28]

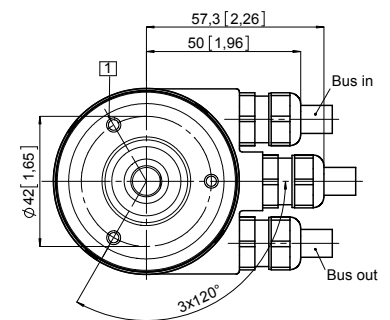
Flange type 2 and 4

(drawing with cable)

- 1 3 x M4, 6 [0.24] deep



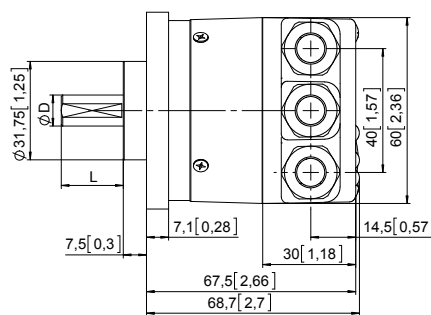
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



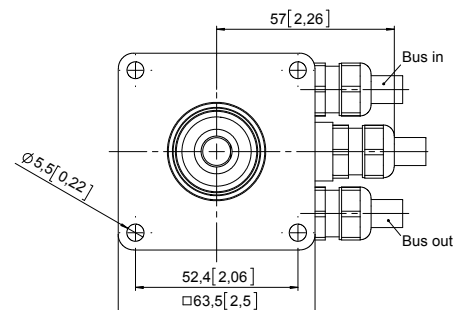
Square flange, $\square 63.5$ [2.5]

Flange type 5 and 7

(drawing with cable)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



Absolute encoders - singleturn

Standard optical

Sendix 5858 / 5878 (shaft / hollow shaft)

CANopen

Dimensions shaft version, with fixed connection

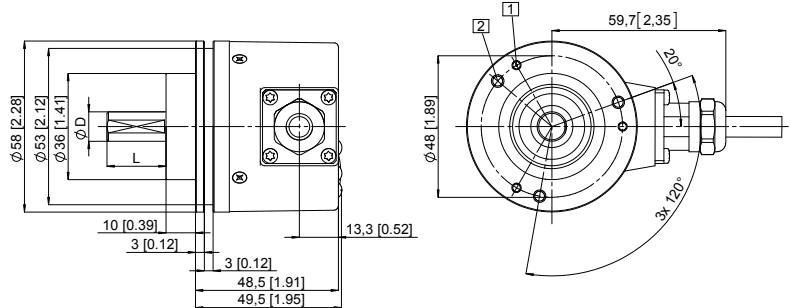
Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

(drawing with cable)

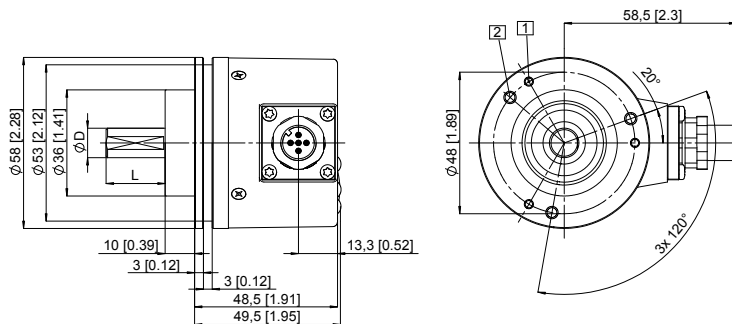
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



(drawing with M12 connector)

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

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

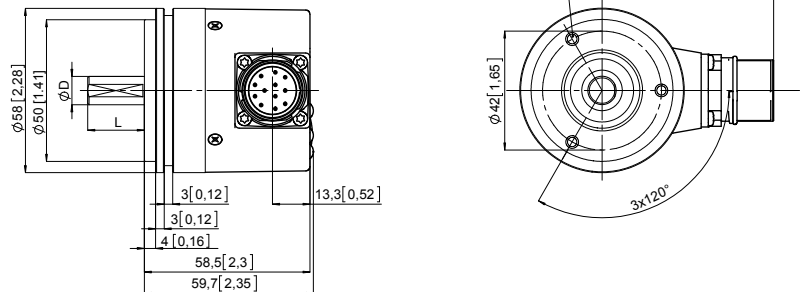


Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with M23 connector)

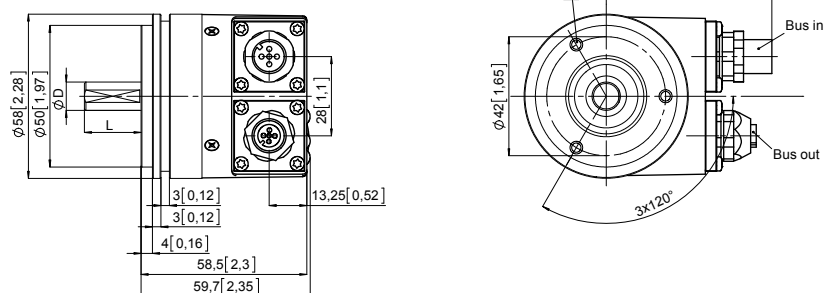
- 1 3 x M4, 6 [0.24] deep



(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

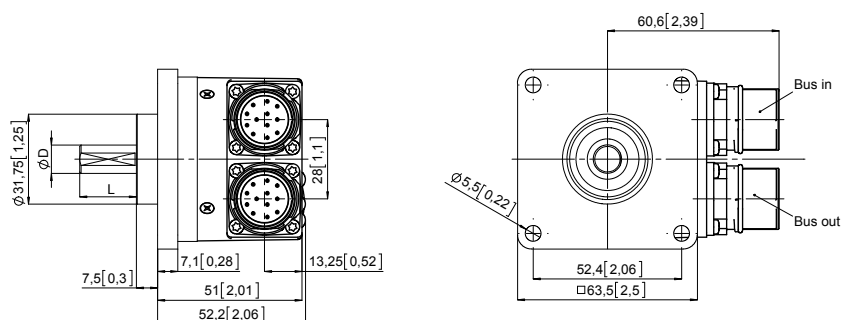


Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(drawing with 2 x M23 connector)

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	CANopen
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Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long

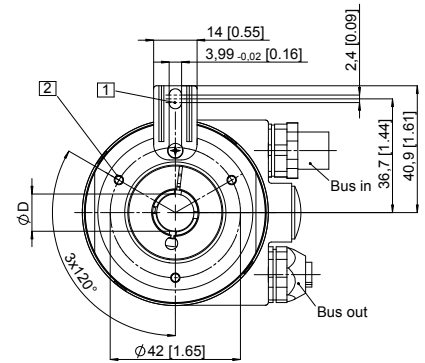
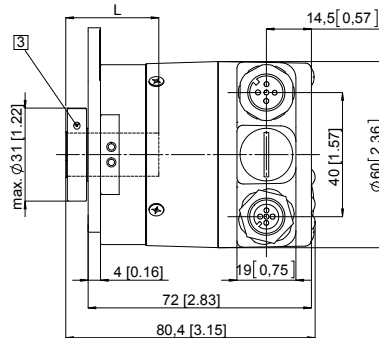
Flange type 1 and 2

(drawing with 2 x M12 connector)

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

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



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

Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

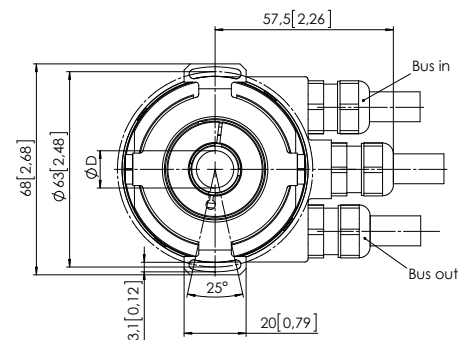
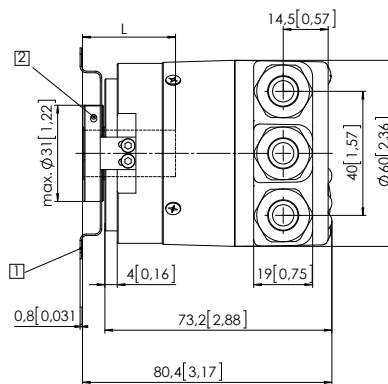
63 [2.48]

(drawing with cable)

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

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



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

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

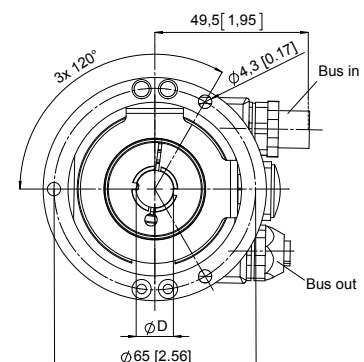
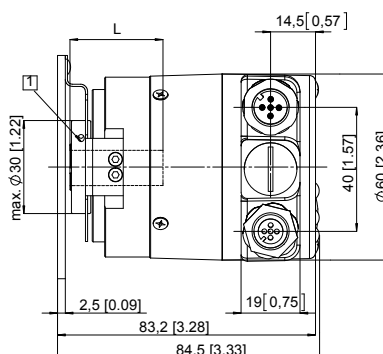
65 [2.56]

(drawing with 2 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



Absolute encoders - singleturn

Standard optical

Sendix 5858 / 5878 (shaft / hollow shaft)

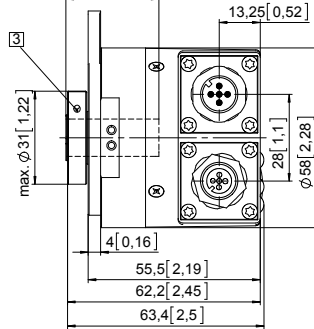
CANopen

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

Dimensions in mm [inch]

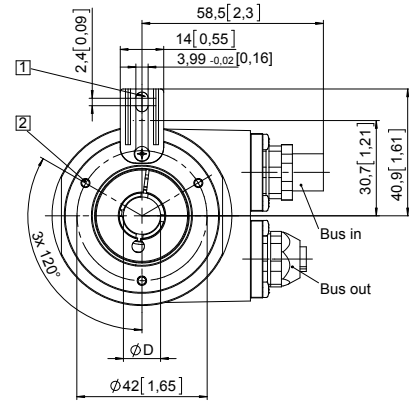
Flange with spring element, long Flange type 1 and 2 (drawing with 2 x M12 connector)

- 1 Slot spring element, 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



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



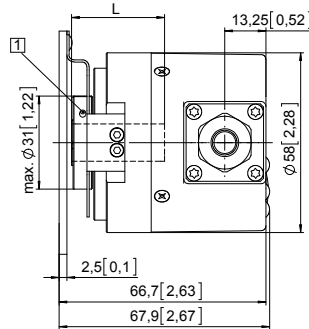
Flange with stator coupling, \varnothing 65 [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

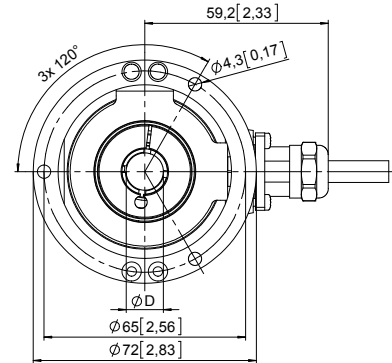
(drawing with cable)

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



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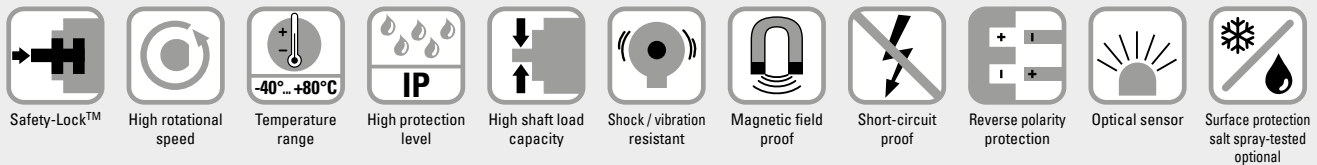
Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT
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The singleturn encoders 5858 and 5878 with second-generation EtherCAT interface and optical sensor technology are ideal for use in all applications with an EtherCAT interface.

The data communication is based on CAN over EtherNet and ideally suited for use in real time applications.

These encoders are available with a solid shaft up to a maximum of 10 mm or a blind hollow shaft up to 15 mm.



Reliable

- EtherCAT conformance tested.
- Integration of the latest slave – EtherCAT stack from Beckhoff, version 5.01.
- Ideally suited for use in harsh outdoor environments, thanks to IP67 protection and rugged housing construction.

Flexible

- Use of CoE (CAN over EtherNet).
- Genuine new position information as a result of minimal cycle time of 62.5 μs in the DC mode.
- Faster, easier error-free connection thanks to M12 connectors.
- Supports Hot-Connect.

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Order code Shaft version	8.5858 Type	. X X B 2 . B2 12 a b c d 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	b Shaft (ø x L), with flat	c Interface / power supply	e Fieldbus profile	
<u>1</u> = clamping flange, IP65 ø 58 mm [2.28"] 3 = clamping flange, IP67 ø 58 mm [2.28"] <u>2</u> = 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"]	<u>1</u> = 6 x 10 mm [0.24 x 0.39"] ¹⁾ <u>2</u> = 10 x 20 mm [0.39 x 0.79"] ²⁾ 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"	<u>B</u> = EtherCAT / 10 ... 30 V DC	<u>B2</u> = EtherCAT with CoE (CAN over EtherNet)	
		d Type of connection removable bus terminal cover	Optional on request - Ex 2/22 - surface protection salt spray tested	
		<u>2</u> = 3 x M12 connector, 4-pin		

Order code Hollow shaft	8.5878 Type	. X X B 2 . B2 12 a b c d 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	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</u> = with stator coupling, IP65 ø 63 mm [2.48"] 6 = with stator coupling, IP67 ø 63 mm [2.48"]	(insertion depth max. 30 mm [1.18"]) <u>3</u> = ø 10 mm [0.39"] <u>4</u> = 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"	<u>B</u> = EtherCAT / 10 ... 30 V DC	<u>B2</u> = EtherCAT with CoE (CAN over EtherNet)	
		d Type of connection removable bus terminal cover	Optional on request - Ex 2/22 - surface protection salt spray tested	
		<u>2</u> = 3 x M12 connector, 4-pin		

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

Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT
Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling \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	Dimensions in mm [inch]	8.0010.4700.0000
for flange with spring element (flange type 1 + 2)	with fixing thread 	
Connection technology		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port IN and port OUT, 4-pin 2 m [6.56'] PUR cable	05.00.6031.4411.002M
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable	05.00.6061.6211.002M
Connector, self-assembly (straight)	M12 male connector with external thread for port IN and port OUT, 4-pin	05.WACSY4S
	M12 female connector with coupling nut for power supply, 4-pin	05.B8141-0

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

Technical data	
Mechanical characteristics	
Maximum speed	IP65 up to 70°C [158°F] 9000 min ⁻¹ , 7000 min ⁻¹ (continuous) IP65 up to T _{max} 7000 min ⁻¹ , 4000 min ⁻¹ (continuous) IP67 up to 70°C [158°F] 8000 min ⁻¹ , 6000 min ⁻¹ (continuous) IP67 up to T _{max} 6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65 < 0.01 Nm IP67 < 0.05 Nm
Mass moment of inertia	shaft version 3.0 x 10 ⁻⁶ kgm ² hollow shaft version 6.9 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529	housing side IP67 shaft side IP65, opt. IP67
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft stainless steel flange aluminum housing zinc die-cast
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz
Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 110 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
Interface characteristics EtherCAT	
Resolution	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Protocol	EtherNet / EtherCAT
Diagnostic LED (red)	
LED is ON with the following fault conditions: Sensor error (internal code or LED error), low voltage, over-temperature	
Run LED (green)	
LED is ON with the following conditions: Preop-, Safeop and Op-State (EtherCAT status machine)	
2 x Link LEDs (yellow)	
LED is ON with the following conditions (port IN and port OUT): Link detected	
Modes	
Freerun, Distributed Clock	

Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT
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General information about CoE (CAN over EtherNet)

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

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

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

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

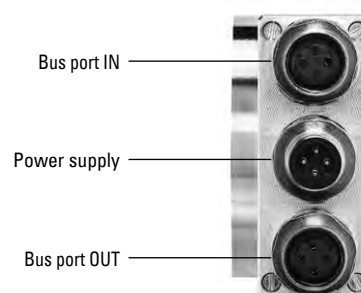
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

The following parameters are programmable:

- Position update time of 62.5 µs.
- EtherCAT certificate of conformity.
- Speed with sign.
- Four units for speed calculation: steps/sec, steps/100 ms, steps/10 ms, rotation/min.
- Time stamp as system time at the point in time when the position is read out.
- Two working area state registers.
- Along with the scaled position, the raw data – position as process value – is also mappable.
- Dynamic mapping.
- Gating time: setting of the time interval, via which the speed value can be interpolated.
- Sensor temperature in degrees Celsius.
- Comprehensive plausibility test when downloading parameters to the encoder.
- Alarm and warning messages.
- User interface with visual display of bus and fault status – 4 LEDs.
- Extended error management for position sensing with integrated temperature control.
- Implementation of the latest CANopen profile 3.2.10 from the 18th February 2011.
- Hot-Connect – Support for rapid change of Bus-topology.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					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	



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Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT
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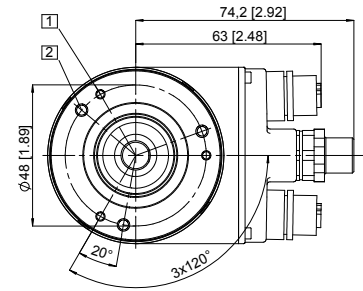
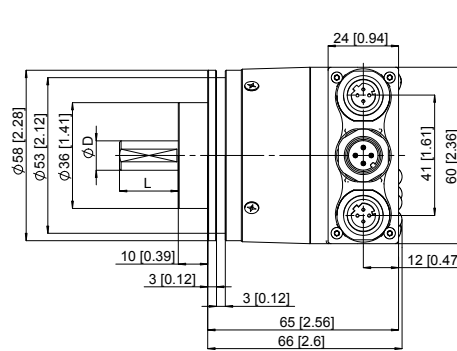
Dimensions shaft version, with removable bus terminal cover

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

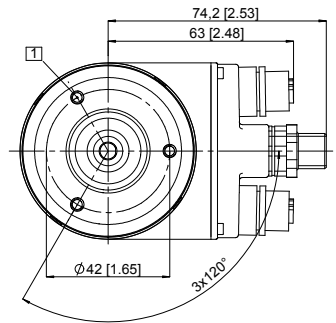
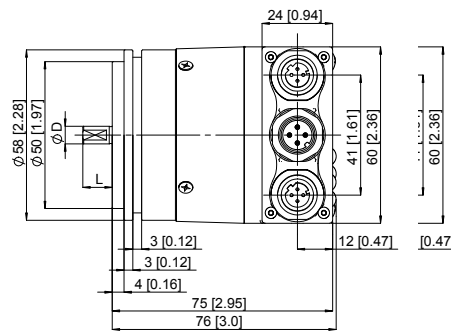
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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

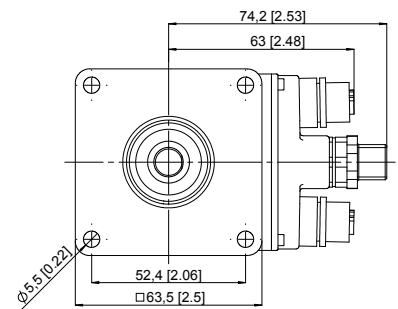
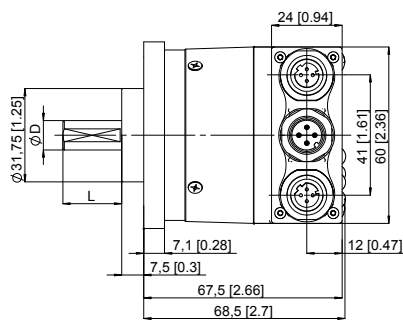
- 1 3 x M4, 6 [0.24] deep

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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Addresses

Absolute encoders - singleturn

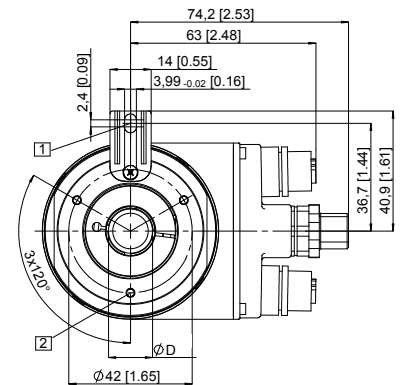
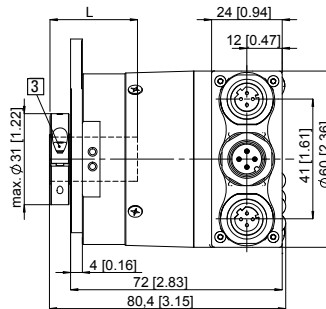
Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	EtherCAT
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Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

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

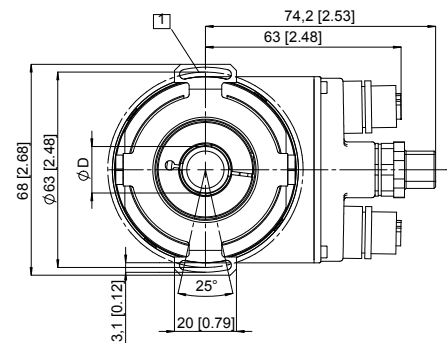
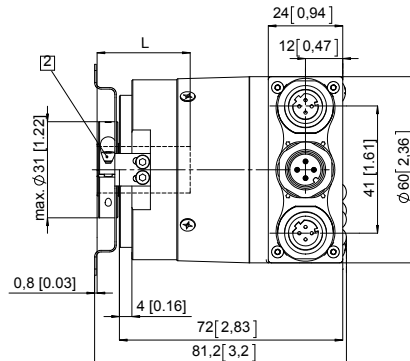


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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

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

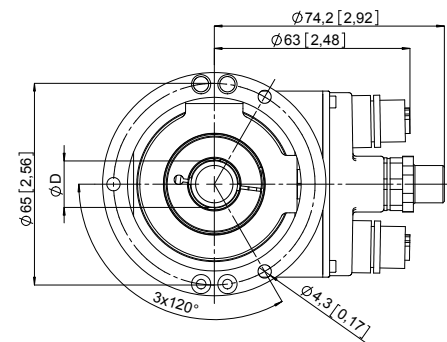
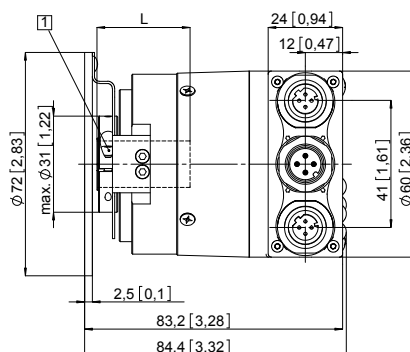


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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.



Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1.
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction.

Flexible

- Easy setting of a preset value using a control bit (telegram 860).
- IRT-Mode.
- Cycle time ≥ 1 ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.

Order code Shaft version

8.5858 . **XXC2** . **C2 12**
Type a b c d e

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



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

- C = PROFINET IO / 10 ... 30 V DC

e Field bus profile

- C2 = PROFINET IO

d Type of connection

- 2 = 3 x M12 connector, 4-pin

Optional on request

- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.5878 . **XXC2** . **C2 12**
Type a b c d e

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



a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 \varnothing 65 mm [2.56"]
- 4 = with stator coupling, IP67 \varnothing 65 mm [2.56"]
- 5 = with stator coupling, IP65 \varnothing 63 mm [2.48"]
- 6 = with stator coupling, IP67 \varnothing 63 mm [2.48"]

b Blind hollow shaft

- (insertion depth max. 30 mm [1.18"])
- 3 = \varnothing 10 mm [0.39"]
- 4 = \varnothing 12 mm [0.47"]
- 5 = \varnothing 14 mm [0.55"]
- 6 = \varnothing 15 mm [0.59"]
- 8 = \varnothing 3/8"
- 9 = \varnothing 1/2"

c Interface / power supply

- C = PROFINET IO / 10 ... 30 V DC

e Field bus profile

- C2 = PROFINET IO

d Type of connection

- 2 = 3 x M12 connector, 4-pin

Optional on request

- Ex 2/22
- surface protection salt spray tested

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

Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	PROFINET IO	Order no.	Product overview Basics
Mounting accessory for shaft encoders			Order no.	Product overview Basics
Coupling	bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"] bellows coupling \varnothing 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.	Incremental encoders
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 		8.0010.4700.0000	
Connection technology			Order no.	Absolute encoders singleturn
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56'] PUR cable M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable		05.00.6031.4411.002M 05.00.6061.6211.002M	
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin M12 female connector with coupling nut for power supply, 4-pin		05.WASCSY4S 05.B8141-0	

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

Technical data			Interface characteristics PROFINET IO			Linear measuring technology
Mechanical characteristics			Link 1 and 2, LED (green / yellow)			
Maximum speed	IP65 up to 70°C [158°F] IP65 up to T_{max} IP67 up to 70°C [158°F] IP67 up to T_{max}	9000 min ⁻¹ , 7000 min ⁻¹ (continuous) 7000 min ⁻¹ , 4000 min ⁻¹ (continuous) 8000 min ⁻¹ , 6000 min ⁻¹ (continuous) 6000 min ⁻¹ , 3000 min ⁻¹ (continuous)	Resolution	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)		
Starting torque - at 20°C [68°F]	IP65 IP67	< 0.01 Nm < 0.05 Nm	Code	binary		Connection technology
Mass moment of inertia	shaft version hollow shaft version	3.0 x 10 ⁻⁶ kgm ² 6.0 x 10 ⁻⁶ kgm ²	Protocol	PROFINET IO		
Load capacity of shaft	radial axial	80 N 40 N	Error LED (red) / PWR LED (green)			Accessories
Weight		approx. 0.50 kg [17.64 oz]	Functionality see manual			
Protection acc. to EN 60529	housing side shaft side	IP67 IP65, opt. IP67	Electrical characteristics			Addresses
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]	Power supply	10 ... 30 V DC		
Material	shaft/hollow shaft flange housing	stainless steel aluminum zinc die-cast	Power consumption (no load)	max. 200 mA		
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms	Reverse polarity protection of the power supply	yes		
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz	UL approval	file no. E224618		
			CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Absolute encoders - singleturn

Standard optical	Sendix 5858 / 5878 (shaft / hollow shaft)	PROFINET IO
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General information about PROFINET IO

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

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

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

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

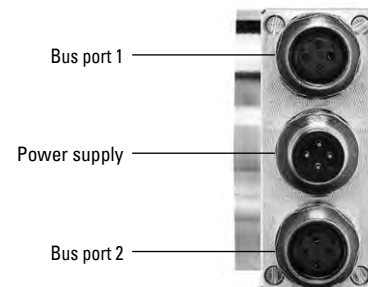
PROFINET IO

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

The **M**edia **R**edundancy **P**rotocol is implemented here. Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					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
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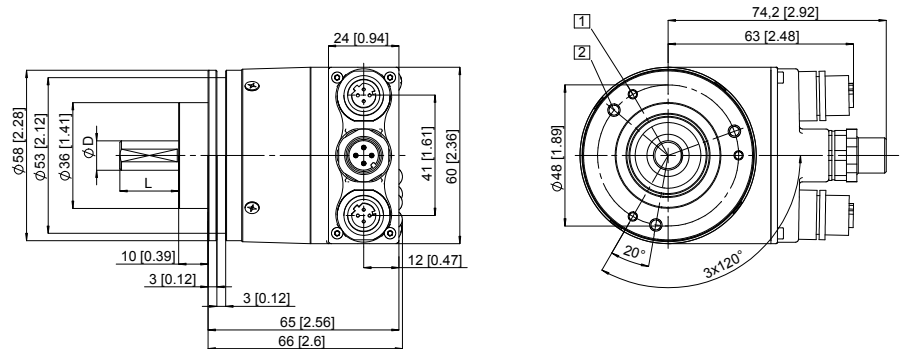
Dimensions shaft version, with removable bus terminal cover

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

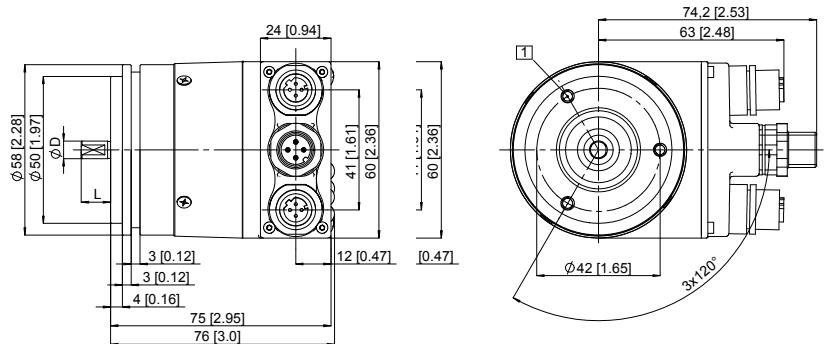
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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

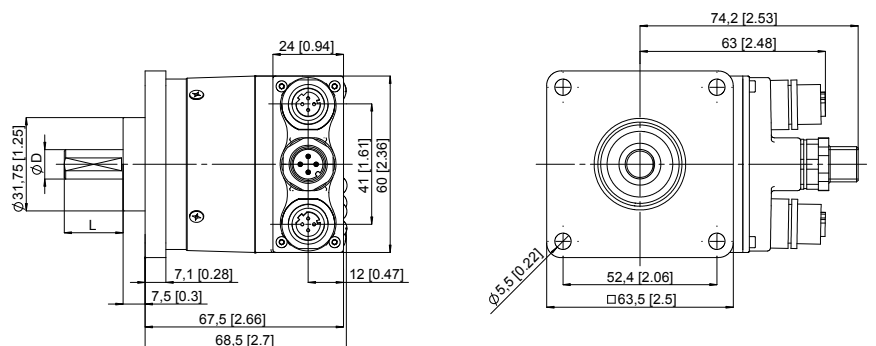
- 1 3 x M4, 6 [0.24] deep

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



Absolute encoders - singleturn

Standard optical

Sendix 5858 / 5878 (shaft / hollow shaft)

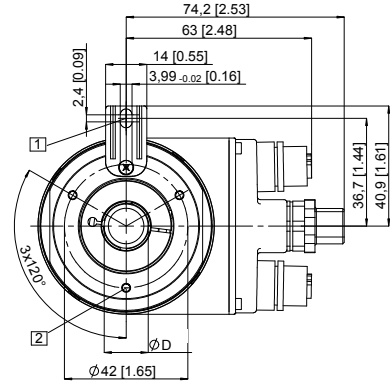
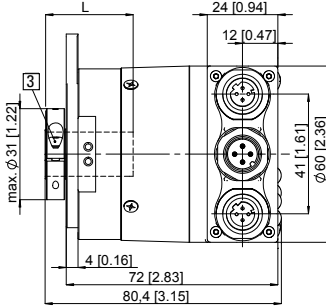
PROFINET IO

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 Slot spring element, 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

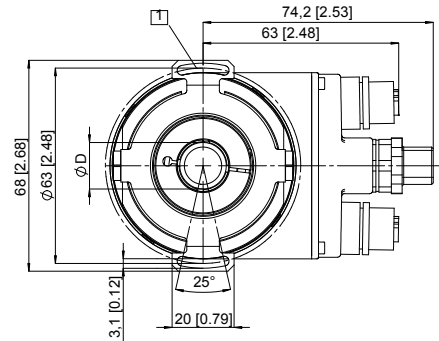
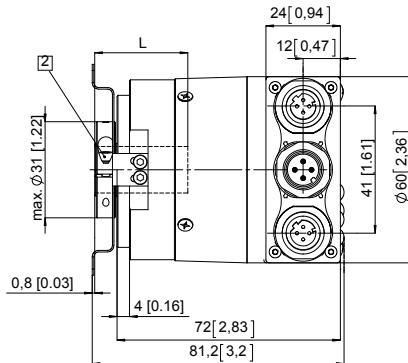


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

**Flange with stator coupling, $\varnothing 63$ [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

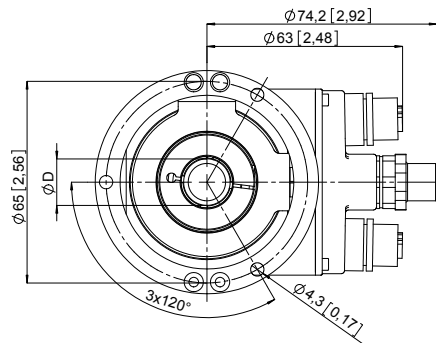
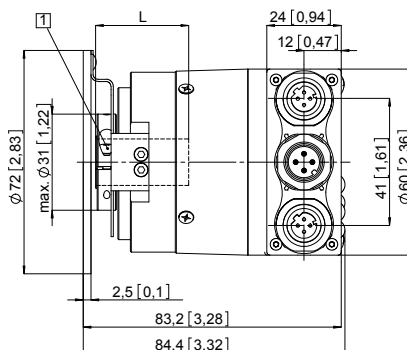


D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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

- 1 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Absolute encoders – singleturn

Standard optical	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP
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The Sendix F58 singleturn is a particularly high resolution optical encoder without gears and with 100 percent magnetic insensitivity.

16 bits total resolution, shaft up to 10 mm, blind hollow shaft up to 15 mm and certified EtherNet/IP functionality.



EtherNet/IP™



Safety-Lock™



High rotational speed



Temperature range
-40°... +80°C



High protection level
IP65



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor

Up-to-the-minute EtherNet/IP functionality

- Fast, easy commissioning and configuration possible thanks to cyclic services.
- Low RPI time, of 1 ms minimum – makes the encoder suitable for time-critical applications up to an update frequency of 1000 Hz.
- Faster encoder start after applying the power – increases plant performance.

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- Thanks to the implementation of DLR (Device Level Ring) a single cable break does not lead to plant stoppage.
- Wide temperature range, -40°C ... +80°C.

Order code **8.F5858** . **XXAN** . **A2 2 2**
Shaft version Type a b c d e

a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]

b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]
- 2 = 10 x 20 mm [0.39 x 0.79"]
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c Interface / Power supply

- A = EtherNet IP / 10 ... 30 V DC

e Fieldbus profile

- A2 = EtherNet/IP

d Type of connection

- N = 3 x axial M12 connector, 4-pin

Optional on request

- Ex 2/22

Order code **8.F5878** . **XXAN** . **A2 2 2**
Hollow version Type a b c d e

a Flange

- 1 = with spring element long, IP65
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]

b Blind hollow shaft

(insertion depth max. 30 mm [1.18"])

- A = ø 10 mm [0.39"]
- B = ø 12 mm [0.47"]
- C = ø 14 mm [0.55"]
- D = ø 15 mm [0.59"]
- E = ø 3/8"
- F = ø 1/2"

c Interface / Power supply

- A = EtherNet IP / 10 ... 30 V DC

e Fieldbus profile

- A2 = EtherNet/IP

d Type of connection

- N = 3 x axial M12 connector, 4-pin

Optional on request

- Ex 2/22

Absolute encoders – singleturn

Standard optical	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP	Order no.
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 flange with spring element (flange type 1)	with fixing thread 		8.0010.4700.0000
Connection technology			Order no.
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56'] PUR cable		05.00.6031.4411.002M
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable		05.00.6061.6211.002M
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin		05.WACSY4S
	M12 female connector with coupling nut for power supply, 4-pin		05.B8141-0

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

Technical data	
Mechanical characteristics	
Max. speed shaft version	
IP65 up to 70°C	8000 min ⁻¹ , 6000 min ⁻¹ (continuous)
IP65 up to T _{max}	6000 min ⁻¹ , 4000 min ⁻¹ (continuous)
Max. speed hollow shaft version	
IP65 up to 70°C	6000 min ⁻¹ , 4000 min ⁻¹ (continuous)
IP65 up to T _{max}	4000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	< 0.01 Nm
Moment of inertia	
shaft version	3.0 x 10 ⁻⁶ kgm ²
hollow shaft version	6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	
radial	80 N
axial	40 N
Weight	approx. 0.45 kg
Protection acc. to EN 60529	IP65
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	
shaft/hollow shaft	stainless steel
flange	aluminum
housing	aluminum
Shock resistance acc. EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz
Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 250 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
Interface characteristics EtherNet/IP	
Resolution	1 ... 65.536 (16 bit), scalable default: 65.536 (16 bit)
Code	binary
Protocol	EtherNet/IP

Absolute encoders – singleturn

Standard optical	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP
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General information about EtherNet/IP

EtherNet/IP conformance tested acc. to version CT-12 of 11. Dez. 2014
 EtherNet/IP specification Vol 2, Ed 1.17
 CIP specification Vol 1, Ed 3.16

The following functionalities are integrated

Adjustable parameters

- Preset
- Count direction
- Resolution
- Unity of speed
- IP address
- Position
- Diagnosis
- Position limit
- Warning messages

Objects (CIP Objects)

- Identity Object
- Message Router
- Assembly Object
- Connection Manager
- Position Sensor Object
- Qos Object
- Port Object
- TCP / IP Interface Object
- EtherNet Link Object

EtherNet/IP features

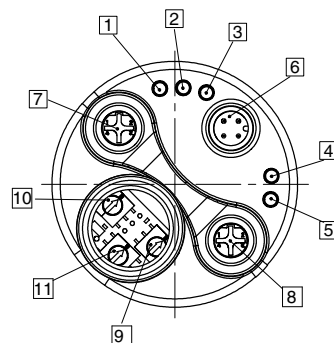
- DLR (Device Level Ring) possible
- Qos (Quality of Service) possible
- ACD (Address Conflict Detection)
- Multicast and unicast capability

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
A	N (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	

Rear side connections and display elements

- 1 LED: Link 1
- 2 LED: Mod.
- 3 LED: Net.
- 4 LED: Encoder
- 5 LED: Link 2
- 6 Power
- 7 Port 1
- 8 Port 2
- 9 Switch: x1
- 10 Switch: x100
- 11 Switch: x10



Absolute encoders – singleturn

Standard optical	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP
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Dimensions shaft version

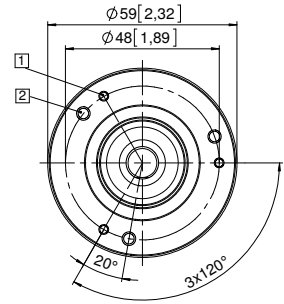
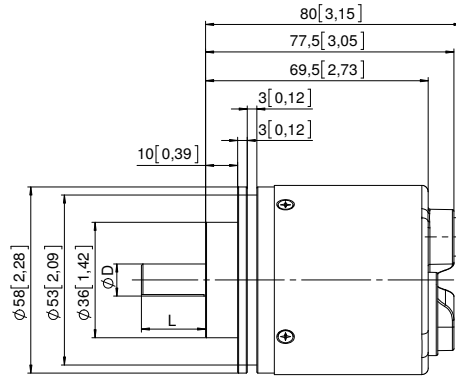
Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]

Flange type 1

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.31] deep

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"

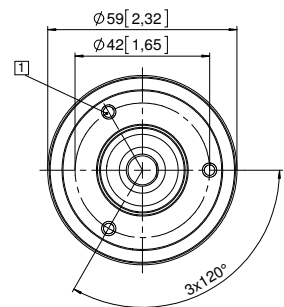
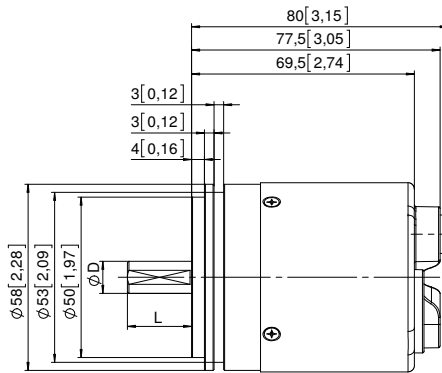


Synchro flange, ø 58 [2.28]

Flange type 2

- 1 3 x M3, 6 [0.24] deep

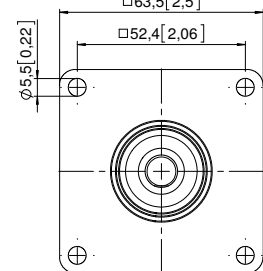
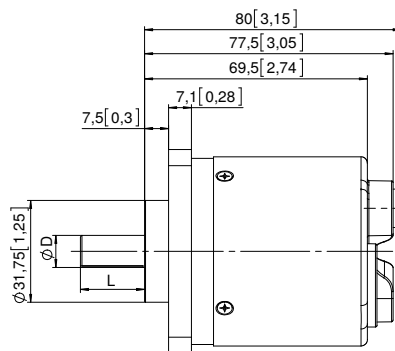
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



Square flange, □ 63.5 [2.5]

Flange type 5

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h8	7/8"
3/8"	h8	7/8"



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Absolute encoders – singleturn

Standard optical	Sendix F5858 / F5878 (shaft / hollow shaft)	EtherNet/IP
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Dimensions hollow shaft version

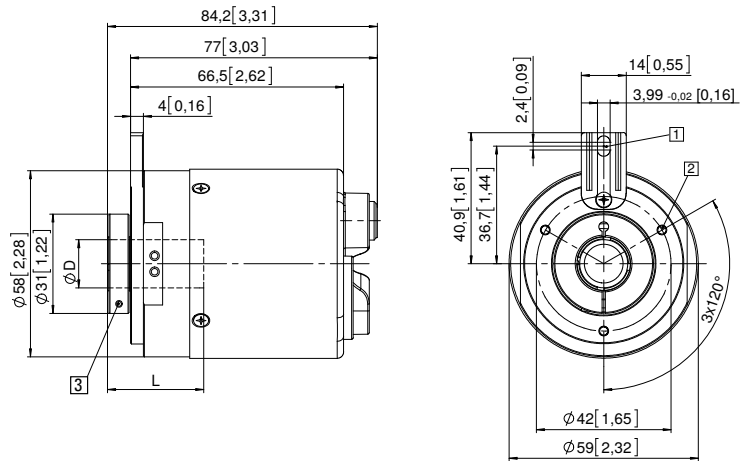
Dimensions in mm [inch]

Flange with spring element, long Flange type 1

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

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

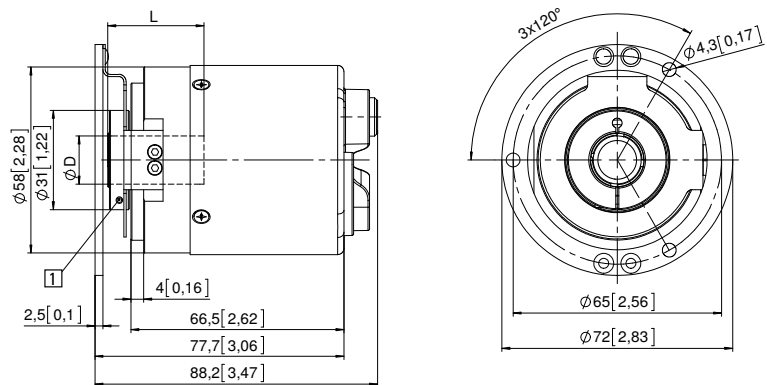


Flange with stator coupling, \varnothing 65 [2.56] Flange type 3

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

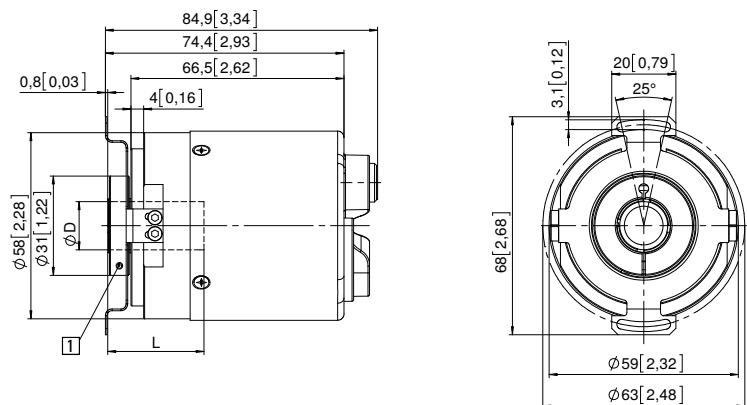


Flange with stator coupling, \varnothing 63 [2.48] Flange type 5

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



Absolute encoders - singleturn

Standard stainless steel, optical

5876 (hollow shaft)

SSI, parallel

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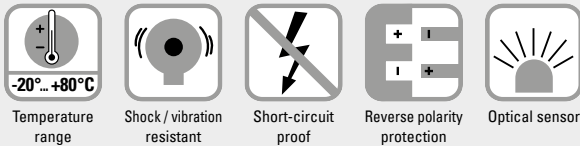
Connection technology

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



Safe

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

Adaptable

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

Order code hollow shaft

8.5876 . **XXXX** . **XXXX**
Type a b c d e f

a Flange

- 1 = with through hollow shaft, \varnothing 58 mm [2.28"]
- 2 = with blind hollow shaft, \varnothing 58 mm [2.28"]

b Hollow shaft

- (insertion depth blind hollow shaft with flange 2 max. 30 mm [1.18"])
- 6 = \varnothing 10 mm [0.39"]
 - 8 = \varnothing 12 mm [0.47"]

c Interface / power supply

- 1 = SSI / 5 V DC
- 2 = SSI / 10 ... 30 V DC
- 3 = parallel / 5 V DC
- 4 = parallel / 10 ... 30 V DC

d Type of connection

- 1 = radial cable, 1 m [3.28] PVC
- 2 = radial M12 connector, 8-pin, without mating connector ¹⁾

e Code type and division

- see table 1 (at interface 3 and 4, parallel)
- see table 2 (at interface 1 and 2, SSI)

f Options

- 2 = SET and V/R
- 3 = SET and Latch ²⁾
- 4 = V/R and Latch ²⁾

Optional on request
- Ex 2/22 ³⁾

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

Interface and power supply, version 3 or 4 (parallel)

Division	250	360	500	720	900	1000	1024 10 bit	1250	1440	1800	2000	2500	2880	3600	4000	4096 12 bit	5000	7200	8192 13 bit	16384 14 bit
Order code gray / gray-excess	E02	E03	E05	E07	E09	E01	G10	E12	E14	E18	E20	E25	E28	E36	E40	G12	E50	E72	G13	G14
Order code binary	B02	B03	B05	B07	B09	B01	B10	BA2	BA1	B18	B20	B25	B28	B36	B40	B12	B50	B72	B13	B14
Order code BCD	D02	D03	D05	D07	D09	D01	D10	DA2	DA1	D18	D20									

Table 2: Code type and SSI output

Interface / power supply, version 1 or 2

Division	1024 10 bit	4096 12 bit	8192 13 bit	16384 14 bit
Order code gray	G10	G12	G13	G14
Order code binary	B10	B12	B13	B14

1) Only in conjunction with SSI output.
2) Not with SSI interface.
3) For the cable connection type, cable material PUR.

Absolute encoders - singleturn

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

Mechanical characteristics

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

Electrical characteristics

Interface type	Synchronous serial (SSI)	Synchronous serial (SSI)	Parallel	Parallel
Power supply (+V)	5 V DC (±5 %)	10 ... 30 V DC	5 V DC (±5 %)	10 ... 30 V DC
Output driver	RS485	RS485	Push-pull	Push-pull
Power consumption (no load)	typ. 89 mA 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 no. E224618			
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU			

Control inputs

Switching levels of the control inputs

Power supply	5 V DC	10 ... 30 V DC
Switching level	LOW ≤ 1.7 V 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.

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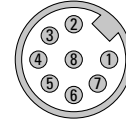
Standard stainless steel, optical	5876 (hollow shaft)	SSI, parallel
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Terminal assignment

SSI interface

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)																	
		Signal	0V	+V	C+	C-	D+	D-	ST	VR	Core color:	WH	BN	GN	YE	GY	PK	BU	RD
1, 2	1																		
1, 2	2	M12 connector, 8-pin																	
		Signal	0V	+V	C+	C-	D+	D-	ST	VR									
		Pin:	1	2	3	4	5	6	7	8									

Top view of mating side, male contact base



M12 connector, 8-pin

Parallel interface up to max. 14 bit and max. 2 options

Interface	Type of connection	Cable (isolate unused cores 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																				
		Core color:	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)
- Sig.: 1 =MSB; 2 = MSB-1; 3 = MSB-2 etc.
- C+, C-: Clock signal
- D+, D-: Data signal
- ST: Set input. The current position becomes defined as position zero.
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning.
- LH: LATCH input. Active HIGH. The current position is saved and is statically available at the output.
- PH ⊥: Plug connector housing (shield)

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Standard stainless steel, optical

5876 (hollow shaft)

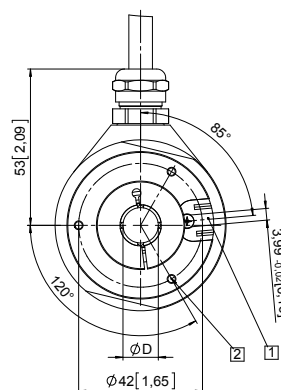
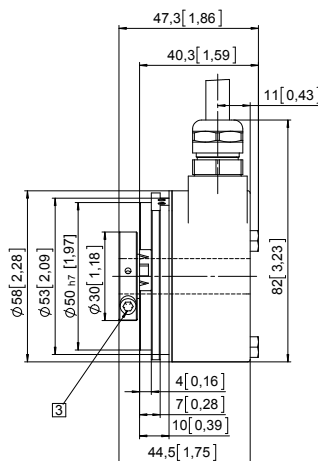
SSI, parallel

Dimensions

Dimensions in mm [inch]

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

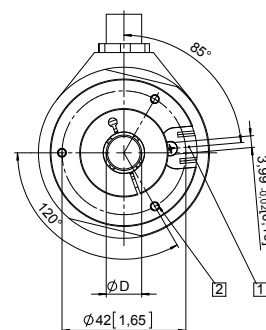
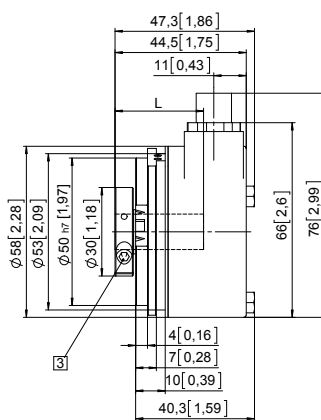
- 1 Slot spring element recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5 [0.2] deep
- 3 Recommended torque for the clamping ring shaft version 6: 0.7 Nm shaft version 8: 1.0 Nm



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

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

- 1 Slot spring element recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5 [0.2] deep
- 3 Recommended torque for the clamping ring shaft version 6: 0.7 Nm shaft version 8: 1.0 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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**Standard, ATEX/IECEX – zone 1/21
optical**

Sendix 7053 / 7073 (shaft / hollow shaft)

SSI / BiSS



The Sendix 7053 / 7073 absolute encoders – singleturn offer Ex protection in a compact 70 mm seawater durable aluminum housing, with an SSI or BiSS interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 17 bits; they are also available with axial and radial cable outlets.



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7053 . 1 X 2 X . X X 2 1 . XXXX
Type a b c d e f g h i¹⁾

a Flange
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b Shaft (ø x L)
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway
for 4 x 4 mm [0.16 x 0.16"] key

c Interface / power supply
2 = SSI, BiSS / 10 ... 30 V DC

d Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

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

f Resolution²⁾
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g Inputs / outputs²⁾
2 = SET, DIR input
additional status output

h Options
1 = no option

i 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
- other resolutions
- IP65 version for T6
- seawater resistant (stainless steel V4A)

*Stainless steel V4A as standard types
(deliverable as from 1 unit)*

V4A 8.7053.2221.XX21.V4A
1.4404 8.7053.222A.XX21.XXXX-V4A

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

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Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7053 / 7073 (shaft / hollow shaft)	SSI / BiSS
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Order code Hollow shaft	8.7073 Type	.XX2X.XX21.XXXX a b c d e f g h i ¹⁾
a Flange 1 = with spring element, short 5 = with stator coupling, IP67, ø 65 mm [2.56"]	e Code B = SSI, binary C = BiSS, binary G = SSI, gray	i Cable length in dm ¹⁾ 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']
b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]	f Resolution ²⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit	Optional on request - special cable length - other resolutions - IP65 version for T6 - seawater resistant (stainless steel V4A)
c Interface / power supply 2 = SSI, BiSS / 10 ... 30 V DC	g Inputs / outputs ²⁾ 2 = SET, DIR input additional status output	Stainless steel V4A as standard types (deliverable as from 1 unit) 8.7073.2221.XX21-V4A 8.7073.222A.XX21.XXXX-V4A
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']	h Options 1 = no option	V4A 1.4404

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

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

Technical data

Explosion protection Sendix 7053	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7073	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014; EN 60079-31:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0020 X
Category (gas)	Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes ³⁾
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEX – zone 1/21 optical		Sendix 7053 / 7073 (shaft / hollow shaft)		SSI / BiSS	
Mechanical characteristics					
Maximum speed	shaft hollow shaft	6000 min ⁻¹ (continuous) 3000 min ⁻¹ (continuous)			
Starting torque - at 20°C [68°F]		< 0.05 Nm			
Mass moment of inertia		4.0 x 10 ⁻⁶ kgm ²			
Load capacity of shaft	radial axial	80 N 40 N			
Weight		approx. 1.5 kg [52.91 oz]			
Protection acc. to EN 60529		IP67			
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!			
Material	shaft flange / housing cable	stainless steel seawater durable Al, type AlSiMgMn (EN AWW-6082) PUR			
Shock resistance to EN/IEC 60068-2-27		2500 m/s ² , 6 ms			
Vibration resistance to EN/IEC 60068-2-6		100 m/s ² , 55 ... 2000 Hz			
SSI interface					
Output driver		RS485 transceiver type			
Permissible load / channel		max. +/- 20 mA			
Signal level	HIGH LOW at I _{Load} = 20 mA	typ 3.8 V typ 1.3 V			
Resolution		10 ... 14 bit and 17 bit			
Code		binary or gray			
SSI clock rate		50 kHz ... 2 MHz			
Data refresh rate	ST resolution ≤ 14 bit ST resolution ≥ 15 bit	< 1 μs 4 μs			
Monoflop time		≤ 15 μs			
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.					
BiSS interface					
Output driver		RS485 transceiver type			
Permissible load / channel		max. +/- 20 mA			
Signal level	HIGH LOW at I _{Load} = 20 mA	typ 3.8 V typ 1.3 V			
Resolution		10 ... 14 bit and 17 bit			
Code		binary			
Clock rate		up to 10 MHz			
Max. update rate		< 10 μs, depends on the clock rate and the data length			
Data refresh rate	ST resolution ≤ 14 bit ST resolution 17 bit	≤ 1 μs 2.4 μs			
Note:					
– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings					
– CRC data verification					
Status output					
Output driver		open collector, internal pull-up resistor 22 kOhm			
Permissible load		max. 20 mA			
Signal level	HIGH LOW	+V < 1 V			
Active at		LOW			
The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation.					
SET input					
Input		HIGH active			
Input type		comparator			
Signal level (+V = power supply)	HIGH LOW	min. 60% of +V max. +V max. 25% of +V			
Input current		< 0.5 mA			
Min. pulse duration (SET)		10 ms			
Timeout after SET signal		14 ms			
The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.					
DIR input					
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.					
Response time (DIR input)		1 ms			
Power-ON					
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.					
Hot plugging of the encoder should be avoided.					

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Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7053 / 7073 (shaft / hollow shaft)	SSI / BiSS
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Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)												
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊕	⊖	
2	1, 2, A, B	SET, DIR	Core marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield	

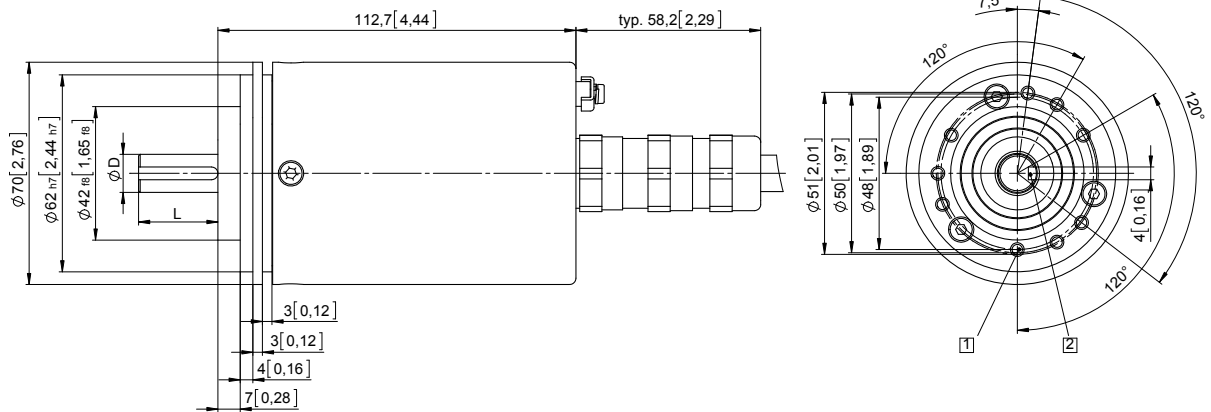
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- Stat: Status output
- ⊕: Protective earth

Dimensions shaft version

Dimensions in mm [inch]

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

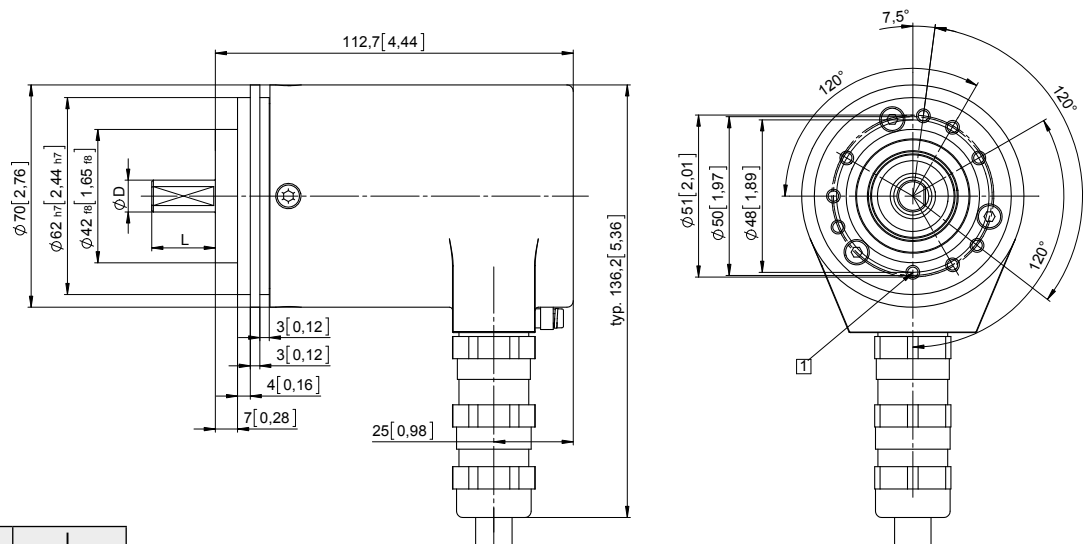
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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Absolute encoders - singleturn

**Standard, ATEX/IECEx – zone 1/21
optical**

Sendix 7053 / 7073 (shaft / hollow shaft)

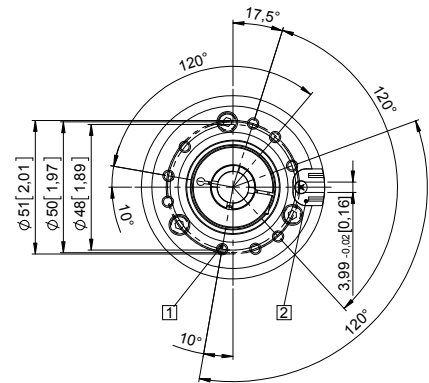
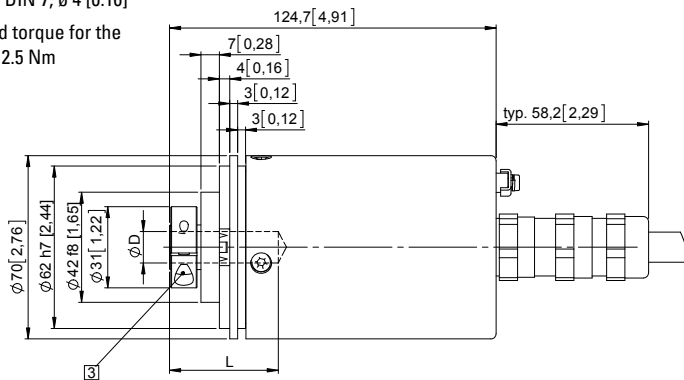
SSI / BiSS

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm

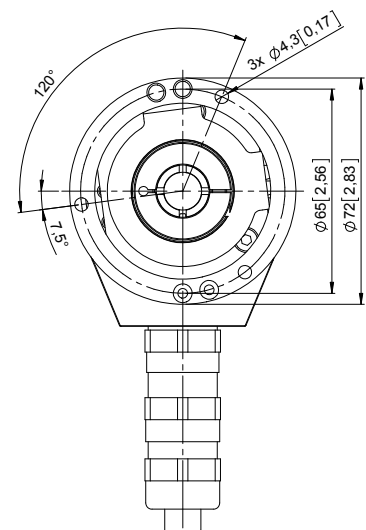
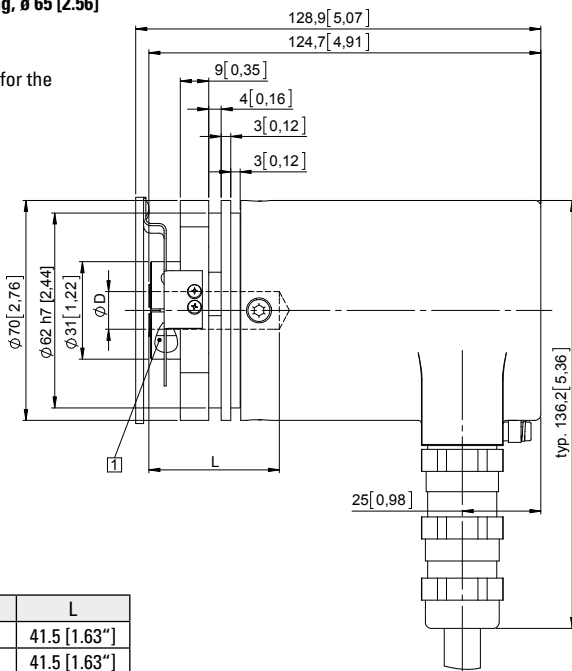


D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56] Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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Standard, ATEX/IECEX – zone 1/21 SIL2/PLd, optical	Sendix SIL 7053FS2 (shaft)	SSI / BiSS + SinCos
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Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



Functional Safety

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

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Order code	8.7053FS2	. 1 X 4 X . XX 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
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see **i**, e. g.: 0100 = 10 m [32.81']

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

f Resolution ²⁾
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g Inputs / outputs ²⁾
2 = SET input

h Options
1 = no option

i Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)

V4A
1.4404
8.7053FS2.2241.XX21.V4A
8.7053FS2.224A.XX21.XXXX-V4A

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

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Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 SIL2/PLd, optical	Sendix SIL 7053FS2 (shaft)	SSI/BiSS + SinCos	
Accessories			Order no.
EMC shield terminal	for top-hat rail mounting		8.0000.4G06.0000
Screw retention	Loctite 243, 5 ml		8.0000.4G05.0000
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .		
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .		
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display .		

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

Technical data

Explosion protection	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"	
These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.	

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

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 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
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEX – zone 1/21 SIL2/PLd, optical	Sendix SIL 7053FS2 (shaft)	SSI/BiSS + SinCos
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SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution	10 ... 14 bit and 17 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 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 ¹⁾
Pulse rate	2048 ppr

SET input	
Input	HIGH active
Input type	comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores 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	Core marking:	6	1	2	3	4	5	11	7	8	9	10	shield	

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Protective earth

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

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Absolute encoders - singleturn

**Standard, ATEX/IECEX – zone 1/21
SIL2/PLd, optical**

Sendix SIL 7053FS2 (shaft)

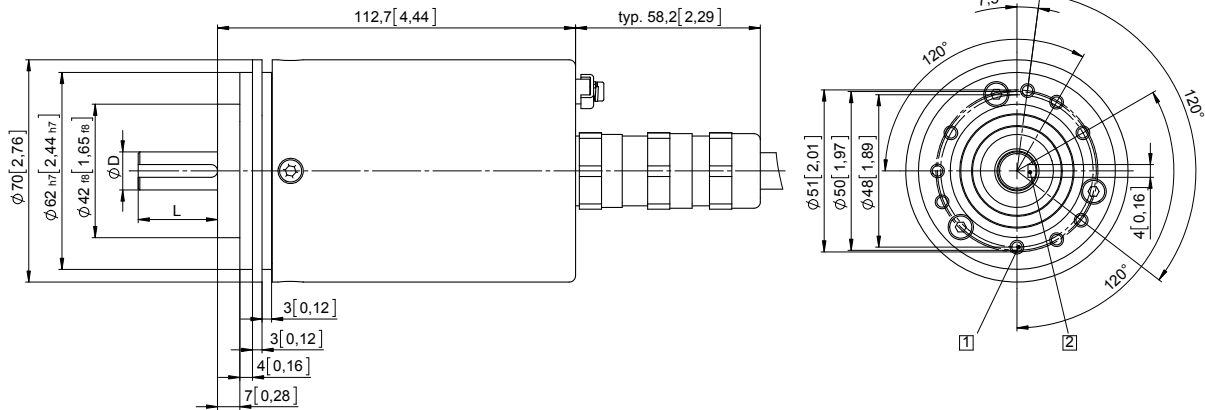
SSI/BiSS + SinCos

Dimensions

Dimensions in mm [inch]

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

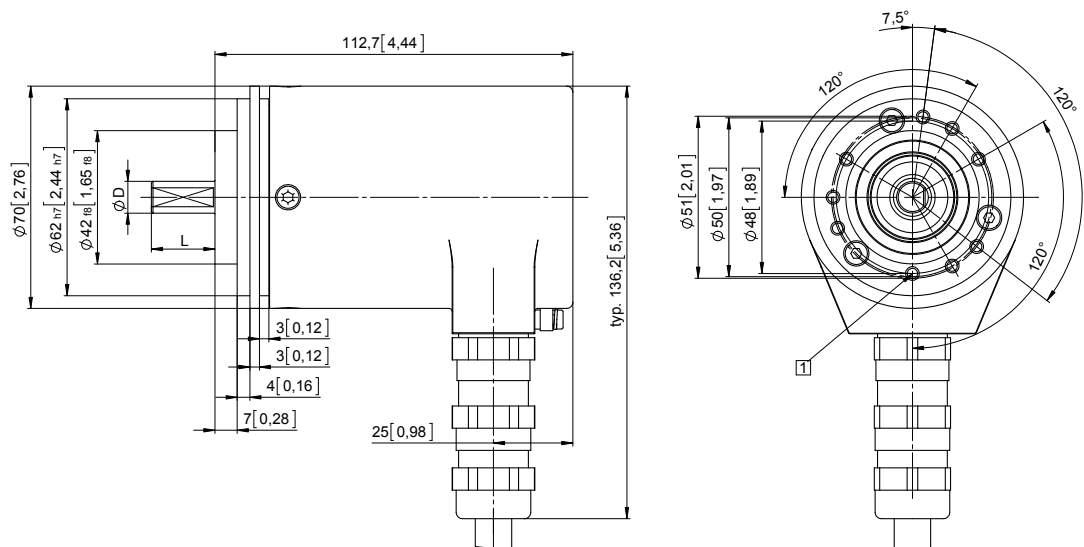
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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Standard, ATEX/IECEX – zone 1/21 SIL3/PLe, optical	Sendix SIL 7053FS3 (shaft)	SSI / BiSS + SinCos
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Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Order code 8.7053FS3 . 1 X 4 X . XX 2 1 . XXXX
Shaft version Type

a Flange
1 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b Shaft (ø x L)
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c Interface / power supply
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56'] preferred length see **i**, e. g.: 0100 = 10 m [32.81']

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

f Resolution ²⁾
A = 10 bit
1 = 11 bit
2 = 12 bit
3 = 13 bit
4 = 14 bit
7 = 17 bit

g Inputs / outputs ²⁾
2 = SET input

h Options
1 = no option

i Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other resolutions
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)

V4A 8.7053FS3.2241.XX21.V4A
1.4404 8.7053FS3.224A.XX21.XXXX-V4A

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	
Accessories			Order no.
EMC shield terminal	for top-hat rail mounting		8.0000.4G06.0000
Screw retention	Loctite 243, 5 ml		8.0000.4G05.0000
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .		
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .		
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display .		

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

Technical data

Explosion protection	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"	
These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.	

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

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 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
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 SIL3/PLe, optical	Sendix SIL 7053FS3 (shaft)	SSI/BiSS + SinCos
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SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution	10 ... 14 bit and 17 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 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 ¹⁾
Pulse rate	2048 ppr

SET input	
Input	HIGH active
Input type	comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores 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	Core marking:	6	1	2	3	4	5	11	7	8	9	10	shield

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Protective earth

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

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Absolute encoders - singleturn

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

Sendix SIL 7053FS3 (shaft)

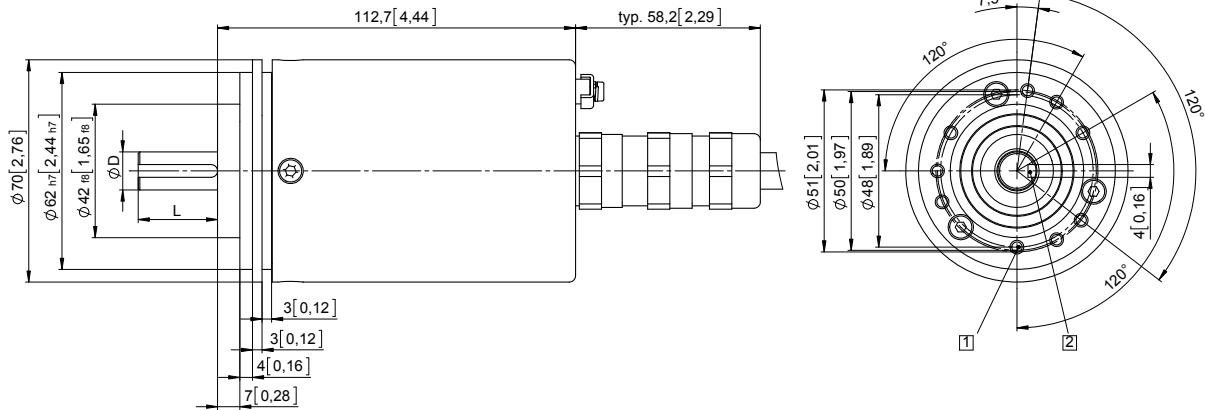
SSI/BiSS + SinCos

Dimensions

Dimensions in mm [inch]

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

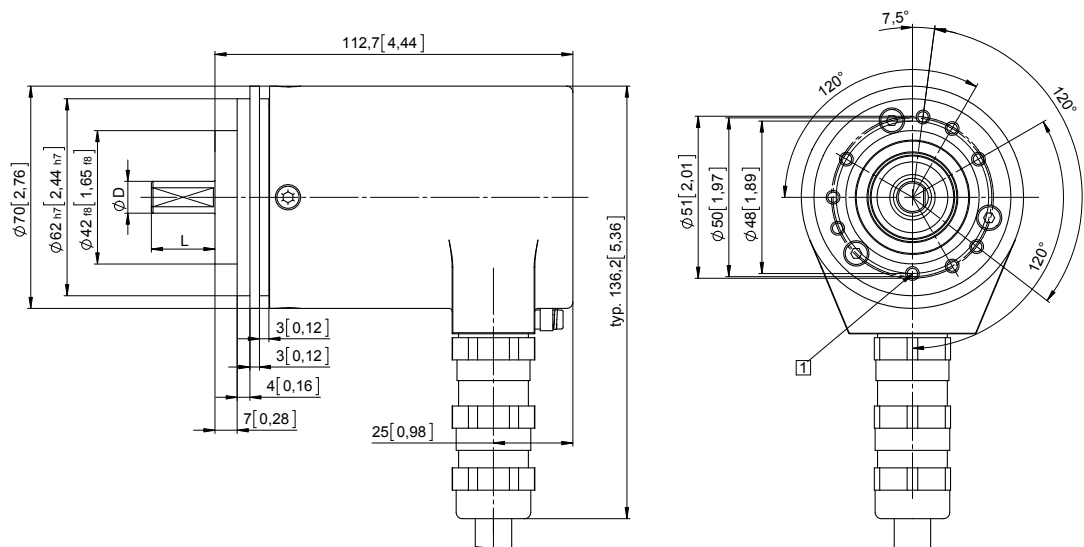
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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singleturn

Absolute encoders
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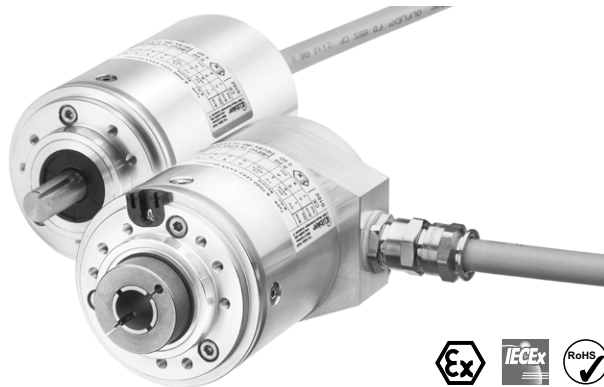
Connection
technology

Accessories

Addresses

Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7058 / 7078 (shaft / hollow shaft)	PROFIBUS DP
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The Sendix 7058 / 7078 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a Profibus interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.



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Ex approval	Safety-Lock™	High rotational speed	High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Short-circuit proof	Reverse polarity protection	Optical sensor	Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code	Shaft version	8.7058	. 1 X 3 X . 31 11 . XXXX
		Type	a b c d e f 1)

<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 3 = PROFIBUS DP V0 / 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 Fieldbus profile 31 = PROFIBUS DP V0 encoder profile class 2</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></p> <ul style="list-style-type: none"> - special cable length - IP65 version for T6 - seawater resistant (stainless steel V4A) <p><i>Stainless steel V4A as standard types (deliverable as from 1 unit)</i></p> <p>V4A 1.4404</p> <p>8.7058.2231.3111.V4A 8.7058.223A.3111.XXXX-V4A</p>
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1) Not applicable with connection types 1 and 2.

Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7058 / 7078 (shaft / hollow shaft)	PROFIBUS DP
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Order code Hollow shaft	8.7078 Type	.XX3X.3111.XXXX a b c d e f 1)	<p>a Flange 1 = with spring element, short 5 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p>b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]</p> <p>c Interface / Power supply 3 = PROFIBUS DP V0 / 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 Fieldbus profile 31 = PROFIBUS DP V0 encoder profile class 2</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> - special cable length - IP65 version for T6 - seawater resistant (stainless steel V4A)</p> <p><i>Stainless steel V4A as standard types (deliverable as from 1 unit)</i> 8.7078.2231.3111.V4A 8.7078.223A.3111.XXXX-V4A</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> V4A 1.4404 </div>
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Mounting accessory for shaft encoders	Order no.
Coupling bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.1010

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

Technical data

Explosion protection Sendix 7058	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; ATEX guideline 94/9/EC EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7078	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012 + A11:2013; ATEX guideline 2014/34/EU EN 60079-1:2014; EN 60079-31:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0020 X
Category (gas)	Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance to EN/IEC 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 110 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.

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Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7058 / 7078 (shaft / hollow shaft)	PROFIBUS DP
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Interface characteristics PROFIBUS DP	
Resolution	1 ... 65536 (16 bit), behavior default: 8192 (13 bit)
Code	binary
Interface	specification according to PROFIBUS DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated
Protocol	Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA service with a class 2 master; default address: 125
Termination	active termination can only be switched on externally

Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core marking:	1	2	4	5	6	7	8	9

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Absolute encoders - singleturn

**Standard, ATEX/IECEX – zone 1/21
optical**

Sendix 7058 / 7078 (shaft / hollow shaft)

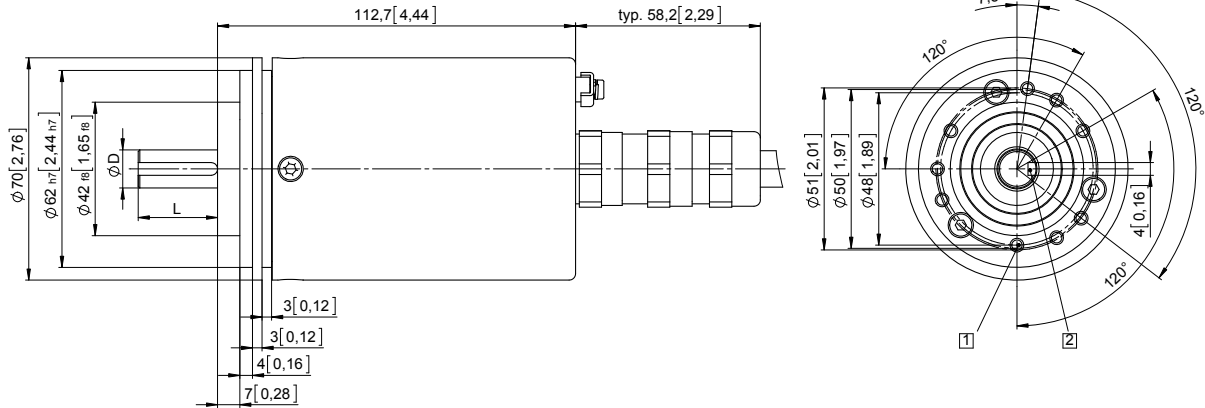
PROFIBUS DP

Dimensions shaft version

Dimensions in mm [inch]

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

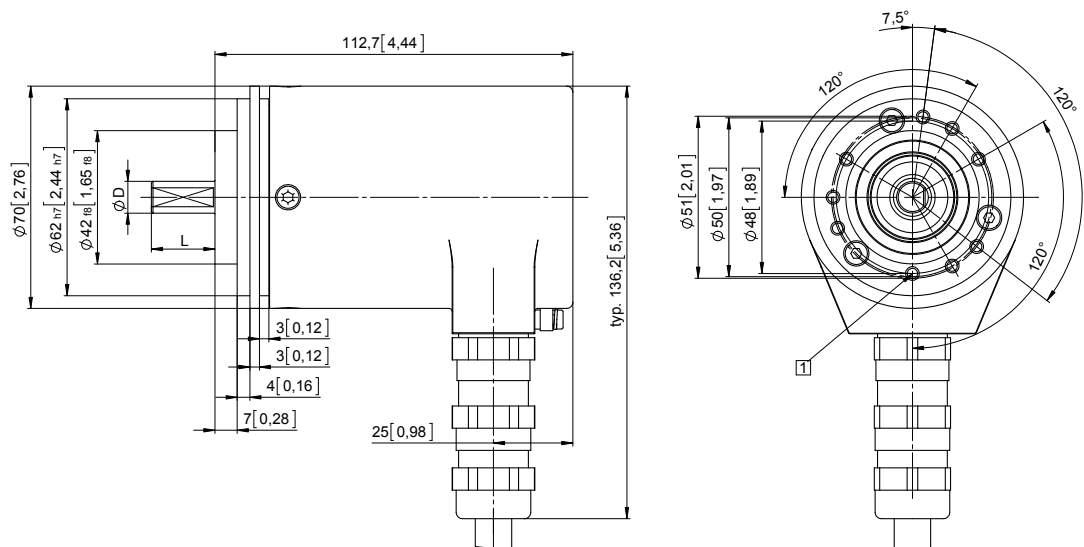
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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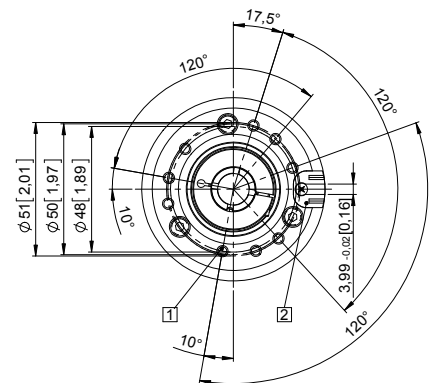
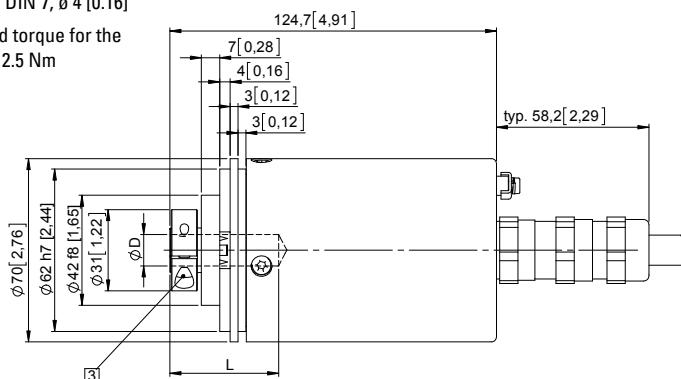
Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7058 / 7078 (shaft / hollow shaft)	PROFIBUS DP
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



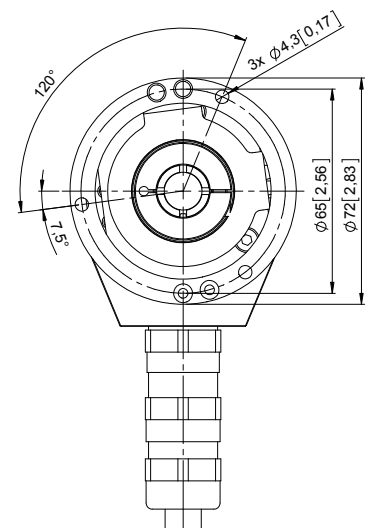
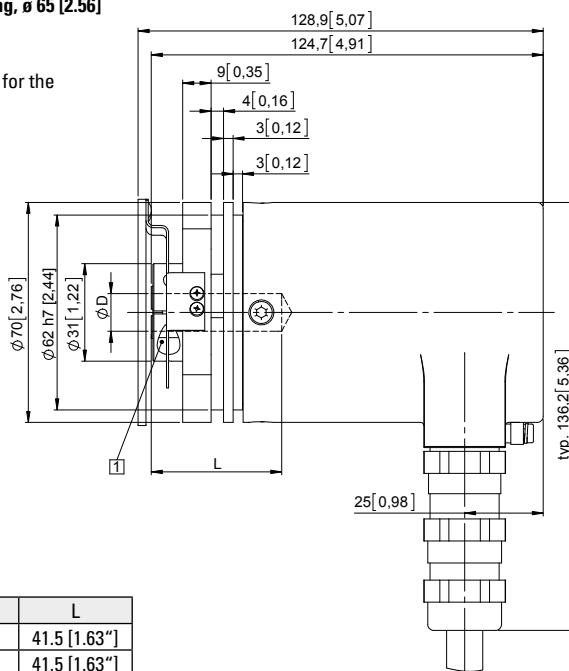
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Absolute encoders - singleturn

**Standard, ATEX/IECEX – zone 1/21
optical**

Sendix 7058 / 7078 (shaft / hollow shaft)

CANopen



The Sendix 7058 / 7078 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a CANopen interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7058 . 1 X 2 X . 21 11 . XXXX
Type a b c d e f 1)

- a Flange**
1 = clamping / synchronous flange, IP67, \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']
- e Fieldbus profile**
21 = CANopen
- f Cable length in dm 1)**
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

*Stainless steel V4A as standard types
(deliverable as from 1 unit)*

V4A
1.4404
8.7058.2221.2111.V4A
8.7058.222A.2111.XXXX-V4A

1) Not applicable with connection types 1 and 2.

Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7058 / 7078 (shaft / hollow shaft)	CANopen
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Order code Hollow shaft	8.7078 Type	.XX2X.2111.XXXX a b c d e f 1)	<p>Optional on request</p> <ul style="list-style-type: none"> - special cable length - IP65 version for T6 - seawater resistant (stainless steel V4A) <p>Stainless steel V4A as standard types (deliverable as from 1 unit)</p> <p>V4A 1.4404</p> <p>8.7078.2221.2111.V4A 8.7078.222A.2111.XXXX-V4A</p>
a Flange 1 = with spring element, short 5 = with stator coupling, IP67, ø 65 mm [2.56"]	d Type of connection 1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length > 2 m [6.56'] B = radial cable, length > 2 m [6.56']	e Fieldbus profile 21 = CANopen	
b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]	f Cable length in dm 1) 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']		
c Interface / power supply 2 = CANopen DS301 V4.02 / 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.

Technical data

Explosion protection Sendix 7058	
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
Relevant standards	EN 60079-0:2012; ATEX guideline 94/9/EC EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7078	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	⊕ II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	⊕ II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012 + A11:2013; ATEX guideline 2014/34/EU EN 60079-1:2014; EN 60079-31:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0020 X
Category (gas)	Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance to EN/IEC 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 90 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.

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Absolute encoders - singleturn

Standard, ATEX/IECEX – zone 1/21 optical	Sendix 7058 / 7078 (shaft / hollow shaft)	CANopen
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Interface characteristics CANopen	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02.

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus termination programmable.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min⁻¹).
- Factor for speed calculation (e.g. measuring wheel circumference) Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core marking:	1	2	4	5	6	7	8	9

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Standard, ATEX/IECEx – zone 1/21 optical	Sendix 7058 / 7078 (shaft / hollow shaft)	CANopen
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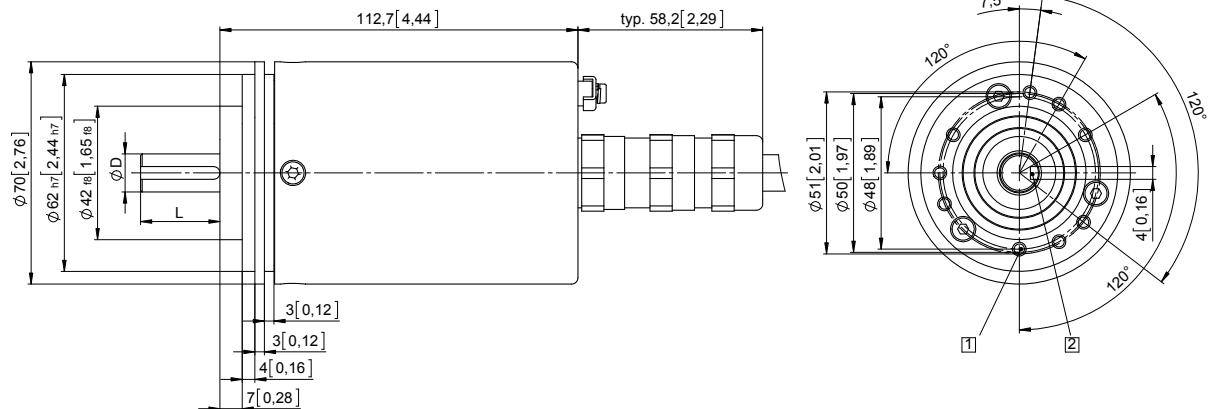
Dimensions shaft version

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

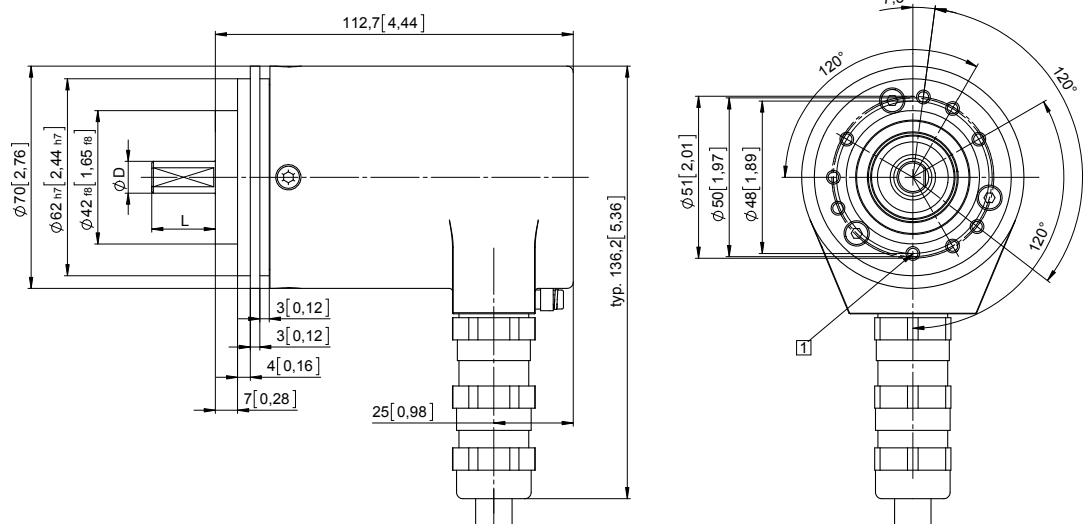


D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



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

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**Standard, ATEX/IECEx – zone 1/21
optical**

Sendix 7058 / 7078 (shaft / hollow shaft)

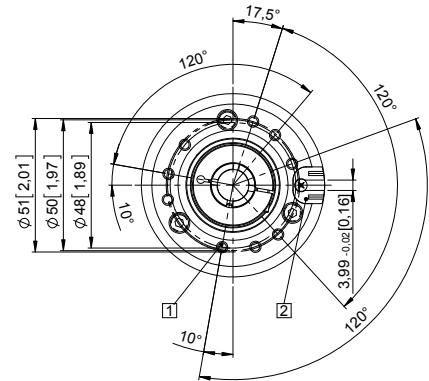
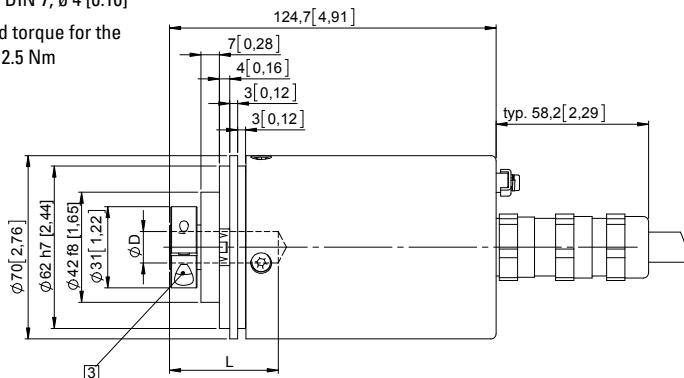
CANopen

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm

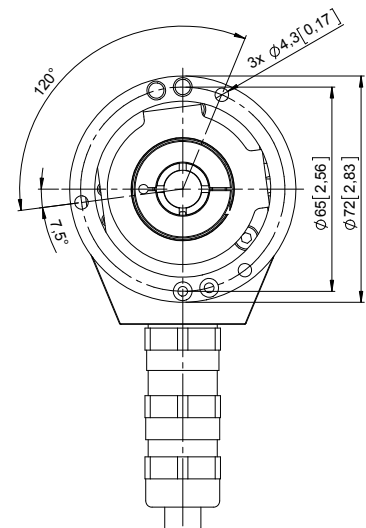
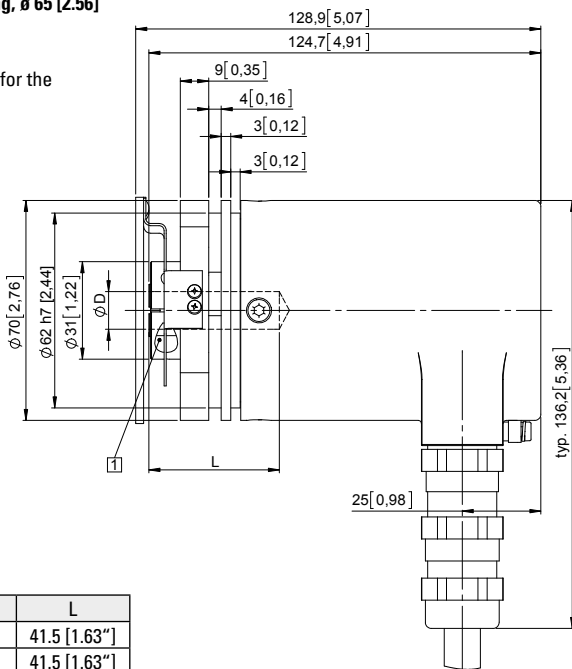


D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56] Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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Standard, ATEX/IECEX – mining optical	Sendix 7153 / 7173 (shaft / hollow shaft)	SSI / BiSS
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The Sendix 7153 / 7173 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.



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']</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><i>Optional on request</i> - special cable length - other resolutions</p>
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1) Not applicable with connection types 1 and 2
2) Resolution, preset value and counting direction factory-programmable.

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Absolute encoders - singleturn

Standard, ATEX/IECEX – mining optical	Sendix 7153 / 7173 (shaft / hollow shaft)	SSI / BiSS
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Order code	Hollow shaft	8.7173	.XX2X	.XX21	.XXXX
	Type		a b c d	e f g h	i 1)
a Flange	2 = with spring element, short 6 = with stator coupling, IP67, ø 65 mm [2.56"]	e Code	B = SSI, binary C = BiSS, binary G = SSI, gray	g Inputs / outputs ²⁾	2 = SET, DIR input additional status output
b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])	1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]	f Resolution ²⁾	A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit	h Options	1 = no option
c Interface / power supply	2 = SSI, BiSS / 10 ... 30 V DC			i Cable length in dm ¹⁾	0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']
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']				Optional on request - special cable length - other resolutions

Technical data

Explosion protection 7153	
ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	⊕ I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2007
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 14.0023 X
Category	Ex d I/IIC T4 - T6 Mb
Relevant standards ATEX guideline 94/9/EC	IEC 60079-0:2011; IEC 60079-1:2007

Explosion protection 7173	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1057 X
Category	⊕ I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0019 X
Category	Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing stainless steel cable PUR
Shock resistance acc. to EN/IEC 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes ³⁾
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEX – mining optical	Sendix 7153 / 7173 (shaft / hollow shaft)	SSI / BiSS
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SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution	10 ... 14 bit and 17 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 μs
Note:	– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

Status output	
Output driver	open collector, internal pull-up resistor 22 kΩ
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 kΩ) in normal operation.	

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)												
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥	⊥	
2	1, 2, A, B	SET, DIR	0 V	1	2	3	4	5	6	7	8	9	YE/GN	shield	
			Core marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield	

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- Stat: Status output
- ⊥: Protective earth

SET input	
Input	HIGH active
Input type	comparator
Signal level	HIGH min. 60% of +V (+V = power supply) max. +V LOW max. 25% of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

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

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Standard, ATEX/IECEX – mining optical

Sendix 7153 / 7173 (shaft / hollow shaft)

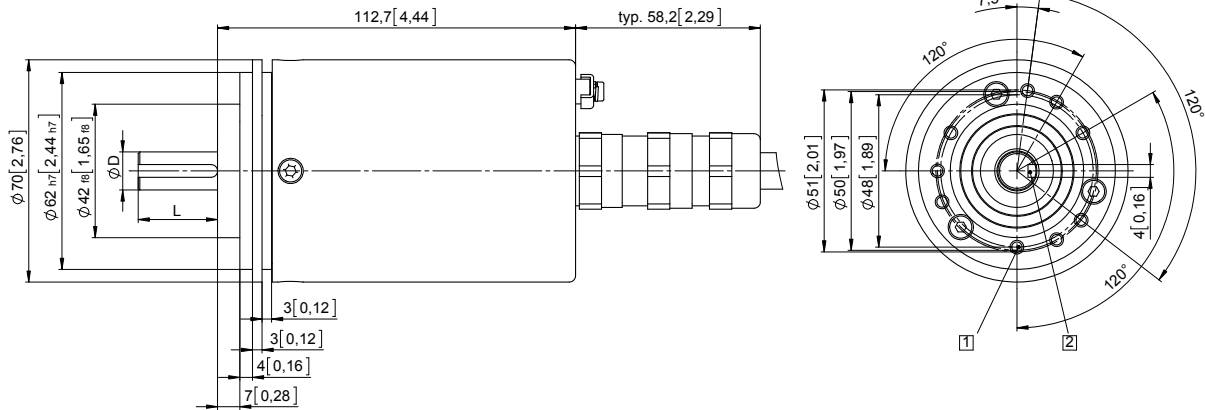
SSI / BiSS

Dimensions shaft version

Dimensions in mm [inch]

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

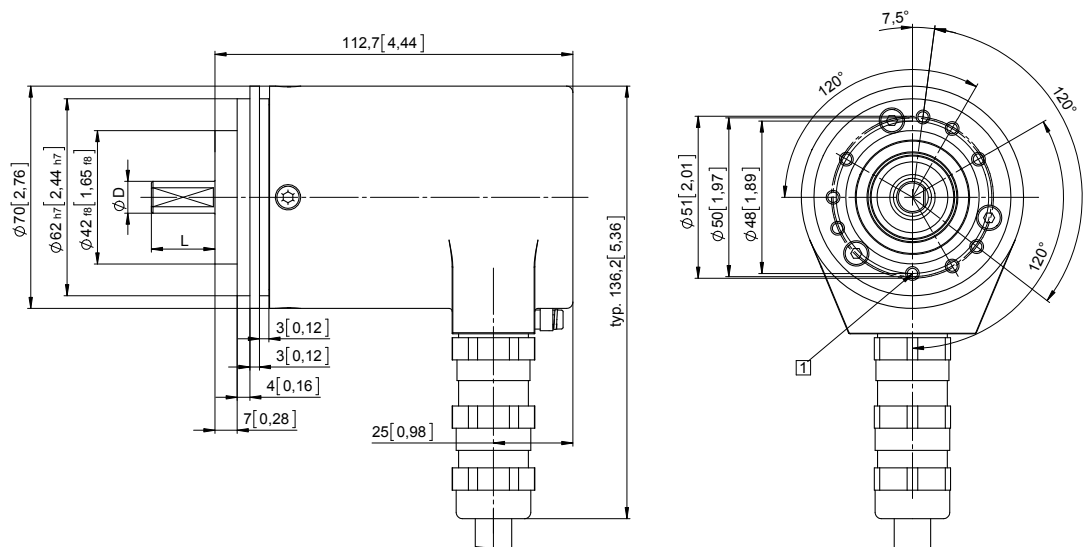
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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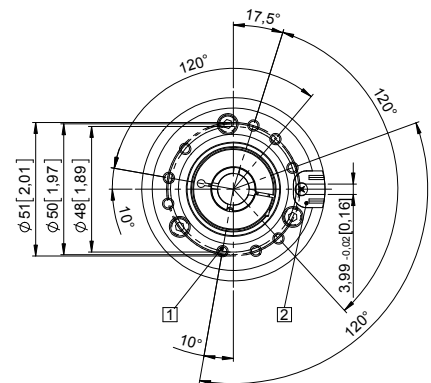
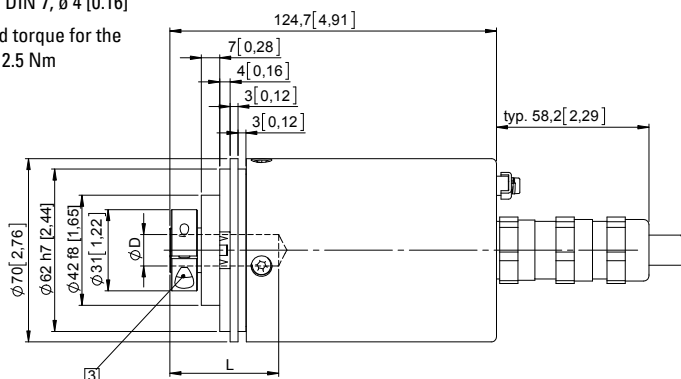
Standard, ATEX/IECEX – mining optical	Sendix 7153 / 7173 (shaft / hollow shaft)	SSI / BiSS
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



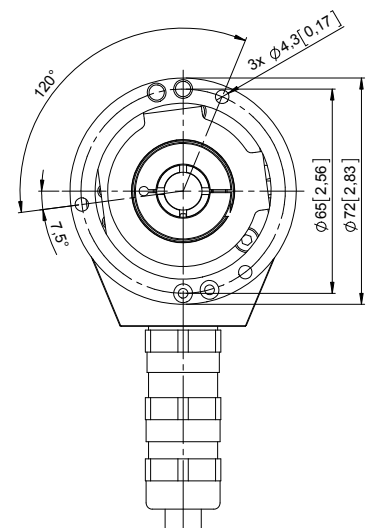
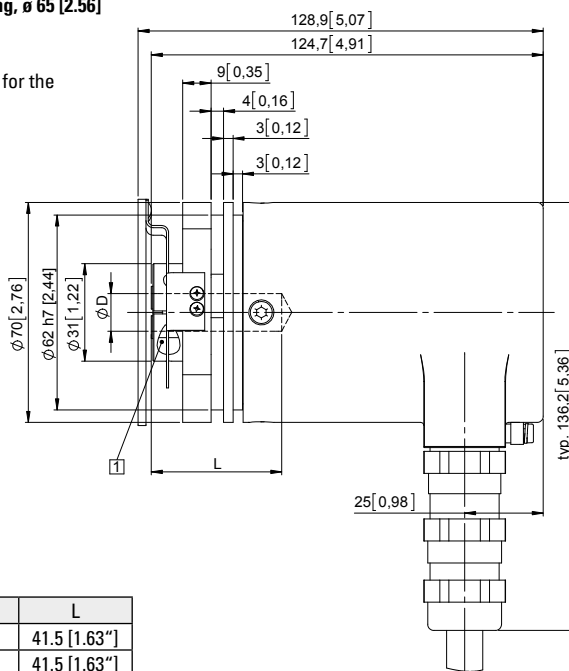
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

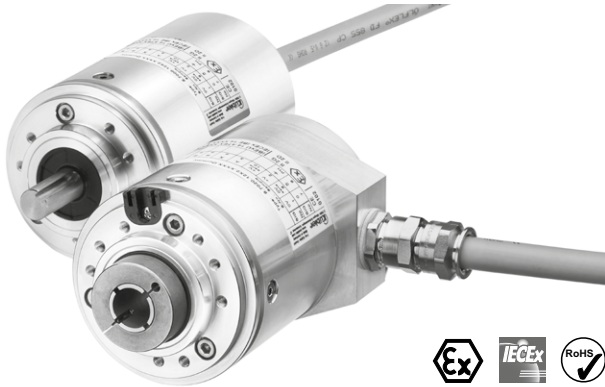
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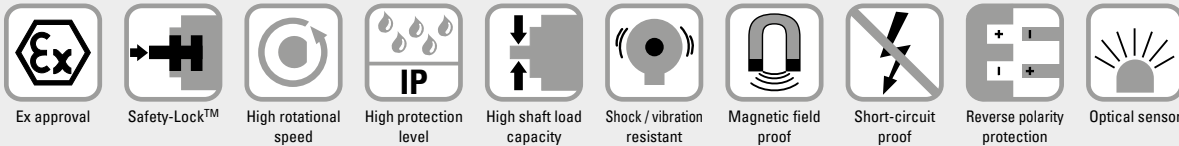
Sendix 7158 / 7178 (shaft / hollow shaft)

PROFIBUS DP



The Sendix 7158 / 7178 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with a PROFIBUS interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.



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 8.7158 . 2 X 3 X . 31 11 . XXXX
Shaft version Type a b c d e f ¹⁾

- a** Flange
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]
- b** Shaft (ø x L)
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key
- c** Interface / power supply
3 = PROFIBUS DP V0 / 10 ... 30 V DC

- d** Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

- e** Fieldbus profile
31 = PROFIBUS DP V0 encoder profile class 2

- f** Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

Order code 8.7178 . X X 3 X . 31 11 . XXXX
Hollow shaft Type a b c d e f ¹⁾

- a** Flange
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]
- b** Blind hollow shaft
(insertion depth max. 41.5 mm [1.63"])
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]
- c** Interface / power supply
3 = PROFIBUS DP V0 / 10 ... 30 V DC

- d** Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

- e** Fieldbus profile
31 = PROFIBUS DP V0 encoder profile class 2

- f** Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

1) Not applicable with connection types 1 and 2.

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Explosion protection 7158	
ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	⊕ I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2007
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 14.0023 X
Category	Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing stainless steel cable PUR
Shock resistance acc. to EN/IEC 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Interface characteristics PROFIBUS DP	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	specification according to PROFIBUS DP 2.0 / standard (DIN 19245 Part 3) / RS485 driver galvanically isolated
Protocol	Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a class 2 master; default address: 125
Termination	active termination can only be switched on externally

Explosion protection 7178	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1057 X
Category	⊕ I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0019 X
Category	Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 110 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Profibus encoder-profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core marking:	1	2	4	5	6	7	8	9

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Standard, ATEX/IECEx – mining optical

Sendix 7158 / 7178 (shaft / hollow shaft)

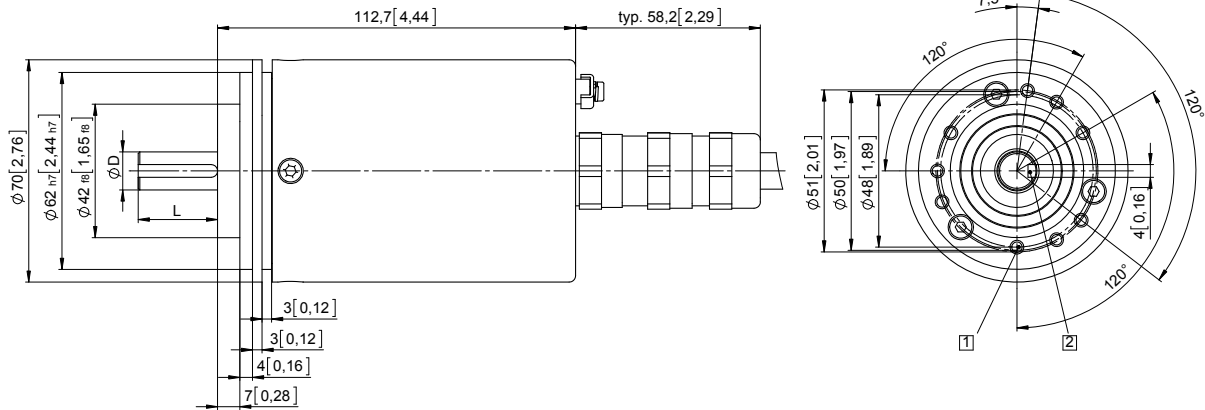
PROFIBUS DP

Dimensions shaft version

Dimensions in mm [inch]

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

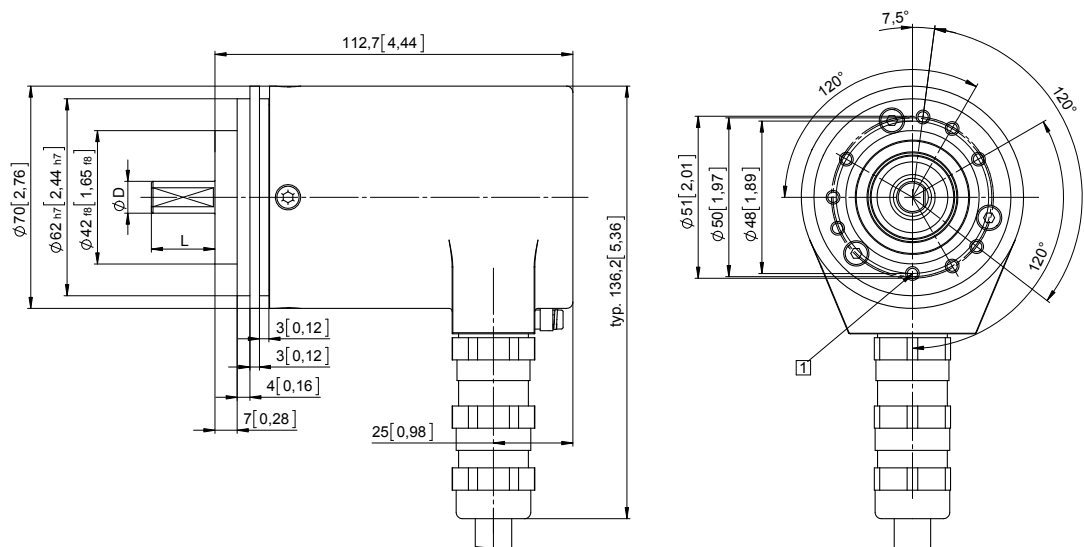
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

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

- 1 9 x M4, 10 [0.39] deep



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

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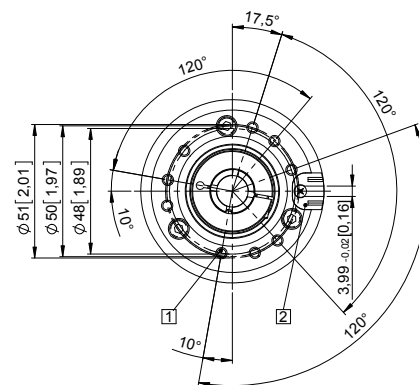
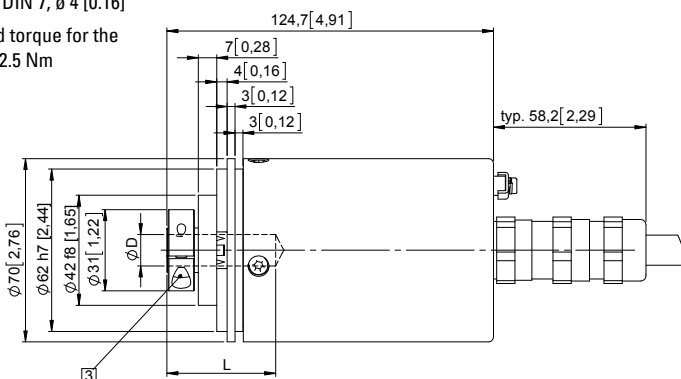
Standard, ATEX/IECEX – mining optical	Sendix 7158 / 7178 (shaft / hollow shaft)	PROFIBUS DP
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



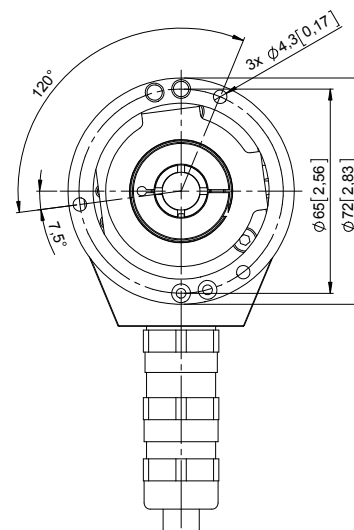
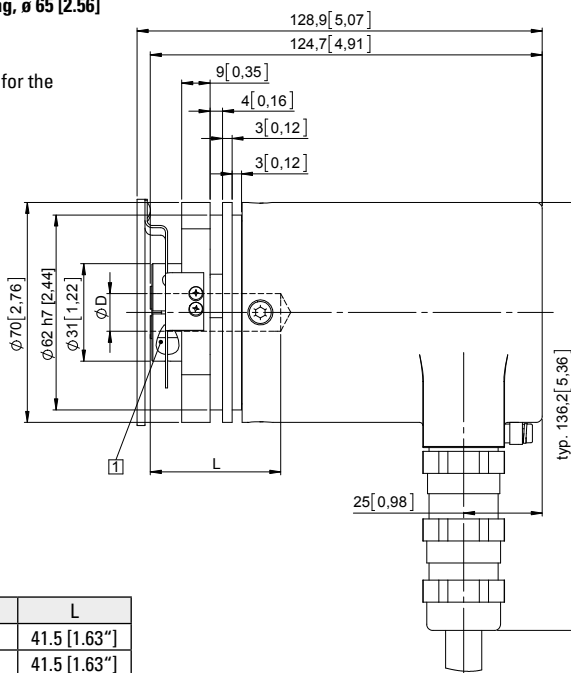
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Absolute encoders - singleturn

Standard, ATEX/IECEX – mining optical

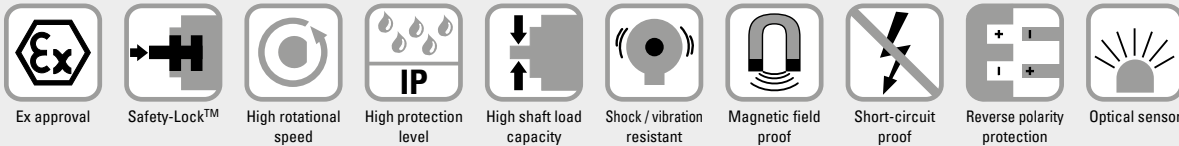
Sendix 7158 / 7178 (shaft / hollow shaft)

CANopen



The Sendix 7158 / 7178 absolute singleturn encoders in a compact 70 mm stainless-steel housing, with a CANopen interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 16 bits; they are also available with axial and radial cable outlets.



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- "Flame-proof enclosure" construction.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7158 . 2 X 2 X . 21 11 . XXXX
Type a b c d e f ¹⁾

- a Flange**
2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]
- b Shaft (ø x L)**
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key
- c Interface / power supply**
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d Type of connection**
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
- e Fieldbus profile**
21 = CANopen

- f Cable length in dm ¹⁾**
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

*Optional on request
- special cable length*

Order code Hollow shaft

8.7178 . X X 2 X . 21 11 . XXXX
Type a b c d e f ¹⁾

- a Flange**
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]
- b Blind hollow shaft**
(insertion depth max. 41.5 mm [1.63"])
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]
- c Interface / power supply**
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d Type of connection**
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
- e Fieldbus profile**
21 = CANopen

- f Cable length in dm ¹⁾**
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

*Optional on request
- special cable length*

1) Not applicable with connection types 1 and 2.

Absolute encoders - singleturn

Standard, ATEX/IECEX – mining optical	Sendix 7158 / 7178 (shaft / hollow shaft)	CANopen
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Technical data

Explosion protection 7158

ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	⊕ I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2007
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 14.0023 X
Category	Ex d I/IIC T4 - T6 Mb
Relevant standards ATEX guideline 94/9/EC	IEC 60079-0:2011; IEC 60079-1:2007

Mechanical characteristics

Maximum speed	shaft	6000 min ⁻¹ (continuous)
	hollow shaft	3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance		acc. to EN/IEC 60068-2-27 1000 m/s ² , 6 ms
Vibration resistance		acc. to EN/IEC 60068-2-6 100 m/s ² , 55 ... 2000 Hz

Explosion protection 7178

ATEX	
EU type-examination certificate	IBExU 15 ATEX 1057 X
Category	⊕ I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0019 X
Category	Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 90 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC

Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013
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Standard, ATEX/IECEX – mining optical	Sendix 7158 / 7178 (shaft / hollow shaft)	CANopen
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Interface characteristics CANopen	
Resolution	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 .

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus termination programmable.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min⁻¹).
- Factor for speed calculation (e.g. measuring wheel circumference) Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core marking:	1	2	4	5	6	7	8	9

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Standard, ATEX/IECEX – mining optical	Sendix 7158 / 7178 (shaft / hollow shaft)	CANopen
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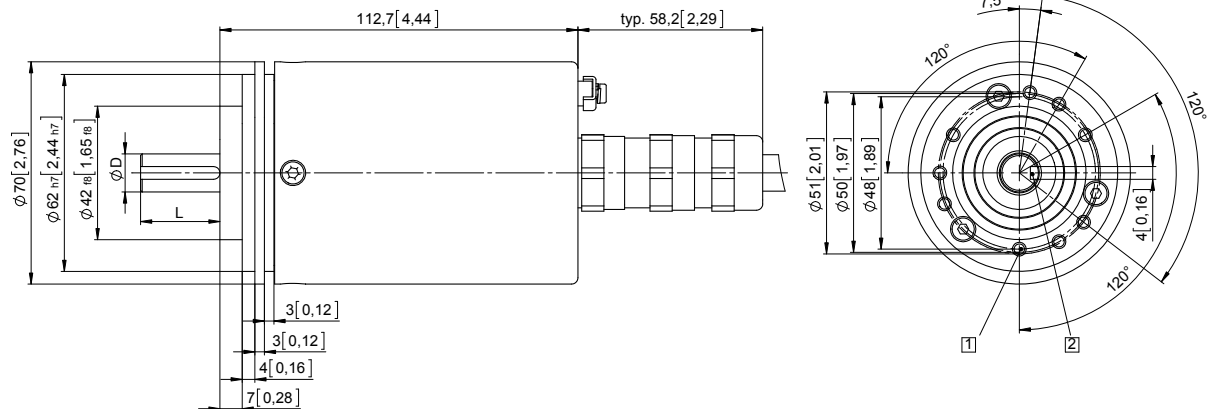
Dimensions shaft version

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

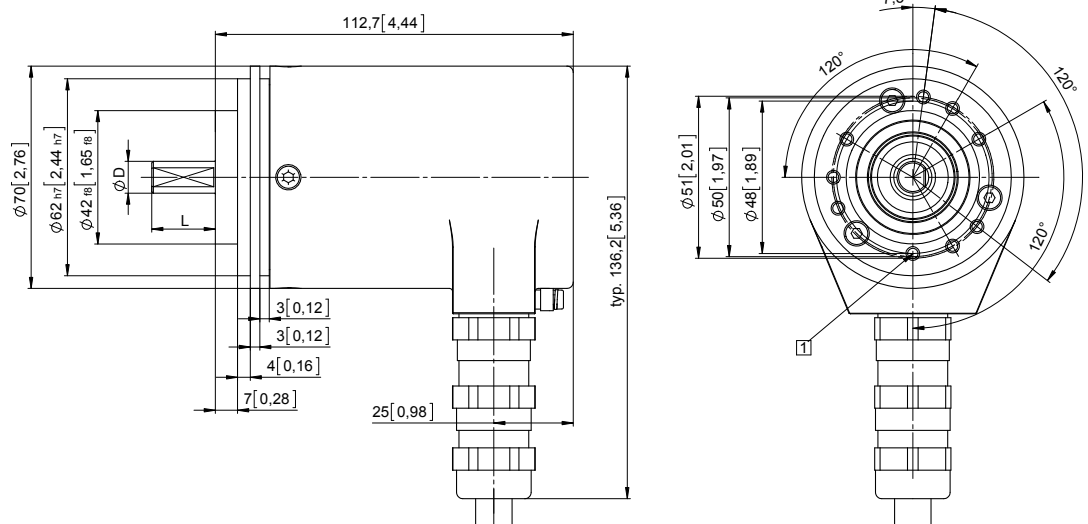


D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



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

Absolute encoders - singleturn

Standard, ATEX/IECEx – mining optical

Sendix 7158 / 7178 (shaft / hollow shaft)

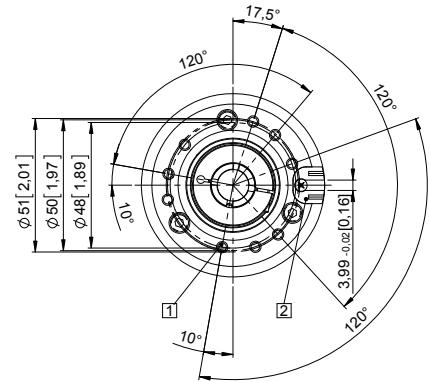
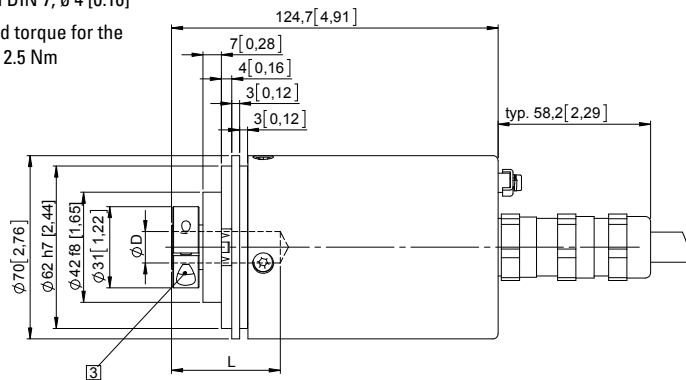
CANopen

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm

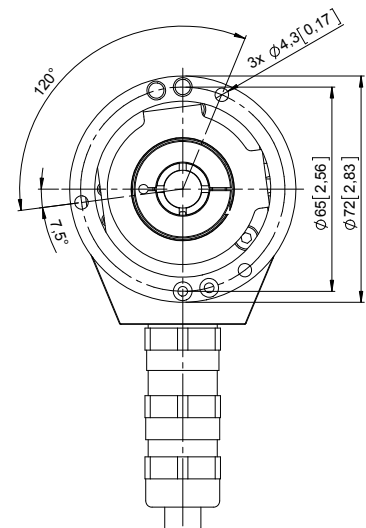
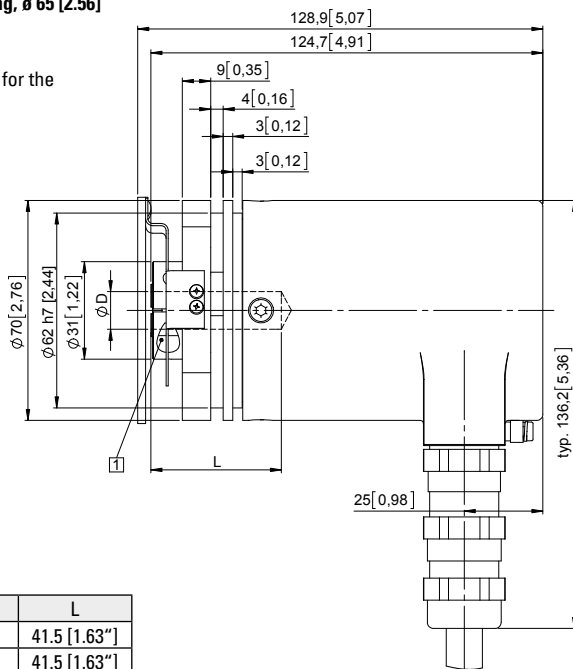


D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56] Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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Type: 8.F3683.1421.G222
10-30 VDC 50 mA
S-Nr: xxxxxxxxxxxx

Kübler

Fritz Kübler GmbH
Made in Germany
www.kuebler.com

GND	+V	AC
WH	BN	GN
DIR	SET	+
RD	BU	PH

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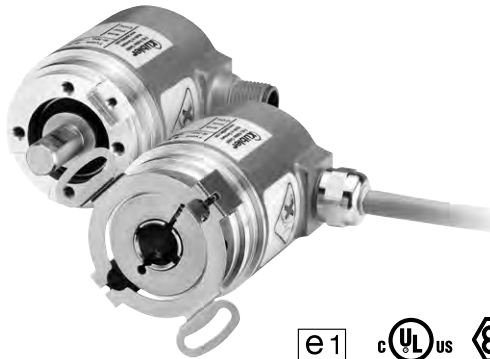
Series	Type	Type	Interface	Page	
Compact, magnetic	Electronic multiturn	Sendix M3661 / M3681 (shaft / hollow shaft)	Analog	300	Product overview Basics
	Electronic multiturn	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI	306	
	Electronic multiturn	Sendix M3668 / M3688 (shaft / hollow shaft)	CANopen	311	
	Robust, electr. multiturn	Sendix M3661R (shaft)	Analog	316	
	Robust, electr. multiturn	Sendix M3663R (shaft)	SSI	320	
	Robust, electr. multiturn	Sendix M3668R (shaft)	CANopen	323	
Compact, optical	Electronic multiturn	Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS + incremental	327	Incremental encoders
	Electronic multiturn	Sendix F3668 / F3688 (shaft / hollow shaft)	CANopen	333	
Standard, magnetic	Electronic multiturn	Sendix M5861 (Welle)	Analog	338	Absolute encoders singleturn
	Electronic multiturn	Sendix M5863 (Welle)	SSI	342	
	Electronic multiturn	Sendix M5868 (Welle)	CANopen	345	
Standard, optical	Electronic multiturn	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS + incremental	349	Absolute encoders multiturn
	Motor-Line, electr. multiturn	Sendix F5883M (hollow shaft)	SSI / BiSS + incremental	357	
	Mechanical multiturn	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS + incremental	361	
	SIL2/PLd, mech. multiturn	Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow s.)	SSI / BiSS + SinCos	369	Bearingsless encoders
	SIL3/PLe, mech. multiturn	Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow s.)	SSI / BiSS + SinCos	376	
	Electronic multiturn	Sendix F5868 / F5888 (shaft / hollow shaft)	CANopen	383	
	Motor-Line, electr. multiturn	Sendix F5888M (hollow shaft)	CANopen	389	Linear measuring technology
	Electronic multiturn	Sendix F5868 / F5888 (shaft / hollow shaft)	EtherNet/IP	393	
	Electronic multiturn	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus	398	
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP	403	Inclinometers
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen / CANopenLift	408	
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT	419	
	Mechanical multiturn	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFINET IO	424	
Standard, optical ATEX / IECEx zone 1/21	Mechanical multiturn	Sendix 7063 / 7083 (shaft / hollow shaft)	SSI / BiSS	429	
	SIL2/PLd, mech. multiturn	Sendix SIL 7063FS2 (shaft)	SSI / BiSS + SinCos	434	Connection technology
	SIL3/PLe, mech. multiturn	Sendix SIL 7063FS3 (shaft)	SSI / BiSS + SinCos	438	
Standard, optical ATEX / IECEx mining	Mechanical multiturn	Sendix 7068 / 7088 (shaft / hollow shaft)	PROFIBUS DP	442	Accessories
	Mechanical multiturn	Sendix 7068 / 7088 (shaft / hollow shaft)	CANopen	447	
	Mechanical multiturn	Sendix 7163 / 7183 (shaft / hollow shaft)	SSI / BiSS	452	
	Mechanical multiturn	Sendix 7168 / 7188 (shaft / hollow shaft)	PROFIBUS DP	457	Addresses
	Mechanical multiturn	Sendix 7168 / 7188 (shaft / hollow shaft)	CANopen	462	
Large hollow shaft	AX (hollow shaft)			467	

Absolute encoders – multiturn

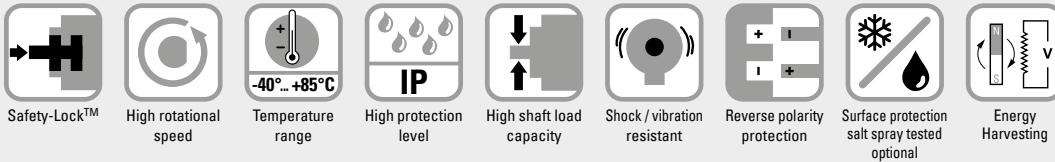
Compact electronic multiturn, magnetic

Sendix M3661 / M3681 (shaft / hollow shaft)

Analog



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. With a size of just 36 x 53 mm it offers a blind hollow shaft of up to 10 mm.



Reliable and insensitive

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

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

Order code Shaft version

8.M3661.XXXX.XX12
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 ¹⁾

- 3 = current output
- 4 = voltage output

d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- A = axial cable, special length PVC *)
- 2 = radial cable, 1 m [3.28'] PVC
- B = radial cable, special length PVC *)
- 3 = axial M12 connector, 5-pin
- 4 = radial M12 connector, 5-pin
- *) Available special lengths (connection types A, B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3661.433A.3112.0030 (for cable length 3 m)

e Interface / resolution / power supply

- 3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
- 4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
- 5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f Measuring range

- 1 = 16 revolutions / cw
- 2 = 16 revolutions / ccw
- 3 = scalable up to 65,536 revolutions, without limit switch function / cw
- 4 = scalable up to 65,536 revolutions, without limit switch function / cw
- 5 = scalable up to 65,536 revolutions, with limit switch function / ccw
- 6 = scalable up to 65,536 revolutions, without limit switch function / ccw

Optional on request

- Ex 2/22 (only for connection types 3 and 4)
- surface protection salt spray tested

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3661 / M3681 (shaft / hollow shaft)	Analog
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Order code	8.M3681	.XXXX.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.	10 By 10
Hollow shaft	Type	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 (insertion depth max. 18.5 mm [0.73"]) 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 ¹⁾ <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, 5-pin <u>4 = radial M12 connector, 5-pin</u> *) 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 Measuring range <u>1 = 16 revolutions / cw</u> 2 = 16 revolutions / ccw 3 = scalable up to 65,536 revolutions, with limit switch function / cw 4 = scalable up to 65,536 revolutions, without limit switch function / cw 5 = scalable up to 65,536 revolutions, with limit switch function / ccw 6 = scalable up to 65,536 revolutions, without limit switch function / ccw</p> <p><i>Optional on request</i> - Ex 2/22 (only for connection types 3 and 4) - surface protection salt spray tested</p>
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Mounting accessory for shaft encoders	Order no.
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Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1102.0808
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Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
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Cylindrical pin, long for flange with spring element (flange type 3 + 6)	with fixing thread 	8.0010.4700.0000
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Connection technology	Order no.
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Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin, 2 m [6.56'] PVC cable	05.00.6081.2211.002M
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Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000
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Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics	
Maximum speed	
shaft or blind hollow shaft version without shaft seal (IP65)	6000 min ⁻¹ 3000 min ⁻¹ (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)	4000 min ⁻¹ 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	
without shaft seal	< 0.007 Nm
with shaft seal (IP67)	< 0.01 Nm
Shaft load capacity	
radial	40 N
axial	20 N

Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	IP65 or IP67
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft: stainless steel flange: aluminum housing: zinc die-cast cable: PVC
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz

1) Output circuit "3" only in conjunction with interface "3", output circuit "4" only in conjunction with interface "4" or "5".

Absolute encoders – multiturn

Compact electronic multiturn, magnetic		Sendix M3661 / M3681 (shaft / hollow shaft)	Analog
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
DA converter resolution	12 bit	DA converter resolution	0 ... 10 V 12 bit 0 ... 5 V 11 bit
Singleturn accuracy, at 25°C [77°F]	±1°	Singleturn accuracy, at 25°C [77°F]	±1°
Temperature coefficient	< 100 ppm/K	Temperature coefficient	< 100 ppm/K
Repeat accuracy, at 25°C [77°F]	±0.2°	Repeat accuracy, at 25°C [77°F]	±0.2°
Output load	at 10 V DC max. 200 Ohm at 24 V DC max. 900 Ohm at 30 V DC max. 1200 Ohm	Current output	max. 10 mA
Setting time	< 1 ms, R _{Burden} = 900 Ohm, 25°C [77°F]	Setting time	< 1 ms, R _{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)	- system status - current loop interruption – input load too high - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode	LEDs (green/red)	- system status - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options	- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function	Options	- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs	level = +V for 1 s min.	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	file no. E224618	UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

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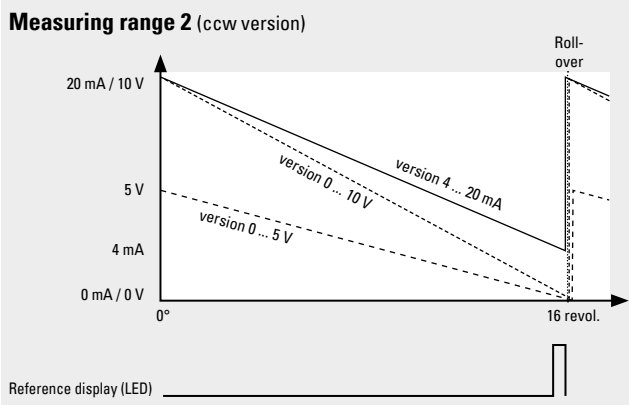
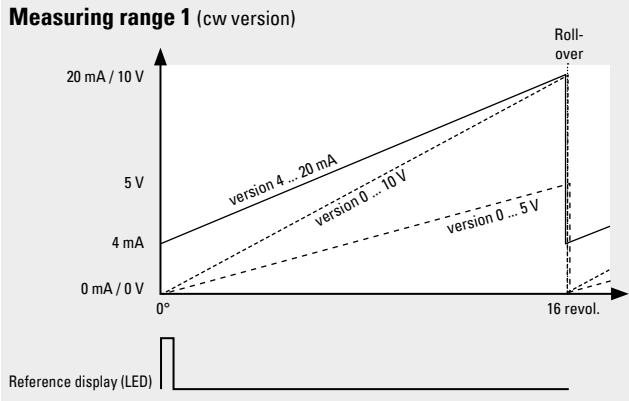
Addresses

1) When the power supply is correctly applied.
But not output to +V. Power supply and sensor output signal are not galvanically isolated.

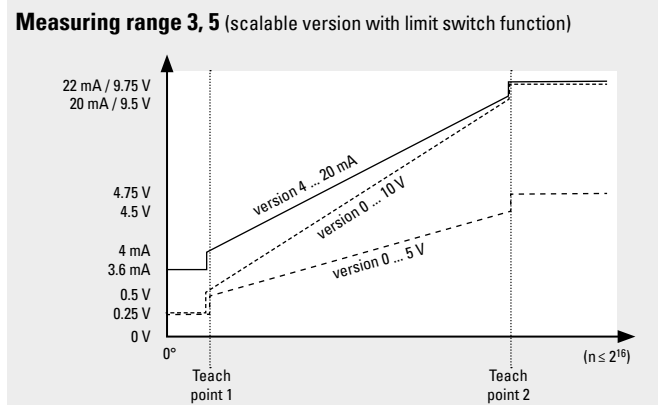
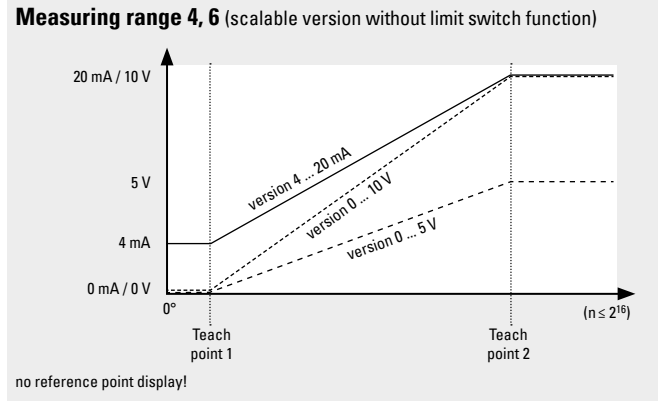
Absolute encoders – multitrurn

Compact electronic multitrurn, magnetic	Sendix M3661 / M3681 (shaft / hollow shaft)	Analog
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Example (output signal evolution) – factory setting



Example (output signal evolution) – option: scalable



Factory-set measuring range 2⁴ revolutions with roll-over

Limit switch function	version	0 ... 10 V	0 ... 5 V	4 ... 20 mA
limit switch low		0.25 V	0.25 V	3.6 mA
limit switch high		9.75 V	4.75 V	22.0 mA

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
		Signal:	0 V	+V	+I	SET 1 ¹⁾	SET 2 ¹⁾
3 (current)	1, 2, A, B	Core color:	WH	BN	GN	GY	PK

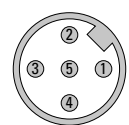
Interface	Type of connection	M12 connector, 5 pin					
		Signal:	0 V	+V	+I	SET 1 ¹⁾	SET 2 ¹⁾
3 (current)	3, 4	Pin:	3	2	1	5	4

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
		Signal:	0 V	+V	+U	SET 1 ¹⁾	SET 2 ¹⁾
4, 5 (voltage)	1, 2, A, B	Core color:	WH	BN	GN	GY	PK

Interface	Type of connection	M12 connector, 5 pin					
		Signal:	0 V	+V	+U	SET 1 ¹⁾	SET 2 ¹⁾
4, 5 (voltage)	3, 4	Pin:	3	2	1	5	4

+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

Top view of mating side, male contact base



M12 connector, 5-pin

1) For scalable version.

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Absolute encoders – multiturn

Compact electronic multiturn, magnetic

Sendix M3661 / M3681 (shaft / hollow shaft)

Analog

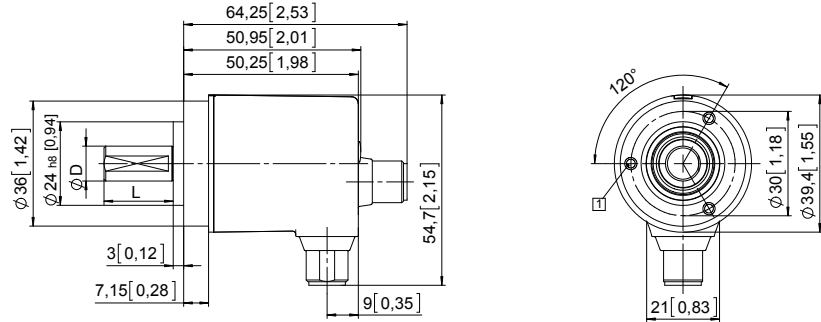
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 36 [1.42]

Flange type 1 and 3

1 3 x M3, 6 [0.24] deep

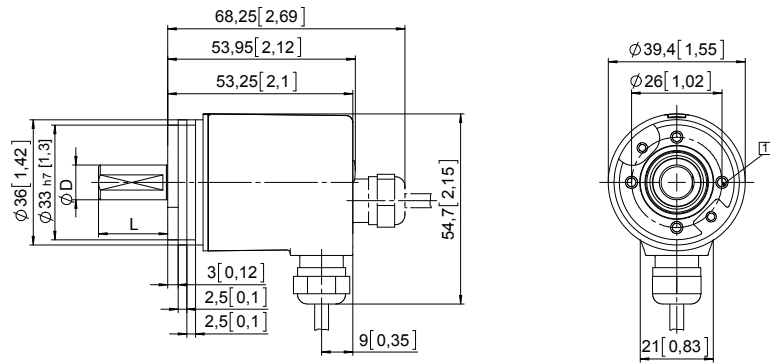


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

Synchro flange, \varnothing 36 [1.42]

Flange type 2 and 4

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

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Compact electronic multiturn, magnetic	Sendix M3661 / M3681 (shaft / hollow shaft)	Analog
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Dimensions hollow shaft version

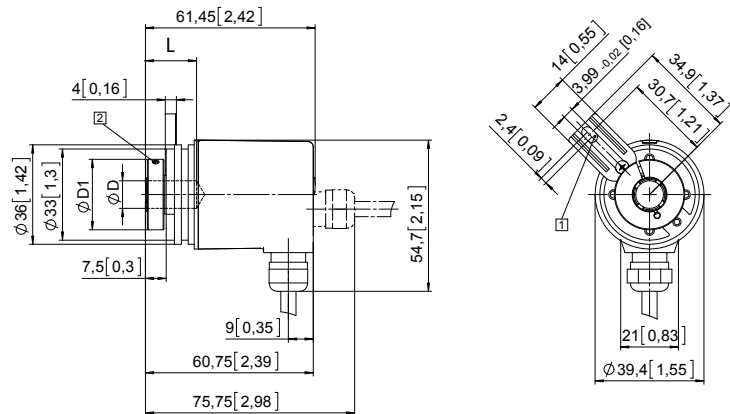
Dimensions in mm [inch]

Flange with spring element, long Flange type 3 and 6

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

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft

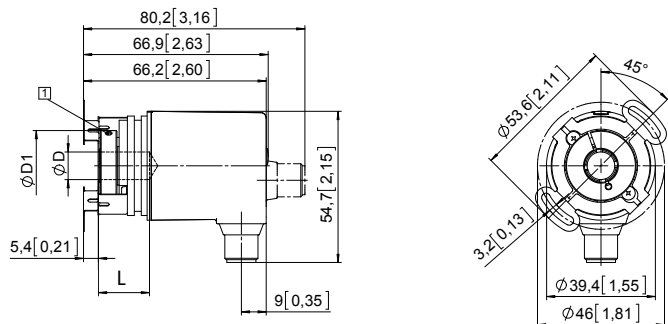


Flange with stator coupling, \varnothing 46 [1.81] Flange type 2 and 5

- 1 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft



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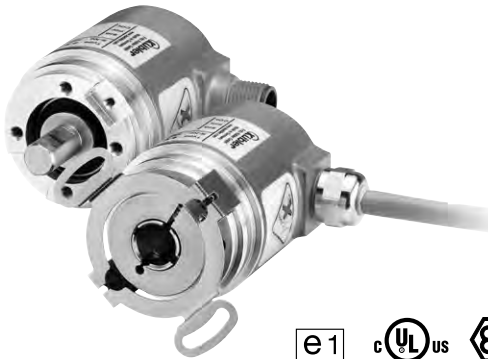
Addresses

Absolute encoders – multiturn

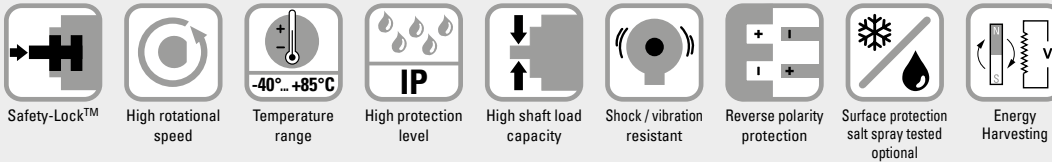
**Compact
electronic multiturn, magnetic**

Sendix M3663 / M3683 (shaft / hollow shaft)

SSI



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. With a size of just 36 x 53 mm it offers a blind hollow shaft of up to 10 mm.



Reliable and insensitive

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

Application oriented

- Absolute accuracy $\pm 1^\circ$.
- Repeat accuracy $\pm 0.2^\circ$.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

**Order code
Shaft version**

8.M3663 . **XX2X** . **XXXX2**
Type a b c d e f g

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



- 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 0.59"]
 5 = \varnothing 10 x 20 mm [0.39 x 0.79"]
 2 = \varnothing 1/4" x 12.5 mm [0.49"]

- c Interface / power supply**
2 = SSI / 10 ... 30 V DC

- d Type of connection**
 1 = axial cable, 1 m [3.28'] PUR
 A = axial cable, special length PUR *)
 2 = radial cable, 1 m [3.28'] PUR
 B = radial cable, special length PUR *)
 3 = axial M12 connector, 8-pin
4 = radial M12 connector, 8-pin
 *) Available special lengths (connection types A, B):
 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
 order code expansion .XXXX = length in dm
 ex.: 8.M3663.432A.G322.0030 (for cable length 3 m)

- e Code**
 B = SSI, binary
G = SSI, gray

- f Resolution (singleturn)**
 A = 10 bit ST
 2 = 12 bit ST
3 = 13 bit ST
 4 = 14 bit ST

- g Resolution (multiturn)**
2 = 12 bit MT
 6 = 16 bit MT
 A = 20 bit MT
 4 = 24 bit MT

Optional on request
 - Ex 2/22 (only for connection types 3 and 4)
 - surface protection salt spray tested

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Compact electronic multiturn, magnetic	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI
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Order code Hollow shaft	8.M3683 . XX2X . XXXX2 Type	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 <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	d Type of connection 1 = axial cable, 1 m [3.28'] PUR A = axial cable, special length PUR *) 2 = radial cable, 1 m [3.28'] PUR B = radial cable, special length PUR *) 3 = axial M12 connector, 8-pin <u>4 = radial M12 connector, 8-pin</u> *) 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)	f Resolution (singleturn) A = 10 bit ST 2 = 12 bit ST <u>3 = 13 bit ST</u> 4 = 14 bit ST	
b Blind hollow shaft (insertion depth max. 18.5 mm [0.73"]) 1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"]</u> 2 = ø 1/4"	e Code B = SSI, binary <u>G = SSI, gray</u>	g Resolution (multiturn) <u>2 = 12 bit MT</u> 6 = 16 bit MT A = 20 bit MT 4 = 24 bit MT	
c Interface / power supply <u>2 = SSI / 10 ... 30 V DC</u>		<i>Optional on request</i> - Ex 2/22 (only for connection types 3 and 4) - surface protection salt spray tested	

Mounting accessory for shaft encoders	Order no.
Coupling Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1102.0808

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 3 + 6)	with fixing thread 	8.0010.4700.0000

Connection technology	Order no.
Cordset, pre-assembled M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6051.8211.002M
Connector, self-assembly (straight) M12 female connector with coupling nut, 8-pin	05.CMB 8181-0

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

Technical data

Mechanical characteristics	
Maximum speed	
shaft or blind hollow shaft version without shaft seal (IP65)	6000 min ⁻¹ 3000 min ⁻¹ (continuous)
shaft or blind hollow shaft version with shaft seal (IP67)	4000 min ⁻¹ 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	
without shaft seal	< 0.007 Nm
with shaft seal (IP67)	< 0.01 Nm
Shaft load capacity	
radial	40 N
axial	20 N

Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	IP65 or IP67
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz

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Compact electronic multiturn, magnetic	Sendix M3663 / M3683 (shaft / hollow shaft)	SSI
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Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 40 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ¹⁾
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 30 mA
Signal level	HIGH typ 3.8 V LOW with I _{Load} = 20 mA typ 1.3 V
Resolution singleturn	10 ... 14 bit
Absolute accuracy ²⁾	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 24 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	2 ms
Monoflop time	≤ 15 µs
Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.	

SET input	
Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Input delay	1 ms
New position data readable after	1 ms
Internal processing time	200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. The SET function should be carried out whilst the encoder is at rest. The number of preset value writing cycles is limited to 10,000. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

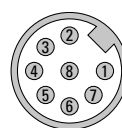
Power-ON	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.	
Hot plugging of the encoder should be avoided.	

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)									
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥
2	1, 2, A, B	SET, DIR	Core color:	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
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

1) Short circuit proof to 0 V or to output when power supply correctly applied.
2) Over the whole temperature range.

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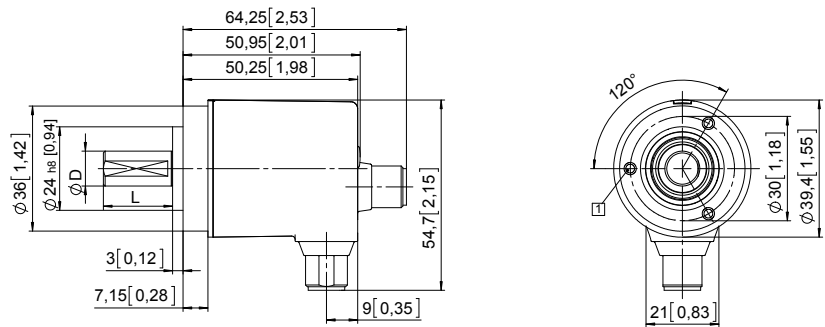
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 36 [1.42]

Flange type 1 and 3

3 x M3, 6 [0.24] deep

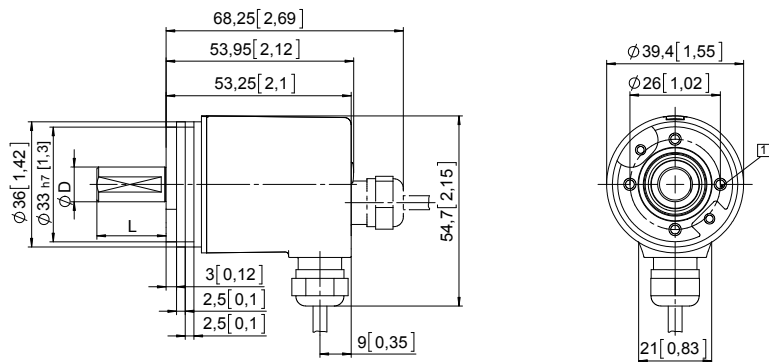


D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

Synchro flange, \varnothing 36 [1.42]

Flange type 2 and 4

4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

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Compact electronic multiturn, magnetic

Sendix M3663 / M3683 (shaft / hollow shaft)

SSI

Dimensions hollow shaft version

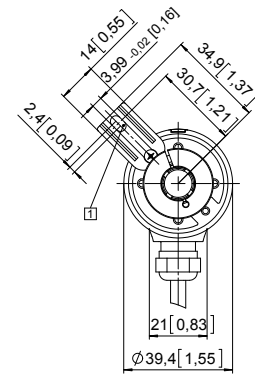
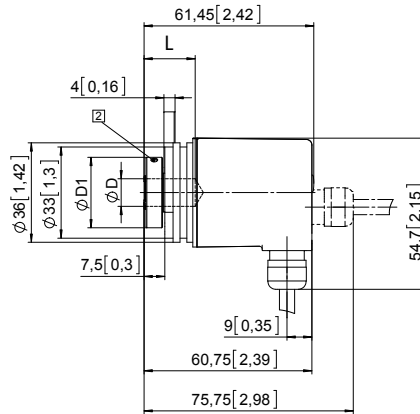
Dimensions in mm [inch]

Flange with spring element, long Flange type 3 and 6

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

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft

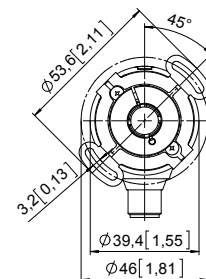
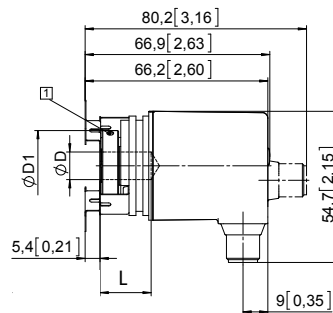


Flange with stator coupling, \varnothing 46 [1.81] Flange type 2 and 5

- 1 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft



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



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Safety-Lock™	High rotational speed	Temperature range -40°... +85°C	High protection level IP67	High shaft load capacity	Shock / vibration resistant	Reverse polarity protection	Surface protection salt spray-tested optional	Energy Harvesting
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Reliable and insensitive

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

Up-to-the-minute fieldbus performance

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

Order code 8.M3668 . XX 2 X . 21 22
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, IP67, ø 36 mm [1.42"]
 3 = clamping flange, IP65, ø 36 mm [1.42"]
 2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]
- b Shaft (ø x L), with flat**
 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
 5 = ø 10 x 20 mm [0.39 x 0.79"]
 2 = ø 1/4" x 12.5 mm [0.49"]

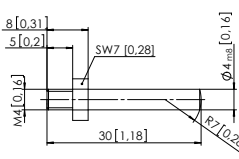
- c Interface / power supply**
2 = CANopen DS301 V4.2 / 10 ... 30 V DC
- d Type of connection**
 1 = axial cable, 1 m [3.28'] PVC
 A = axial cable, special length PVC *)
 2 = radial cable, 1 m [3.28'] PVC
 B = radial cable, special length PVC *)
 3 = axial M12 connector, 5-pin
4 = radial M12 connector, 5-pin
- *) Available special lengths (connection types A, B):
 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
 order code expansion .XXXX = length in dm
 ex.: 8.M3668.432A.2122.0030 (for cable length 3 m)

- e Fieldbus profile**
21 = CANopen
- Optional on request*
 - Ex 2/22 (only for connection types 3 and 4)
 - surface protection salt spray tested

Absolute encoders – multiturn

Compact electronic multiturn, magnetic	Sendix M3668 / M3688 (shaft / hollow shaft)	CANopen
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Order code Hollow shaft	8.M3688 Type	XX2X a b c d	21 22 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.	10 by 10
a Flange	2 = with stator coupling, IP65, ø 46 mm [1.81"] 3 = with spring element, long, IP65 5 = with stator coupling, IP67, ø 46 mm [1.81"] 6 = with spring element, long, IP67	c Interface / power supply	2 = CANopen DS301 V4.2 / 10 ... 30 V DC	e Fieldbus profile	21 = CANopen
b Blind hollow shaft (insertion depth max. 18.5 mm [0.73"])	1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] 4 = ø 10 mm [0.39"] 2 = ø 1/4"	d Type of connection	1 = axial cable, 1 m [3.28'] PVC A = axial cable, special length PVC * 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC * 3 = axial M12 connector, 5-pin 4 = radial M12 connector, 5-pin	Optional on request - 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		Order no.
Cylindrical pin, long for flange with spring element (flange type 3 + 6)	with fixing thread 	8.0010.4700.0000
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A211.005M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

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

Technical data	
Mechanical characteristics	
Maximum speed	shaft or blind hollow shaft version 6000 min ⁻¹ without shaft seal (IP65) 3000 min ⁻¹ (continuous)
	shaft or blind hollow shaft version 4000 min ⁻¹ with shaft seal (IP67) 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	without shaft seal < 0.007 Nm with shaft seal (IP67) < 0.01 Nm
Shaft load capacity	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	IP65 or IP67
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC
Electrical characteristics	
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
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ¹⁾
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

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

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Absolute encoders – multiturn

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

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General information about CANopen

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

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

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

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

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

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

LSS layer setting services DS305 V2.0

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

CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated. (Class C2 functionality):

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

CANopen encoder profile DS406 V4.0

The following parameters can be programmed:

- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

1) Over the whole temperature range.

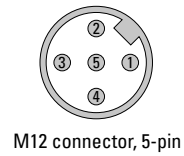
Absolute encoders – multiturn

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

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
2	1, 2, A, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Core color:	BN	WH	GY	GN	YE
Interface	Type of connection	M12 connector, 5-pin					
2	3, 4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



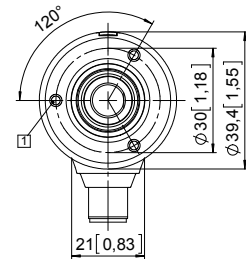
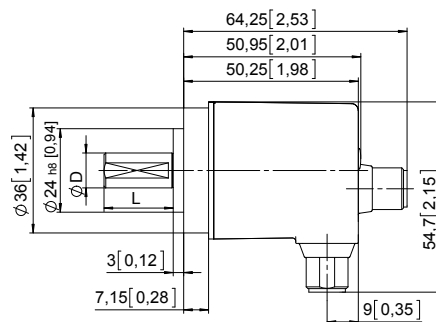
M12 connector, 5-pin

Dimensions shaft version

Dimensions in mm [inch]

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

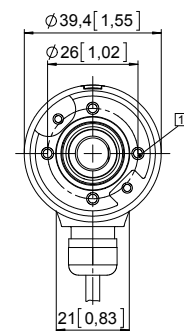
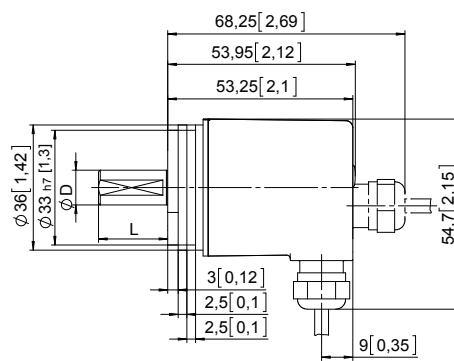
1 3 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

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

1 4 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]

Absolute encoders – multiturn

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

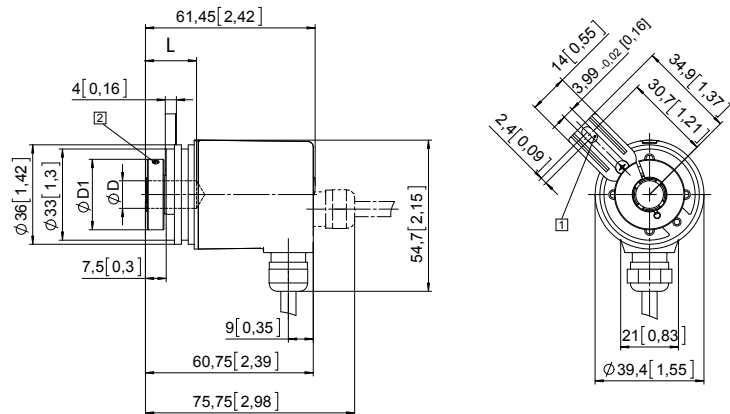
Dimensions in mm [inch]

Flange with spring element, long Flange type 3 and 6

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

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft

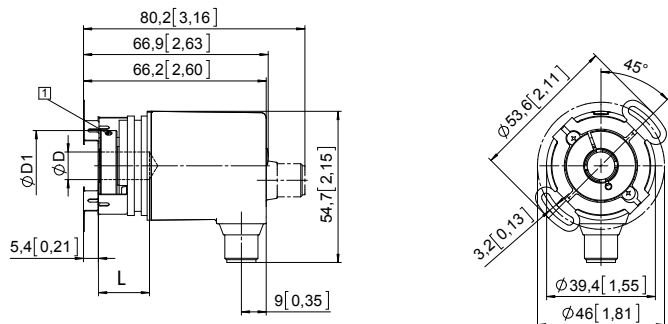


Flange with stator coupling, \varnothing 46 [1.81] Flange type 2 and 5

- 1 Recommended torque for the clamping ring 0.7 Nm

D	Fit	L	D1
6 [0.24]	H7	18.5 [0.73]	24 [0.94]
8 [0.32]	H7	18.5 [0.73]	25.5 [1.00]
10 [0.39]	H7	18.5 [0.73]	25.5 [1.00]
1/4"	H7	18.5 [0.73]	24 [0.94]

L = insertion depth max. blind hollow shaft



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**Compact, robust
electronic multiturn, magnetic**

Sendix M3661R (shaft)

Analog

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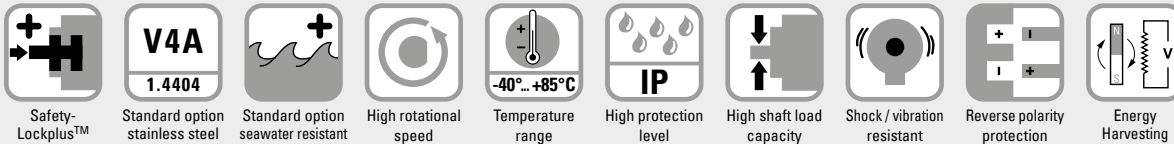
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The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

The "R" robust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.



Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

Order code 8.M3661R.XXXX.XX12
Shaft version Type

- | | | |
|---|--|--|
| <p>a <i>Version</i></p> <p>1 = standard ¹⁾
clamping flange ø 42 mm [1.65"]</p> <p>7 = stainless steel V4A ²⁾
clamping flange ø 42 mm [1.65"]
all metal parts accessible from outside
are out of stainless steel V4A</p> <p>b <i>Shaft (ø x L), with flat</i></p> <p>1 = ø 6 x 12.5 mm [0.24 x 0.49"]</p> <p>3 = ø 8 x 15 mm [0.32 x 0.59"]</p> <p>5 = ø 10 x 20 mm [0.39 x 0.79"]</p> <p>2 = ø 1/4" x 12.5 mm [0.49"]</p> <p>E = ø 10 x 20 mm [0.39 x 0.79"],
stainless steel V4A</p> | <p>c <i>Output circuit</i> ³⁾</p> <p>3 = current output</p> <p>4 = voltage output</p> <p>d <i>Type of connection</i></p> <p>2 = radial cable, 1 m [3.28'] PVC</p> <p>B = radial cable, special length PVC *)</p> <p>4 = radial M12 connector, 5-pin</p> <p>*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M3661R.133B.3112.0030 (for cable length 3 m)</p> <p>e <i>Interface / resolution / power supply</i></p> <p>3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC</p> <p>4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC</p> <p>5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC</p> | <p>f <i>Measuring range</i></p> <p>1 = 16 revolutions / cw</p> <p>2 = 16 revolutions / ccw</p> <p>3 = scalable up to 65,536 revolutions,
with limit switch function / cw</p> <p>4 = scalable up to 65,536 revolutions,
without limit switch function / cw</p> <p>5 = scalable up to 65,536 revolutions,
with limit switch function / ccw</p> <p>6 = scalable up to 65,536 revolutions,
without limit switch function / ccw</p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - Ex 2/22 (only for connection type 4) - other shaft diameters out of V4A stainless steel |
|---|--|--|

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4".
3) Output circuit "3" only in conjunction with interface "3",
output circuit "4" only in conjunction with interface "4" or "5".

Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3661R (shaft)	Analog
Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1102.0808 ¹⁾
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56"] PVC cable	05.00.6081.2211.002M ¹⁾
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000 ¹⁾

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

Technical data

Electrical characteristics current interface 4 ... 20 mA	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ²⁾
Measuring range	factory setting 2 ⁴ revolutions optionally scalable up to 2 ¹⁶ revolutions
DA converter resolution	12 bit
Singleturn accuracy, at 25°C [77°F]	±1°
Temperature coefficient	< 100 ppm/K
Repeat accuracy, at 25°C [77°F]	±0.2°
Output load	at 10 V DC max. 200 Ohm at 24 V DC max. 900 Ohm at 30 V DC max. 1200 Ohm
Setting time	< 1 ms, R _{Burden} = 900 Ohm, 25°C [77°F]
LEDs (green/red)	- system status - current loop interruption – input load too high - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options	- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs	level = +V for 1 s minimum
PowerON Time	< 1 s
Update rate	1 ms
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	File no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V	
Power supply	output 0 ... 5 V 10 ... 30 V DC output 0 ... 10 V 15 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ²⁾
Measuring range	factory setting 2 ⁴ revolutions optionally scalable up to 2 ¹⁶ revolutions
DA converter resolution	0 ... 10 V 12 bit 0 ... 5 V 11 bit
Singleturn accuracy, at 25°C [77°F]	±1°
Temperature coefficient	< 100 ppm/K
Repeat accuracy, at 25°C [77°F]	±0.2°
Current output	max. 10 mA
Setting time	< 1 ms, R _{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)	- system status - reference point display (only with factory settings) at cw: betw. 0° and 1° at ccw: betw. 0° and -1° - status in teach mode
Options	- output signal scalable via the teach inputs - output signal scalable via the teach inputs + limit switch function
Teach inputs	level = +V for 1 s minimum
PowerON Time	< 1 s
Update rate	1 ms
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	File no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

1) Not for version "7" (V4A stainless steel)

2) When the power supply is correctly applied.

But not output to +V. Power supply and sensor output signal are not galvanically isolated.

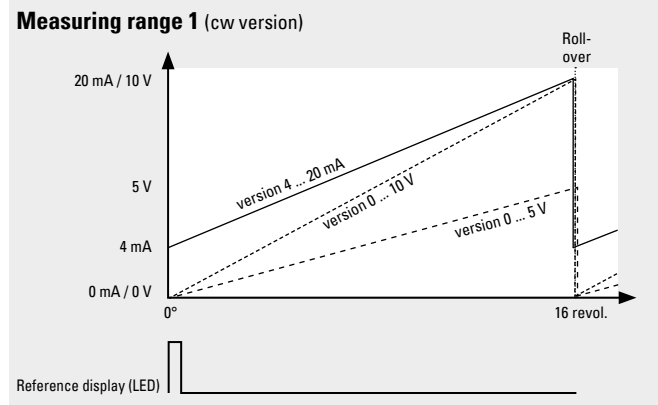
Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3661R (shaft)	Analog
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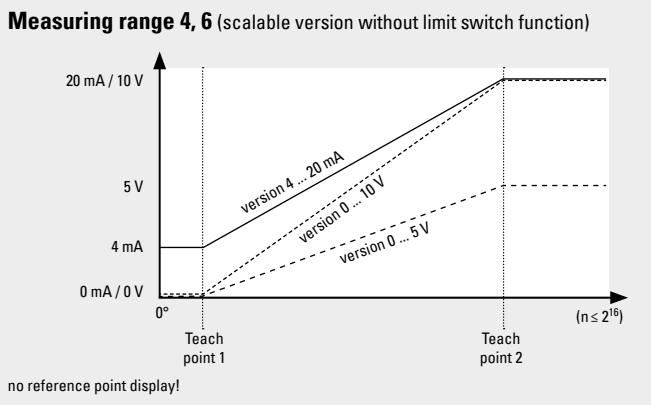
Mechanical characteristics	
Maximum speed	4000 min ⁻¹ 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	< 0.01 Nm
Shaft load capacity	radial 80 N axial 40 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9	IP66, IP67, IP69k
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]

Materials	version "1" (standard)	version "7" (stainless steel)
shaft	V2A	V4A
flange	aluminum	V4A
housing	zinc die-cast	V4A
cable	PVC	–
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 4 ms	
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz	

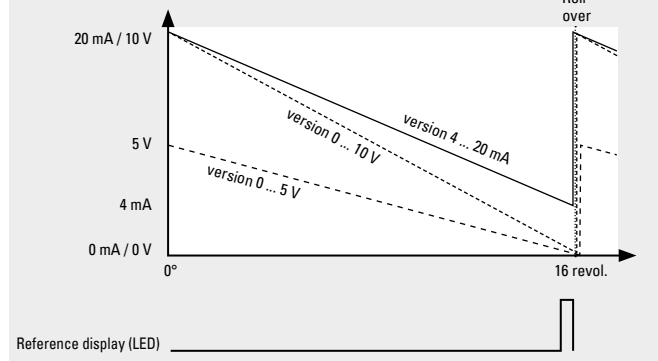
Example (output signal evolution) – factory setting



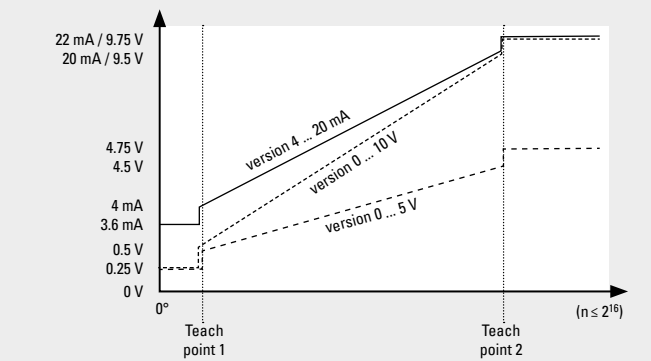
Example (output signal evolution) – option: scalable



Measuring range 2 (ccw version)



Measuring range 3, 5 (scalable version with limit switch function)



Factory-set measuring range	2 ⁴ revolutions with roll-over			
Limit switch function	version	0 ... 10 V	0 ... 5 V	4 ... 20 mA
	limit switch low	0.25 V	0.25 V	3.6 mA
	limit switch high	9.75 V	4.75 V	22.0 mA

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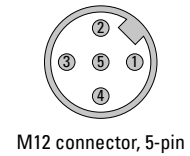
Compact, robust electronic multiturn, magnetic	Sendix M3661R (shaft)	Analog
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Terminal assignment

Interface 3 (current)	Type of connection 2, B	Cable (isolate unused cores individually before initial start-up)					
		Signal:	0 V	+V	+I	SET 1 ¹⁾	SET 2 ¹⁾
		Core color:	WH	BN	GN	GY	PK
Interface 3 (current)	Type of connection 4	M12 connector, 5 pin					
		Signal:	0 V	+V	+I	SET 1 ¹⁾	SET 2 ¹⁾
		Pin:	3	2	1	5	4
Interface 4, 5 (voltage)	Type of connection 2, B	Cable (isolate unused cores individually before initial start-up)					
		Signal:	0 V	+V	+U	SET 1 ¹⁾	SET 2 ¹⁾
		Core color:	WH	BN	GN	GY	PK
Interface 4, 5 (voltage)	Type of connection 4	M12 connector, 5 pin					
		Signal:	0 V	+V	+U	SET 1 ¹⁾	SET 2 ¹⁾
		Pin:	3	2	1	5	4

+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

Top view of mating side, male contact base



M12 connector, 5-pin

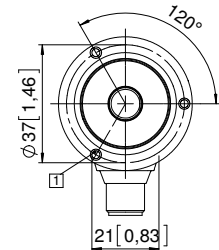
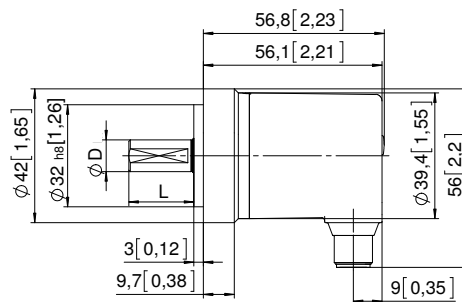
Dimensions

Dimensions in mm [inch]

Aluminum clamping flange, ø 42 [1.65] version 1

□ 3 x M3, 6 [0.24] deep

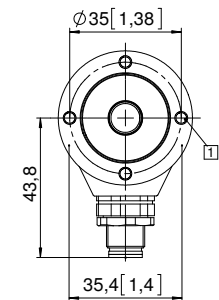
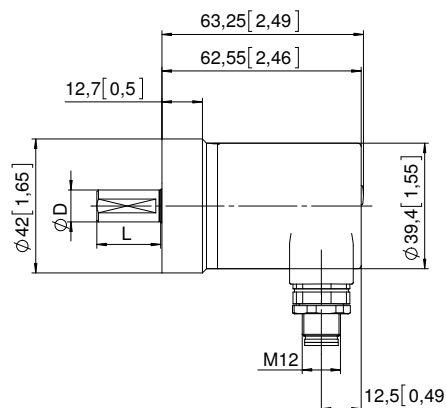
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



Stainless steel V4A clamping flange, ø 42 [1.65] version 7

□ 4 x M4, 8 [0.31] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



1) For scalable version.

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Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic

Sendix M3663R (shaft)

SSI

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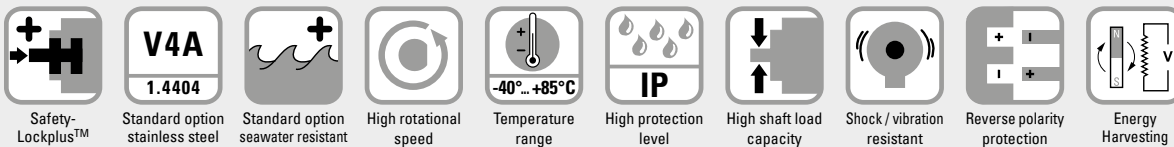
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Addresses



The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery.

The "R" robust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.



Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Absolute accuracy $\pm 1^\circ$.
- Repeat accuracy $\pm 0.2^\circ$.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

Order code 8.M3663R.XX2X.XXX2
Shaft version Type

a Version

- 1 = standard ¹⁾
clamping flange \varnothing 42 mm [1.65"]
- 7 = stainless steel V4A ²⁾
clamping flange \varnothing 42 mm [1.65"]
all metal parts accessible from outside are out of stainless steel V4A

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 0.59"]
- 5 = \varnothing 10 x 20 mm [0.39 x 0.79"]
- 2 = \varnothing 1/4" x 12.5 mm [0.49"]
- E = \varnothing 10 x 20 mm [0.39 x 0.79"], stainless steel V4A

c Interface / power supply

- 2 = SSI / 10 ... 30 V DC

d Type of connection

- 2 = radial cable, 1 m [3.28'] PUR
- B = radial cable, special length PUR *)
- 4 = radial M12 connector, 8-pin

*) Available special lengths (connection type B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21"]
order code expansion .XXXX = length in dm
ex.: 8.M3663R.132B.G322.0030 (for cable length 3 m)

e Code

- B = SSI, binary
- G = SSI, gray

f Resolution (singleturn)

- A = 10 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST
- 4 = 14 bit ST

g Resolution (multiturn)

- 2 = 12 bit MT
- 6 = 16 bit MT
- A = 20 bit MT
- 4 = 24 bit MT

Optional on request

- Ex 2/22 (only for connection type 4)
- other shaft diameters out of V4A stainless steel

1) Not in conjunction with shaft type "E".
2) Only in conjunction with shaft type "E" + type of connection "4".

Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic		Sendix M3663R (shaft)	SSI
Mounting accessory for shaft encoders			Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]		8.0000.1102.0808 ¹⁾
Connection technology			Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PUR cable		05.00.6051.8211.002M ¹⁾
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin		05.CMB 8181-0 ¹⁾

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

Technical data

Mechanical characteristics		
Maximum speed	4000 min ⁻¹ 2000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]	< 0.01 Nm	
Shaft load capacity	radial	80 N
	axial	40 N
Weight	approx. 0.2 kg [7.06 oz]	
Protection acc. to EN 60529/DIN 40050-9	IP66, IP67, IP69k	
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]	
Materials	version "1" (standard)	version "7" (stainless steel)
	shaft	V2A
	flange	aluminum
	housing	zinc die-cast
	cable	PUR
		V4A
		V4A
		–
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 4 ms	
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz	

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ²⁾
e1 compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	File no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 30 mA
Signal level	HIGH typ 3.8 V LOW with I _{Load} = 20 mA typ 1.3 V
Resolution singleturn	10 ... 14 bit
Absolute accuracy ³⁾	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 24 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	2 ms
Monoflop time	≤ 15 µs
Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.	

SET input	
Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Input delay	1 ms
New position data readable after	1 ms
Internal processing time	200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

1) Not for version "7" (V4A stainless steel)
2) Short circuit proof to 0 V or to output when power supply correctly applied.
3) Over the whole temperature range.

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Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3663R (shaft)	SSI
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DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)									
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥
2	2, B	SET, DIR	Core color:	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	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
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

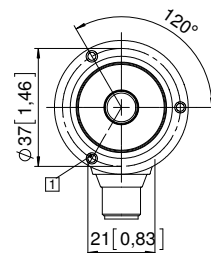
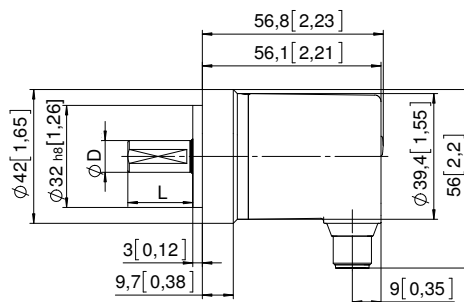
Dimensions

Dimensions in mm [inch]

Aluminum, clamping flange, ø 42 [1.65] version 1

1 3 x M3, 6 [0.24] deep

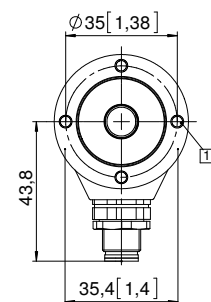
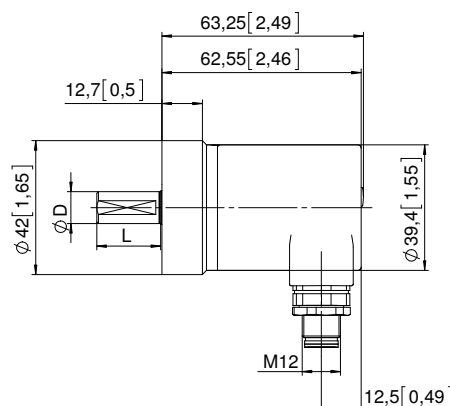
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



Stainless steel V4A clamping flange, ø 42 [1.65] version 7

1 4 x M4, 8 [0.31] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3668R (shaft)	CANopen
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The Sendix M36 with Energy Harvesting Technology is an electronic multiturn encoder in miniature format, without gear and without battery. It is characterized by robustness, reliability and cost-efficiency.

The "R"obust version is particularly suitable for use in harsh environments. Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix M36 encoder is suitable even for demanding outdoor applications.



Safety-Lockplus™	Standard option stainless steel 1.4404	Standard option seawater resistant	High rotational speed	Temperature range -40°...+85°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Reverse polarity protection	Energy Harvesting

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Protection level IP66, IP67 and IP69k in one device.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Up-to-the-minute fieldbus performance

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

Order code 8.M3668R.XX2X.2122
Shaft version Type

<p>a Version</p> <p>1 = standard ¹⁾ clamping flange ø 42 mm [1.65"]</p> <p>7 = stainless steel V4A ²⁾ clamping flange ø 42 mm [1.65"] all metal parts accessible from outside are out of stainless steel V4A</p> <p>b Shaft (ø x L), with flat</p> <p>1 = ø 6 x 12.5 mm [0.24 x 0.49"]</p> <p>3 = ø 8 x 15 mm [0.32 x 0.59"]</p> <p>5 = ø 10 x 20 mm [0.39 x 0.79"]</p> <p>2 = ø 1/4" x 12.5 mm [0.49"]</p> <p>E = ø 10 x 20 mm [0.39 x 0.79"], stainless steel V4A</p>	<p>c Interface / power supply</p> <p>2 = CANopen DS301 V4.2 / 10 ... 30 V DC</p> <p>d Type of connection</p> <p>2 = radial cable, 1 m [3.28'] PVC</p> <p>B = radial cable, special length PVC *)</p> <p>4 = radial M12 connector, 5-pin</p> <p>*) Available special lengths (connection type B): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXX = length in dm ex.: 8.M3668.132B.2122.0030 (for cable length 3 m)</p>	<p>e Fieldbus profile</p> <p>21 = CANopen</p> <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - Ex 2/22 (only for connection type 4) - other shaft diameters out of V4A stainless steel
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1) Not in conjunction with shaft type "E".
 2) Only in conjunction with shaft type "E" + type of connection "4".

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Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3668R (shaft)	CANopen
Mounting accessory for shaft encoders		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1102.0808 ¹⁾
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [19.69'] PVC cable	05.00.6091.A211.005M ¹⁾
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000 ¹⁾

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

Technical data

Mechanical characteristics		
Maximum speed	4000 min ⁻¹ 2000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]	< 0.01 Nm	
Shaft load capacity	radial 80 N axial 40 N	
Weight	approx. 0.2 kg [7.06 oz]	
Protection acc. to EN 60529/DIN 40050-9	IP66, IP67, IP69k	
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]	
Materials	version "1" (standard) version "7" (stainless steel)	
shaft	V2A V4A	
flange	aluminum V4A	
housing	zinc die-cast V4A	
cable	PVC -	
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 4 ms	
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz	

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ²⁾
CE compliant acc. to (pending)	EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
UL approval	File no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen	
Resolution singleturn	1 ... 16384 (14 bit), scalable default: 8192 (13 bit)
Absolute accuracy ³⁾	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 16.777.216 (24 bit) scalable only via the total resolution
Total resolution	1 ... 274.877.906.944 (38 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader
Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object
Bootloader	configuration management CIA DS 302-3

1) Not for version "7" (V4A stainless steel)
2) Short circuit proof to 0 V or to output when power supply correctly applied.
3) Over the whole temperature range.

Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3668R (shaft)	CANopen
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General information about CANopen

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

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

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

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

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

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	2, B	Core color:	BN	WH	GY	GN	YE
		Signal:					
Interface	Type of connection	M12 connector, 5-pin					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	4	Pin:	2	3	1	4	5
		Signal:					

CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated. (Class C2 functionality):

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

CANopen encoder profile DS406 V4.0

The following parameters can be programmed:

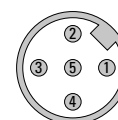
- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

Top view of mating side, male contact base



M12 connector, 5-pin

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1) Over the whole temperature range.

Absolute encoders – multiturn

Compact, robust electronic multiturn, magnetic	Sendix M3668R (shaft)	CANopen
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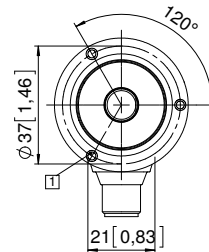
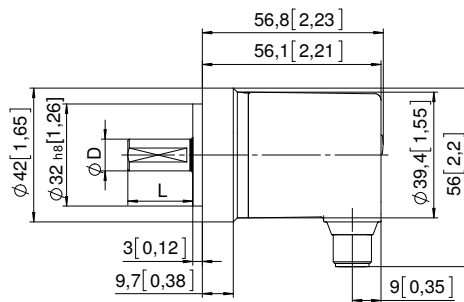
Dimensions

Dimensions in mm [inch]

Aluminum, clamping flange, ø 42 [1.65] version 1

1 3 x M3, 6 [0.24] deep

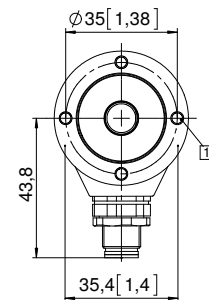
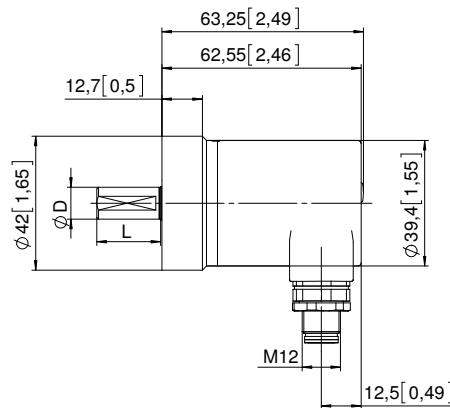
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



Stainless steel V4A clamping flange, ø 42 [1.65] version 7

1 4 x M4, 8 [0.31] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]



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Absolute encoders – multiturn

Compact electronic multiturn, optical

Sendix F3663 / F3683 (shaft / hollow shaft)

SSI / BiSS + incremental



The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm.



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

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +90°C.
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoASIC) - offering highest reliability, a high resolution up to 41 bits and 100% magnetic field insensitivity.

Optimized performance

- High precision with data refresh rate of the position value ≤ 1µs.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code **8.F3663** . XXXX . XXX **2**
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.



<p>a Flange</p> <p>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"] <u>4 = synchro flange, IP65, ø 36 mm [1.42"]</u></p> <p>b Shaft (ø x L), with flat</p> <p>1 = ø 6 x 12.5 mm [0.24 x 0.49"] <u>3 = ø 8 x 15 mm [0.32 x 0.59"]</u> 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"</p>	<p>c Interface / power supply</p> <p>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</p> <p>d Type of connection</p> <p><u>1 = 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-pin¹⁾</p>	<p>e Code</p> <p>B = SSI, binary C = BiSS, binary <u>G = SSI, gray</u></p> <p>f Resolution (singleturn)</p> <p>B = 9 bit ST A = 10 bit ST 2 = 12 bit ST <u>3 = 13 bit ST</u> 4 = 14 bit ST 7 = 17 bit ST</p> <p>g Resolution (multiturn)</p> <p><u>2 = 12 bit MT</u> 6 = 16 bit MT 4 = 24 bit MT</p>	<p><i>Optional on request</i></p> <ul style="list-style-type: none"> - surface protection salt spray tested - other singleturn resolutions
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1) Only with interface 1 and 2.

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Absolute encoders – multiturn

Compact electronic multiturn, optical

Sendix F3663 / F3683 (shaft / hollow shaft)

SSI / BiSS + incremental

**Order code
Hollow shaft**

8.F3683 . **XXXXX** . **XXXX2**
Type **a** **b** **c** **d** **e** **f** **g**

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

10 by 10

a Flange
1 = with spring element, short, IP65
3 = with spring element, long, IP65
2 = with stator coupling, IP65,
∅ 46 mm [1.81"]

b Through hollow shaft
1 = ∅ 6 mm [0.24"]
3 = ∅ 8 mm [0.32"]
2 = ∅ 1/4"
Blind hollow shaft
(insertion depth max. 14.5 mm [0.57"])
4 = ∅ 10 mm [0.39"]

c Interface / power supply
1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d Type of connection
1 = tangential cable, 1 m [3.28'] PUR
3 = tangential cable, 5 m [16.40'] PUR
U = tangential cable, 10 m [32.81'] PUR
5 = tangential cable, 1 m [3.28'] PUR
with M12 connector for central fastening, 8-pin ¹⁾

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

f Resolution (singleturn)
B = 9 bit ST
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g Resolution (multiturn)
2 = 12 bit MT
6 = 16 bit MT
4 = 24 bit MT

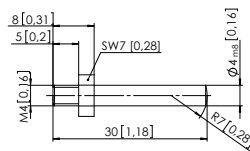
Optional on request
- surface protection
- salt spray tested
- other singleturn resolutions

Mounting accessory for shaft encoders

Coupling	Order no.
Bellows coupling ∅ 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1102.0808

Mounting accessory for hollow shaft encoders

Cylindrical pin, long for flange with spring element (flange type 1 + 3)	Dimensions in mm [inch] with fixing thread	Order no.
		8.0010.4700.0000



Connection technology

Cordset, pre-assembled	Order no.
M12 female connector with coupling nut, 8-pin 2 m [6.56'] PUR cable	05.00.6051.8211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin 05.CMB 8181-0

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

Technical data

Mechanical characteristics

Maximum speed	
shaft version without shaft seal (IP65) or blind hollow shaft version	12000 min ⁻¹ 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	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

1) Only with output circuits 1 and 2.

Absolute encoders – multiturn

Compact electronic multiturn, optical		Sendix F3663 / F3683 (shaft / hollow shaft)		SSI / BiSS + incremental	
Electrical characteristics					
Power supply	5 V DC (±5 %) or 10 ... 30 V DC				
Current consumption (no load)	5 V DC	max. 60 mA	10 ... 30 V DC	max. 30 mA	
Reverse polarity protection of the power supply	yes (only with 10 ... 30 V DC)				
Short-circuit proof outputs	yes ¹⁾				
UL approval	file no. E224618				
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU				
SSI interface					
Output driver	RS485 transceiver type				
Permissible load / channel	max. +/- 30 mA				
Signal level	HIGH	typ 3.8 V	LOW with I _{Load} = 20 mA	typ 1.3 V	
Resolution singleturn	10 ... 17 bit				
Number of revolutions (multiturn)	max. 24 bit				
Code	binary or gray				
SSI clock rate	50 kHz ... 2 MHz				
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs	ST resolution ≥ 15 bit	4 μs	
Monoflop time	≤ 15 μs				
Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.					
BiSS interface					
Output driver	RS485 transceiver type				
Permissible load / channel	max. +/- 30 mA				
Signal level	HIGH	typ 3.8 V	LOW with I _{Load} = 20 mA	typ 1.3 V	
Resolution singleturn	10 ... 17 bit				
Number of revolutions (multiturn)	max. 24 bit				
Code	binary				
BiSS Clock rate	50 kHz ... 10 MHz				
Max. update rate	< 10 μs, depends on the clock rate and the data length				
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs	ST resolution 17 bit	2.4 μs	
Note: - bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification					
Incremental outputs (A/B)					
	SinCos		RS422 TTL-compatible		
Max. frequency -3dB	400 kHz		400 kHz		
Signal level	1 V _{pp} (± 20%)		HIGH: min. 2.5 V LOW: max. 0.5 V		
Short circuit proof	yes ¹⁾		yes ¹⁾		
Pulse rate	2048 ppr		2048 ppr		
Status output					
Output driver	open collector, internal pull up resistor 22 kOhm				
Permissible load	max. 20 mA				
Signal level	HIGH	+V	LOW	< 1 V	
Active	LOW				
The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).					
An active status output (LOW) displays: LED fault (failure or ageing) – over-temperature – undervoltage In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.					
SET input					
Input	active HIGH				
Input type	comparator				
Signal level (+V = power supply)	HIGH	min. 60 % of +V, max: +V	LOW	max. 30 % of +V	
Input current	< 0.5 mA				
Min. pulse duration (SET)	10 ms				
Input delay	1 ms				
New position data readable after	1 ms				
Internal processing time	200 ms				
The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. The SET function should be carried out whilst the encoder is at rest. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.					
DIR input					
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.					
Response time (DIR input)	1 ms				
Power-ON					
After Power-ON the device requires a time of approx. 150 ms before valid data can be read. Hot plugging of the encoder should be avoided.					

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

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Absolute encoders – multiturn

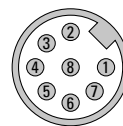
Compact electronic multiturn, optical	Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS
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Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)															
1, 2	1, 3, U	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥					
			Core color:	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 cores individually before initial start-up)															
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	⊥		
			Core color:	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 cores individually before initial start-up)															
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 V _{sens}	+V _{sens}	⊥				
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	RD-BU	shield				
6	1, 3, U	2048 SinCos, Sensor output	Cable (isolate unused cores individually before initial start-up)															
			Signal:	0 V	+V	C+	C-	D+	D-	0 V _{sens}	+V _{sens}	A	\bar{A}	B	\bar{B}	⊥		
			Core color:	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 cores individually before initial start-up)															
			Signal:	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{B}	⊥				
			Core color:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	shield				

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A, \bar{A} : Incremental output channel A (cosine)
- B, \bar{B} : Incremental output channel B (sine)
- SET: Set input
- DIR: Direction input
- Stat: Status output
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

Absolute encoders – multiturn

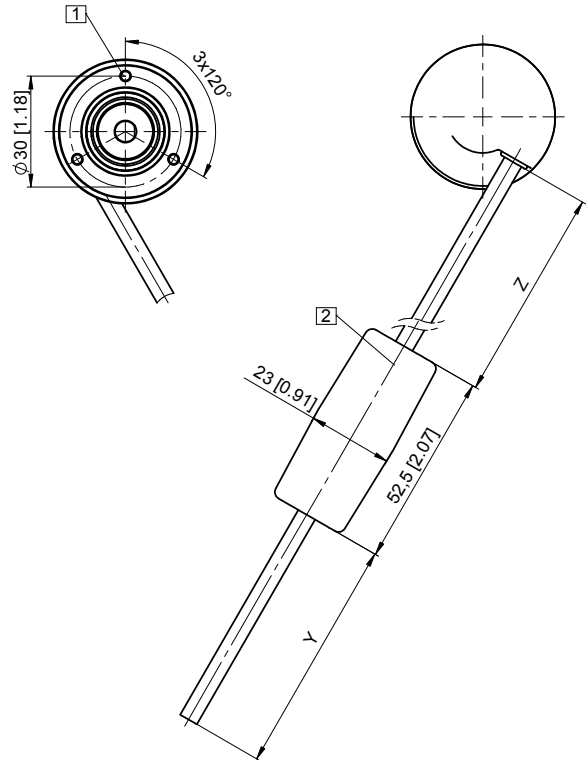
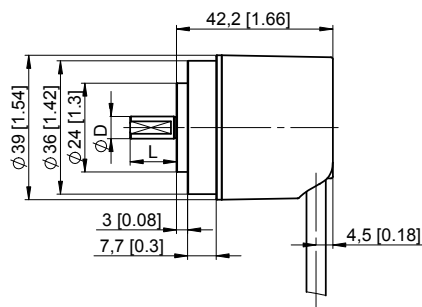
Compact electronic multiturn, optical	Sendix F3663 / F3683 (shaft / hollow shaft)	SSI / BiSS
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Dimensions shaft version

Dimensions in mm [inch]

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

- 1 3 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



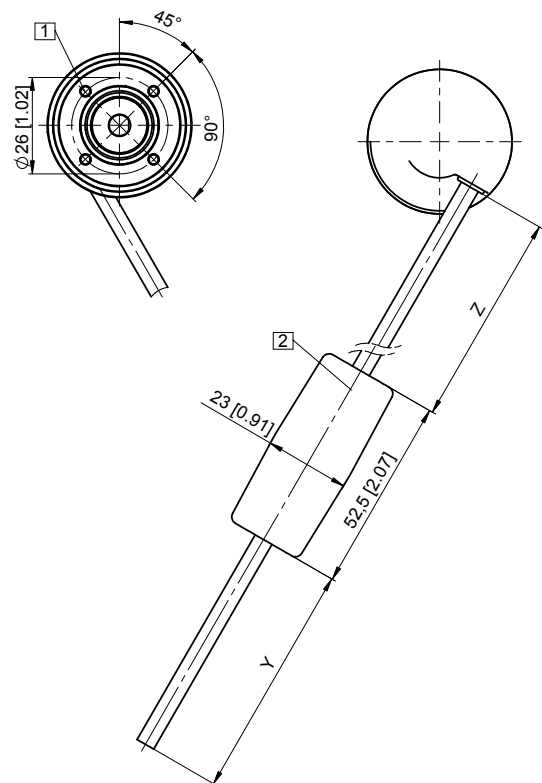
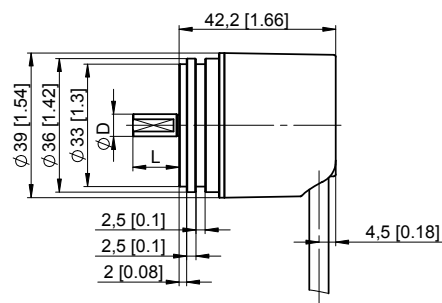
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

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

Synchro flange, $\varnothing 36$ [1.42]

Flange type 2 and 4 (drawing with cable)

- 1 4 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

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

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Compact electronic multiturn, optical

Sendix F3663 / F3683 (shaft / hollow shaft)

SSI / BiSS

Dimensions hollow shaft version

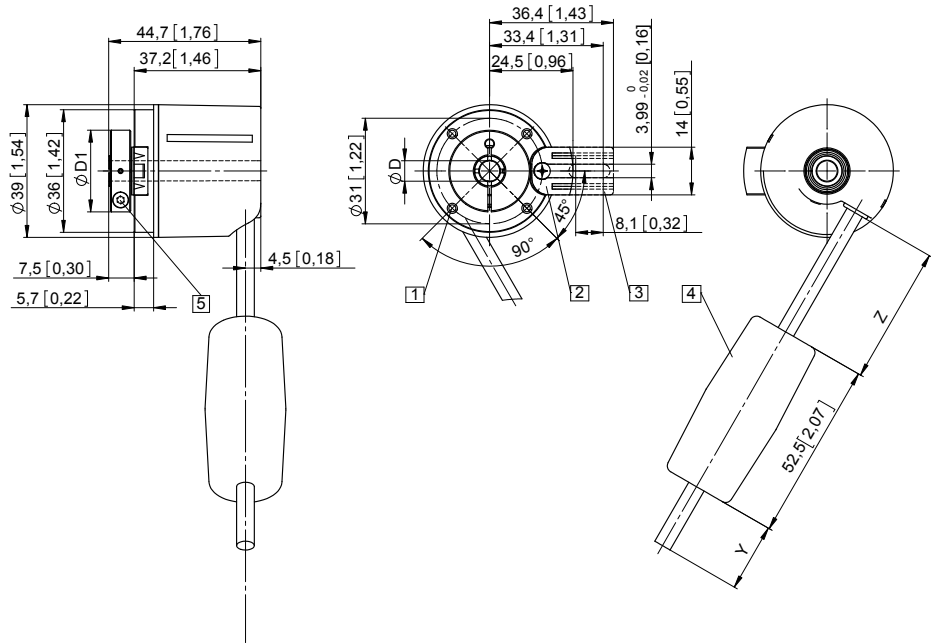
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

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

- 1 4 x M2.5, 5 [0.20] deep
- 2 Spring element, short recommendation: cylindrical pin DIN 7, \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	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

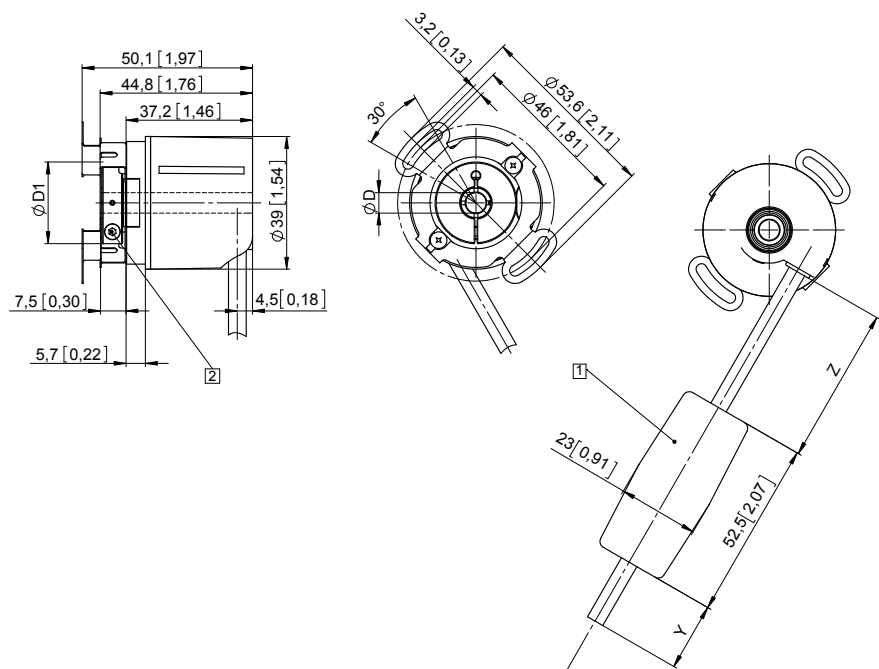
*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

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

Flange with stator coupling, \varnothing 46 [1.81]

Flange type 2

- 1 Battery (in the cable)
- 2 Recommended torque for the clamping ring 0.6 Nm



D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

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

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Compact electronic multiturn, optical	Sendix F3668 / F3688 (shaft / hollow shaft)	CANopen
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The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.

With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm.



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

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C [-40°F ... +185°F].
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoAsic) - offering highest reliability, a high resolution up to 32 bits and 100% magnetic field 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	.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	Type	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"] <u>4 = synchro flange, IP65, ø 36 mm [1.42"]</u>	b Shaft (ø x L), with flat 1 = ø 6 x 12.5 mm [0.24 x 0.49"] <u>3 = ø 8 x 15 mm [0.32 x 0.49"]</u> 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 <u>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</u>	<i>Optional on request</i> - surface protection salt spray tested
d Type of connection <u>1 = tangential cable, 1 m [3.28'] PUR</u> 3 = tangential cable, 5 m [16.40'] PUR U = tangential cable, 10 m [32.81'] PUR		e Fieldbus profile <u>21 = CANopen</u>	

Order code	8.F3688	.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.	
Hollow shaft	Type	a b c d	e		

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>	b Blind hollow shaft (insertion depth max. 14.5 mm [0.57"]) 5 = ø 6 mm [0.24"] 7 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"]</u> 6 = ø 1/4"	c Interface / power supply <u>2 = CANopen DS301 V4.02 / 10 ... 30 V DC</u>	<i>Optional on request</i> - surface protection salt spray tested
d Type of connection <u>1 = tangential cable, 1 m [3.28'] PUR</u> 3 = tangential cable, 5 m [16.40'] PUR U = tangential cable, 10 m [32.81'] PUR		e Fieldbus profile <u>21 = CANopen</u>	

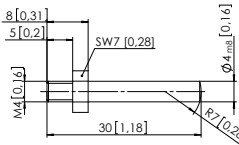
Absolute encoders – multiturn

Compact electronic multiturn, optical	Sendix F3668 / F3688 (shaft / hollow shaft)	CANopen
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Mounting accessory for shaft encoders		Order no.
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Coupling	bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1102.0808
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Mounting accessory for hollow shaft encoders		Order no.
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Cylindrical pin, long for flange with spring element (flange type 1 + 3)	with fixing thread 	8.0010.4700.0000
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Connection technology		Order no.
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Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5111.0000
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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 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	aluminum
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics

Power supply	10 ... 30 V DC
Current consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons, LSS-Service DS305 V2.0
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object

Diagnostic LED (two-color, red/green)

LED ON or blinking	red	error display
	green	status display

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Absolute encoders – multiturn

Compact electronic multiturn, optical	Sendix F3668 / F3688 (shaft / hollow shaft)	CANopen
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General information about CANopen

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

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

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

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

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

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length Lu.

Lu < 5 m [16.40'] cable length for 125 Kbit

Lu < 2 m [6.56'] cable length for 250 Kbit

Lu < 1 m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

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

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

LSS layer setting services DS305 V2.0

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

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated. (Class C2 functionality):

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

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

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

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	1, 3, U	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Core color:	BN	WH	GY	GN	YE

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Compact electronic multiturn, optical

Sendix F3668 / F3688 (shaft / hollow shaft)

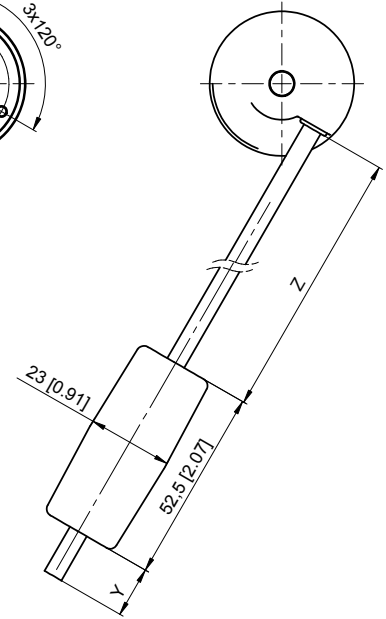
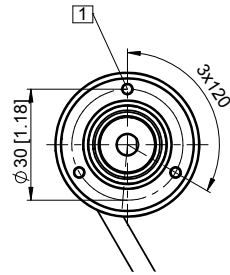
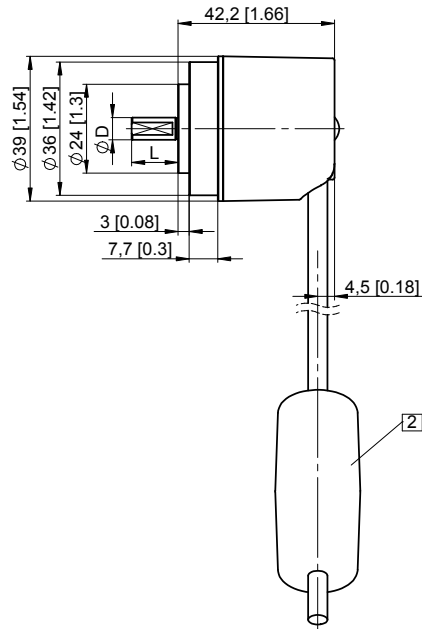
CANopen

Dimensions shaft version

Dimensions in mm [inch]

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

- 1 3 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



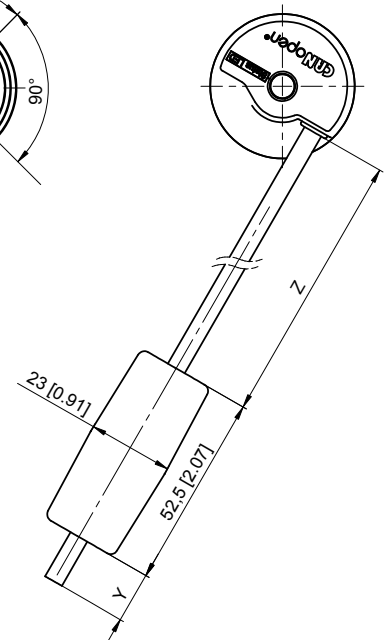
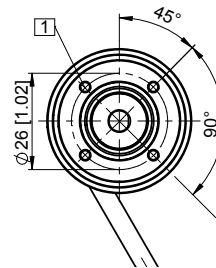
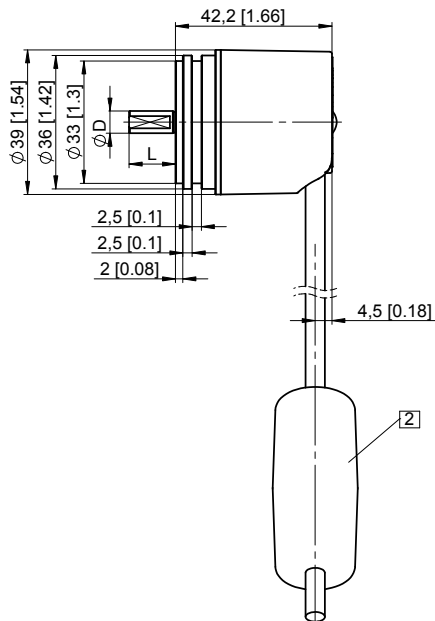
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

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

Synchro flange, \varnothing 36 [1.42]

Flange type 2 and 4
(drawing with cable)

- 1 4 x M3, 6 [0.24] deep
- 2 Battery (in the cable)



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

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

Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

Absolute encoders – multiturn

Compact electronic multiturn, optical

Sendix F3668 / F3688 (shaft / hollow shaft)

CANopen

Dimensions hollow shaft version

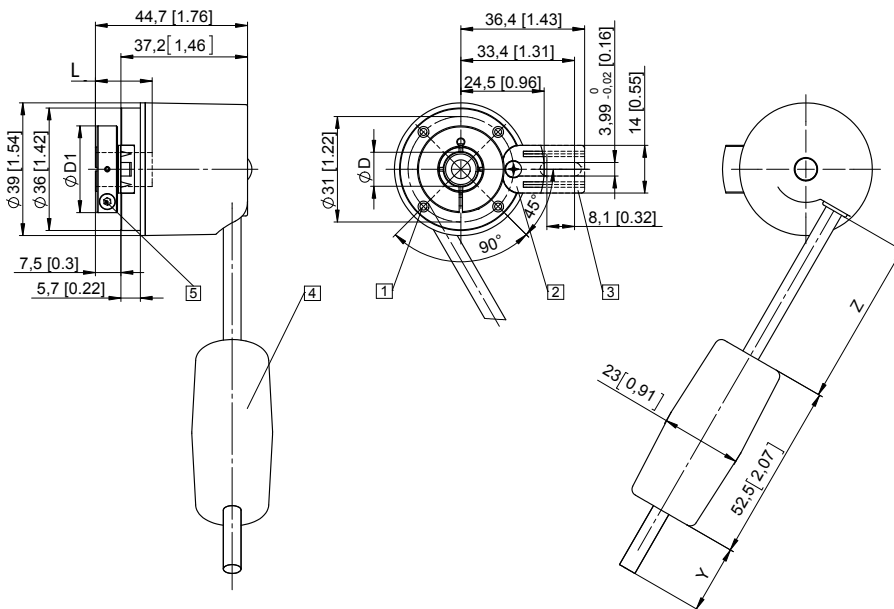
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

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

- 1 4 x 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	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]

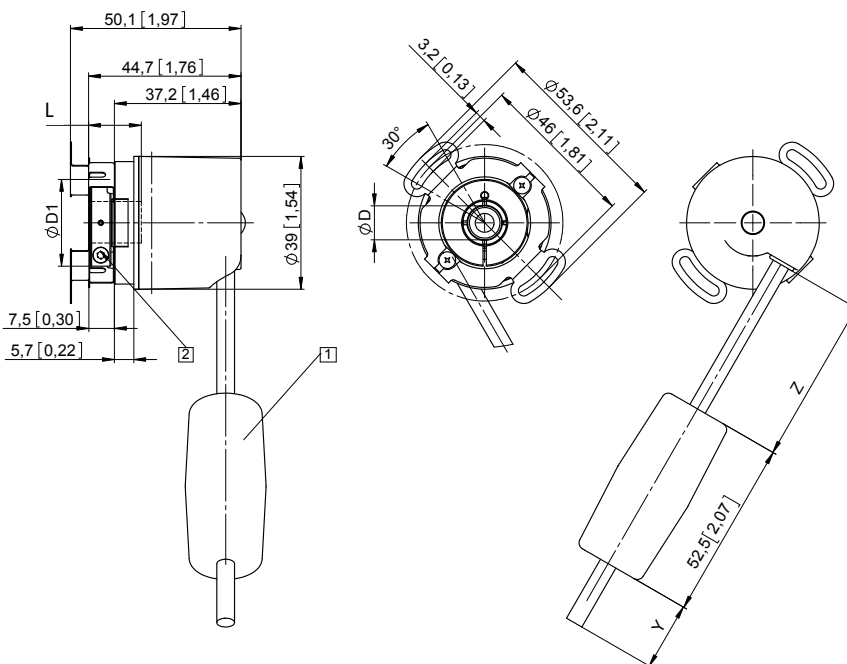
L = insertion depth max. blind hollow shaft

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

Flange with stator coupling, \varnothing 46 [1.81"]

Flange type 2

- 1 Battery (in the cable)
- 2 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L	D1
6 [0.24]	H7	14.5 [0.57]	24 [0.94]
8 [0.32]	H7	14.5 [0.57]	25.5 [1.00]
10 [0.39]	H7	14.5 [0.57]	25.5 [1.00]
1/4"	H7	14.5 [0.57]	24 [0.94]

L = insertion depth max. blind hollow shaft

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

Absolute encoders – multiturn

Standard electronic multiturn, magnetic

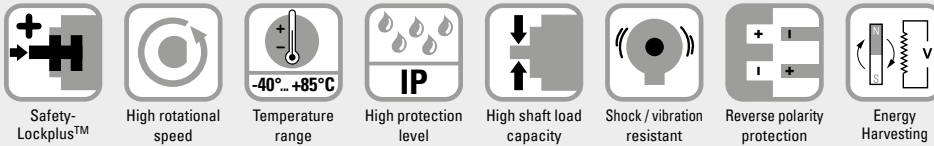
Sendix M5861 (shaft)

Analog



The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Current output 4 ... 20 mA.
- Voltage output 0 ... 10 V or 0 ... 5 V.
- Measuring range scalable.
- Limit switch function.

Order code
Shaft version

8.M5861.XXXX.XX12
Type

a Version

- 3 = clamping flange, IP65, ø 58 mm [2.28"]
- 4 = synchro flange, IP65, ø 58 mm [2.28"]

b Shaft (ø x L), with flat

- 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
- 5 = ø 10 x 20 mm [0.39 x 0.79"]

c Output circuit¹⁾

- 3 = current output
- 4 = voltage output

d Type of connection

- 2 = radial cable, 1 m [3.28'] PVC
- B = radial cable, special length PVC *)
- 4 = radial M12 connector, 5-pin

*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M5861.3132.3112.0030 (for cable length 3 m)

e Interface / resolution / power supply

- 3 = 4 ... 20 mA / 12 bit / 10 ... 30 V DC
- 4 = 0 ... 10 V / 12 bit / 15 ... 30 V DC
- 5 = 0 ... 5 V / 11 bit / 10 ... 30 V DC

f Measuring range

- 1 = 16 revolutions / cw
- 2 = 16 revolutions / ccw
- 3 = scalable up to 65,536 revolutions, with limit switch function / cw
- 4 = scalable up to 65,536 revolutions, without limit switch function / cw
- 5 = scalable up to 65,536 revolutions, with limit switch function / ccw
- 6 = scalable up to 65,536 revolutions, without limit switch function / ccw

Optional on request

- Ex 2/22 (only for connection type 4)

Connection technology

Order no.

Coupling

Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]

8.0000.1102.1010

Connection technology

Order no.

Cordset, pre-assembled

M12 female connector with coupling nut, 5-pin,
2 m [6.56'] PVC cable

05.00.6081.2211.002M

Connector, self-assembly (straight)

M12 female connector with coupling nut, 5-pin

8.0000.5116.0000

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

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

1) Output circuit "3" only in conjunction with interface "3",
output circuit "4" only in conjunction with interface "4" or "5".

Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5861 (shaft)	Analog
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Technical data

Electrical characteristics current interface 4 ... 20 mA	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ¹⁾
Measuring range	factory setting 2 ⁴ revolutions optionally scalable up to 2 ¹⁶ revolutions
DA converter resolution	12 bit
Singleturn accuracy, at 25°C [77°F]	±1°
Temperature coefficient	< 100 ppm/K
Repeat accuracy, at 25°C [77°F]	±0.2°
Output load	at 10 V DC max. 200 Ohm at 24 V DC max. 900 Ohm at 30 V DC max. 1200 Ohm
Setting time	< 1 ms, R _{Burden} = 900 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
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 minimum
PowerON Time	< 1 s
Update rate	1 ms
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

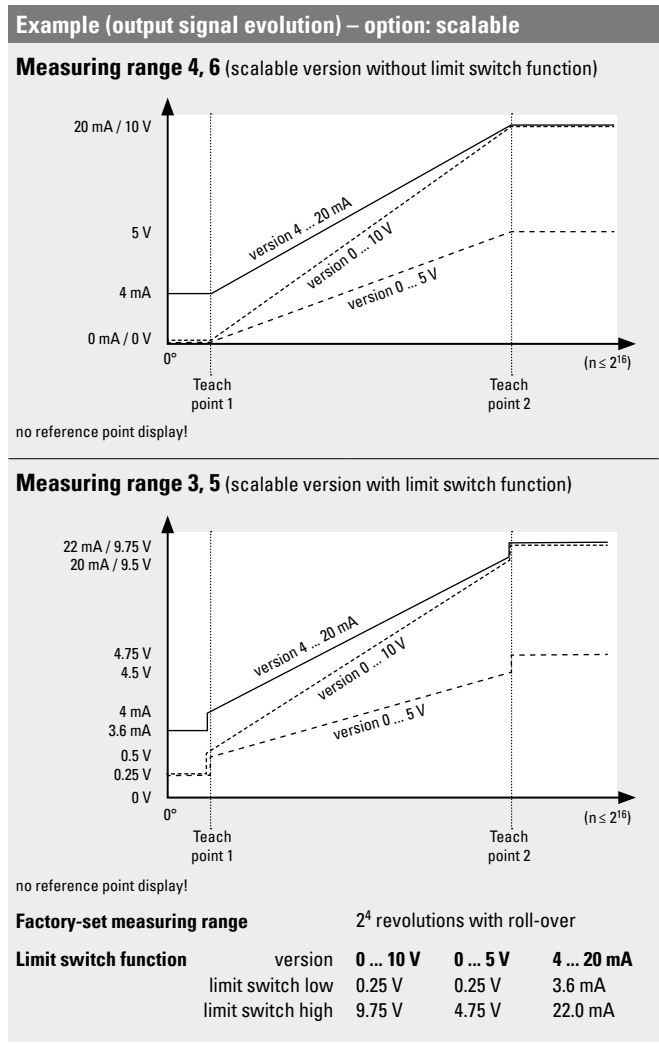
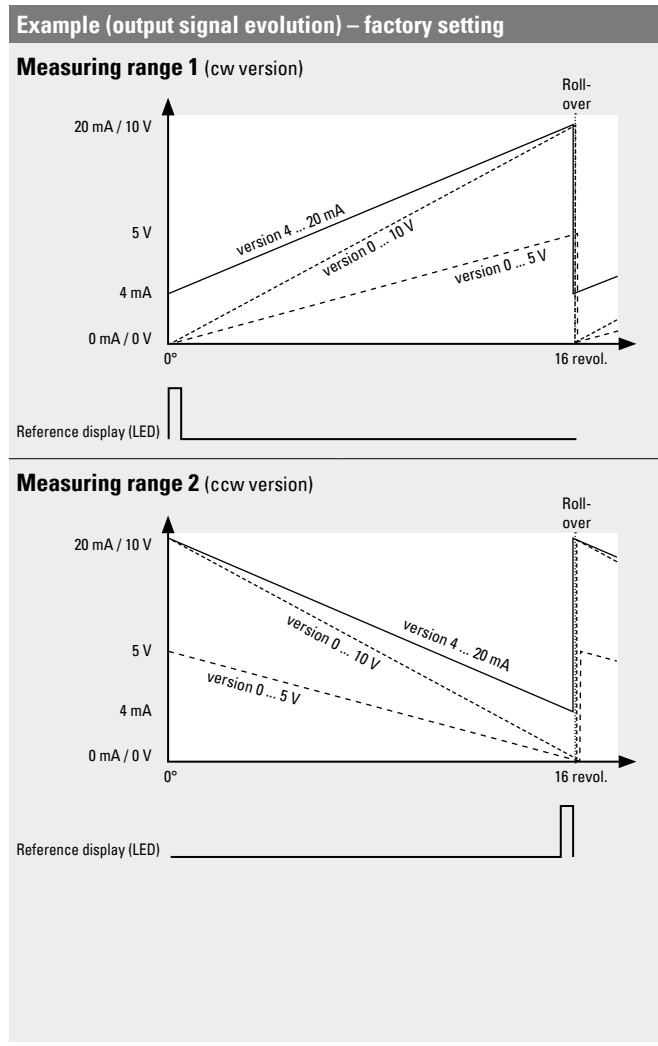
Mechanical characteristics	
Maximum speed	4000 min ⁻¹ 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	< 0.01 Nm
Shaft load capacity	radial 80 N axial 40 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9	IP65
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft V2A flange aluminum housing zinc die-cast cable PVC
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 4 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz

Electrical characteristics voltage interface 0 ... 10 V / 0 ... 5 V	
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
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ¹⁾
Measuring range	factory setting 2 ⁴ revolutions optionally scalable up to 2 ¹⁶ revolutions
DA converter resolution	0 ... 10 V 12 bit 0 ... 5 V 11 bit
Singleturn accuracy, at 25°C [77°F]	±1°
Temperature coefficient	< 100 ppm/K
Repeat accuracy, at 25°C [77°F]	±0.2°
Current output	max. 10 mA
Setting time	< 1 ms, R _{Load} = 1000 Ohm, 25°C [77°F]
LEDs (green/red)	<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
Teach inputs	level = +V for 1 s minimum
PowerON Time	< 1 s
Update rate	1 ms
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

1) When the power supply is correctly applied.
But not output to +V. Power supply and sensor output signal are not galvanically isolated.

Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5861 (shaft)	Analog
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Terminal assignment

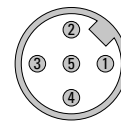
Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
3 (current)	2, B	Signal:	0 V	+V	+I	SET 1 ¹⁾	SET 2 ¹⁾
		Core color:	WH	BN	GN	GY	PK
Interface	Type of connection	M12 connector, 5 pin					
3 (current)	4	Signal:	0 V	+V	+I	SET 1 ¹⁾	SET 2 ¹⁾
		Pin:	3	2	1	5	4
Interface	Type of connection	Cable (isolate unused cores individually before initial start-up)					
4, 5 (voltage)	2, B	Signal:	0 V	+V	+U	SET 1 ¹⁾	SET 2 ¹⁾
		Core color:	WH	BN	GN	GY	PK
Interface	Type of connection	M12 connector, 5 pin					
4, 5 (voltage)	4	Signal:	0 V	+V	+U	SET 1 ¹⁾	SET 2 ¹⁾
		Pin:	3	2	1	5	4

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

+U: voltage
+I: current

SET 1: set input for teachpoint 1
SET 2: set input for teachpoint 2

Top view of mating side, male contact base



M12 connector, 5-pin

1) For scalable version.

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Bearings encoders
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Inclinometers
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Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5861 (shaft)	Analog
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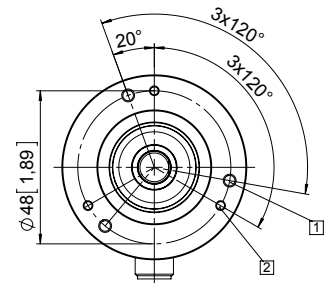
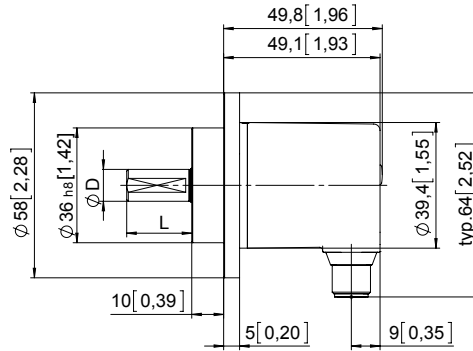
Dimensions

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28] Flange type 3

- 1 3 x M4, 10 [0.39] deep
- 2 3 x M3, 6 [0.24] deep

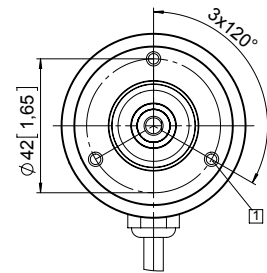
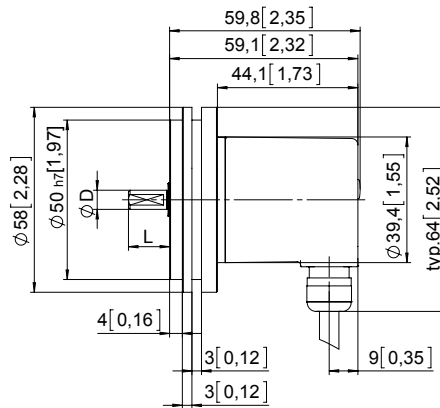
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]



Synchro flange, ø 58 [2.28] Flange type 4

- 1 3 x M4, 10 [0.39] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]



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Absolute encoders
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Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

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Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5863 (shaft)	SSI
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The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



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

Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Application oriented

- Absolute accuracy ±1°.
- Repeat accuracy ±0.2°.
- Short control cycles, clock frequency with SSI up to 2 MHz.
- Max. resolution 38 bit (14 bit ST + 24 bit MT).

Order code	8.M5863	.XX2X.XXX2
Shaft version	Type	a b c d e f g

- | | | |
|---|---|--|
| <p>a <i>Version</i>
3 = clamping flange, IP65, ø 58 mm [2.28"]
4 = synchro flange, IP65, ø 58 mm [2.28"]</p> <p>b <i>Shaft (ø x L), with flat</i>
1 = ø 6 x 12.5 mm [0.24 x 0.49"]
5 = ø 10 x 20 mm [0.39 x 0.79"]</p> <p>c <i>Interface / power supply</i>
2 = SSI / 10 ... 30 V DC</p> | <p>d <i>Type of connection</i>
2 = radial cable, 1 m [3.28'] PUR
B = radial cable, special length PUR *)
4 = radial M12 connector, 8-pin</p> <p>*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M5863.3524.G322.0030 (for cable length 3 m)</p> <p>e <i>Code</i>
B = SSI, binary
G = SSI, gray</p> | <p>f <i>Resolution (singleturn)</i>
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST</p> <p>g <i>Resolution (multiturn)</i>
2 = 12 bit MT
6 = 16 bit MT
A = 20 bit MT
4 = 24 bit MT</p> |
|---|---|--|

Optional on request
- Ex 2/22 (only for connection type 4)

Connection technology		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.1010
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin, 2 m [6.56'] PUR cable	05.00.6051.8211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0

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

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Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5863 (shaft)	SSI
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Technical data

Mechanical characteristics

Maximum speed		4000 min ⁻¹ 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial axial	80 N 40 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP65
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft flange housing cable	V2A aluminum zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		5000 m/s ² , 4 ms
Vibration resistance acc. to EN 60068-2-6		300 m/s ² , 10 ... 2000 Hz

Electrical characteristics

Power supply		10 ... 30 V DC
Current consumption (no load)		max. 30 mA
Reverse polarity protection of the power supply		yes
Short-circuit proof outputs		yes ¹⁾
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH LOW with I _{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution singleturn		10 ... 14 bit
Absolute accuracy²⁾		±1°
Repeat accuracy		±0.2°
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate		2 ms
Monoflop time		≤ 15 μs

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

SET input

Input		active HIGH
Input type		comparator
Signal level	HIGH LOW	min. 60 % of +V, max: +V max. 30 % of +V
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Input delay		1 ms
New position data readable after		1 ms
Internal processing time		200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

The number of preset value writing cycles is limited to 10,000.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms
----------------------------------	------

Power-ON

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

Hot plugging of the encoder should be avoided.

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

2) Over the whole temperature range.

Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5863 (shaft)	SSI
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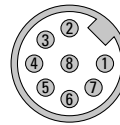
Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)									
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥
2	2, B	SET, DIR	Core color:	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	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
- DIR: Direction input
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

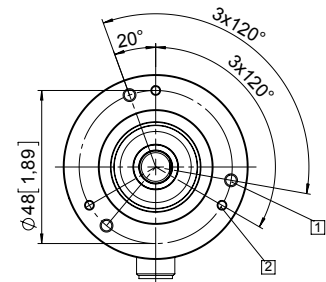
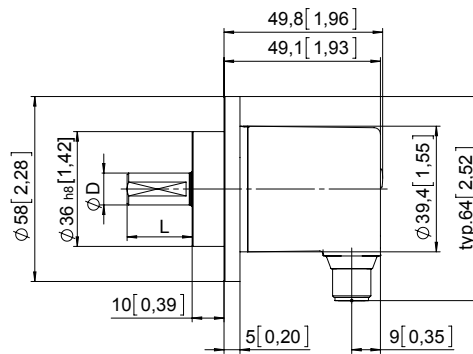
Dimensions

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28] Flange type 3

- 1 3 x M4, 10 [0.39] deep
- 2 3 x M3, 6 [0.24] deep

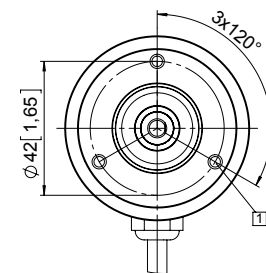
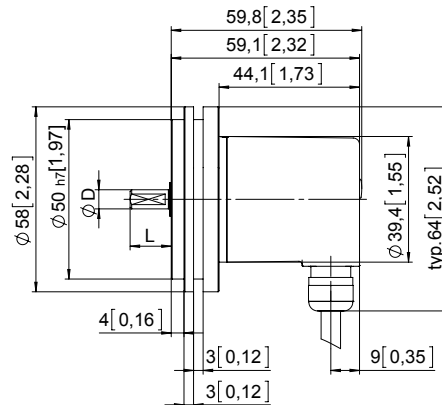
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]



Synchro flange, ø 58 [2.28] Flange type 4

- 1 3 x M4, 10 [0.39] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]



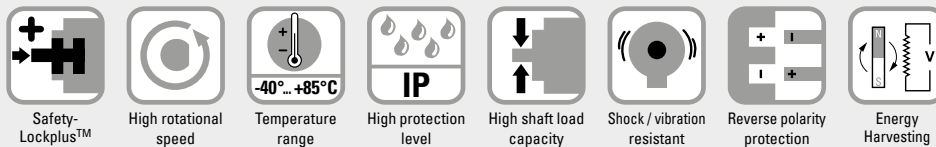
Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5868 (shaft)	CANopen
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The Sendix M58 with Energy Harvesting Technology is an electronic multiturn encoder without gear and without battery – in the standard format with 58 mm flange.

High robustness and high resolution make this encoder the ideal device for use in demanding applications.



Highest robustness

- Sturdy bearing construction in Safety-Lockplus™ design for particularly high resistance.
- Extra large bearings.
- Mechanically protected shaft seal.
- Wide temperature range -40°C ... +85°C.
- Without gear and without battery, thanks to the Energy Harvesting technology.

Up-to-the-minute fieldbus performance

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

Order code	8.M5868	.XX2X.2122
Shaft version	Type	a b c d e

a Version

- 3 = clamping flange, IP65, ø 58 mm [2.28"]
- 4 = synchro flange, IP65, ø 58 mm [2.28"]

b Shaft (ø x L), with flat

- 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
- 5 = ø 10 x 20 mm [0.39 x 0.79"]

c Interface / power supply

- 2 = CANopen DS301 V4.2 / 10 ... 30 V DC

d Type of connection

- 2 = radial cable, 1 m [3.28'] PVC
- B = radial cable, special length PVC *)
- 4 = radial M12 connector, 5-pin

*) Available special lengths (connection types B):
2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.M5868.312B.2122.0030 (for cable length 3 m)

e Fieldbus profile

- 21 = CANopen

Optional on request

- Ex 2/22 (only for connection type 4)

Connection technology		Order no.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.1010
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A211.005M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

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

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Standard electronic multiturn, magnetic	Sendix M5868 (shaft)	CANopen
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Technical data

Mechanical characteristics	
Maximum speed	4000 min ⁻¹ 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	< 0.01 Nm
Shaft load capacity	radial 80 N axial 40 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9	IP65
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Materials	shaft V2A flange aluminum housing zinc die-cast cable PVC
Shock resistance acc. to EN 60068-2-27	5000 m/s ² , 4 ms
Vibration resistance acc. to EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 30 mA
Reverse polarity protection of the power supply	yes
Short-circuit proof outputs	yes ¹⁾
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen	
Resolution singleturn	1 ... 16384 (14 bit), scalable default: 8192 (13 bit)
Absolute accuracy ²⁾	±1°
Repeat accuracy	±0.2°
Number of revolutions (multiturn)	max. 16.777.216 (24 bit) scalable only via the total resolution
Total resolution	1 ... 274.877.906.944 (38 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V4.0 with manufacturer-specific add-ons, LSS-Service, bootloader
Power-ON time	< 1200 ms
SDO timeout	< 1000 ms
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object
Bootloader	configuration management CIA DS 302-3

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1) Short circuit proof to 0 V or to output when power supply correctly applied.
2) Over the whole temperature range.

Absolute encoders – multiturn

Standard electronic multiturn, magnetic	Sendix M5868 (shaft)	CANopen
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General information about CANopen

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

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

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

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

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

The two-color LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus connection

The CANopen encoders are equipped with a bus trunk line in various lengths or a M12 connector and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

LSS layer setting services DS305 V2.0

- Global command support for node ID and baud rate configuration.
- Selective protocol via identity object (1018h).

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	2, B	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable color:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector, 5-pin					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated. (Class C2 functionality):

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

CANopen encoder profile DS406 V4.0

The following parameters can be programmed:

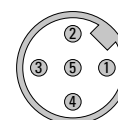
- Event mode, start optional.
- 1 work area with upper and lower limit and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error and acceleration.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status 1 LED two colors.
- Customer-specific protocol.
- "Watchdog controlled" device.

Bootloader functionality DS302-3

Configuration Management:

- Program download.
- Program start.
- Program erase.

Top view of mating side, male contact base



M12 connector, 5-pin

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Standard electronic multiturn, magnetic	Sendix M5868 (shaft)	CANopen
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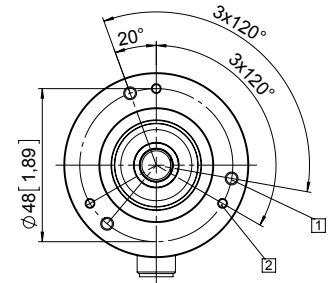
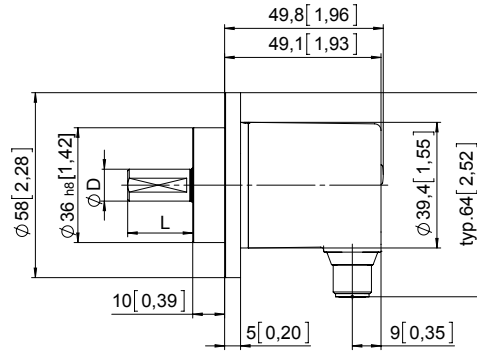
Dimensions

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28] Flange type 3

- 1 3 x M4, 10 [0.39] deep
- 2 3 x M3, 6 [0.24] deep

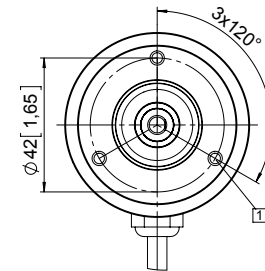
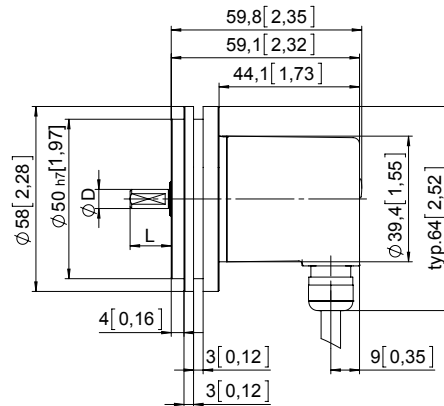
D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]



Synchro flange, ø 58 [2.28] Flange type 4

- 1 3 x M4, 10 [0.39] deep

D	Fit	L
6 [0.24]	h7	12.5 [0.49]
10 [0.39]	f7	20 [0.79]



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Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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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.



24 bit MT Multiturn resolution	Safety-Lock™	High rotational speed	-40°...+85°C Temperature range	IP High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Intelligent Scan Technology™	Surface protection salt spray-tested optional
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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 **8.F5863** . XXXX . XXXX
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.



<p>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"]</p> <p>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"</p>	<p>c Interface / power supply 1 = SSI, BiSS / 5 V DC 2 = <u>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</p> <p>d Type of connection 1 = axial cable, 1 m [3.28'] PVC A = axial cable, special length PVC *) 2 = <u>radial cable, 1 m [3.28'] PVC</u> B = radial cable, special length PVC *) 3 = axial M23 connector, 12-pin 4 = <u>radial M23 connector, 12-pin</u> 5 = axial M12 connector, 8-pin³⁾ 6 = radial M12 connector, 8-pin³⁾</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.F5863.122A.G323.0030 (for cable length 3 m)</p>	<p>e Code B = SSI, binary C = BiSS, binary G = <u>SSI, gray</u></p> <p>f Resolution (singleturn)⁴⁾ B = 9 bit ST A = 10 bit ST 1 = 11 bit ST 2 = 12 bit ST 3 = <u>13 bit ST</u> 4 = 14 bit ST 7 = 17 bit ST</p> <p><i>Optional on request</i> - Ex 2/22⁵⁾ - surface protection salt spray tested - other singleturn resolutions</p>	<p>g Resolution (multiturn)⁴⁾ 2 = <u>12 bit MT</u> 6 = 16 bit MT 4 = 24 bit MT</p> <p>h Options (service) 1 = no option 2 = status LED 3 = <u>SET button and status LED</u></p>
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1) Preferred type only in conjunction with flange type 2.
 2) Preferred type only in conjunction with flange type 1.
 3) Can be combined only with interface 1 and 2.

4) Resolution, preset value and counting direction factory-programmable.
 5) For the cable connection type, cable material PUR.

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Standard electronic multiturn, optical	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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Order code	Hollow shaft	Type	XXXXX.XXXXX	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	b	c	d	e	f
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"]	Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	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	Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12-pin 6 = radial M12 connector, 8-pin ²⁾	Code B = SSI, binary C = BiSS, binary G = SSI, gray	Resolution (multiturn) ¹⁾ 2 = 12 bit MT 6 = 16 bit MT 4 = 24 bit MT
			Resolution (singleturn) ¹⁾ B = 9 bit ST A = 10 bit ST 1 = 11 bit ST 2 = 12 bit ST 3 = 13 bit ST 4 = 14 bit ST 7 = 17 bit ST	Options (service) 1 = no option 2 = status LED 3 = SET button and status LED	
*) 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)					
Optional on request - Ex 2/22 (not for type of connection E, F) ³⁾ - surface protection salt spray tested - other singleturn resolutions					

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

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

Connection technology	Order no.
Cordset, pre-assembled	
M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6041.8211.002M
M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	8.0000.6901.0002.0031
Connector, self-assembly (straight)	
M12 female connector with coupling nut, 8-pin	05.CMB 8181-0
M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

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

1) Resolution, preset value and counting direction factory-programmable.
 2) Can be combined only with Interface 1 and 2.
 3) For the cable connection type, cable material PUR.

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Standard electronic multiturn, optical	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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Technical data

Mechanical characteristics

Maximum speed shaft version		
IP65 up to 70°C [158°F]	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)	
IP65 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
IP67 up to 70°C [158°F]	11000 min ⁻¹ , 9000 min ⁻¹ (continuous)	
IP67 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
Maximum speed hollow shaft version		
IP65 up to 70°C [158°F]	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)	
IP65 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)	
IP67 up to 70°C [158°F]	8000 min ⁻¹ , 4000 min ⁻¹ (continuous)	
IP67 up to T _{max}	4000 min ⁻¹ , 2000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft version	3.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +85°C [-40°F ... +185°F] ¹⁾
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics

Power supply		5 V DC (+5%) or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 60 mA
	10 ... 30 V DC	max. 30 mA
Reverse polarity protection of the power supply		yes (at 10 ... 30 V DC)
Short circuit proof outputs		yes ²⁾
UL approval		file no. E224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW at I _{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 17 bit
Number of revolutions (multiturn)		max. 24 bit
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs
	ST resolution ≥ 15 bit	4 μs
Monoflop time		≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.		

BiSS interface

Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 30 mA
Signal level	HIGH	typ 3.8 V
	LOW at I _{Load} = 20 mA	typ 1.3 V
Resolution singleturn		10 ... 17 bit
Number of revolutions (multiturn)		max. 24 bit
Code		binary
BiSS clock rate		50 kHz ... 10 MHz
Max. update rate		< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs
	ST resolution 17 bit	2.4 μs
Note:		
	– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings	
	– CRC data verification	

Status output and LED

Output driver		open collector, internal pull up resistor 22 kOhm
Permissible load		max. 20 mA
Signal level		HIGH: +V / LOW: < 1 V
Active		LOW
The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open collector with int. pull up 22 kOhm).		
An active status output (LOW) displays:		
	– sensor error, singleturn or multiturn (soiling, glass breakage etc.)	
	– LED fault (failure or ageing)	
	– over- or under-temperature	
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.		

Incremental outputs (A/B)

	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⁾
Pulse rate	2048 ppr	2048 ppr

1) Cable version: -30°C ... +75°C [-22°F ... +167°F].
2) Short circuit to 0 V or to output; if power supply correctly applied.

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Standard electronic multiturn, optical	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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SET input	
Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Input delay	1 ms
New position data readable after	1 ms
Internal processing time	200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.	
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

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

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**Standard
electronic multiturn, optical**

Sendix F5863 / F5883 (shaft / hollow shaft)

SSI / BiSS + incremental

Terminal assignment

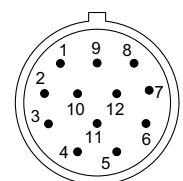
Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)
1, 2	1, 2, A, B, E, F	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Core color: WH BN GN YE GY PK BU RD BK - - - shield
1, 2	3, 4	SET, DIR, Status	M23 connector, 12-pin
			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
5	1, 2, A, B, E, F	SET, DIR, Status sensor output	Cable (isolate unused cores 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, 12-pin
			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 cores 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, 12-pin
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
6	1, 2, A, B, E, F	SinCos o. incr. RS422 sensor output	Cable (isolate unused cores individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
6	3, 4	SinCos o. incr. RS422 sensor output	M23 connector, 12-pin
			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, 8-pin
			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
- DIR: Direction input
- 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

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Absolute encoders – multiturn

Standard electronic multiturn, optical

Sendix F5863 / F5883 (shaft / hollow shaft)

SSI / BiSS + incremental

Dimensions shaft version

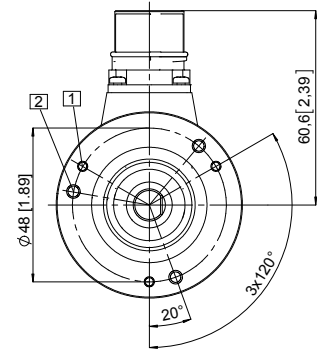
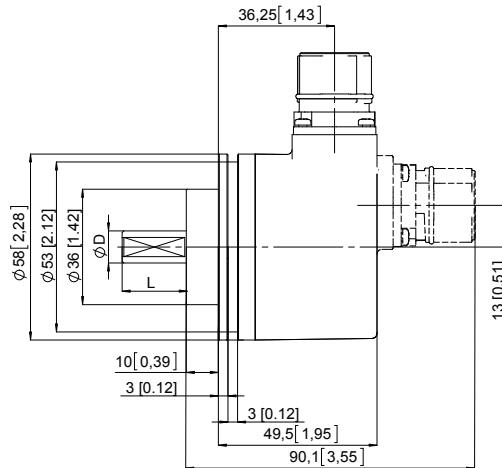
Dimensions in mm [inch]

Clamping flange, \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



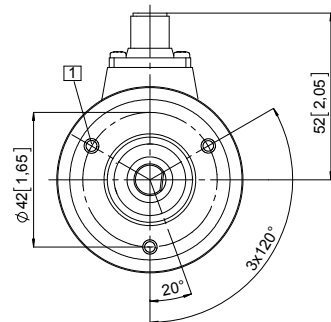
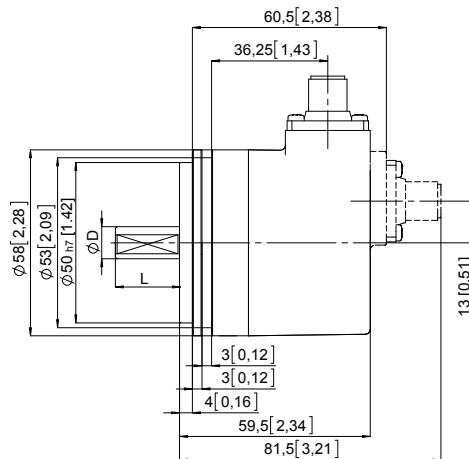
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep



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

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Standard electronic multiturn, optical	Sendix F5863 / F5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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Dimensions hollow shaft version

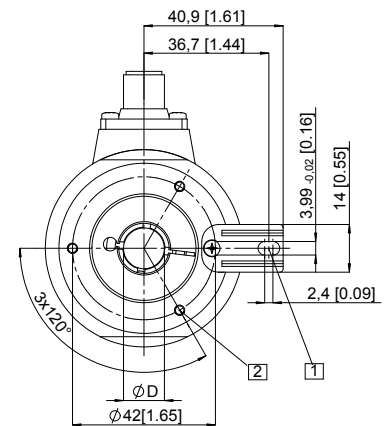
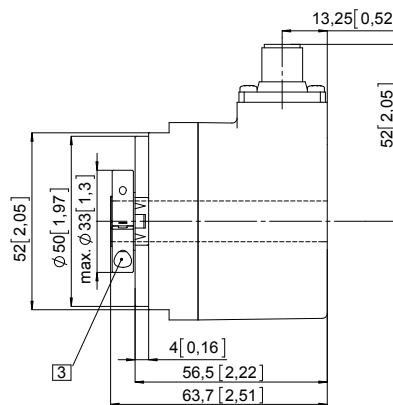
Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

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

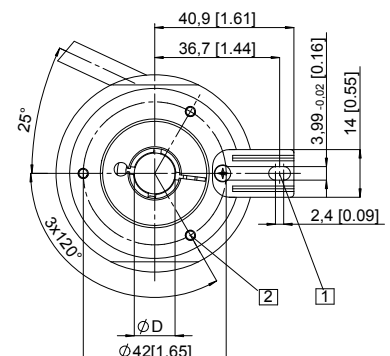
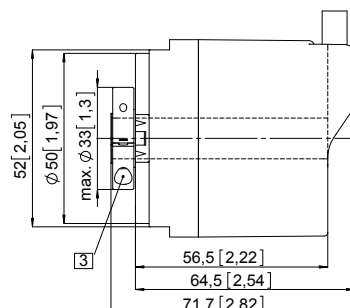
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7



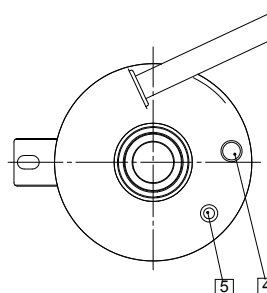
(drawing with tangential cable)

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

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



- 4 Status-LED
- 5 SET button



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Standard electronic multiturn, optical

Sendix F5863 / F5883 (shaft / hollow shaft)

SSI / BiSS + incremental

Dimensions hollow shaft version

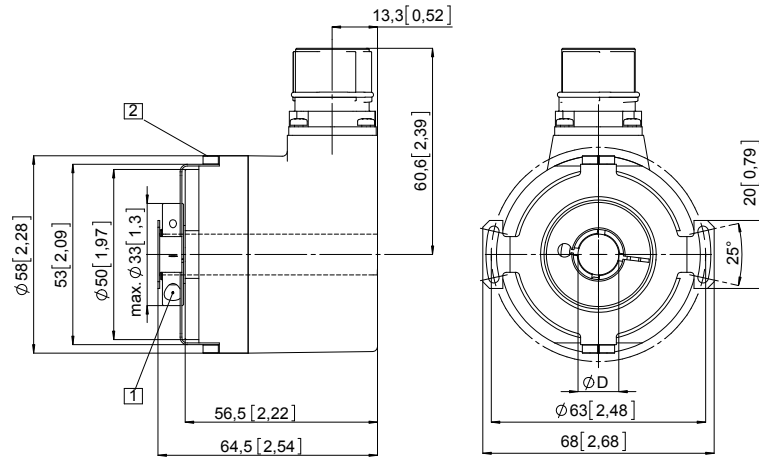
Dimensions in mm [inch]

Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6

Pitch circle diameter for fixing screws
63 mm [2.48]
(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Fixing screws (4x) DIN 912 M3 x 8 (washer included in delivery)



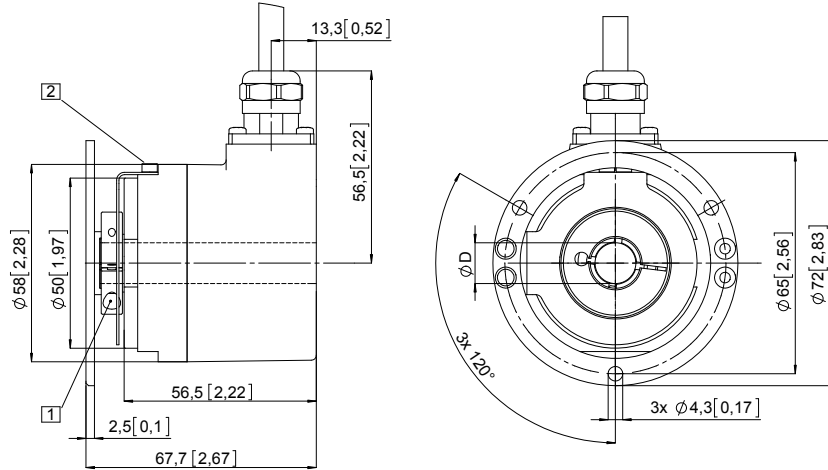
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
3/8"	H7
1/2"	H7

Flange with stator coupling, \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
- 2 Fixing screws (2x) DIN 912 M3 x 8 (washer included in delivery)



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

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Standard Motor-Line, electronic multiturn, optical	Sendix F5883M (hollow shaft)	SSI / BiSS + incremental
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The optical Sendix F5883 multiturn encoder in the Motor-Line version stands out particularly because of its reduced overall depth of only 43 mm with a through hollow shaft up to 15 mm.

This opens up new possibilities when dimensioning the motors and for installation in tight mounting spaces. Its technical features make the F5883 Motor-Line the ideal device for use in geared motors.



24 bit MT Multiturn resolution	Safety-Lock™	High rotational speed	-40°...+85°C Temperature range	IP High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Intelligent Scan Technology™	Surface protection salt spray-tested optional
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Compact and robust

- Suitable for restricted mounting spaces thanks to its small construction depth of 43 mm and its tangential cable outlet.
- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

Versatile

- Through hollow shaft up to max. 15 mm and clamping both on the flange and on the cover side – suitable for usual drive shafts for geared motors, flexible installation.
- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- SET button and LED for simple start-up.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code
Hollow shaft

8.F5883M . XXXX . XXXX
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.



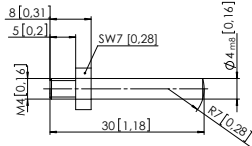
<p>a Flange 1 = with spring element, long, IP65 5 = with stator coupling, IP65, ø 63 mm [2.48"] 9 = with torque stop, flexible, IP65</p> <p>b Through hollow shaft <i>Clamping on the flange side</i> 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 9 = ø 1/2"</p> <p><i>Clamping on the cover side</i> A = ø 12 mm [0.39"] B = ø 14 mm [0.55"] C = ø 15 mm [0.59"]</p>	<p>c Interface / power supply 1 = SSI, BiSS / 5 V DC 2 = SSI, BiSS / 10 ... 30 V DC 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC 5 = SSI, BiSS / 5 V DC, with sensor output 6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output 7 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 5 V DC 8 = SSI, BiSS + 2048 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC A = SSI, BiSS + 1024 ppr. RS422 (TTL-comp.) / 5 V DC B = SSI, BiSS + 1024 ppr. RS422 (TTL-comp.) / 10 ... 30 V DC</p> <p>d Type of connection E = tangential cable, 1 m PVC F = tangential cable, special length PVC *)</p> <p>*) Available special lengths (connection type F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21"] order code expansion .XXXX = length in dm ex.: 8.F5883M.542FG323.0030 (for cable length 3 m)</p>	<p>e Code B = SSI, binary C = BiSS, binary G = SSI, gray</p> <p>f Resolution (singleturn) ¹⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit</p> <p><i>Optional on request</i> - surface protection salt spray tested - other singleturn resolutions</p>	<p>g Resolution (multiturn) ¹⁾ 2 = 12 bit MT 6 = 16 bit MT 4 = 24 bit MT</p> <p>h Options (service) 1 = no option 2 = status LED 3 = SET button and status LED</p>
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1) Resolution, preset value and counting direction factory-programmable.

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Absolute encoders – multiturn

Standard Motor-Line, electronic multiturn, optical	Sendix F5883M (hollow shaft)	SSI / BiSS + incremental
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Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1)	with fixing thread 	8.0010.4700.0000

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

Technical data

Mechanical characteristics	
Maximum speed	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	< 0.01 Nm
Mass moment of inertia	6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection	IP65
Working temperature range	-40°C ... +85°C [-40°F ... +185°F] ¹⁾
Material	hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	5 V DC (+5%) or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 60 mA 10 ... 30 V DC max. 30 mA
Reverse polarity protection of the power supply	yes (at 10 ... 30 V DC)
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 30 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution singleturn	10 ... 17 bit
Number of revolutions (multiturn)	max. 24 bit
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	

BiSS interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 30 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution singleturn	10 ... 17 bit
Number of revolutions (multiturn)	max. 24 bit
Code	binary
BiSS clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 μs
Note:	– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

Status output and LED	
Output driver	open collector, internal pull up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH: +V / LOW: < 1 V
Active	LOW
The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open collector with int. pull up 22 kOhm).	
An active status output (LOW) displays:	
– sensor error, singleturn or multiturn (soiling, glass breakage etc.) – LED fault (failure or ageing) – over- or under-temperature	
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.	

Incremental outputs (A/B)		
	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⁾
Pulse rate	1024 / 2048 ppr	1024 / 2048 ppr

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).
2) Short circuit to 0 V or to output; if power supply correctly applied.

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Standard Motor-Line, electronic multiturn, optical	Sendix F5883M (hollow shaft)	SSI / BiSS + incremental
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SET input	
Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Input Delay	1 ms
New position data readable after	1 ms
Internal processing time	200 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.	
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⊥
1, 2	E, F	SET, DIR, Status	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	shield
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	N/C	N/C	⊥
5	E, F	SET, DIR, Status sensor output	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY-PK	RD-BU	shield
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	N/C	0Vsens	+Vsens	⊥
3, 4, 7, 8, A, B	E, F	SET, DIR, SinCos or incr. RS422	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	⊥
6	E, F	SinCos or incr. RS422 sensor output	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
			Signal:	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{B}	0Vsens	+Vsens	⊥

- +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
- DIR: Direction input
- Stat: Status output
- PH ⊥: Plug connector housing (shield)

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Standard
Motor-Line, electronic multiturn, optical

Sendix F5883M (hollow shaft)

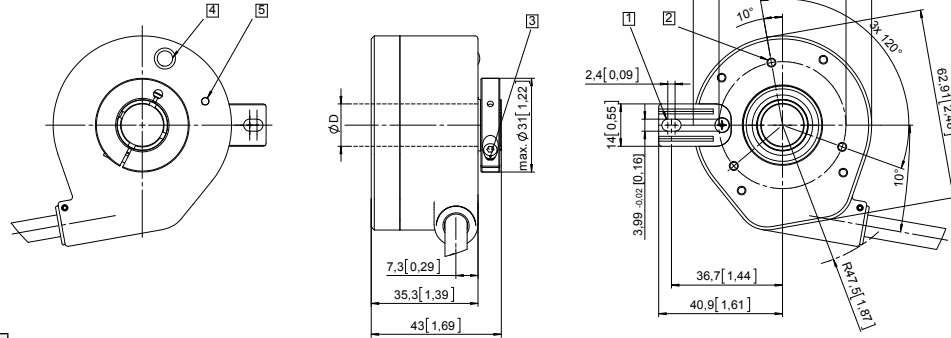
SSI / BiSS + incremental

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm
- 4 Status-LED
- 5 SET button



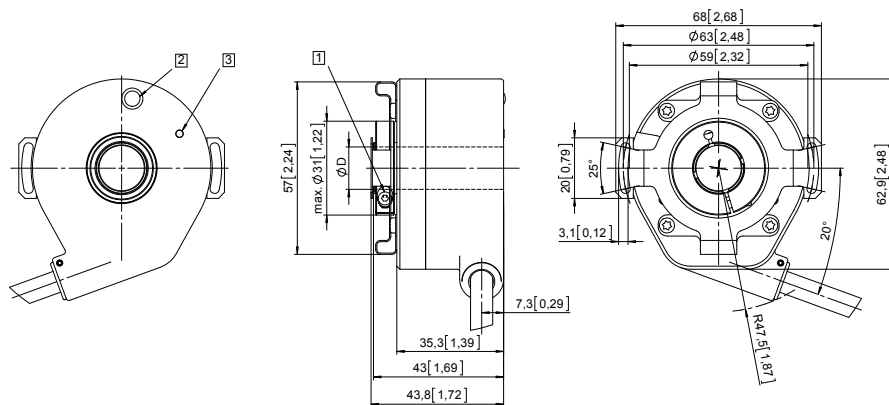
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5

Pitch circle diameter for fixing screws 63 mm [2.48]

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Status-LED
- 3 SET button

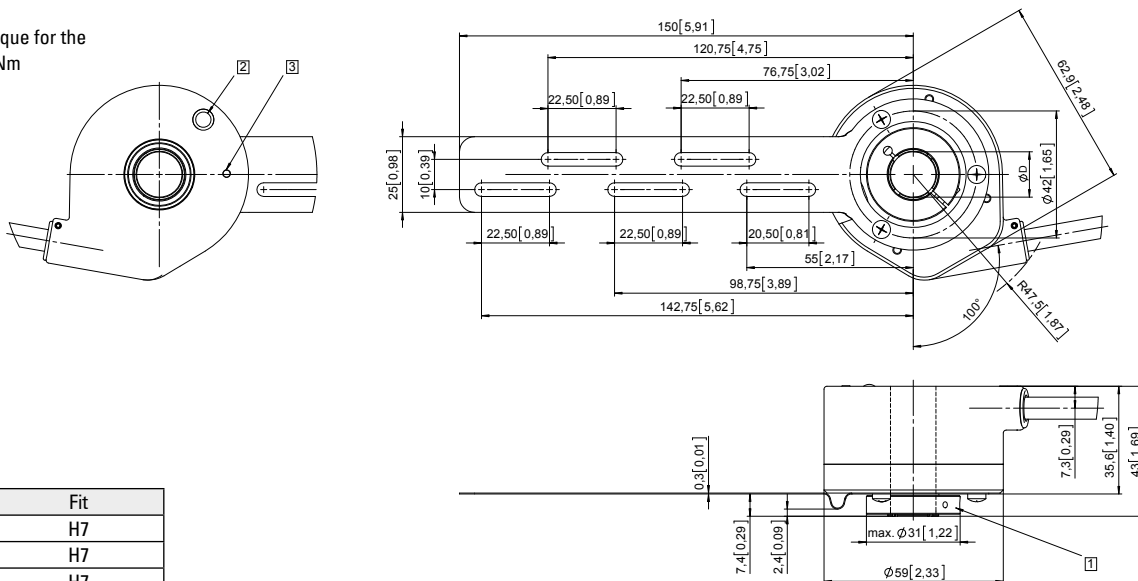


D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

Flange with torque stop, flexible

Flange type 9

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Status-LED
- 3 SET button



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

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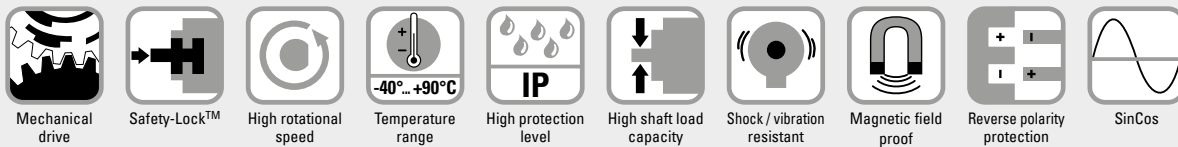
Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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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.

Order code

Shaft version

8.5863
Type

.XXXX.XX2X
a b c d e f g

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



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

g Options (service)

- 1 = no option
- 2 = status LED
- 3 = SET button and status LED**

Optional on request

- Ex 2/22⁶⁾
- other singleturn resolutions
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested:
8.5863.32X6.XX22-C



stainless steel V4A:
8.5863.32X6.XX22-V4A

1) US version.

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

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

4) Only in conjunction with interface type 1 and 2.

5) Resolution, preset value and counting direction factory-programmable.

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

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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Order code	Hollow shaft	8.5883 <small>Type</small>	XXXXX.XX2X <small>a b c d e f g</small>	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 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"]		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>		g Options (service) 1 = no option 2 = status LED <u>3 = SET button and status LED</u>	
b Through hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 8 = ø 3/8" 9 = ø 1/2" <i>Blind hollow shaft</i> <i>(insertion depth max. 30 mm [1.18"])</i> 6 = ø 15 mm [0.59"]		i 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		Optional on request - Ex 2/22 (not for type of connection E, F) ³⁾ - other singleturn resolutions - surface protection salt spray tested - seawater resistant (stainless steel V4A)		Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit) salt spray tested: 8.5883.24X6.XX22-C 8.5883.25X6.XX22-C	
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				stainless steel V4A: 8.5883.24X6.XX22-V4A			

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.1010
Mounting accessory for hollow shaft encoders		Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	Dimensions in mm [inch] with fixing thread 	8.0010.4700.0000
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56'] PVC cable	05.00.6041.8211.002M
	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	8.0000.6901.0002.0031
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0
	M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

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

1) Resolution, preset value and counting direction factory-programmable.
 2) Only in conjunction with interface type 1 and 2.
 3) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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Technical data

Mechanical characteristics

Maximum speed shaft version		
IP65 up to 70°C [158°F]	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)	
IP65 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
IP67 up to 70°C [158°F]	11000 min ⁻¹ , 9000 min ⁻¹ (continuous)	
IP67 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
Maximum speed hollow shaft version		
IP65 up to 70°C [158°F]	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)	
IP65 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)	
IP67 up to 70°C [158°F]	8000 min ⁻¹ , 4000 min ⁻¹ (continuous)	
IP67 up to T _{max}	4000 min ⁻¹ , 2000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]		
IP65	< 0.01 Nm	
IP67	< 0.05 Nm	
Mass moment of inertia		
shaft version	4.0 x 10 ⁻⁶ kgm ²	
hollow shaft version	7.0 x 10 ⁻⁶ kgm ²	
Load capacity of shaft		
radial	80 N	
axial	40 N	
Weight		
	approx. 0.45 kg [15.87 oz]	
Protection acc. to EN 60529		
housing side	IP67	
shaft side	IP65, opt. IP67	
Working temperature range		
	-40°C ... +90°C [-40°F ... +194°F] ¹⁾	
Material		
shaft/hollow shaft	stainless steel	
flange	aluminum	
housing	zinc die-cast	
cable	PVC (PUR for Ex 2/22)	
Shock resistance acc. to EN 60068-2-27		
	2500 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6		
	100 m/s ² , 55 ... 2000 Hz	

Electrical characteristics

Power supply	5 V DC (+5%) or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 80 mA 10 ... 30 V DC max. 50 mA
Reverse polarity protection of the power supply	yes (at 10 ... 30 V DC)
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SSI interface

Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ. 3.8 V LOW at I _{Load} = 20 mA typ. 1.3 V
Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs

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

BiSS interface

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
Clock rate	50 kHz ... 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 μs
Note:	– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

Status output and LED

Output driver	open collector, internal pull up resistor 22 kΩ
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 kΩ).	
An active status output (LOW) displays:	
– sensor error, singleturn or multiturn (soiling, glass breakage etc.)	
– LED fault (failure or ageing)	
– over- or under-temperature	
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.	

Incremental outputs (A/B)

	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⁾
Pulse rate	2048 ppr	2048 ppr

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 + incremental
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SET input or SET button	
Input	active HIGH
Input type	comparator
Signal level	HIGH min: 60 % of +V (power supply) max: +V
	LOW max: 25 % of +V (power supply)
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
<p>Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.</p> <p>If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.</p>	
Response time (DIR input)	1 ms

Power-ON	
<p>After Power-ON the device requires a time of approx. 150 ms before valid data can be read.</p> <p>Hot plugging of the encoder should be avoided.</p>	

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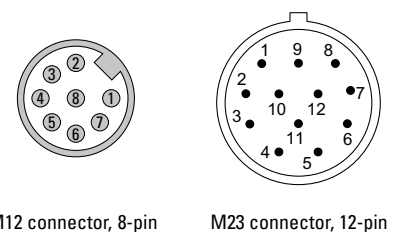
Standard mechanical multiturn, optical	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores 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
			Core color: WH BN GN YE GY PK BU RD BK - - - shield
1, 2	3, 4	SET, DIR, Status	M23 connector, 12-pin
			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
5	1, 2, A, B, E, F	SET, DIR, Status sensor output	Cable (isolate unused cores individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
			Core color: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield
5	3, 4	SET, DIR, Status sensor output	M23 connector, 12-pin
			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
3, 4, 7, 8	1, 2, A, B, E, F	SET, DIR, SinCos or incr. RS422	Cable (isolate unused cores individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
			Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
3, 4, 7, 8	3, 4	SET, DIR, SinCos or incr. RS422	M23 connector, 12-pin
			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
6, 9	1, 2, A, B, E, F	SinCos o. incr. RS422 sensor output	Cable (isolate unused cores individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			Core color: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
6, 9	3, 4	SinCos o. incr. RS422 sensor output	M23 connector, 12-pin
			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
1, 2	5, 6	SET, DIR	M12 connector, 8-pin
			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
- DIR: Direction input
- 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 + incremental

Dimensions shaft version

Dimensions in mm [inch]

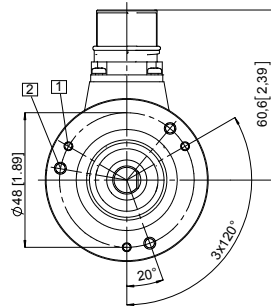
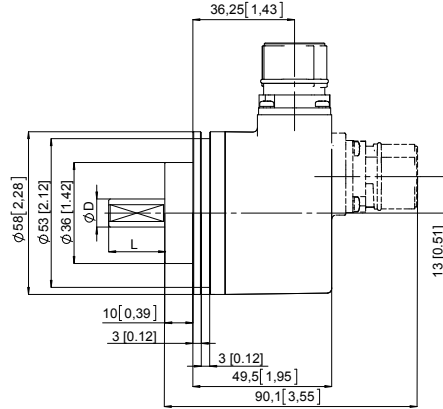
Clamping flange, \varnothing 58 [2.28]

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



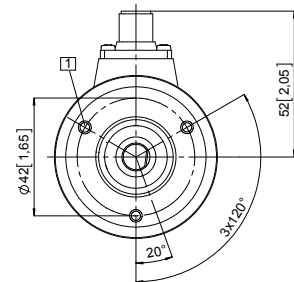
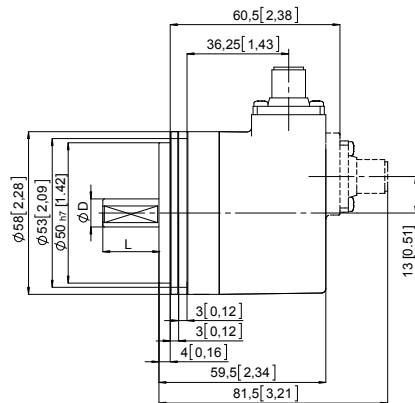
Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep

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

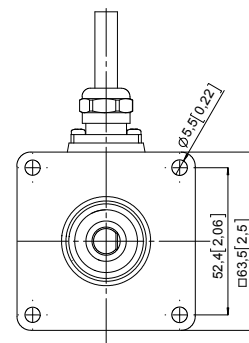
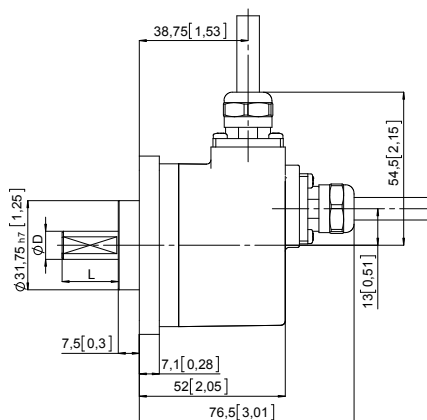


Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(drawing with cable)

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



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Standard mechanical multiturn, optical	Sendix 5863 / 5883 (shaft / hollow shaft)	SSI / BiSS + incremental
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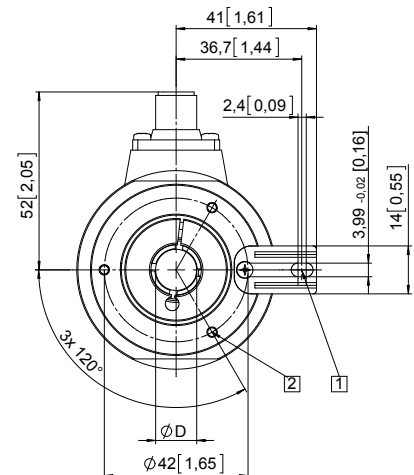
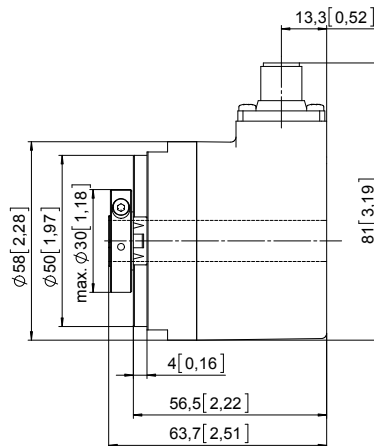
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

(drawing with M12 connector)

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

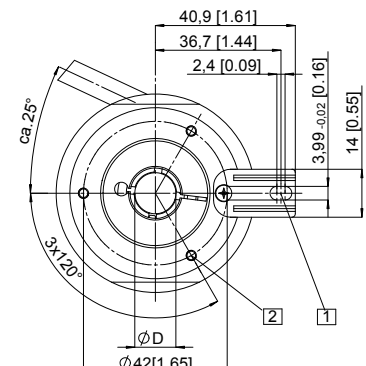
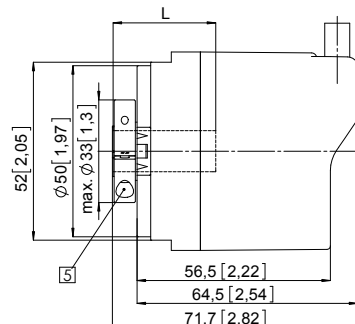


D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59] *)	H7
3/8"	H7
1/2"	H7

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]

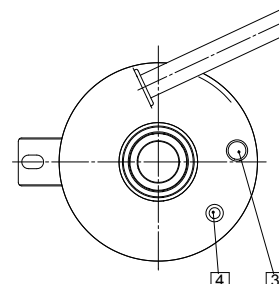
(drawing with tangential cable)

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Status-LED
- 4 SET button
- 5 Recommended torque for the clamping ring 0.6 Nm



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

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]



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Standard mechanical multiturn, optical

Sendix 5863 / 5883 (shaft / hollow shaft)

SSI / BiSS + incremental

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

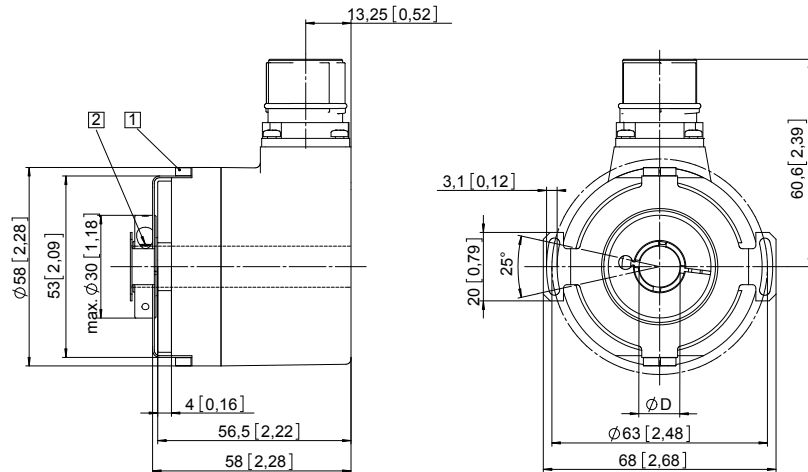
63 [2.48]

(drawing with M23 connector)

- 1 Fixing screws DIN 912 M2,5 x 6 (washer included in delivery)
- 2 Recommended torque for the clamping ring 0.6 Nm

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

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]



Flange with stator coupling, \varnothing 65 [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

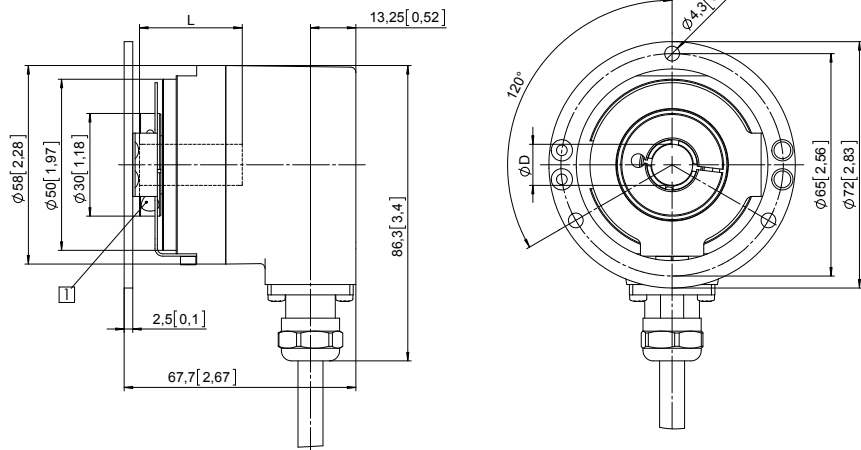
65 [2.56]

(drawing with cable)

- 1 Recommended torque for the clamping ring 0.6 Nm

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

*) Blind hollow shaft, insertion depth (L) max. = 30 mm [1.18"]



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Standard SIL2/PLd, mech. multiturn, optical	Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)	SSI/BiSS + SinCos
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The absolute multiturn encoders 5863FS2 and 5883FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

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



Mechanical drive	Safety-Lock™	High rotational speed	Temperature range -40°...+90°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	SinCos	Optical sensor
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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	. 1 X X X . X X 2 X
Shaft version	Type	a b c d e f g

- 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** Options (service)
1 = no option
2 = status LED
3 = SET button and status LED

Optional on request
- Ex 2/22 ²⁾
- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.

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Absolute encoders – multiturn

Standard SIL2/PLd, mech. multiturn, optical	Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)	SSI/BiSS + SinCos
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Order code Hollow shaft	8.5883FS2 Type	.XXXX.XX2X a b c d e f g
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"]	d Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12 pin *) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5883FS2.B44B.G322.0030 (for cable length 3 m)	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
b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] <i>Tapered shaft</i> K = ø 10 mm [0.39"]	e Code B = SSI, binary C = BiSS, binary G = SSI, gray	g 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) ²⁾ - other singleturn resolutions
c Interface / power supply 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC		

Accessories		Order no.
EMC shield terminal	for top-hat rail mounting	8.0000.4G06.0000
Screw retention	Loctite 243, 5 ml	8.0000.4G05.0000
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .	
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .	
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display .	

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

Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable ³⁾	8.0000.6901.0002.0031
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable ³⁾	8.0000.6905.0002.0032
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	8.0000.5012.0000

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

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

Absolute encoders – multiturn

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

Notes regarding “Functional Safety”
 These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.
 Additional functions can be found in the operating manual.

Safety characteristics	
Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 80 mA 10 ... 30 V DC max. 50 mA
Reverse polarity protection of the power supply	yes
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics	
Maximum speed shaft version	up to 70°C [158°F] 12000 min ⁻¹ , 10000 min ⁻¹ (continuous) up to T _{max} 8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed hollow shaft version	up to 70°C [158°F] 9000 min ⁻¹ , 6000 min ⁻¹ (continuous) up to T _{max} 6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	shaft version < 0.01 Nm hollow shaft version < 0.03 Nm
Mass moment of inertia	shaft version 4.0 x 10 ⁻⁶ kgm ² hollow shaft version 7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft	hollow shaft version min. 34 mm [1.34"]
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ³⁾
Material	shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

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

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 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 ²⁾
Pulse rate	2048 ppr

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
 The encoder evaluation unit must meet at least the requirements for SIL2.
 2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.
 3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

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Absolute encoders – multiturn

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

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

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.	

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.	
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Reaction time (DIR input)	1 ms

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

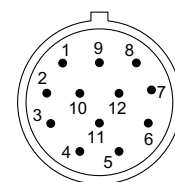
Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core color:	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
- DIR: Direction input
- 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

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Absolute encoders – multiturn

Standard
SIL2/PLd, mech. multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)

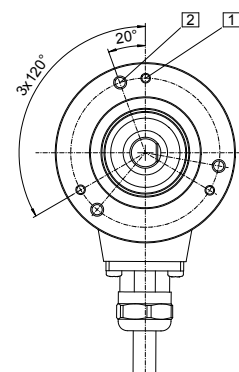
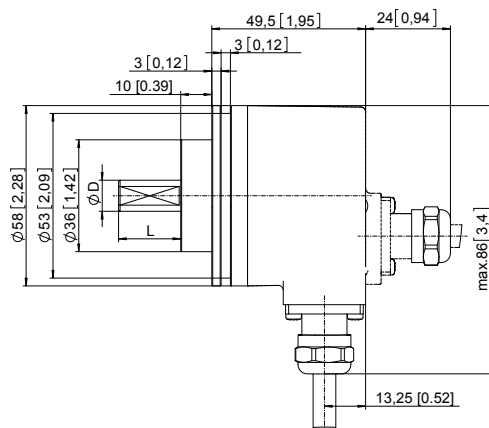
SSI/BiSS + SinCos

Dimensions shaft version

Dimensions in mm [inch]

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

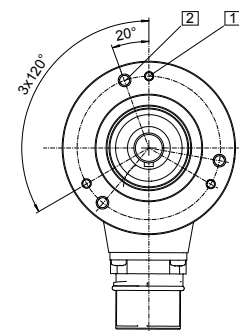
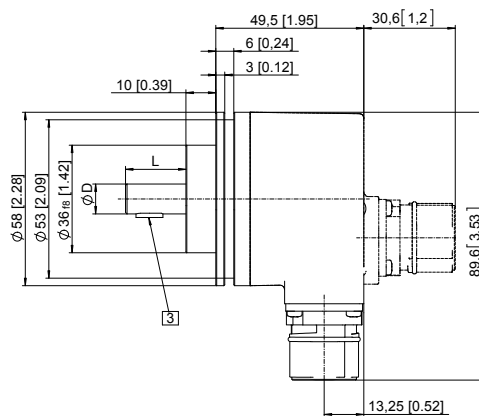
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



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

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

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



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

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]

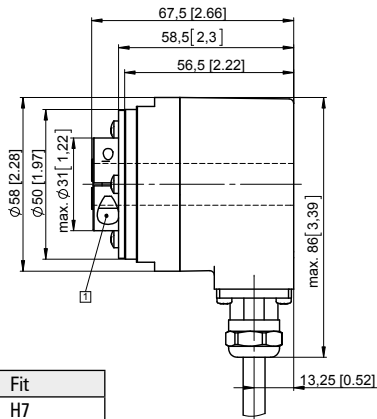
Flange with torque stop set, rigid

Flange type A

Through hollow shaft

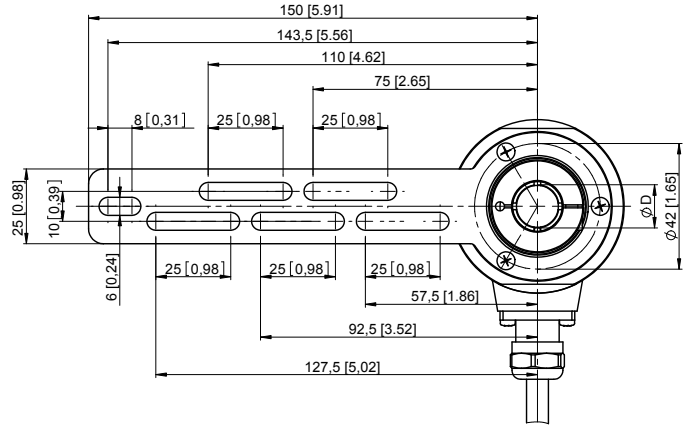
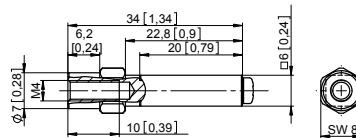
(drawing with cable)

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



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

Torque pin with rectangular sleeve with M4 thread



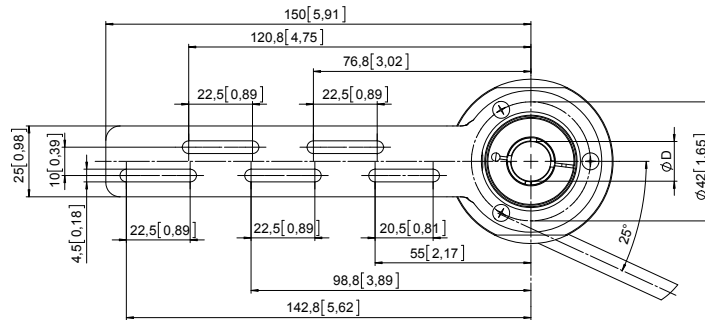
Flange with torque stop, flexible

Flange type 9

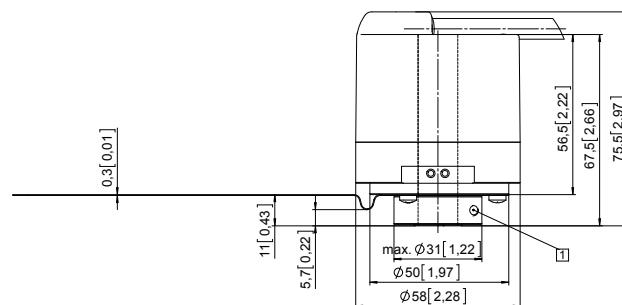
Through hollow shaft

(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm



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



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SIL2/PLd, mech. multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (shaft / hollow shaft)

SSI/BiSS + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, ø 63 [2.48]

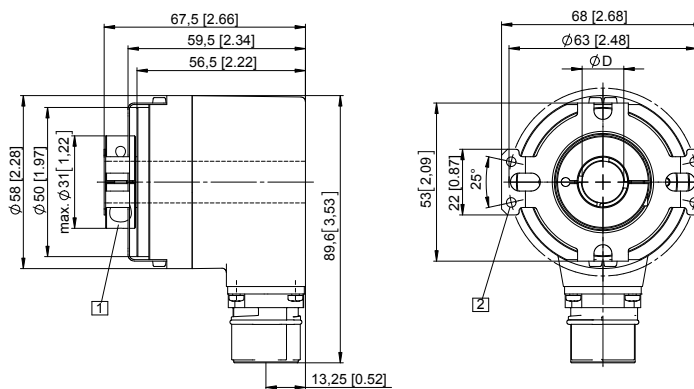
Flange type B

Through hollow shaft

(drawing with M23 connector)

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

- 2 For (4x) M3 screw



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

Flange with stator coupling, ø 63 [2.48]

Flange type B

Tapered shaft

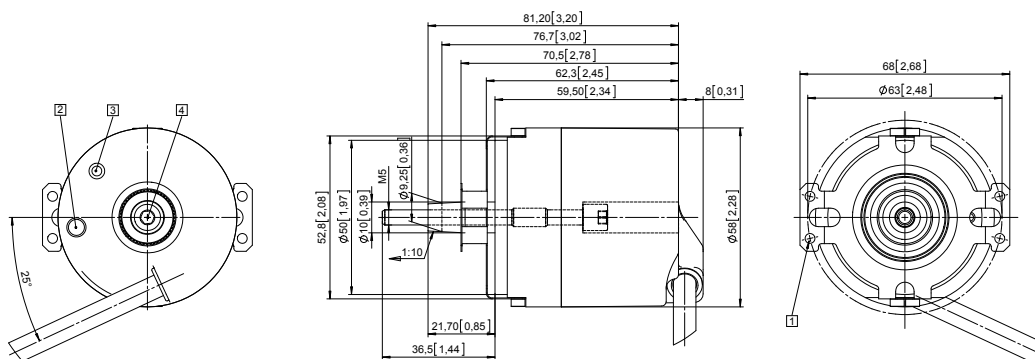
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



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Absolute encoders – multiturn

Standard
SIL3/PLe, mech. multiturn, optical

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

SSI / BiSS + SinCos

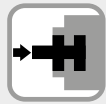


The absolute multiturn encoders 5863FS3 and 5883FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 according to EN 61800-5-2 or PLe to EN ISO 13849-1.

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.



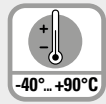
Mechanical drive



Safety-Lock™



High rotational speed



Temperature range



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Flexible

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

Order code
Shaft version

8.5863FS3
Type

1 **X** **X** **X** . **X** **X** **2** **X**
a b c d e f g

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 Options (service)

1 = no option
2 = status LED
3 = SET button and status LED

Optional on request

- Ex 2/22 ²⁾
- other singleturn resolutions

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.

Absolute encoders – multiturn

Standard SIL3/PLe, mech. multiturn, optical	Sendix SIL 5863FS3 / 5883FS3 (shaft / hollow shaft)	SSI/BiSS + SinCos
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Order code Hollow shaft	8.5883FS3 Type	. X X X X . X X 2 X
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<p>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"]</p> <p>b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] <i>Tapered shaft</i> K = ø 10 mm [0.39"]</p> <p>c Interface / power supply 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC</p>	<p>d Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12 pin *) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5883FS3.B44B.G322.0030 (for cable length 3 m)</p> <p>e Code B = SSI, binary C = BiSS, binary G = SSI, gray</p>	<p>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</p> <p>g Options (service) 1 = no option 2 = status LED 3 = SET button and status LED</p> <p><i>Optional on request</i> - Ex 2/22 (not for type of connection E, F) ²⁾ - other singleturn resolutions</p>
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Accessories	Order no.
EMC shield terminal	for top-hat rail mounting 8.0000.4G06.0000
Screw retention	Loctite 243, 5 ml 8.0000.4G05.0000
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .
LED SSI display 570 / 575	Electronic position display up to 32 bit. You will find an overview in the accessories section or under www.kuebler.com/position_display .

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

Connection technology	Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin single-ended, 2 m [6.56'] PVC cable ³⁾ 8.0000.6901.0002.0031
	M23 female connector with coupling nut, 12-pin M23 male connector with external thread, 12-pin 2 m [6.56'] PVC cable ³⁾ 8.0000.6905.0002.0032
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin 8.0000.5012.0000

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

1) Resolution, preset value and count direction are factory-programmable.
2) For the cable connection type, cable material PUR.
3) Other lengths available.

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

Notes regarding "Functional Safety"

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

Safety characteristics	
Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008; EN ISO 13849-2:2013; EN 61800-5-2:2007

Electrical characteristics	
Power supply	5 V DC (±5 %) or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 80 mA 10 ... 30 V DC max. 50 mA
Reverse polarity protection of the power supply	yes
Short circuit proof outputs	yes ²⁾
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

Mechanical characteristics	
Maximum speed shaft version up to 70°C [158°F] 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 hollow shaft version	< 0.01 Nm < 0.03 Nm
Mass moment of inertia shaft version hollow shaft version	4.0 x 10 ⁻⁶ kgm ² 7.0 x 10 ⁻⁶ kgm ²
Insertion depth for shaft hollow shaft version	min. 34 mm [1.34"]
Load capacity of shaft radial axial	80 N 40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ³⁾
Material shaft / hollow shaft flange housing cable	stainless steel aluminum zinc die-cast PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

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

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level HIGH LOW at I _{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate ST resolution ≤ 14 bit ST resolution ≥ 15 bit	≤ 1 μs 4 μs
Monoflop time	≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	

BiSS interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level HIGH LOW at I _{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution 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 ST resolution ≤ 14 bit ST resolution 17 bit	≤ 1 μs 2.4 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 ²⁾
Pulse rate	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 to 0 V or to output, one channel at a time, power supply correctly applied.
3) Cable version: -30°C ... +90°C [-22°F ... +194°F].

Absolute encoders – multiturn

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

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

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.	

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.	
If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Reaction time (DIR input)	1 ms

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

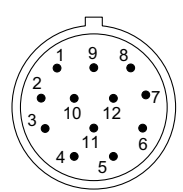
Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core color:	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
- DIR: Direction input
- 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

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Absolute encoders – multiturn

Standard
SIL3/PLe, mech. multiturn, optical

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

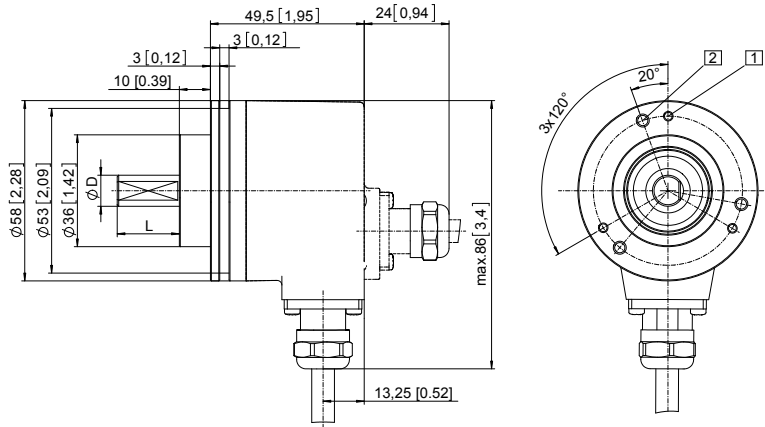
SSI/BiSS + SinCos

Dimensions shaft version

Dimensions in mm [inch]

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

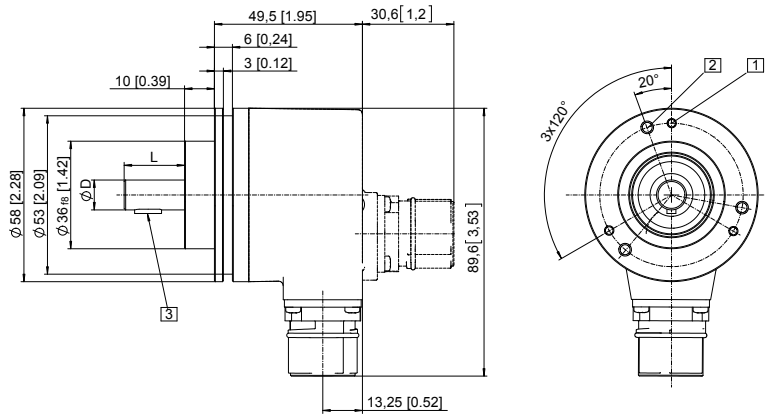
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



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

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

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



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

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Absolute encoders – multiturn

Standard
SIL3/PLe, mech. multiturn, optical

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

SSI/BiSS + SinCos

Dimensions hollow shaft version

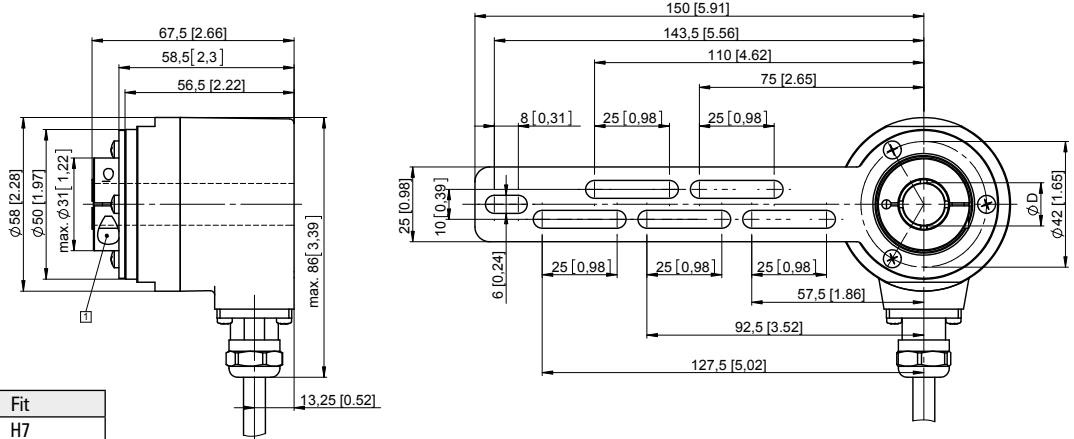
Dimensions in mm [inch]

Flange with torque stop set, rigid

Flange type A

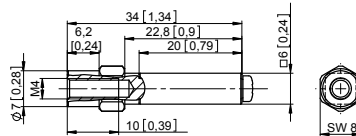
Through hollow shaft
(drawing with cable)

SW 3, recommended torque for the clamping ring 2.5 Nm



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

Torque pin with rectangular sleeve with M4 thread



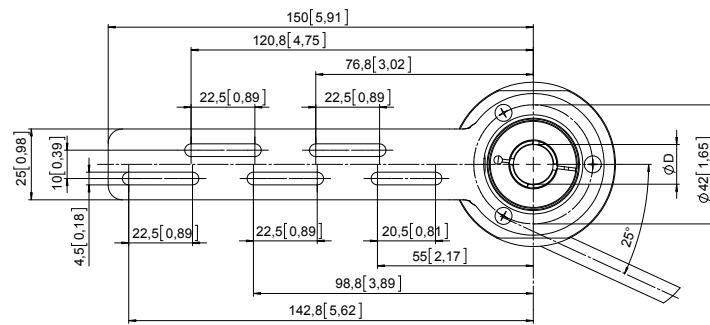
Flange with torque stop, flexible

Flange type 9

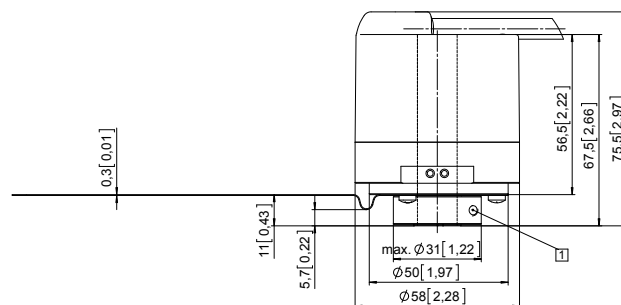
Through hollow shaft

(drawing with M23 connector)

Recommended torque for the clamping ring 2.5 Nm



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



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]

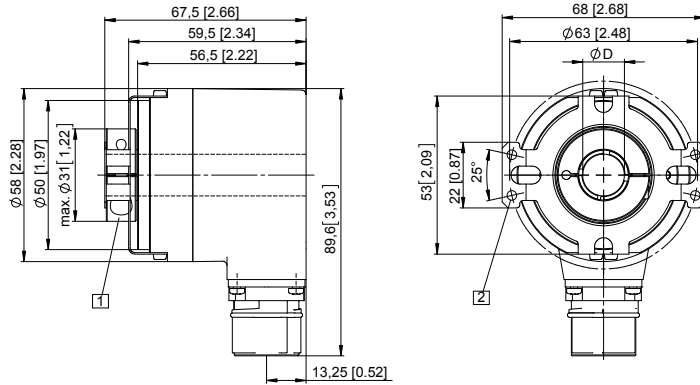
Flange type B

Through hollow shaft

(drawing with M23 connector)

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

- 2 For (4x) M3 screw



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

Flange with stator coupling, \varnothing 63 [2.48]

Flange type B

Tapered shaft

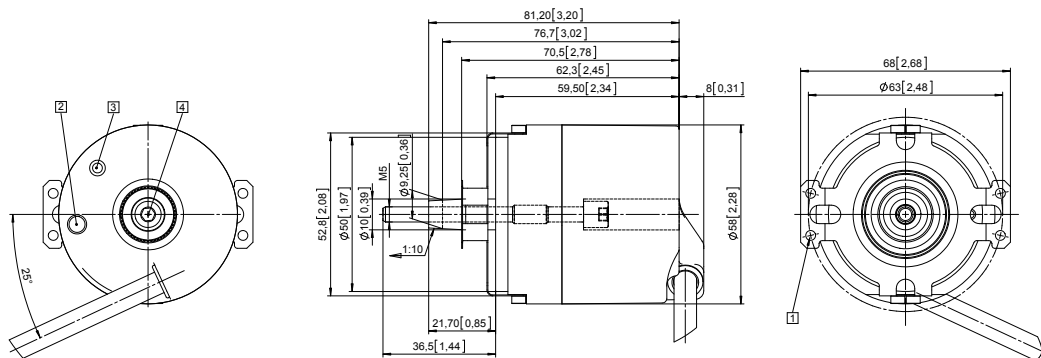
(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status LED

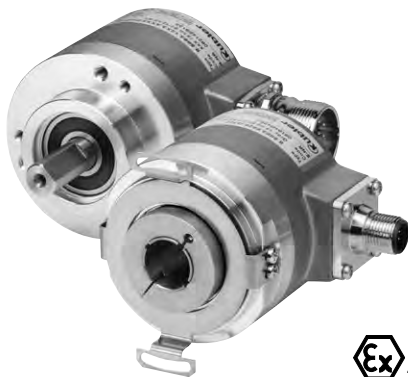
- 3 SET button

- 4 SW 4



Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	CANopen
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The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical multiturn encoder without gears and with 100 percent magnetic insensitivity.

32 bits total resolution, through hollow shaft up to 15 mm and CANopen functionalities according to up-to-date encoder profile.



16 bit MT Multiturn resolution	Safety-Lock™	High rotational speed	-40°...+80°C Temperature range	IP High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Intelligent Scan Technology™	Surface protection salt spray-tested optional
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Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.

Up-to-the-minute Fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).

Order code	8.F5868	.XX2X	.212X	10 by 10
Shaft version	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"]

- b Shaft (ø x L), with flat**
1 = 6 x 10 mm [0.24 x 0.39"]¹⁾
2 = 10 x 20 mm [0.39 x 0.79"]²⁾
 3 = 1/4" x 7/8"
 4 = 3/8" x 7/8"

- c Interface / power supply**
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d Type of connection**
 A = radial cable, 2 m [6.56'] PVC
 B = radial cable, special length PVC *)
E = 1 x radial M12 connector, 5-pin
 F = 2 x radial M12 connector, 5-pin

*) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
 order code expansion .XXXX = length in dm
 ex.: 8.F5868.122B.2123.0030 (for cable length 3 m)

- e Fieldbus profile**
21 = CANopen

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

Optional on request
 - Ex 2/22³⁾
 - surface protection salt spray tested

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

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

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Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	CANopen
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Order code Hollow shaft	8.F5888 Type	XX2X a b c d	.212X e f	If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.	10 by 10
a Flange 1 = with spring element, long, IP65 2 = with spring element, long, IP67 3 = with stator coupling, IP65 ø 65 mm [2.56"] 4 = with stator coupling, IP67 ø 65 mm [2.56"] 5 = with stator coupling, IP65 ø 63 mm [2.48"] 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] <i>Blind hollow shaft</i> (insertion depth max. 30 mm [1.18"]) B = ø 12 mm ¹⁾	c Interface / power supply 2 = CANopen DS301 V4.02 / 10 ... 30 V DC	d Type of connection L = tangential cable, 2 m [6.56'] PVC M = tangential cable, special length PVC *) E = 1 x radial M12 connector, 5-pin F = 2 x radial M12 connector, 5-pin ²⁾	e Fieldbus profile 21 = CANopen	f Options (service) 2 = no option 3 = SET button <i>Optional on request</i> - Ex 2/22 ³⁾ (not for type of connection L, M) - surface protection salt spray tested

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

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
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Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	8.0010.4700.0000
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Connection technology	Order no.
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Cordset, pre-assembled	M12 female connector with coupling nut for bus in, 5-pin 2 m [6.56'] PVC cable	05.00.6091.A211.002M
	M12 male connector with external thread for bus out, 5-pin 2 m [6.56'] PVC cable	05.00.6091.A411.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in, 5-pin	8.0000.5116.0000
	M12 male connector with external thread for bus out, 5-pin	8.0000.5111.0000

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

1) Can be combined only with type of connection F.
2) Can be combined only with blind hollow shaft ø12 mm [0.47"].

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

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Absolute encoders – multiturn

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

Mechanical characteristics		
Maximum speed shaft version		
IP65 up to 70°C	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)	
IP65 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
IP67 up to 70°C	11000 min ⁻¹ , 9000 min ⁻¹ (continuous)	
IP67 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)	
Maximum speed hollow shaft version		
IP65 up to 70°C	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)	
IP65 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)	
IP67 up to 70°C	8000 min ⁻¹ , 4000 min ⁻¹ (continuous)	
IP67 up to T _{max}	4000 min ⁻¹ , 2000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Load capacity of shaft	radial	80 N
	axial	40 N
Mass moment of inertia	shaft version	3.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	6.0 x 10 ⁻⁶ kgm ²
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F] ¹⁾
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC (PUR for Ex 2/22)
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 100 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

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

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

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1) Cable version: -30°C ... +75°C [-22°F ... +167°F].

Absolute encoders – multiturn

Standard electronic multiturn, optical

Sendix F5868 / F5888 (shaft / hollow shaft)

CANopen

General information about CANopen

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

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters, which have been saved on an EEPROM to protect them against power failure, are loaded again.

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

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

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

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

CANopen Communication Profile DS301 V4.2

Among others, the following functionality is integrated. Class C2 functionality:

- NMT slave.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 4 sending PDO's.
- Node address, baud rate and CANbus / programmable termination.
- Producer / consumer heartbeat.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error message, raw data.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- Customer-specific memory 16 Byte.
- Customer-specific protocol.
- Universal Scaling Function (USF).
- "Watchdog controlled" device.
- Extended diagnostic modes.

LSS layer setting services DS305 V2.0

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

Terminal assignment

Interface	Type of connection	Function	Cable (isolate unused cores individually before initial start-up)						
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
2	A, B, L, M	Bus IN	Core color:	WH	BN	YE	GN	GY	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
Interface	Type of connection	Function	2 x M12 connector, 5-pin						Diagram
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
2	F	Bus IN	Pin:	3	2	5	4	1	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
		Bus OUT	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, 5-pin						Diagram
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	
2	E	Bus IN	Pin:	3	2	5	4	1	
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	

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

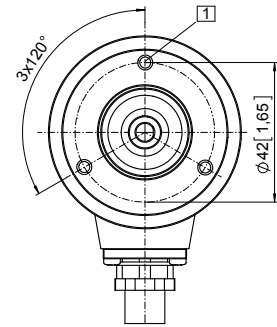
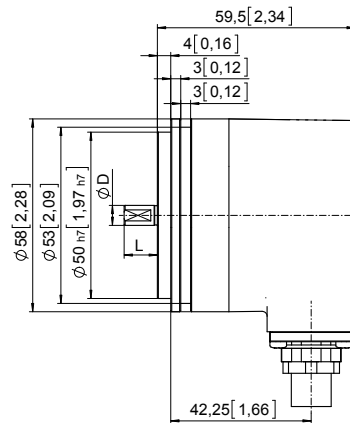
Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with M12 connector)

1 3 x M4, 6 [0.24] deep



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

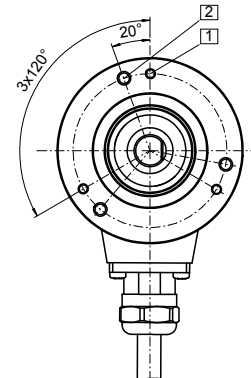
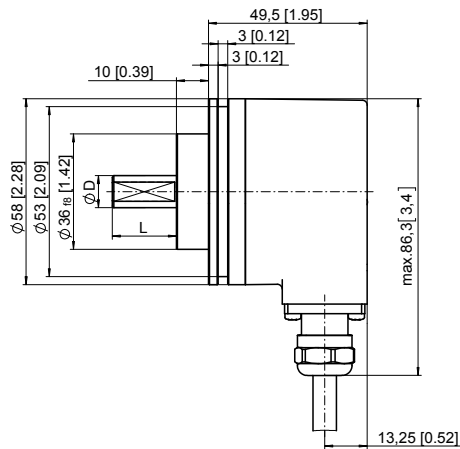
Clamping flange, \varnothing 58 [2.28]

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

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Standard electronic multiturn, optical

Sendix F5868 / F5888 (shaft / hollow shaft)

CANopen

Dimensions hollow shaft version

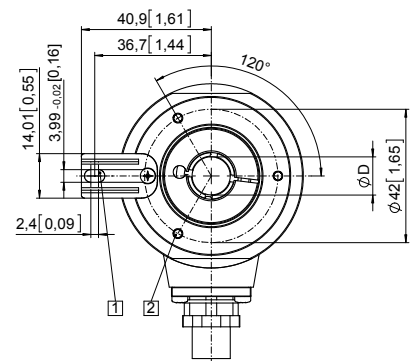
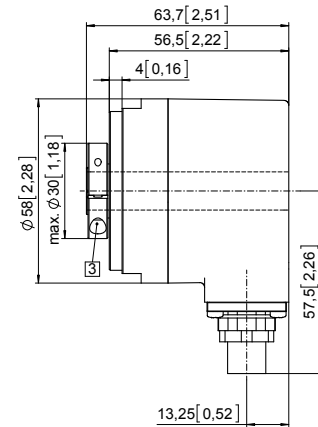
Dimensions in mm [inch]

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

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

D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]



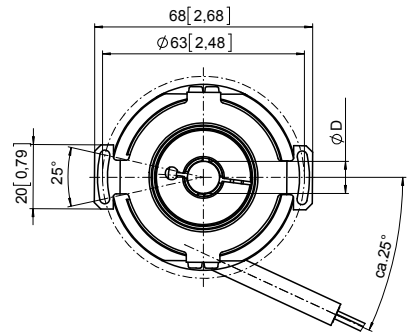
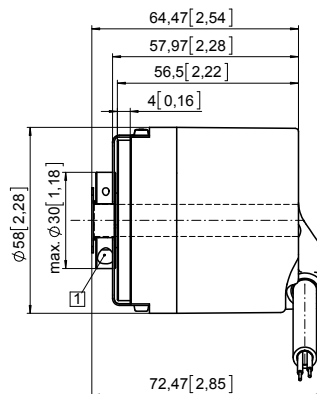
Flange with stator coupling, \varnothing 63 [2.48] Flange type 5 and 6

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

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

*) Blind hollow shaft, insertion depth max. = 30 mm [1.18"]



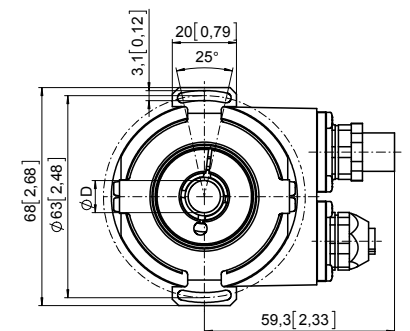
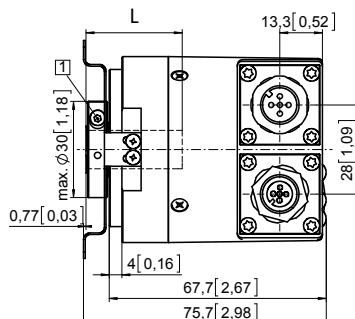
Flange with stator coupling, \varnothing 63 [2.48] Flange type 5 and 6

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

D	Fit
10 [0.39]	H7
12 [0.47] *)	H7
14 [0.55]	H7
15 [0.59]	H7

*) Blind hollow shaft, insertion depth (L) max. = 30 mm [1.18"]



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Standard Motor-Line, electronic multiturn, optical	Sendix F5888M (hollow shaft)	CANopen
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The optical Sendix F5888 multiturn encoder in the Motor-Line version stands out particularly because of its reduced overall depth of only 43 mm with a through hollow shaft up to 15 mm.

This opens up new possibilities when dimensioning the motors and for installation in tight mounting spaces. Its technical features make the F5888 Motor-Line the ideal device for use in geared motors.



16 bit MT Multiturn resolution	Safety-Lock™	High rotational speed	-40°...+85°C Temperature range	IP High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Intelligent Scan Technology™	Surface protection salt spray-tested optional
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Compact and robust

- Suitable for restricted mounting spaces thanks to its small construction depth of 43 mm and its tangential cable outlet.
- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

Up-to-the-minute Fieldbus performance

- CANopen with current encoder profile.
- LSS services for configuration of the node address and baud rate.
- Variable PDO mapping in the memory.
- Universal scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).

Order code Hollow shaft

8.F5888M	.	XXXX	.	21	2X
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 = with spring element, long, IP65
5 = with stator coupling, IP65, ø 63 mm [2.48"]
 9 = with torque stop, flexible, IP65
- b Through hollow shaft**
Clamping on the flange side
 3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
 5 = ø 14 mm [0.55"]
 6 = ø 15 mm [0.59"]
 9 = ø 1/2"
- Clamping on the cover side*
 A = ø 12 mm [0.39"]
 B = ø 14 mm [0.55"]
 C = ø 15 mm [0.59"]

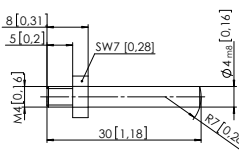
- c Interface / power supply**
2 = CANopen DS301 V4.2 / 10 ... 30 V DC
 5 = CANopen DS301 V4.2, 10 ... 30 V DC with 2048 ppr incremental track (TTL compatible)
- d Type of connection**
L = tangential cable, 1 m [3.28'] PVC
 M = tangential cable, special length PVC *)
- *) Available special lengths (connection type M):
 2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']
 order code expansion .XXXX = length in dm
 ex.: 8.F5888M.542M.2123.0030 (for cable length 3 m)

- e Fieldbus profile**
21 = CANopen
- f Options (service)**
 2 = no option
3 = SET button
- Optional on request*
 - surface protection salt spray tested

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Standard Motor-Line, electronic multiturn, optical	Sendix F5888M (hollow shaft)	CANopen
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Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1)	with fixing thread 	8.0010.4700.0000

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

Technical data

Mechanical characteristics	
Maximum speed	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	< 0.01 Nm
Mass moment of inertia	6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection	IP65
Working temperature range	-40°C ... +85°C [-40°F ... +185°F] ¹⁾
Material	hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	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 no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

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

Interface characteristics CANopen	
Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit) default: 25 bit
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons, LSS-service DS305 V2.0
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Termination switchable	software configurable
LSS protocol	CIA LSS protocol DS305, global command support for node address and baud rate, selective commands via attributes of the identity object

Incremental track characteristics	
Output driver	RS422 (TTL-compatible)
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ. 3.8 V LOW typ. 1.3 V
Short circuit proof outputs	yes ²⁾
Resolution	2048 ppr

1) Temperature measured on the flange – max. 80°C allowable on the cable (fixed installation).
2) Short circuit to 0 V or to output, only one channel at a time, power supply correctly applied.

Absolute encoders – multiturn

Standard Motor-Line, electronic multiturn, optical	Sendix F5888M (hollow shaft)	CANopen
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General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.2. In addition, device specific profiles such as encoder profile DS406 V3.2 and DS305 (LSS) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters, which have been saved on an EEPROM to protect them against power failure, are loaded again.

The following output values may be combined in a freely variable way as PDO (PDO mapping): **position, speed, temperature** as well as the **status of the working area**.

The encoders are available with a connector or a cable connection.

The device address and baud rate can be set/modified by means of the software.

The two-color LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

CANopen Communication Profile DS301 V4.2

Among others, the following functionality is integrated. Class C2 functionality:

- NMT slave.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 4 sending PDO's.
- Node address, baud rate and CANbus / programmable termination.
- Producer / consumer heartbeat.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status, error message, raw data.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- Customer-specific memory 16 Byte.
- Customer-specific protocol.
- Universal Scaling Function (USF).
- "Watchdog controlled" device.
- Extended diagnostic modes.

LSS layer setting services DS305 V2.0

- Global support of node-ID and baud rate
- Selective protocol via identity object (1018h)

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)					
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
2	L, M	Bus IN	Core color:	WH	BN	YE	GN	GY

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)									
			Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND	A	\bar{A}	B	\bar{B}
5	L, M	Bus IN	Core color:	WH	BN	YE	GN	GY	BK	VT	GY-PK	RD-BU

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Standard Motor-Line, electronic multiturn, optical

Sendix F5888M (hollow shaft)

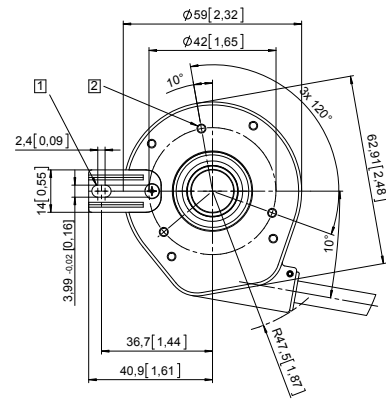
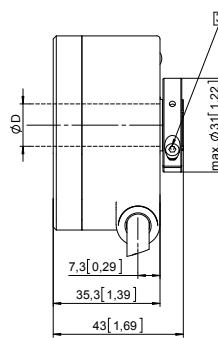
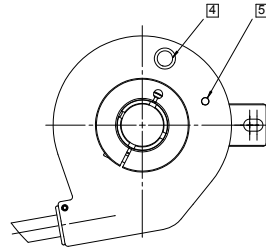
CANopen

Dimensions

Dimensions in mm [inch]

Flange with spring element, long Flange type 1

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm
- 4 Status-LED
- 5 SET button



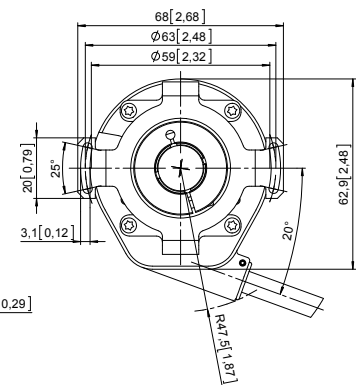
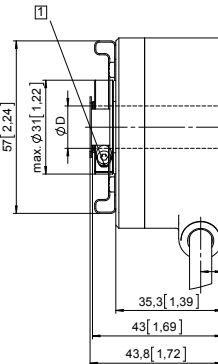
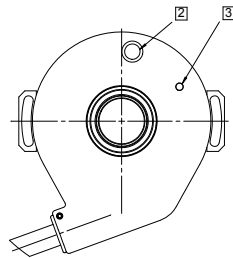
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5

Pitch circle diameter for fixing screws 63 mm [2.48]

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Status-LED
- 3 SET button

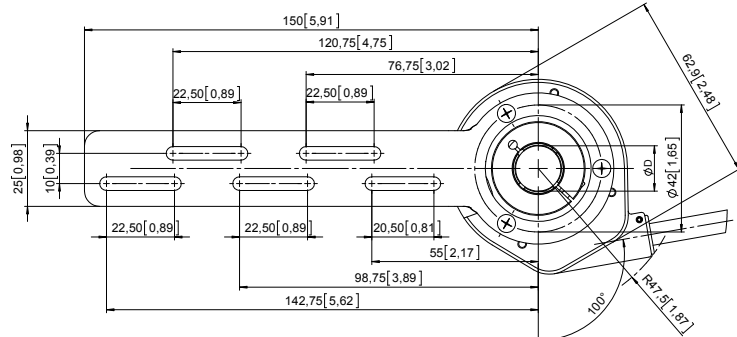
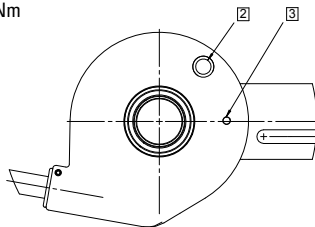


D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7

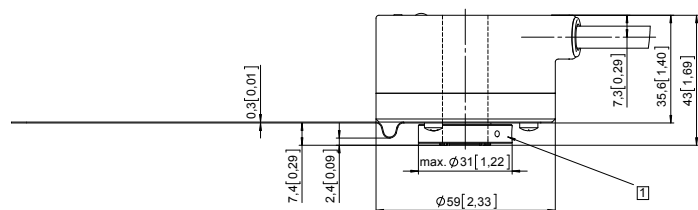
Flange with torque stop, flexible

Flange type 9

- 1 Recommended torque for the clamping ring 0.6 Nm
- 2 Status-LED
- 3 SET button



D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7
1/2 "	H7



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Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	EtherNet/IP
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The Sendix F58 multiturn with patented Intelligent Scan Technology™ is a particularly high resolution optical encoder without gears and with 100 percent magnetic insensitivity. 32 bits total resolution, shaft up to 10 mm, blind hollow shaft up to 15 mm and certified EtherNet/IP functionality.



EtherNet/IP™

16 bit MT Multiturn resolution	Safety-Lock™	High rotational speed	-40°...+80°C Temperature range	IP65 High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Optical sensor
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Up-to-the-minute EtherNet/IP functionality

- Fast, easy commissioning and configuration possible thanks to cyclic services.
- Low RPI time, of 1 ms minimum – makes the encoder suitable for time-critical applications up to an update frequency of 1000 Hz.
- Faster encoder start after applying the power – increases plant performance.

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100% magnetic field insensitivity.
- Thanks to the implementation of DLR (Device Level Ring) a single cable break does not lead to plant stoppage.

Order code	8.F5868	.XXAN.	A2	2	2
Shaft version	Type	a b c d	e		
a Flange	b Shaft (ø x L), with flat	c Interface / Power supply	e Fieldbus profile		
1 = clamping flange, IP65 ø 58 mm [2.28"]	1 = 6 x 10 mm [0.24 x 0.39"]	A = EtherNet IP / 10 ... 30 V DC	A2 = EtherNet/IP		
2 = synchro flange, IP65 ø 58 mm [2.28"]	2 = 10 x 20 mm [0.39 x 0.79"]	d Type of connection	Optional on request		
5 = square flange, IP65 □ 63.5 mm [2.5"]	3 = 1/4" x 7/8"	N = 3 x axial M12 connector, 4-pin	- Ex 2/22		
	4 = 3/8" x 7/8"				

Order code	8.F5888	.XXAN.	A2	2	2
Hollow shaft	Type	a b c d	e		
a Flange	b Blind hollow shaft	c Interface / Power supply	e Fieldbus profile		
1 = with spring element long, IP65	(insertion depth max. 30 mm [1.18"])	A = EtherNet IP / 10 ... 30 V DC	A2 = EtherNet/IP		
3 = with stator coupling, IP65 ø 65 mm [2.56"]	A = ø 10 mm [0.39"]	d Type of connection	Optional on request		
5 = with stator coupling, IP65 ø 63 mm [2.48"]	B = ø 12 mm [0.47"]	N = 3 x axial M12 connector, 4-pin	- Ex 2/22		
	C = ø 14 mm [0.55"]				
	D = ø 15 mm [0.59"]				
	E = ø 3/8"				
	F = ø 1/2"				

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Standard electronic multiturn, optical		Sendix F5868 / F5888 (shaft / hollow shaft)	EtherNet/IP
Mounting accessory for shaft encoders			Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1102.0606
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]		8.0000.1102.1010
Mounting accessory for hollow shaft encoders			Order no.
Cylindrical pin, long	Dimensions in mm [inch]		8.0010.4700.0000
for flange with spring element (flange type 1)	with fixing thread		
Connection technology			Order no.
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56'] PUR cable		05.00.6031.4411.002M
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable		05.00.6061.6211.002M
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin		05.WACSY4S
	M12 female connector with coupling nut for power supply, 4-pin		05.B8141-0

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data		
Mechanical characteristics		
Max. speed shaft version	IP65 up to 70°C	8000 min ⁻¹ , 6000 min ⁻¹ (continuous)
	IP65 up to T _{max}	6000 min ⁻¹ , 4000 min ⁻¹ (continuous)
Max. speed hollow shaft version	IP65 up to 70°C	6000 min ⁻¹ , 4000 min ⁻¹ (continuous)
	IP65 up to T _{max}	4000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]		< 0.01 Nm
Moment of inertia	shaft version	3.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529		IP65
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	aluminum
Shock resistance acc. EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz
Electrical characteristics		
Power supply		10 ... 30 V DC
Power consumption (no load)		max. 250 mA
Reverse polarity protection of the power supply (+V)		yes
UL approval		File no. E224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
Interface characteristics EtherNet/IP		
Singleturn resolution		1 ... 65.536 (16 bit), scalable default: 65.536 (16 bit)
Multiturn resolution		max. 65.536 (16 bit) scalable only via the total resolution
Total resolution		1 ... 4.294.967.296 (32 bit), scalable
Code		binary
Protocol		EtherNet/IP

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Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	EtherNet/IP
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General information about EtherNet/IP

EtherNet/IP conformance tested acc. to version CT-12 of 11. Dez. 2014
 EtherNet/IP specification Vol 2, Ed 1.17
 CIP specification Vol 1, Ed 3.16

The following functionalities are integrated

Adjustable parameters

- Preset
- Count direction
- Resolution
- Unity of speed
- IP address
- Number of revolutions
- Position
- Diagnosis
- Position limit
- Warning messages

Objects (CIP Objects)

- Identity Object
- Message Router
- Assembly Object
- Connection Manager
- Position Sensor Object
- Qos Object
- Port Object
- TCP / IP Interface Object
- EtherNet Link Object

EtherNet/IP features

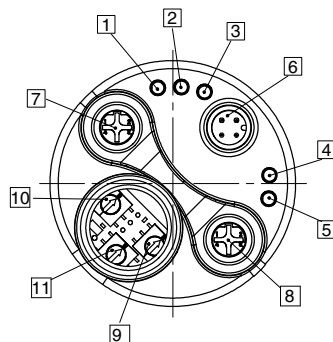
- DLR (Device Level Ring) possible
- Qos (Quality of Service) possible
- ACD (Address Conflict Detection)
- Multicast and unicast capability

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin				Diagram	
			Signal:	Transmit data+	Receive data+	Transmit data -		Receive data -
A	N (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	

Rear side connections and display elements

- 1 LED: Link 1
- 2 LED: Mod.
- 3 LED: Net.
- 4 LED: Encoder
- 5 LED: Link 2
- 6 Power
- 7 Port 1
- 8 Port 2
- 9 Switch: x1
- 10 Switch: x100
- 11 Switch: x10



Absolute encoders – multiturn

Standard electronic multiturn, optical

Sendix F5868 / F5888 (shaft / hollow shaft)

EtherNet/IP

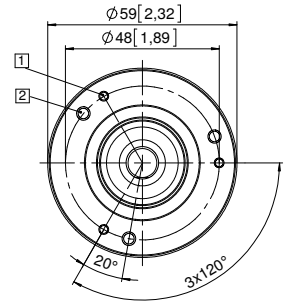
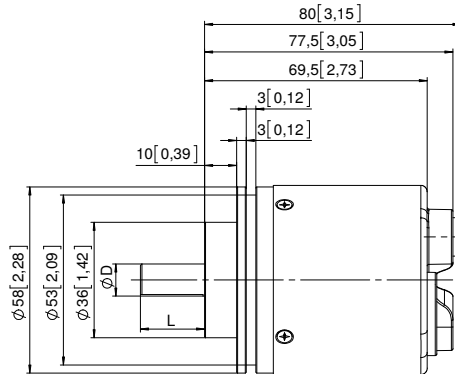
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.31] deep

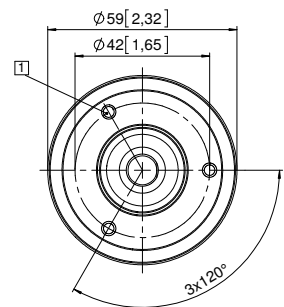
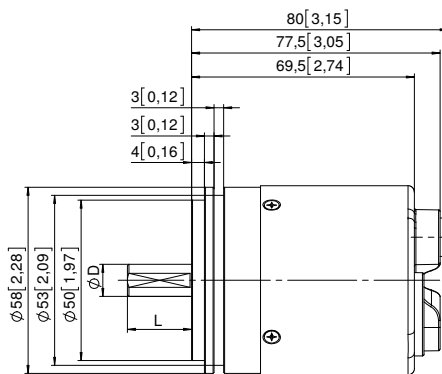


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, \varnothing 58 [2.28]

Flange type 2

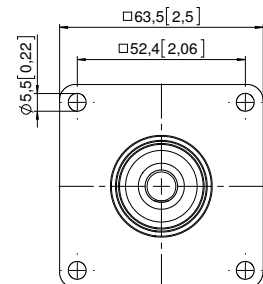
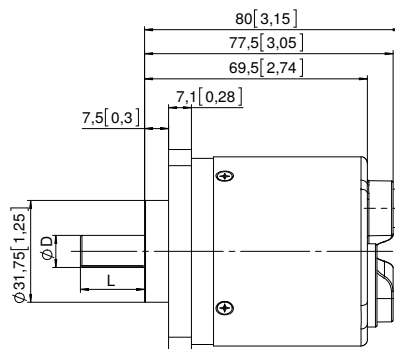
- 1 3 x M3, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, \square 63.5 [2.5]

Flange type 5



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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Absolute encoders – multiturn

**Standard
electronic multiturn, optical**

Sendix F5868 / F5888 (shaft / hollow shaft)

EtherNet/IP

Dimensions hollow shaft version

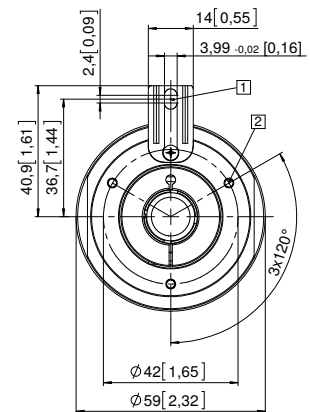
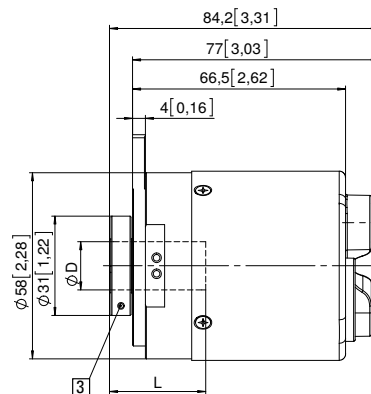
Dimensions in mm [inch]

Flange with spring element, long Flange type 1

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, ϕ 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

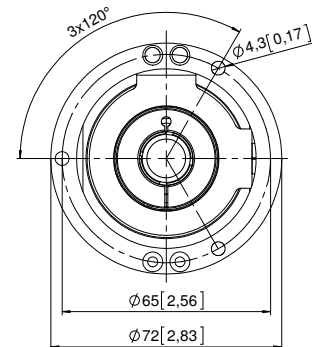
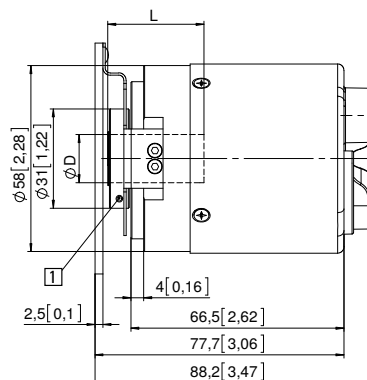


Flange with stator coupling, ϕ 65 [2.56] Flange type 3

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

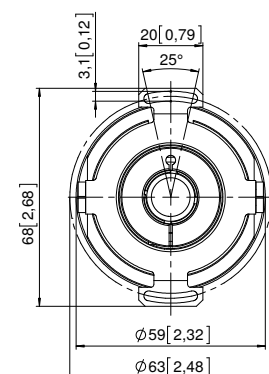
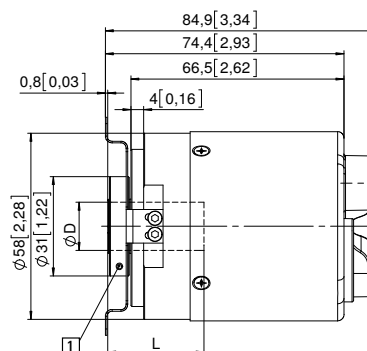


Flange with stator coupling, ϕ 63 [2.48] Flange type 5

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



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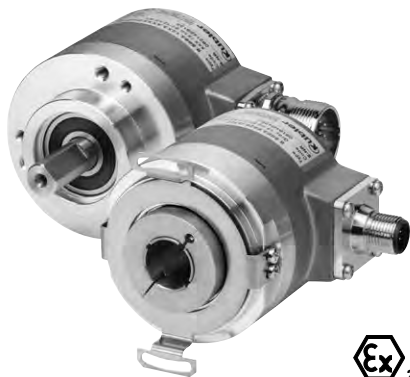
Addresses

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.



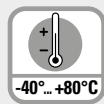
16 bit MT
Multiturn resolution



Safety-Lock™



High rotational speed



-40...+80°C
Temperature range



High protection level



High shaft load capacity



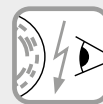
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Intelligent Scan Technology™



Surface protection salt spray tested optional

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 32 bits and 100 % magnetic field insensitivity.

Current Modbus performance

- Modbus register for configuration of the node address and baud rate.
- Scaling function.
- 32 bits total resolution (16 bit MT + 16 bit ST).
- Preset function.
- Diagnostic functions.
- Limit switch function.

Order code Shaft version

8.F5868.XX6E.6112
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"

d Type of connection

- E = 1 x radial M12 connector, 5-pin

e Fieldbus profile

- 61 = Modbus RTU Application Protocol V1.1b3

c Interface / power supply

- 6 = Modbus RTU, 10 ... 30 V DC

Optional on request

- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.F5888.XX6E.6112
Type a b c d e

a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b Through hollow shaft

- 3 = ø 10 mm [0.39"]
- 4 = ø 12 mm [0.47"]
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]

d Type of connection

- E = 1 x radial M12 connector, 5-pin

e Fieldbus profile

- 61 = Modbus RTU Application Protocol V1.1b3

c Interface / power supply

- 6 = Modbus RTU, 10 ... 30 V DC

Optional on request

- Ex 2/22
- surface protection salt spray tested

Absolute encoders – multiturn

Standard electronic multiturn, optical		Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus
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	Dimensions in mm [inch]	8.0010.4700.0000	
for flange with spring element (flange type 1 + 2)	with fixing thread 		
Connection technology			Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in, 5-pin 2 m [6.56"] PVC cable	05.00.6091.A211.002M	
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in, 5-pin	8.0000.5116.0000	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data	
Mechanical characteristics	
Maximum speed shaft version	
IP65 up to 70°C	12000 min ⁻¹ , 10000 min ⁻¹ (continuous)
IP65 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
IP67 up to 70°C	11000 min ⁻¹ , 9000 min ⁻¹ (continuous)
IP67 up to T _{max}	8000 min ⁻¹ , 5000 min ⁻¹ (continuous)
Maximum speed hollow shaft version	
IP65 up to 70°C	9000 min ⁻¹ , 6000 min ⁻¹ (continuous)
IP65 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
IP67 up to 70°C	8000 min ⁻¹ , 4000 min ⁻¹ (continuous)
IP67 up to T _{max}	4000 min ⁻¹ , 2000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	IP65 < 0.01 Nm IP67 < 0.05 Nm
Mass moment of inertia	shaft version 3.0 x 10 ⁻⁶ kgm ² hollow shaft version 6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.45 kg [15.87 oz]
Protection acc. to EN 60529	housing side IP67 shaft side IP65, opt. IP67
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft stainless steel flange aluminum housing zinc die-cast
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz
Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 100 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
Diagnostic LED (two-color, red/green)	
LED ON or blinking	red error display green status display combination red / green error code
Interface characteristics Modbus	
Resolution singleturn	1 ... 65536 (16 bit), scalable default: 65536 (16 bit)
Number of revolutions (multiturn)	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit), scalable
Code	binary
Interface	Modbus V1.02
Protocol	Modbus RTU V1.1b3
Baud rate	9600 ... 115200 kbit/s software configurable
Node address	1 ... 63 software configurable
Termination	software configurable

Absolute encoders – multiturn

Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus
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Read holding register

Register	Data name
40257	Baud rate Number Data Parity Stopbits
40261	Comm Update
40262	Node Address
40263	Node Update
40264	Presetvalue
40266	Preset Update
40267	Count Direct
40268	Count Update
40269	Termination
40270	Term Update

Write holding register

Register	Data name
40275	Lower Limit
40276	Upper Limit
40277	Compare Activ
40278	MUR (MSB)
40279	MUR (LSB)
40280	TMR (MSB)
40281	TMR (LSB)
40282	Scaling Function
40283	Delay Prescaler

Modbus Communication Profile V 1.02

- Node address, baud rate and bus termination programmable.

Modbus Application Protocol V1.1b3

The following parameters can be programmed:

- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Extended failure management for position sensing.
- User interface with visual display of bus and failure status.
- "Watchdog controlled" device.
- Extended diagnostic modes.

Terminal assignment

Interface	Type of connection	1 x M12 connector, 5-pin						
6	E Bus in	Signal:	0 V power supply	+V power supply	D0	D1	TG	
		Pin:	3	2	5	4	1	

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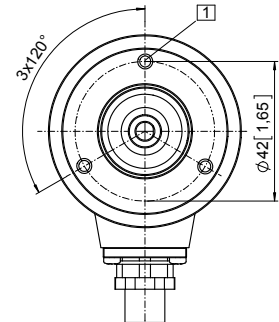
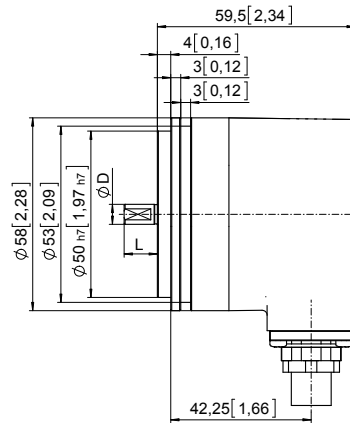
Standard electronic multiturn, optical	Sendix F5868 / F5888 (shaft / hollow shaft)	Modbus
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Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28] Flange type 2 and 4

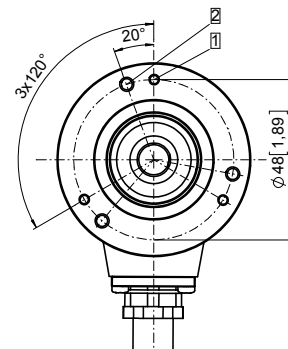
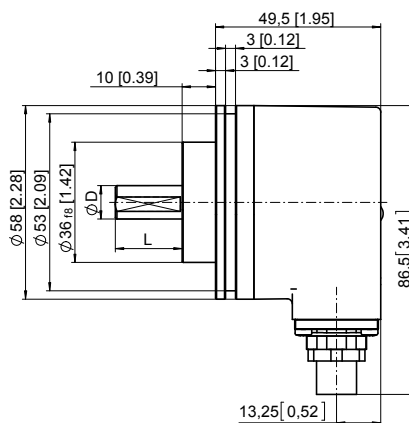
- 1 3 x M4, 6 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Clamping flange, \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	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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Absolute encoders – multiturn

Standard electronic multiturn, optical

Sendix F5868 / F5888 (shaft / hollow shaft)

Modbus

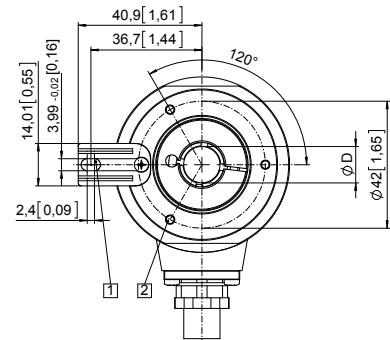
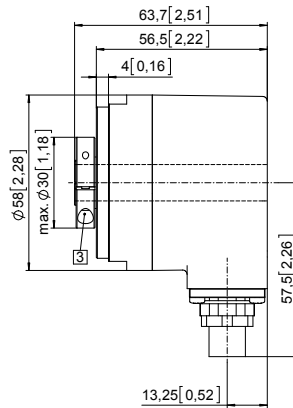
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

- 1 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 6 [0.24] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

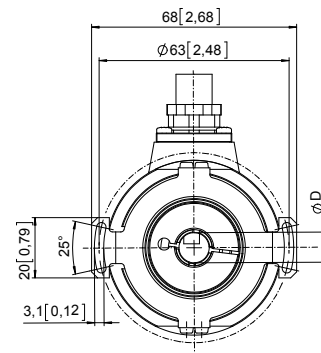
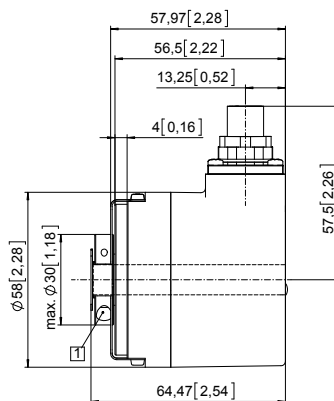
D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7



Flange with stator coupling, \varnothing 63 [2.48] Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit
10 [0.39]	H7
12 [0.47]	H7
14 [0.55]	H7
15 [0.59]	H7



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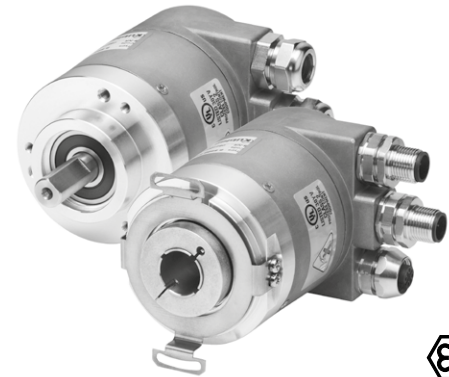
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Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP
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The multiturn encoders Sendix 5868 and 5888 with Profibus interface and optical sensor technology are the ideal solution for all Profibus applications.

With a maximum resolution of 28 bits these encoders are available with blind hollow shaft up to 15 mm.



Mechanical drive	Safety-Lock™	High rotational speed	Temperature range -40°...+80°C	High protection level IP	High shaft load capacity	Magnetic field proof	Shock / vibration resistant	Reverse polarity protection	SinCos
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<h3>Reliable</h3> <ul style="list-style-type: none"> 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. 	<h3>Flexible</h3> <ul style="list-style-type: none"> 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 <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 = 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"]	c Interface / power supply <u>3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC</u>	e Fieldbus profile <u>31 = PROFIBUS DP V0 encoder profile class 2</u>		
b Shaft (ø x L), with flat <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"	d Type of connection, removable bus terminal cover <u>2 = with 3 x radial M12 connectors</u>	f Options (service) 2 = no option <u>3 = SET button</u>		
Optional on request - Ex 2/22 - surface protection salt spray tested - seawater resistant (stainless steel V4A)				
Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit) salt spray tested: 8.5868.3232.3112-C			V4A 1.4404	stainless steel V4A: 8.5868.3232.3112-V4A

1) Preferred type only in conjunction with flange type 2.

2) Preferred type only in conjunction with flange type 1.

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Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP
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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 <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"] 5 = with stator coupling, IP65 ø 63 mm [2.48"] 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Blind hollow shaft (insertion depth max. 30 mm [1.18"]) 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	c Interface / power supply 3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC	d Type of connection, removable bus terminal cover 1 = with radial cable gland fitting 2 = with 3 x radial M12 connectors	e Fieldbus profile 31 = PROFIBUS DP V0 encoder profile class 2	f Options (service) 2 = no option 3 = SET button
Optional on request - Ex 2/22 - surface protection salt spray tested - seawater resistant (stainless steel V4A)		Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)			
salt spray tested: 8.5888.2432.3112-C 8.5888.2532.3112-C		stainless steel V4A: 8.5888.2432.3112-V4A 1.4404			

Mounting accessory for shaft encoders	Order no.
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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
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Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
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Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	8.0010.4700.0000
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Connection technology	Order no.
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Cordset, pre-assembled	M12 female connector with coupling nut for bus in , 5-pin 5 m [16.40'] PUR cable M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PUR cable M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable	05.00.6011.3211.005M 05.00.6011.3411.005M 05.00.6061.6211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in , 5-pin M12 male connector with external thread for bus out, 5-pin M12 female connector with coupling nut for power supply, 4-pin	05.BMWS 8151-8.5 05.BMSWS 8151-8.5 05.B8141-0

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP
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Technical data

Mechanical characteristics		
Maximum speed	IP65 up to 70°C [158°F]	9000 min ⁻¹ , 7000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7000 min ⁻¹ , 4000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8000 min ⁻¹ , 6000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Mass moment of inertia	shaft version	3.0 x 10 ⁻⁶ kgm ²
	hollow shaft version	7.5 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	with bus terminal cover	approx. 0.57 kg [10.11 oz]
	with fixed connection	approx. 0.52 kg [18.34 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 120 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

SET button (zero or defined value, option)

Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)

LED is ON with following errors Sensor error (Profibus error)

Interface characteristics PROFIBUS DP	
Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scalable
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	Interface specification acc. to PROFIBUS-DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated
Protocol	Profibus encoder profile V1.1 class1 and class 2 with manufacturer-specific add-ons
Baud rate	max. 12 Mbit/s
Device address	1 ... 127 set by rotary switches
Termination switchable	set by DIP switches

Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the user-specific component within the Profibus field bus system. For encoders, the encoder profile is definitive. Here the individual objects are defined independent of the manufacturer. Furthermore, the profiles offer space for additional manufacturer-specific functions; this means that Profibus-compliant device systems can be used now with the guarantee that they are ready for the future too.

The following parameters can be programmed

- Direction of rotation.
- Scaling (number of steps per revolution).
- Preset value.
- Diagnostics mode.

The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Address programmable via DIP switches.
- Diagnostics LED.
- Full class 1 and class 2 functionality.

Terminal assignment terminal box

Interface	Type of connection	BUS IN				BUS OUT				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		A
3	1 (terminal box)	Terminal:	1	2	3	4	5	6	7	8	

Interface	Type of connection	Function	3 x M12 connector							Diagram
			Signal:	–	PB_A	–	PB_B	Shield		
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

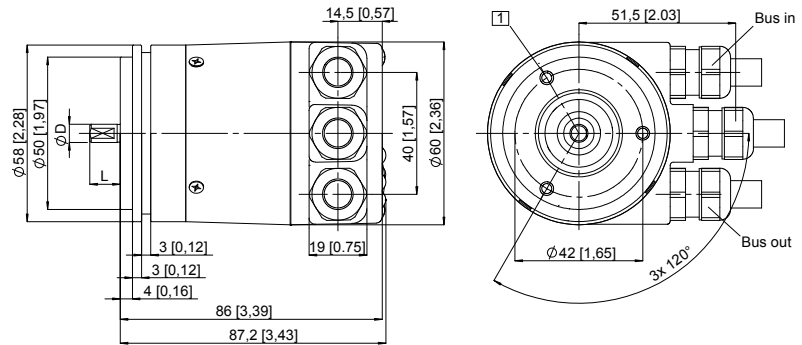
Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with cable)

- 1 3 x M4, 6 [0.24] deep



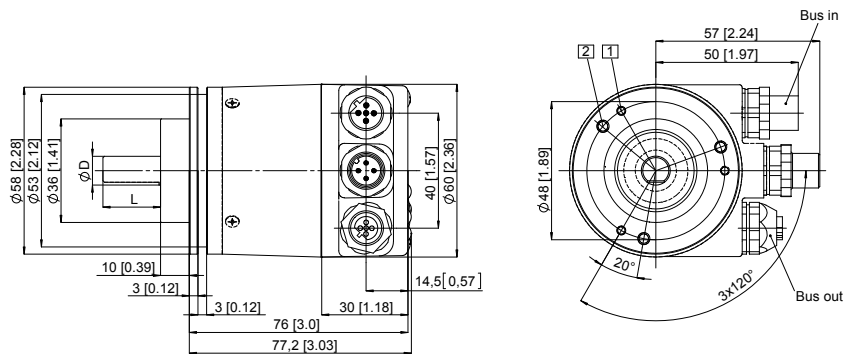
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Clamping flange, \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

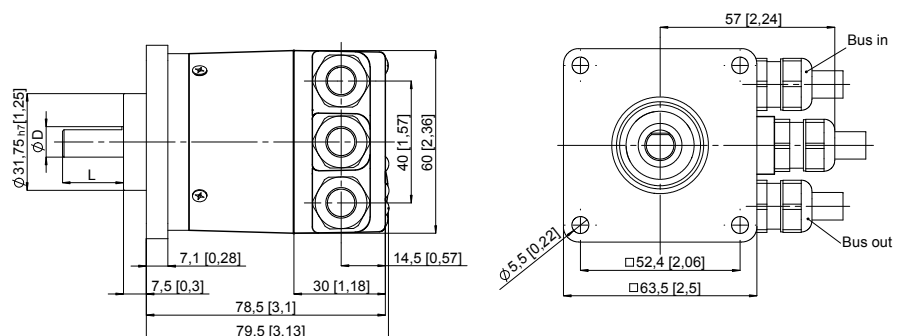


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(drawing with cable)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
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Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFIBUS DP
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Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element, long

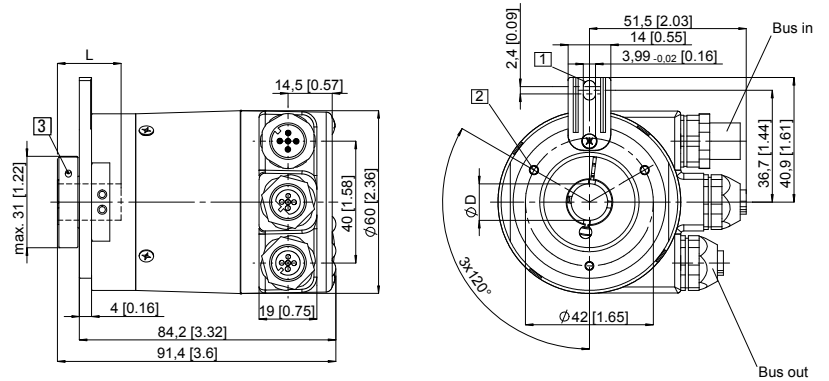
Flange type 1 and 2

(drawing with 3 x M12 connector)

- 1 Slot spring element recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

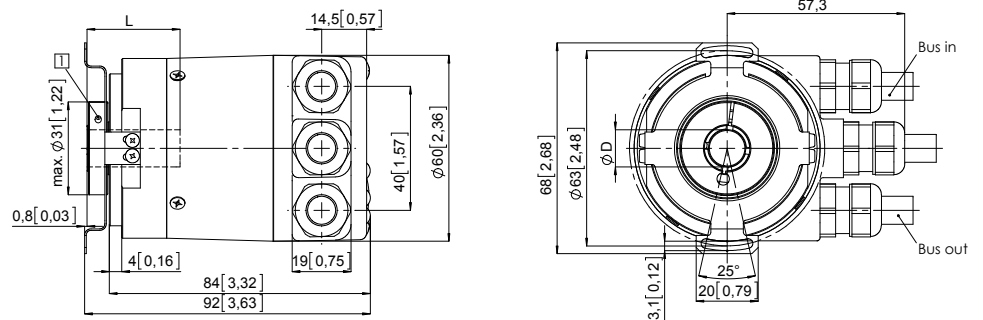
63 [2.48]

(drawing with cable)

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



Flange with stator coupling, \varnothing 65 [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

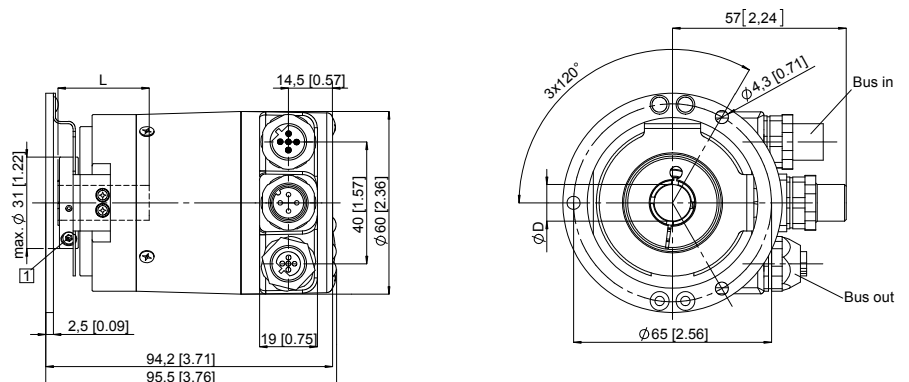
65 [2.56]

(drawing with 3 x M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



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Absolute encoders singleturn
Absolute encoders multiturn
Gearless encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Absolute encoders – multiturn

Standard mechanical multiturn, optical

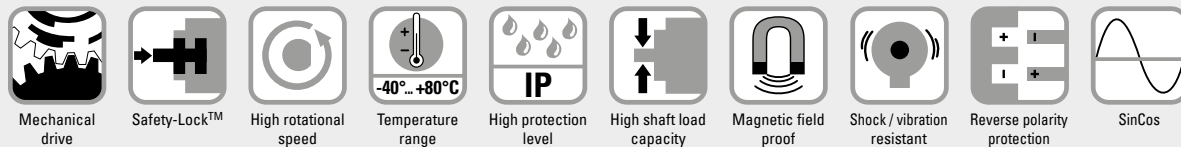
Sendix 5868 / 5888 (shaft / hollow shaft)

CANopen/CANopenLift



The Sendix multiturn encoders 5868 and 5888 with CANopen or CANopenLift interface and optical sensor technology are the right encoders for all CANopen or CANopenLift applications.

With a maximum resolution of 28 bits these encoders offer an optional additional RS422 incremental track with 2048 pulses.



Reliable

- Tried-and-tested in applications with the highest demands, such as in mobile automation or medical technology.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C.

Flexible

- Node address can be set via rotary switches or software.
- Baud rate and termination can be set via DIP switches or software.
- With bus terminal cover or fixed connection, as well as M12 connectors or cable connection.
- Universal scaling function.

Order code Shaft version

8.5868 . **XXXX** . **XXX** **X**
 Type a b c d e f

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]
- 7 = square flange, IP67 □ 63.5 mm [2.5"]

b Shaft (ø x L), with flat

- 1 = **6 x 10 mm [0.24 x 0.39"]**¹⁾
- 2 = **10 x 20 mm [0.39 x 0.79"]**²⁾
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c Interface / power supply

- 2 = CANopen DS301 V4.02, 10 ... 30 V DC
- 5 = CANopen DS301 V4.02, 10 ... 30 V DC with 2048 ppr incremental track (TTL-compatible)³⁾

d Type of connection

- removable bus terminal cover
- 1 = radial cable gland
- 2 = **2 x or 3 x M12 connector, 5-pin**
- Fixed connection without bus terminal cover
- A = radial cable, 2 m [6.56'] PVC
- B = radial cable, special length PVC *)
- E = 1 x radial M12 connector, 5-pin
- F = 2 x radial M12 connector, 5-pin
- I = 1 x radial M23 connector, 12-pin
- J = 2 x radial M23 connector, 12-pin
- K = 1 x Sub-D connector, 9-pin

*) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5868.112B.2123.0030 (for cable length 3 m)

Optional on request

- Ex 2/22⁴⁾
- surface protection salt spray tested
- seawater resistant (stainless steel V4A)

Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)

salt spray tested:
8.5868.3222.2122-C



stainless steel V4A:
8.5868.3222.2122-V4A

e Fieldbus profile

- 212 = CANopen
- 221 = CANlift DS417 V1.01

f Options (service)

- 2 = no options
- 3 = SET button

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

3) Only in conjunction with connection type 2.
4) For the cable connection type, cable material PUR.

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
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Order code	Hollow shaft	8.5888 Type	. X X X X . X X X X	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	b Blind hollow shaft	c Interface / power supply	d Type of connection	e Fieldbus profile	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"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	(insertion depth max. 30 mm [1.18"]) 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>2 = CANopen DS301 V4.02, 10 ... 30 V DC</u> <u>5 = CANopen DS301 V4.02, 10 ... 30 V DC</u> <u>with 2048 ppr incremental track (TTL-compatible) 1)</u>	1 = radial cable gland <u>2 = 2 x or 3 x M12 connector, 5-pin</u> <i>Fixed connection without bus terminal cover</i> A = radial cable, 2 m [6.56'] PVC B = radial cable, special length PVC *) E = 1 x radial M12 connector, 5-pin F = 2 x radial M12 connector, 5-pin I = 1 x radial M23 connector, 12-pin J = 2 x radial M23 connector, 12-pin K = 1 x Sub-D connector, 9-pin *) Available special lengths (connection type B): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXX = length in dm ex.: 8.5888.542B.2123.0030 (for cable length 3 m)	<u>212 = CANopen</u> 221 = CANlift DS417 V1.01	2 = no options <u>3 = SET button</u>
			<i>Optional on request</i> - Ex 2/22 2) - surface protection salt spray tested - seawater resistant (stainless steel V4A)		
			<i>Salt spray tested / stainless steel V4A as standard types (deliverable as from 1 unit)</i>		
			salt spray tested: 8.5888.2422.2122-C 8.5888.2522.2122-C	stainless steel V4A: 8.5888.2422.2122-V4A	

Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1102.0606
	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.1010

Mounting accessory for hollow shaft encoders		Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	8.0010.4700.0000

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for bus in, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A211.005M
	M12 male connector with external thread for bus out, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A411.005M
Connector, self-assembly (straight)	M12 female connector with coupling nut for bus in, 5-pin	8.0000.5116.0000
	M12 male connector with external thread for bus out, 5-pin	8.0000.5111.0000

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Only in conjunction with connection type 2.
2) For the cable connection type, cable material PUR.

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
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Technical data

Mechanical characteristics

Maximum speed		
IP65 up to 70°C [158°F]	9000 min ⁻¹ , 7000 min ⁻¹ (continuous)	
IP65 up to T _{max}	7000 min ⁻¹ , 4000 min ⁻¹ (continuous)	
IP67 up to 70°C [158°F]	8000 min ⁻¹ , 6000 min ⁻¹ (continuous)	
IP67 up to T _{max}	6000 min ⁻¹ , 3000 min ⁻¹ (continuous)	
Starting torque - at 20°C [68°F]		
IP65	< 0.01 Nm	
IP67	< 0.05 Nm	
Mass moment of inertia		
shaft version	4.0 x 10 ⁻⁶ kgm ²	
hollow shaft version	7.5 x 10 ⁻⁶ kgm ²	
Load capacity of shaft		
radial	80 N	
axial	40 N	
Weight		
with bus terminal cover	approx. 0.57 kg [20.11 oz]	
with fixed connection	approx. 0.52 kg [18.34 oz]	
Protection acc. to EN 60529		
housing side	IP67	
shaft side	IP65, opt. IP67	
Working temperature range		
	-40°C ... +80°C [-40°F ... +176°F] ¹⁾	
Material		
shaft/hollow shaft	stainless steel	
flange	aluminum	
housing	zinc die-cast	
cable	PVC (PUR for Ex 2/22)	
Shock resistance acc. to EN 60068-2-27		
	2500 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6		
	100 m/s ² , 55 ... 2000 Hz	

Electrical characteristics

Power supply	10 ... 30 V DC
Power consumption (no load)	max. 100 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen/CANopenLift

Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons or CANlift profile DS417 V1.1
Baud rate	10 ... 1000 kbit/s can be set via DIP switches, software configurable
Node address	1 ... 127 can be set via rotary switches, software configurable
Termination switchable	can be set via DIP switches, software configurable

Incremental track characteristics

Output driver	RS422 (TTL-compatible)
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ. 3.8 V LOW typ. 1.3 V
Short circuit proof outputs	yes ²⁾
Resolution	2048 ppr

SET button (zero or defined value, option)

Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)

LED is ON with the following fault conditions
Sensor error (internal code or LED error) too low voltage, over-temperature

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Gearless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

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
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General information about CANopen / CANopenLift

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device specific profiles such as encoder profile DS406 V3.2 and DS417 V1.1 (for lift applications) are available

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

The following output values may be combined in a freely variable way as PDO (PDO mapping): position, speed, acceleration as well as the status of the working area.

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

Universal Scaling Function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The Universal Scaling Function remedies this problem.

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated.

- Class C2 functionality.
- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping.
- Self-start programmable (power on to operational).
- 3 Sending PDO's.
- Node address, baud rate and CANbus.
- Programmable termination.

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min⁻¹).
- Factor for speed calculation (e.g. circumference of measuring wheel).
- Integration time for the speed value from 1 ... 32.
- 2 working areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, work area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

CANopen Lift Profile DS417 V1.1

Among others, the following functionality is integrated:

- Car position unit.
- 2 virtual devices.
- 1 virtual device delivers the position in absolute measuring steps (steps).
- 1 virtual device delivers the position as an absolute travel information in mm.
- Lift number programmable.
- Independent setting of the node address in relation with the CAN identifier.
- Factor for speed calculation (e.g. measuring wheel periphery).
- Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping for position, speed, acceleration, work area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- "Watchdog controlled" device.

All profiles stated here: Key-features

The object 6003h "Preset" is assigned to an integrated key, accessible from the outside.

Product overview	Basics
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Absolute encoders	singleturn
Absolute encoders	multiturn
Bearingless encoders	
Linear measuring technology	
Inclinometers	
Connection technology	
Accessories	
Addresses	

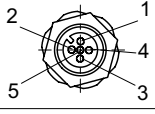
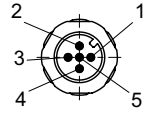
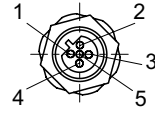
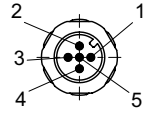
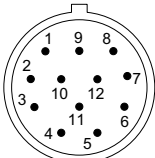
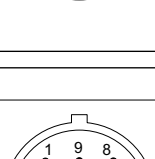
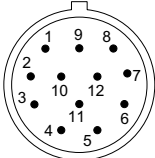
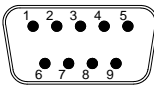
Absolute encoders – multiturn

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 cores 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					
		Core color:	WH	BN	YE	GN	GY					
Interface	Type of connection	2 x M12 connector, 5-pin (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, 5-pin										
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, 12-pin										
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, 12-pin										
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, 9-pin										
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	

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Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
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Dimensions shaft version, with removable bus terminal cover

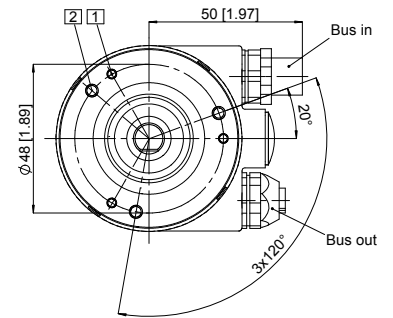
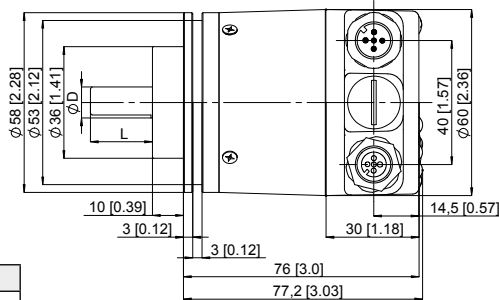
Dimensions in mm [inch]

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



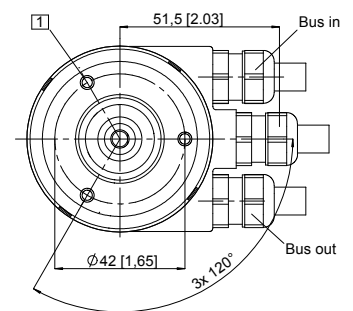
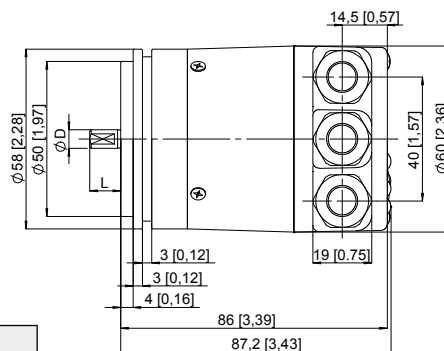
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with cable)

- 1 3 x M4, 6 [0.24] deep

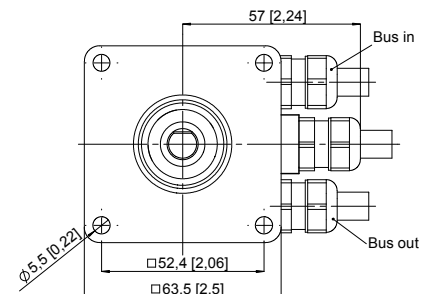
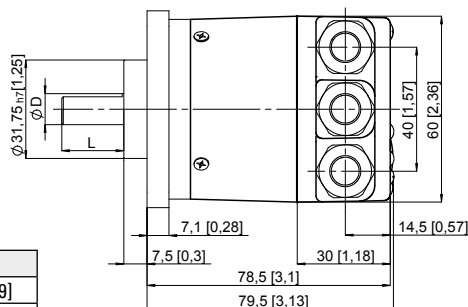


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(drawing with cable)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Absolute encoders – multiturn

Standard mechanical multiturn, optical

Sendix 5868 / 5888 (shaft / hollow shaft)

CANopen/CANopenLift

Dimensions shaft version, with fixed connection

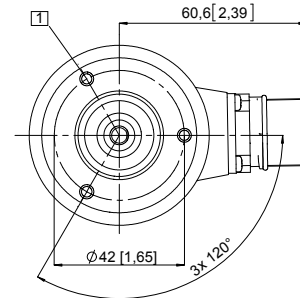
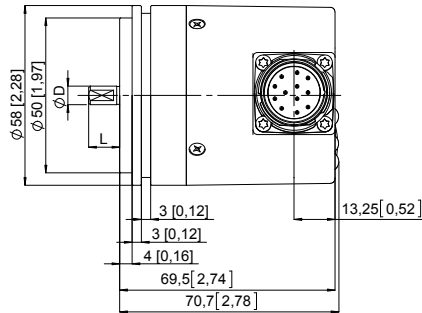
Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with M23 connector)

- 1 3 x M4, 6 [0.24] deep



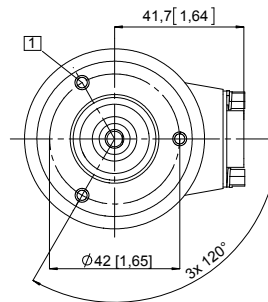
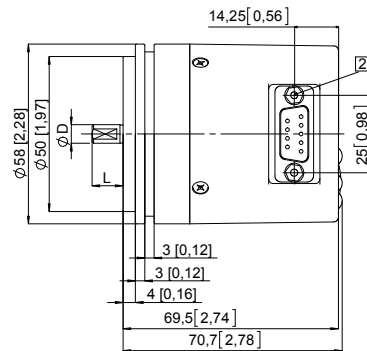
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with Sub-D connector)

- 1 3 x M4, 6 [0.24] deep
- 2 2 x 4/40 UNC; 3.0 [0.12] deep

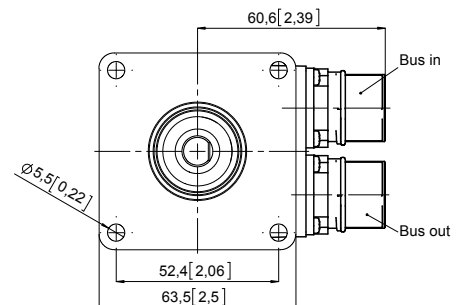
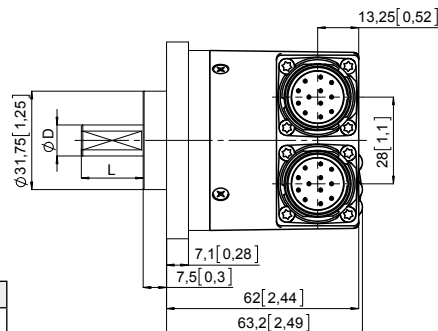


D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(drawing with 2 x M23 connector)



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
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Dimensions shaft version, with fixed connection

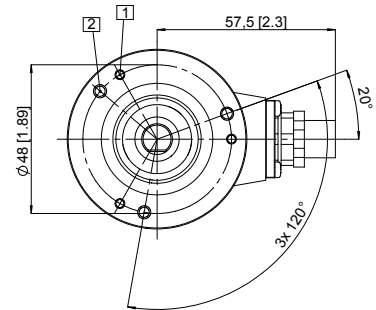
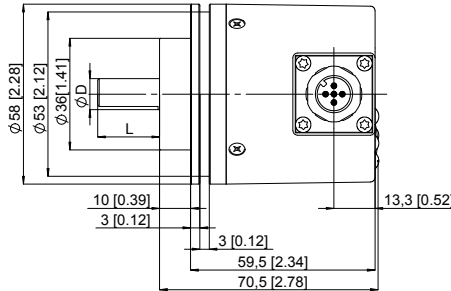
Dimensions in mm [inch]

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



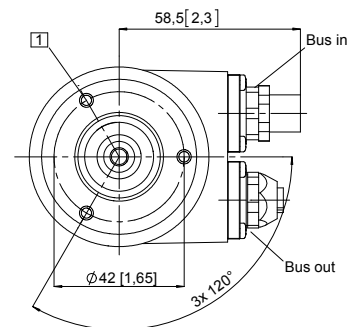
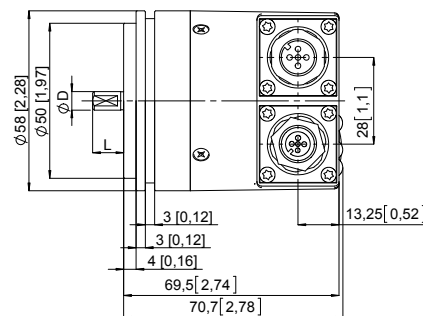
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(drawing with 2 x M12 connector)

- 1 3 x M4, 8 [0.32] deep



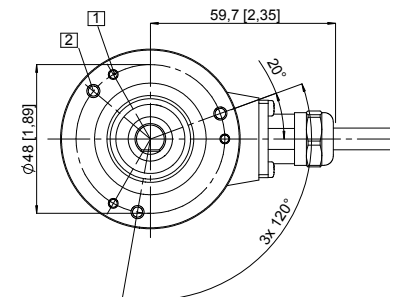
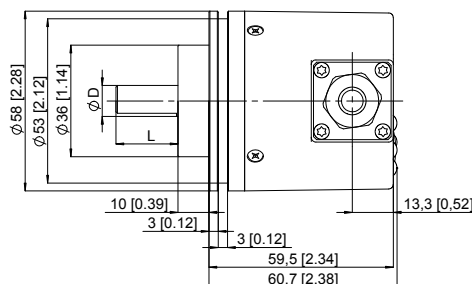
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Clamping flange, \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	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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Absolute encoders – multiturn

Standard mechanical multiturn, optical

Sendix 5868 / 5888 (shaft / hollow shaft)

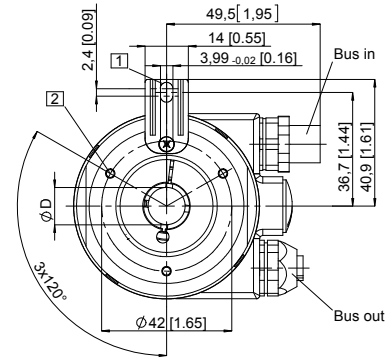
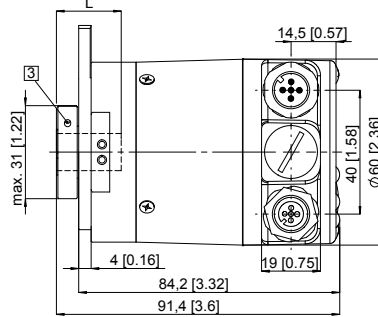
CANopen/CANopenLift

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 Slot spring element 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



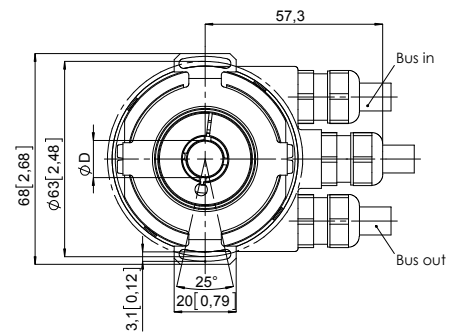
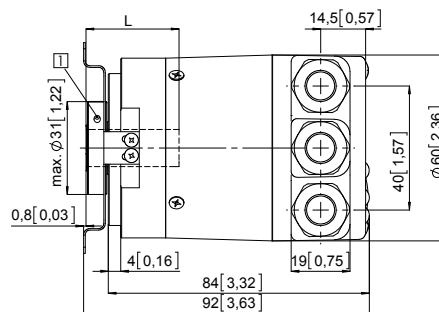
D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \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



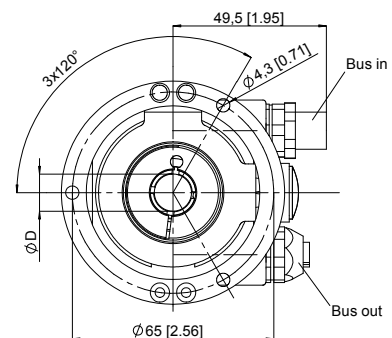
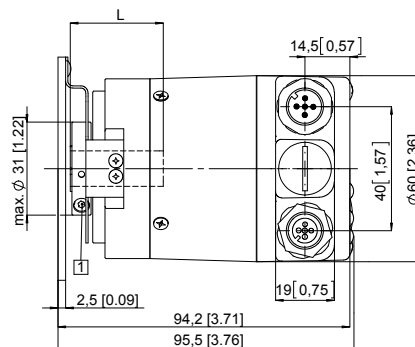
D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \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



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	CANopen/CANopenLift
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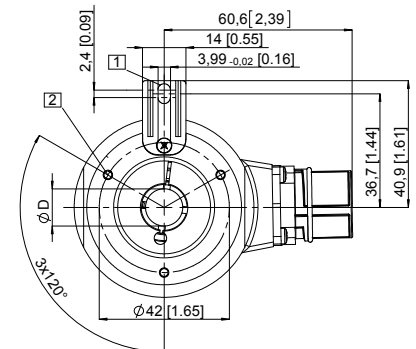
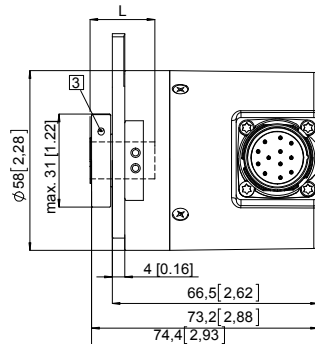
Dimensions hollow shaft version (blind hollow shaft), with fixed connection

Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

(drawing with M23 connector)

- 1 Slot spring element recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm



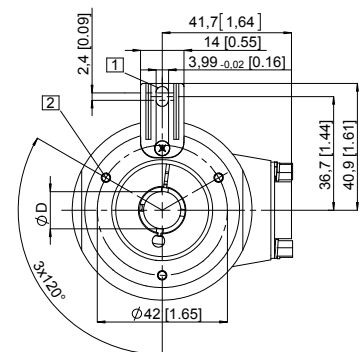
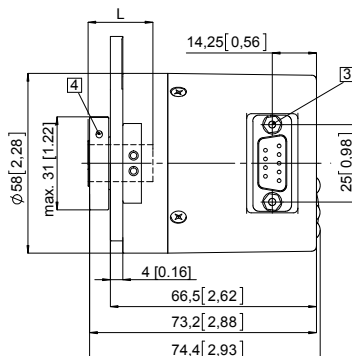
D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

Flange with spring element, long Flange type 1 and 2

(drawing with Sub-D connector)

- 1 Slot spring element recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 2 x 4/40 UNC; 3.0 [0.12] deep
- 4 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

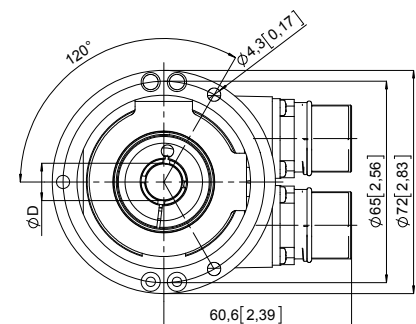
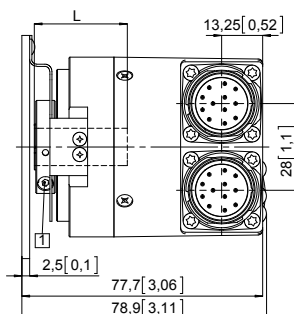
Flange with stator coupling, \varnothing 65 [2.56]

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



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

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**Standard
mechanical multiturn, optical**

Sendix 5868 / 5888 (shaft / hollow shaft)

CANopen/CANopenLift

Dimensions hollow shaft version (blind hollow shaft), with fixed connection

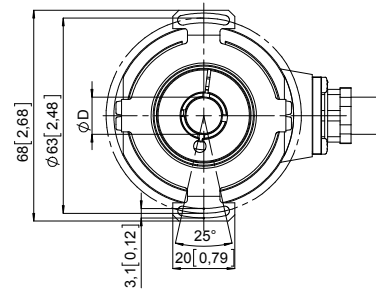
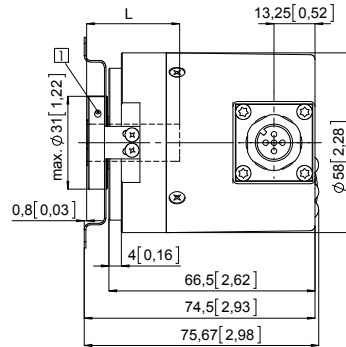
Dimensions in mm [inch]

Flange with stator coupling, $\varnothing 63$ [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



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

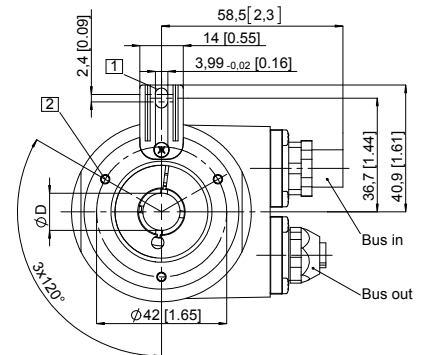
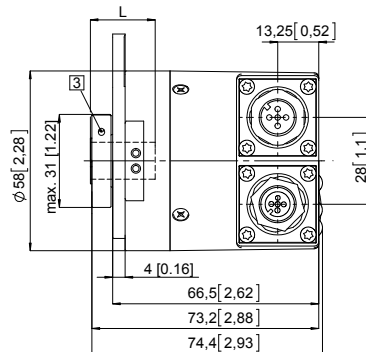
L = insertion depth max. blind hollow shaft

Flange with spring element, long

Flange type 1 and 2

(drawing with 2 x M12 connector)

- 1 Slot spring element recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
2 3 x M3, 5.5 [0.22] deep
3 Recommended torque for the clamping ring 0.6 Nm



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

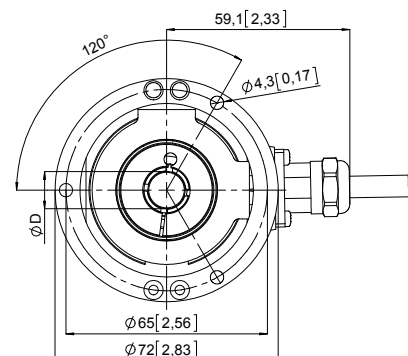
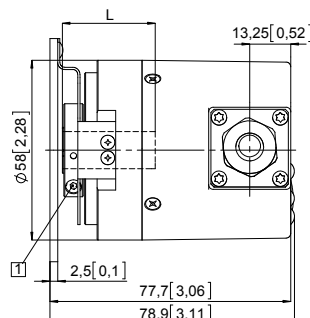
L = insertion depth max. blind hollow shaft

Flange with stator coupling, $\varnothing 65$ [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



D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT
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The multiturn encoders Sendix 5868 and 5888 with second-generation EtherCAT interface and optical sensor technology are ideal for use in all applications with an EtherCAT interface.

The data communication is based on CAN over EtherNet and ideally suited for use in real time applications.

These encoders are available with a solid shaft up to a maximum of 10 mm or a blind hollow shaft up to 15 mm.



EtherCAT
Conformance tested



Mechanical drive



Safety-Lock™



High rotational speed



Temperature range
-40°...+80°C



High protection level
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor



Surface protection salt spray-tested optional

Reliable

- EtherCAT conformance tested.
- Integration of the latest slave – EtherCAT stack from Beckhoff, Version 5.01.
- Ideally suited for use in harsh outdoor environments, thanks to IP67 protection and rugged housing construction.

Flexible

- Use of CoE (CAN over EtherNet).
- Genuine new position information as a result of minimal cycle time of 62.5 μs in the DC mode.
- Faster, easier error-free connection thanks to M12 connectors.
- Supports Hot Connect.

Order code Shaft version

8.5868 . **X** **X** **B** **2** . **B2** **12**
Type a b c d e

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]
- 4 = synchro flange, IP67 ø 58 mm [2.28"]
- 5 = square flange, IP65 □ 63.5 mm [2.5"]
- 7 = square flange, IP67 □ 63.5 mm [2.5"]

b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]¹⁾
- 2 = 10 x 20 mm [0.39 x 0.79"]²⁾
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c Interface / power supply

- B = EtherCAT / 10 ... 30 V DC

Optional on request

- Ex 2/22
- surface protection salt spray tested

d Type of connection

- 2 = 3 x M12 connector, 4-pin

e Fieldbus profile

- B2 = EtherCAT with CoE (CAN over EtherNet)

Order code Hollow shaft

8.5888 . **X** **X** **B** **2** . **B2** **12**
Type a b c d e

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.
Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b Blind hollow shaft

- (insertion depth max. 30 mm [1.18"])
- 3 = ø 10 mm [0.39"]
- 4 = ø 12 mm [0.47"]
- 5 = ø 14 mm [0.55"]
- 6 = ø 15 mm [0.59"]
- 8 = ø 3/8"
- 9 = ø 1/2"

c Interface / power supply

- B = EtherCAT / 10 ... 30 V DC

Optional on request

- Ex 2/22
- surface protection salt spray tested

d Type of connection

- 2 = 3 x M12 connector, 4-pin

e Fieldbus profile

- B2 = EtherCAT with CoE (CAN over EtherNet)

1) Preferred type only in conjunction with flange type 2.
2) Preferred type only in conjunction with flange type 1.

Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT
Mounting accessory for shaft encoders		Order no.
Coupling	bellows coupling \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	with fixing thread	8.0010.4700.0000
for flange with spring element (flange type 1 + 2)		
Connection technology		Order no.
Cordset, pre-assembled	M12 male connector with external thread for port IN and port OUT, 4-pin 2 m [6.56'] PUR cable	05.00.6031.4411.002M
	M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable	05.00.6061.6211.002M
Connector, self-assembly (straight)	M12 male connector with external thread for port IN and port OUT, 4-pin	05.WACSY4S
	M12 female connector with coupling nut for power supply, 4-pin	05.B8141-0

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data	
Mechanical characteristics	
Maximum speed	IP65 up to 70°C [158°F] 9000 min ⁻¹ , 7000 min ⁻¹ (continuous) IP65 up to T _{max} 7000 min ⁻¹ , 4000 min ⁻¹ (continuous) IP67 up to 70°C [158°F] 8000 min ⁻¹ , 6000 min ⁻¹ (continuous) IP67 up to T _{max} 6000 min ⁻¹ , 3000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65 < 0.01 Nm IP67 < 0.05 Nm
Mass moment of inertia	shaft version 3.0 x 10 ⁻⁶ kgm ² hollow shaft version 7.5 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 0.54 kg [19.05 oz]
Protection acc. to EN 60529	housing side IP67 shaft side IP65, opt. IP67
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft stainless steel flange aluminum housing zinc die-cast
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz
Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 120 mA
Reverse polarity protection of the power supply	yes
UL approval	file no. E224618
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
Interface characteristics EtherCAT	
Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Protocol	EtherNet / EtherCAT
Diagnostic LED (red)	
LED is ON with the following fault conditions: Sensor error (internal code or LED error), low voltage, over-temperature	
Run LED (green)	
LED is ON with the following conditions: Preop-, Safeop and Op-State (EtherCAT status machine)	
2 x Link LEDs (yellow)	
LED is ON with the following conditions (port IN and port OUT): Link detected	
Modes	
Freerun, distributed clock	

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Absolute encoders – multiturn

Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT
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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.

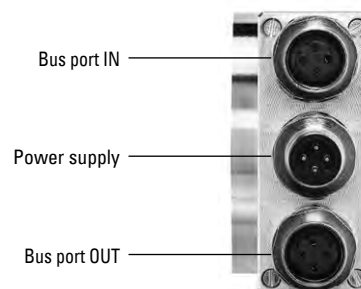
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

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.
- Hot-Connect – Support for rapid change of Bus-topology.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector, 4-pin					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	



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Standard mechanical multiturn, optical

Sendix 5868 / 5888 (shaft / hollow shaft)

EtherCAT

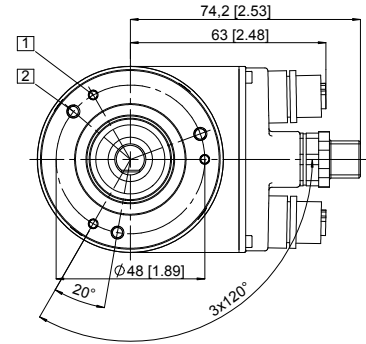
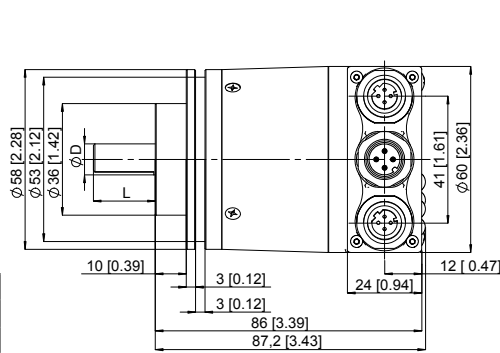
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, \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

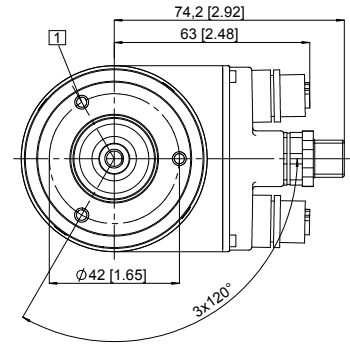
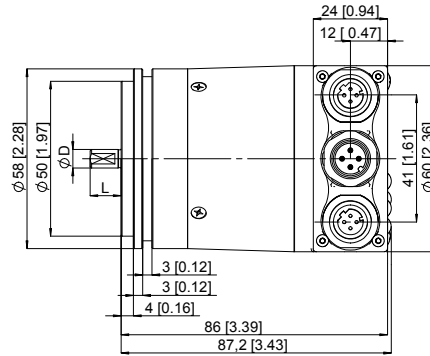
D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"



Synchro flange, \varnothing 58 [2.28] Flange type 2 and 4

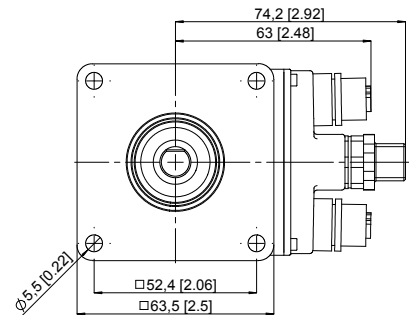
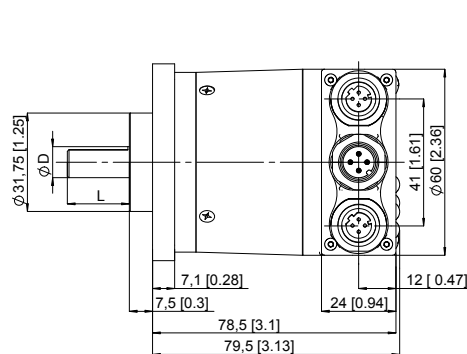
- 1 3 x M4, 6.0 [0.24] deep

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"



Square flange, \square 63.5 [2.5] Flange type 5 and 7

D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"



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Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	EtherCAT
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Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

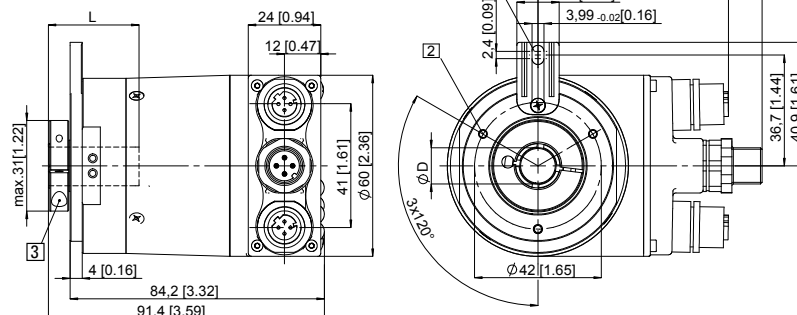
Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

- 1 Slot spring element recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 2 3 x M3, 5.5 [0.22] deep
- 3 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

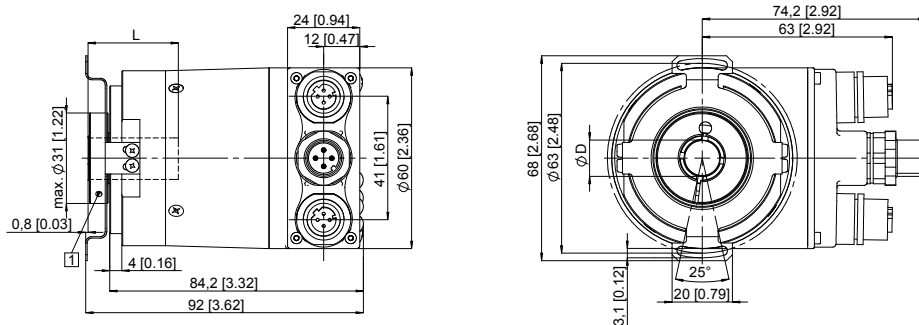


Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

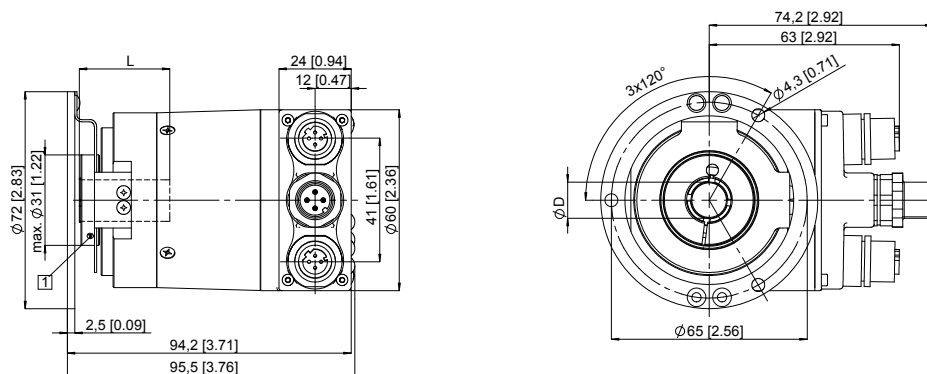


Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



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Absolute encoders – multiturn

Standard mechanical multiturn, optical

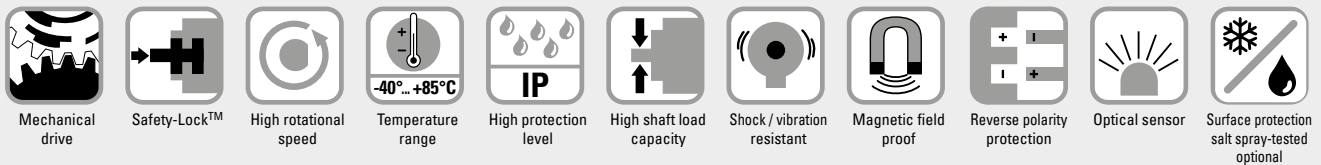
Sendix 5868 / 5888 (shaft / hollow shaft)

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.



Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1.
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction.

Flexible

- Easy setting of a preset value using a control bit (telegram 860).
- IRT-Mode.
- Cycle time ≥ 1 ms.
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.

Order code Shaft version

8.5868 . **XX** **C2** . **C2** **12**
Type **a** **b** **c** **d** **e**

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



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 x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]¹⁾**
- 2 = 10 x 20 mm [0.39 x 0.79"]²⁾**
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c Interface / power supply

- C = PROFINET IO / 10 ... 30 V DC**

e Fieldbus profile

- C2= PROFINET IO**

d Type of connection

- 2 = 3 x M12 connector, 4-pin**

Optional on request

- Ex 2/22
- surface protection salt spray tested

Order code Hollow shaft

8.5888 . **XX** **C2** . **C2** **12**
Type **a** **b** **c** **d** **e**

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange

- 1 = with spring element, long, IP65
- 2 = with spring element, long, IP67
- 3 = with stator coupling, IP65 \varnothing 65 mm [2.56"]
- 4 = with stator coupling, IP67 \varnothing 65 mm [2.56"]
- 5 = with stator coupling, IP65 \varnothing 63 mm [2.48"]**
- 6 = with stator coupling, IP67 \varnothing 63 mm [2.48"]

b Blind hollow shaft

- (insertion depth max. 30 mm [1.18"])
- 3 = \varnothing 10 mm [0.39"]
- 4 = \varnothing 12 mm [0.47"]**
- 5 = \varnothing 14 mm [0.55"]
- 6 = \varnothing 15 mm [0.59"]
- 8 = \varnothing 3/8"
- 9 = \varnothing 1/2"

c Interface / power supply

- C = PROFINET IO / 10 ... 30 V DC**

e Fieldbus profile

- C2= PROFINET IO**

d Type of connection

- 2 = 3 x M12 connector, 4-pin**

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)	PROFINET IO	Product overview Basics
Mounting accessory for shaft encoders		Order no.	Product overview Basics
Coupling	bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"] bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1102.0606 8.0000.1102.1010	
Mounting accessory for hollow shaft encoders		Dimensions in mm [inch]	Incremental encoders
Cylindrical pin, long for flange with spring element (flange type 1 + 2)	with fixing thread 	8.0010.4700.0000	
Connection technology		Order no.	Absolute encoders singleturn
Cordset, pre-assembled	M12 male connector with external thread for port 1 and port 2, 4-pin 2 m [6.56'] PUR cable M12 female connector with coupling nut for power supply, 4-pin 2 m [6.56'] PUR cable	05.00.6031.4411.002M 05.00.6061.6211.002M	
Connector, self-assembly (straight)	M12 male connector with external thread for port 1 and port 2, 4-pin M12 female connector with coupling nut for power supply, 4-pin	05.WASCSY4S 05.B8141-0	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data		Interface characteristics PROFINET IO		Bearingless encoders
Mechanical characteristics		Resolution singleturn		
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)	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)		
Starting torque - at 20°C [68°F]	IP65 < 0.01 Nm IP67 < 0.05 Nm	Number of revolutions (multiturn)		Inclinometers
Mass moment of inertia	shaft version 3.0 x 10 ⁻⁶ kgm ² hollow shaft version 7.5 x 10 ⁻⁶ kgm ²	max. 4096 (12 bit) scalable only via the total resolution		
Load capacity of shaft	radial 80 N axial 40 N	Total resolution		Connection technology
Weight	approx. 0.54 kg [19.05 oz]	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)		
Protection acc. to EN 60529	housing side IP67 shaft side IP65, opt. IP67	Code		Accessories
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]	binary		
Material	shaft/hollow shaft stainless steel flange aluminum housing zinc die-cast	Protocol		Addresses
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms	PROFINET IO		
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz	Link 1 and 2, LED (green / yellow)		
Electrical characteristics		two colored green active link yellow data transfer		
Power supply	10 ... 30 V DC	Error LED (red) / PWR LED (green)		
Power consumption (no load)	max. 200 mA	Functionality see manual		
Reverse polarity protection of the power supply	yes			
UL approval	file no. E224618			
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU			

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.

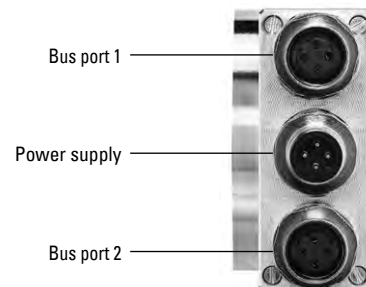
PROFINET IO

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**rotocol is implemented here. Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

Terminal assignment

Interface	Type of connection	Function	M12 connector, 4-pin					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	



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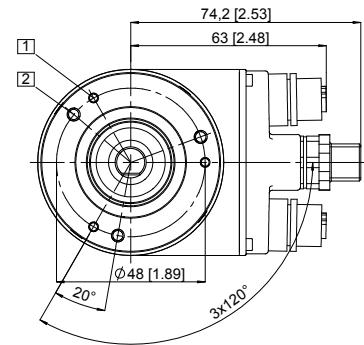
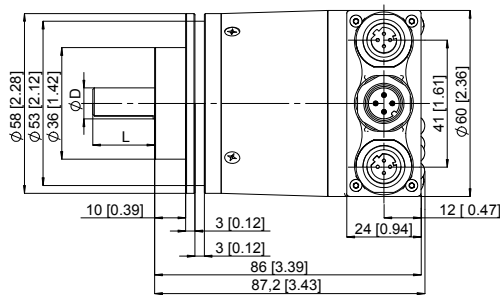
Standard mechanical multiturn, optical	Sendix 5868 / 5888 (shaft / hollow shaft)	PROFINET IO
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Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28] Flange type 1 and 3

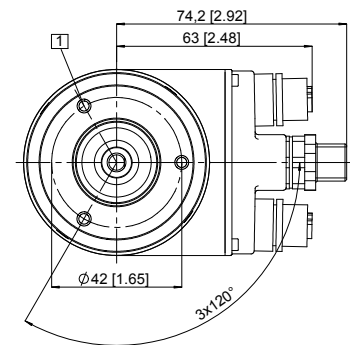
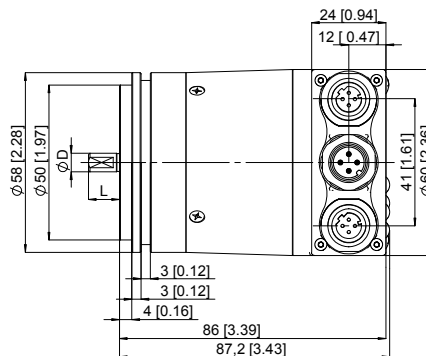
- 1 3 x M3, 6.0 [0.24] deep
- 2 3 x M4, 8.0 [0.31] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

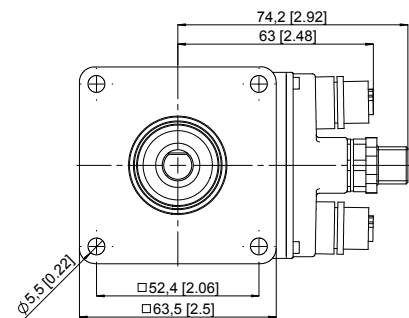
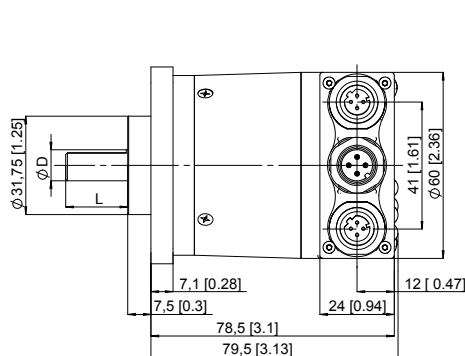
Synchro flange, \varnothing 58 [2.28] Flange type 2 and 4

- 1 3 x M4, 6.0 [0.24] deep



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

Square flange, \square 63.5 [2.5] Flange type 5 and 7



D	Fit	L
6 [0.24]	h7	10 [0.39]
10 [0.39]	f7	20 [0.79]
1/4"	h7	7/8"
3/8"	h7	7/8"

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

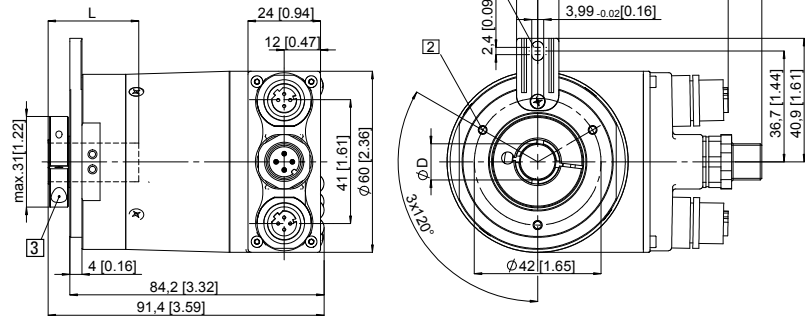
Dimensions in mm [inch]

Flange with spring element, long Flange type 1 and 2

- 1 Slot spring element 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

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

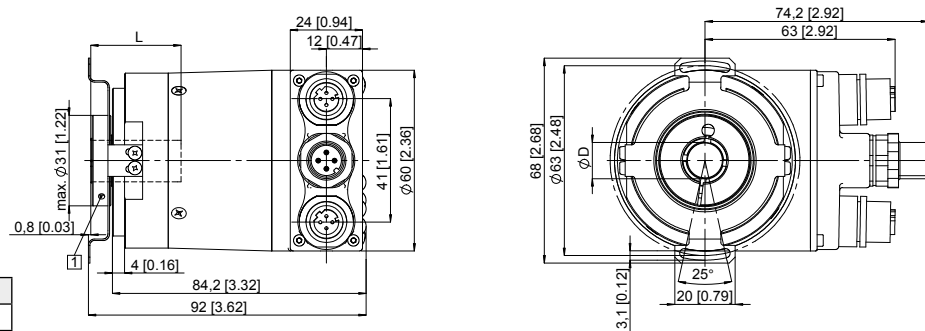


Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft

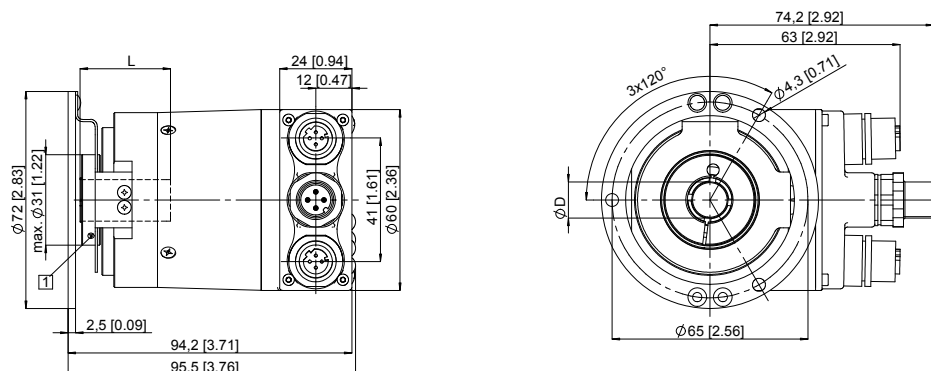


Flange with stator coupling, $\varnothing 65$ [2.56] Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm

D	Fit	L
10 [0.39]	H7	30 [1.18]
12 [0.47]	H7	30 [1.18]
14 [0.55]	H7	30 [1.18]
15 [0.59]	H7	30 [1.18]
3/8"	H7	30 [1.18]
1/2"	H7	30 [1.18]

L = insertion depth max. blind hollow shaft



Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

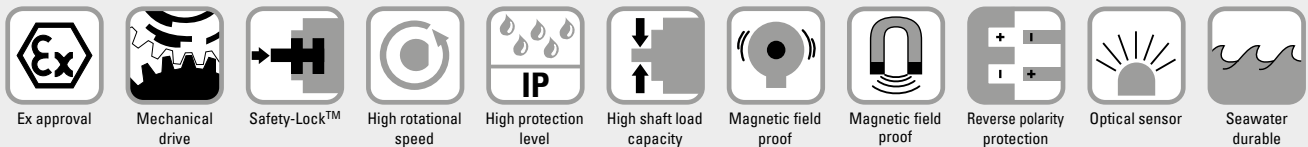
Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical **Sendix 7063 / 7083 (shaft / hollow shaft) SSI/BiSS**



The Sendix 7063 / 7083 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with an SSI or BiSS interface and optical sensor technology.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 29 bits; they are also available with axial and radial cable outlets.



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Order code **8.7063 . 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']

- 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']
0200 = 20 m [65.62']
- Optional on request*
- special cable length
- other singleturn resolutions
- IP65 version for T6
- seawater resistant (stainless steel V4A)
- Stainless steel V4A as standard types (deliverable as from 1 unit)*
8.7063.2221.XX21.V4A
8.7063.222A.XX21.XXXX-V4A



1) Not applicable with connection types 1 and 2.
 2) Resolution, preset value and counting direction factory-programmable.

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Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical	Sendix 7063 / 7083 (shaft / hollow shaft)	SSI / BiSS
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Order code Hollow shaft	8.7083 Type	.XX2X.XX21.XXXX a b c d e f g h i 1)
a Flange 1 = with spring element, short 5 = with stator coupling, IP67, ø 65 mm [2.56"]	e Code B = SSI, binary C = BiSS, binary G = SSI, gray	i Cable length in dm 1) 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21'] 0200 = 20 m [65.62']
b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]	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	<i>Optional on request</i> - special cable length - other singleturn resolutions - IP65 version for T6 - seawater resistant (stainless steel V4A)
c Interface / power supply 2 = SSI, BiSS / 10 ... 30 V DC	g Inputs / outputs 2) 2 = SET, DIR input additional status output	<i>Stainless steel V4A as standard types (deliverable as from 1 unit)</i> V4A 1.4404 8.7083.2221.XX21-V4A 8.7083.222A.XX21.XXXX-V4A
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']	h Options 1 = no option	

Mounting accessory for shaft encoders	Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]
	8.0000.1102.1010

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7063	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012; ATEX guideline 94/9/EC EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7083	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards	EN 60079-0:2012 + A11:2013; ATEX guideline 2014/34/EU EN 60079-1:2014; EN 60079-31:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0020 X
Category (gas)	Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes 3)
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2.
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical	Sendix 7063 / 7083 (shaft / hollow shaft)	SSI/BiSS
---	--	-----------------

Mechanical characteristics		
Maximum speed	shaft hollow shaft	6000 min ⁻¹ (continuous) 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft flange / housing cable	stainless steel seawater durable Al, type AlSiMgMn (EN AW-6082) PUR
Shock resistance	acc. to EN/IEC 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance	acc. to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

SSI interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH LOW at I _{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution singleturn		10 ... 14 bit and 17 bit
Number of revolutions (multiturn)		4096 (12 bit)
Code		binary or gray
SSI clock rate		50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ST resolution ≥ 15 bit	≤ 1 μs 4 μs
Monoflop time		≤ 15 μs ²⁾
Note:	if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. +/- 20 mA
Signal level	HIGH LOW at I _{Load} = 20 mA	typ 3.8 V typ 1.3 V
Resolution 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	ST resolution ≤ 14 bit ST resolution 17 bit	≤ 1 μs 2.4 μs
Note:	– bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification	

Status output	
Output driver	open collector, internal pull-up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH +V LOW < 1 V
Active at	LOW
The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation.	

SET input	
Input	HIGH active
Input type	comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

Power-ON	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.	
Hot plugging of the encoder should be avoided.	

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Absolute encoders – multiturn

**Standard, ATEX/IECEx – zone 1/21
mechanical multiturn, optical**

Sendix 7063 / 7083 (shaft / hollow shaft)

SSI / BiSS

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)												
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊕	⊖	
2	1, 2, A, B	SET, DIR	Core marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield	

+V: Encoder power supply +V DC

0 V: Encoder power supply ground GND (0 V)

C+, C-: Clock signal

D+, D-: Data signal

SET: Set input

DIR: Direction input

Stat: Status output

⊕: Protective earth

Dimensions shaft version

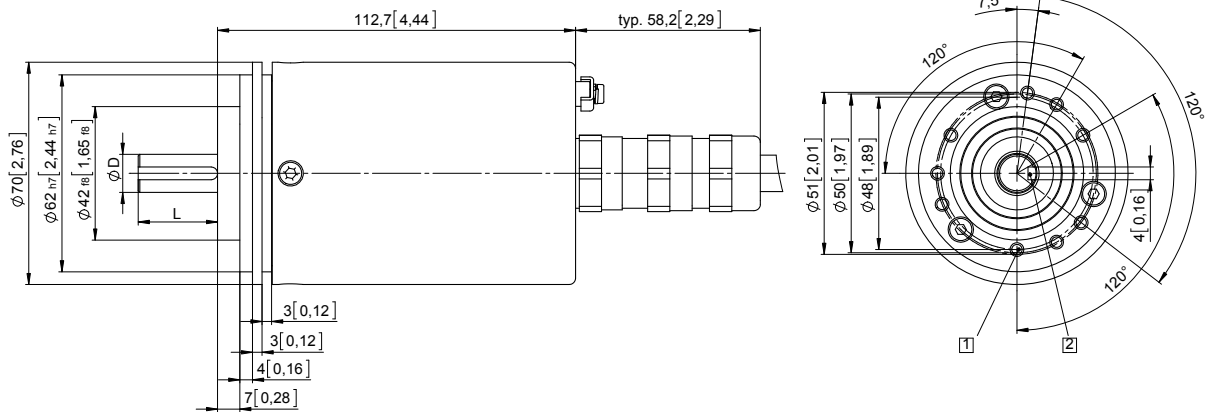
Dimensions in mm [inch]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

1 9 x M4, 10 [0.39] deep

2 Keyway for DIN 6885-A-4x4x25 key

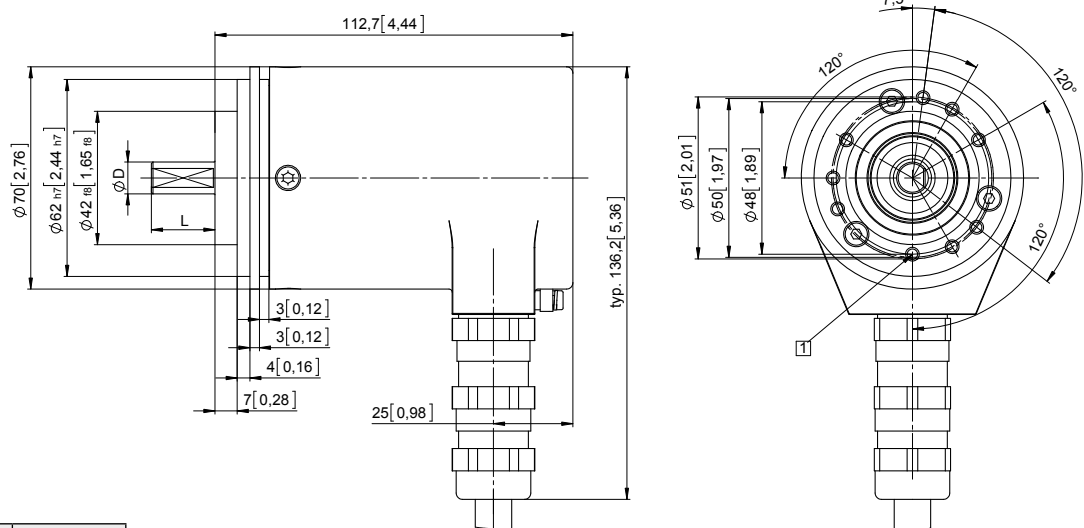


D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, ø 70 [2.76]

Shaft type 2 with radial cable outlet

1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

Absolute encoders – multiturn

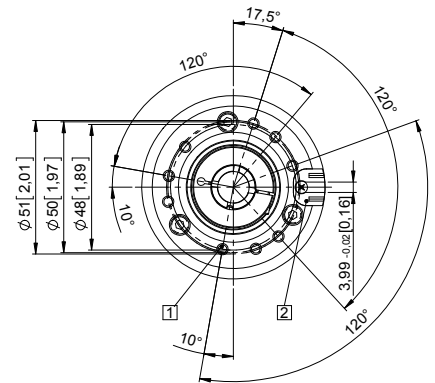
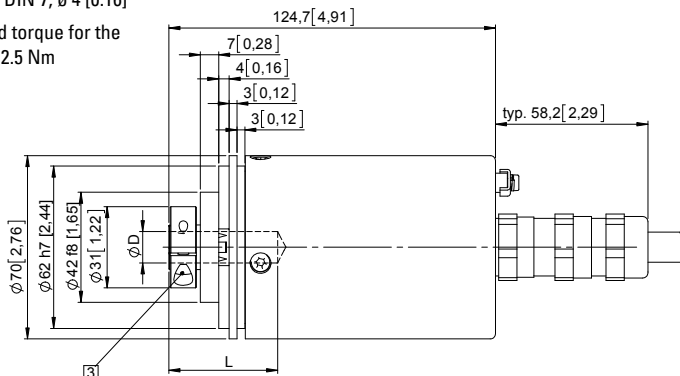
Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical	Sendix 7063 / 7083 (shaft / hollow shaft)	SSI/BiSS
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



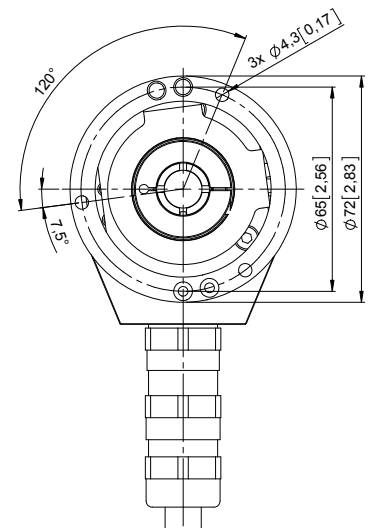
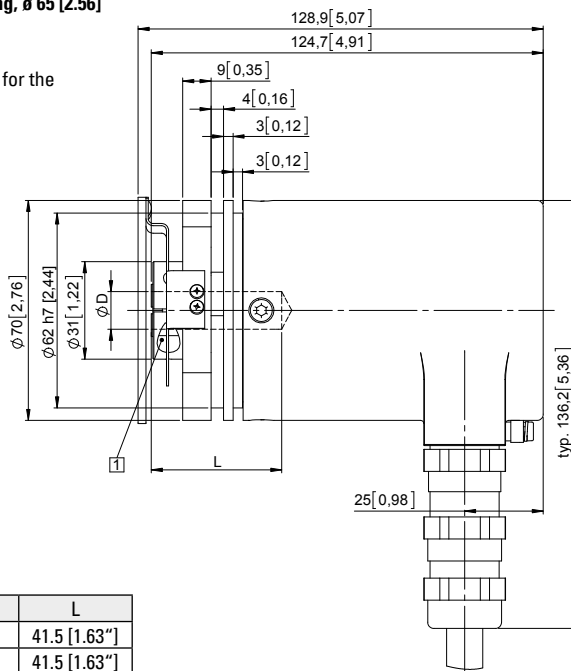
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, $\varnothing 65$ [2.56]

Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Absolute encoders – multiturn

**Standard, ATEX/IECEx – zone 1/21
SIL2/PLd, mechanical multiturn, optical**

Sendix SIL 7063FS2 (shaft)

SSI / BiSS + SinCos



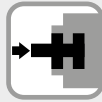
Ex protection and Functional Safety in one device.

The absolute multiturn encoders 7063FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



Ex approval



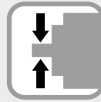
Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



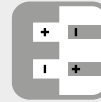
Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater durable

Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL2 acc. to EN 61800-5-2.
- Suitable for applications up to PLd acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7063FS2 . 1 X 4 X . X X 2 1 . XXXX
Type a b c d e f g h i 1)

a Flange

1 = clamping / synchronous flange, IP67, Ø 70 mm [2.76"]

b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat

1 = 12 x 25 mm [0.47 x 0.98"],

with keyway for 4 x 4 mm [0.16 x 0.16"] key

c Interface / power supply

4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC

d Type of connection

1 = axial cable, 2 m [6.56'] PUR

2 = radial cable, 2 m [6.56'] PUR

A = axial cable, length > 2 m [6.56']

B = radial cable, length > 2 m [6.56']

preferred length see i, e. g.: 0100 = 10 m [32.81']

e Code

B = SSI, binary

C = BiSS, binary

G = SSI, gray

f Resolution 2)

A = 10 bit ST + 12 bit MT

1 = 11 bit ST + 12 bit MT

2 = 12 bit ST + 12 bit MT

3 = 13 bit ST + 12 bit MT

4 = 14 bit ST + 12 bit MT

7 = 17 bit ST + 12 bit MT

g Inputs / outputs 2)

2 = SET input

h Options

1 = no option

i Cable length in dm 1)

0050 = 5 m [16.40']

0100 = 10 m [32.81']

0150 = 15 m [49.21']

0200 = 20 m [65.62']

Optional on request

- special cable length

- other singleturn resolutions

- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types

(deliverable as from 1 unit)

8.7063FS2.2241.XX21.V4A

8.7063FS2.224A.XX21.XXXX-V4A



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, mechanical multiturn, optical		Sendix SIL 7063FS2 (shaft)	SSI/BiSS + SinCos	Product overview Basics
Accessories			Order no.	
EMC shield terminal	for top-hat rail mounting	8.0000.4G06.0000		
Screw retention	Loctite 243, 5 ml	8.0000.4G05.0000		
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .			
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .			Incremental encoders
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 .			Absolute encoders singleturn

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
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"	
These encoders are suitable for use in safety-related systems up to SIL2 acc. to EN 61800-5-2 and PLd to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.	

Safety characteristics	
Classification	PLd / SIL2
System structure	2 channel (Cat. 3)
PFH_d value ¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 50 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 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
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 90 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL2.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Standard, ATEX/IECEX – zone 1/21 SIL2/PLd, mechanical multiturn, optical	Sendix SIL 7063FS2 (shaft)	SSI / BiSS + SinCos
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SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 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 ¹⁾
Pulse rate	2048 ppr

SET input	
Input	HIGH active
Input type	comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Power-ON	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.	
Hot plugging of the encoder should be avoided.	

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores 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	Core marking:	6	1	2	3	4	5	11	7	8	9	10	shield

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Protective earth

¹⁾ Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Absolute encoders – multiturn

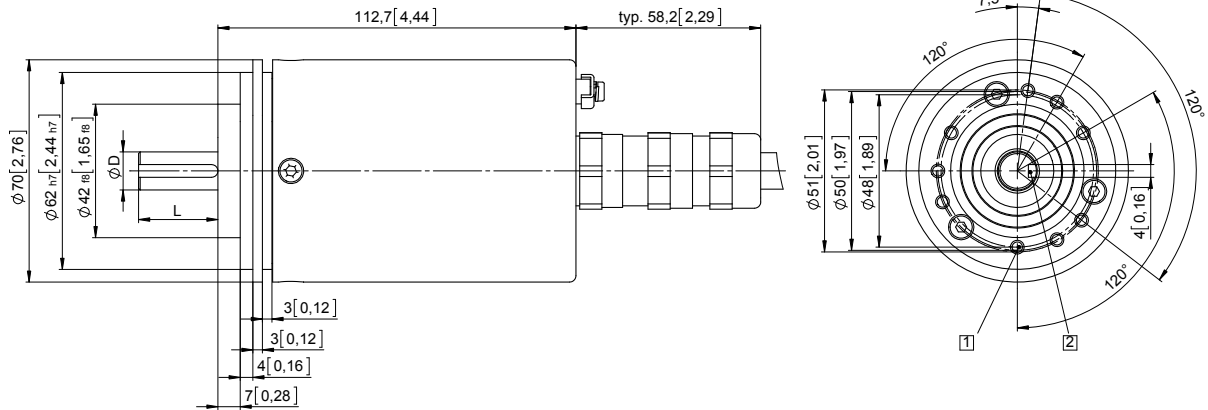
Standard, ATEX/IECEX – zone 1/21 SIL2/PLd, mechanical multiturn, optical	Sendix SIL 7063FS2 (shaft)	SSI/BiSS + SinCos
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Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

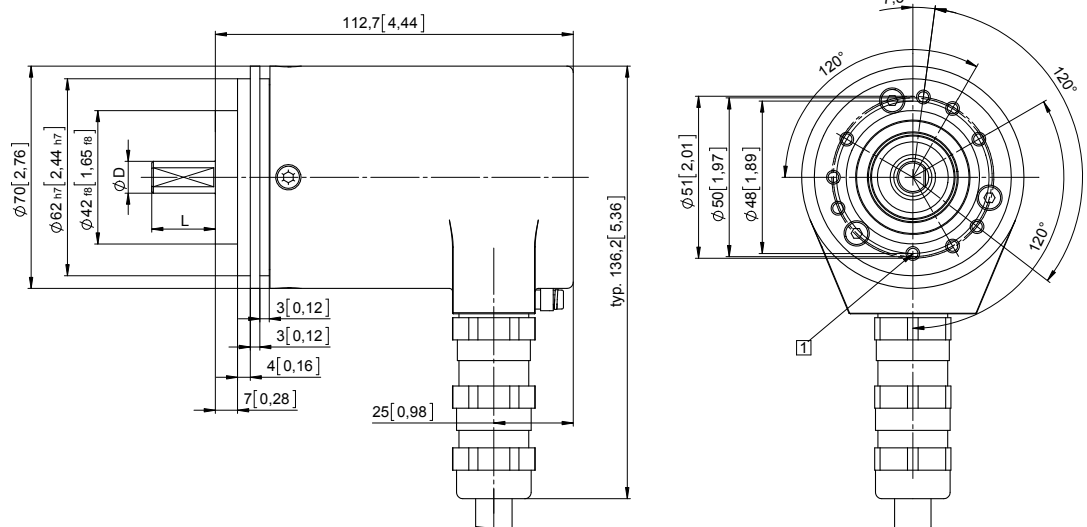
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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Absolute encoders – multiturn

**Standard, ATEX/IECEx – zone 1/21
SIL3/PLe, mechanical multiturn, optical**

Sendix SIL 7063FS3 (shaft)

SSI / BiSS + SinCos



SIL3
Functional Safety
PLe

Ex protection and Functional Safety in one device.

The absolute multiturn encoders 7063FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater durable aluminum.



Functional Safety

- Encoder with individual certificate from IFA / TÜV.
- Suitable for applications up to SIL3 acc. to EN 61800-5-2.
- Suitable for applications up to PLe acc. to EN ISO 13849-1.
- SSI or BiSS interface with incremental SinCos tracks with 2048 ppr.
- Certified mechanical mounting + electronic.

Explosion protection

- "Flameproof-enclosure" version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code **8.7063FS3** . **1** X **4** X . **X** X **2** 1 . **XXXX**
Shaft version Type

- 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 ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT
- g** Inputs / outputs ²⁾
2 = SET input
- h** Options
1 = no option

- i** Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']
0200 = 20 m [65.62']
- Optional on request*
- special cable length
- other singleturn resolutions
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)
8.7063FS3.2241.XX21.V4A
8.7063FS3.224A.XX21.XXXX-V4A



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, mechanical multiturn, optical		Sendix SIL 7063FS3 (shaft)	SSI/BiSS + SinCos	Product overview Basics
Accessories			Order no.	
EMC shield terminal	for top-hat rail mounting	8.0000.4G06.0000		
Screw retention	Loctite 243, 5 ml	8.0000.4G05.0000		
Bellows coupling, safety-oriented	You will find an overview of our couplings for Sendix SIL shaft encoders in the accessories section or under www.kuebler.com/accessories .			
Safety modules Safety-M compact / modular	You will find an overview of our systems and components for Functional Safety and the corresponding software in the safety technology section or under www.kuebler.com/safety .			Incremental encoders
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 .			Absolute encoders singleturn

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
Relevant standards	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Notes regarding "Functional Safety"	
These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality. Additional functions can be found in the operating manual.	

Safety characteristics	
Classification	PLe / SIL3
System structure	2 channel (Cat. 4)
PFH_d value ¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Mission time / Proof test interval	20 years
Relevant standards	EN ISO 13849-1:2008 EN ISO 13849-2:2013 EN 61800-5-2:2007

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 50 mA
Reverse polarity protection for power supply	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2014/30/EU ATEX guideline 2014/34/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

Mechanical characteristics	
Maximum speed	6000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 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
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance acc. to EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.
2) Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

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Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21 SIL3/PLe, mechanical multiturn, optical	Sendix SIL 7063FS3 (shaft)	SSI / BiSS + SinCos
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SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. +/- 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Resolution singleturn	10 ... 14 bit and 17 bit
Number of revolutions (multiturn)	4096 (12 bit)
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface	
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
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 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 ¹⁾
Pulse rate	2048 ppr

SET input	
Input	HIGH active
Input type	comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Power-ON	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.	
Hot plugging of the encoder should be avoided.	

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores 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	
			Core marking:	6	1	2	3	4	5	11	7	8	9	10	shield	

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: SET input
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Protective earth

¹⁾ Short circuit to 0 V or to output, one channel at a time, power supply correctly applied.

Absolute encoders – multiturn

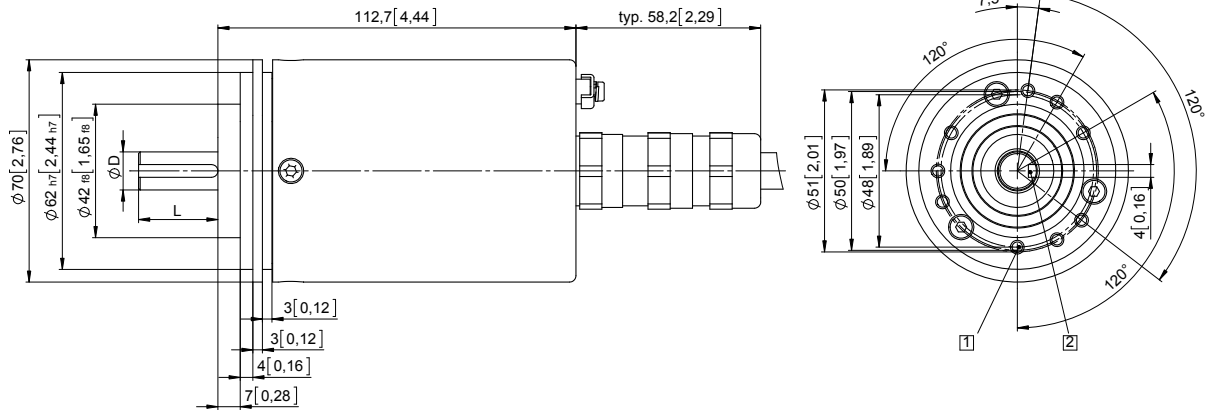
Standard, ATEX/IECEX – zone 1/21 SIL3/PLe, mechanical multiturn, optical	Sendix SIL 7063FS3 (shaft)	SSI/BiSS + SinCos
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Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

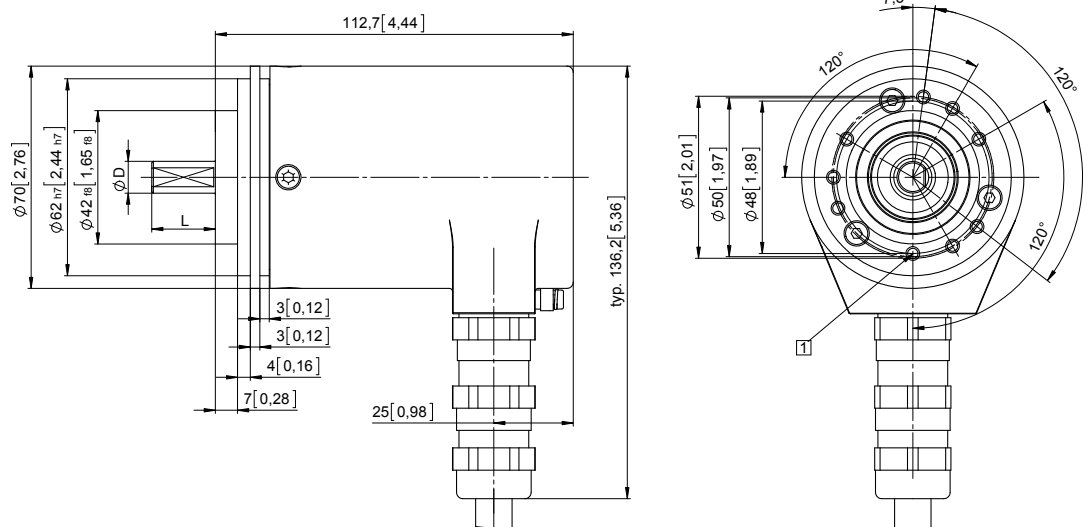
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

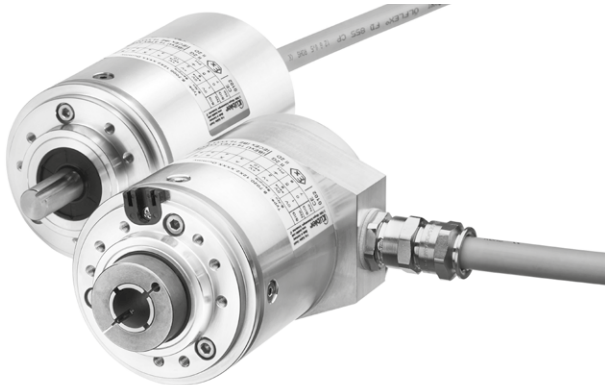
Addresses

Absolute encoders – multiturn

**Standard, ATEX/IECEX – zone 1/21
mechanical multiturn, optical**

Sendix 7068 / 7088 (shaft / hollow shaft)

PROFIBUS DP



The Sendix 7068 / 7088 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a Profibus interface and optical sensor technology.

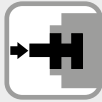
These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



Ex approval



Mechanical drive



Safety-Lock™



High rotational speed



High protection level



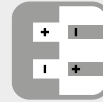
High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor



Seawater durable

Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEx with certificate of conformity (CoC).

Order code Shaft version

8.7068 . 1 X 3 X . 31 11 . XXXX
Type a b c d e f 1)

a Flange

1 = clamping / synchronous flange, IP67, Ø 70 mm [2.76"]

b Shaft (Ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway
for 4 x 4 mm [0.16 x 0.16"] key

c Interface / power supply

3 = PROFIBUS DP V0 / 10 ... 30 V DC

d Type of connection

1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e Fieldbus profile

31 = PROFIBUS DP V0 encoder profile class 2

f Cable length in dm 1)

0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request

- special cable length
- IP65 version for T6
- seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types
(deliverable as from 1 unit)

V4A 8.7068.2231.3111.V4A
1.4404 8.7068.223A.3111.XXXX-V4A

1) Not applicable with connection types 1 and 2.

Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical	Sendix 7068 / 7088 (shaft / hollow shaft)	PROFIBUS DP
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Order code Hollow shaft	8.7088 Type	.XX3X.3111.XXXX a b c d e f 1)	
a Flange 1 = with spring element, short 5 = with stator coupling, IP67, ø 65 mm [2.56"]	d Type of connection 1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length > 2 m [6.56'] B = radial cable, length > 2 m [6.56']	e Fieldbus profile 31 = PROFIBUS DP V0 encoder profile class 2	f Cable length in dm ¹⁾ 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']
b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]	c Interface / Power supply 3 = PROFIBUS DP V0 / 10 ... 30 V DC	Optional on request - special cable length - IP65 version for T6 - seawater resistant (stainless steel V4A)	Stainless steel V4A as standard types (deliverable as from 1 unit) 8.7088.2231.3111.V4A 8.7088.223A.3111.XXXX-V4A
		V4A 1.4404	

Mounting accessory for shaft encoders	Order no.
Coupling	bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]
	8.0000.1102.1010

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Explosion protection Sendix 7068	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	II 2D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7088	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014; EN 60079-31:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0020 X
Category (gas)	Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance to EN/IEC 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 120 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical	Sendix 7068 / 7088 (shaft / hollow shaft)	PROFIBUS DP
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Interface characteristics PROFIBUS DP	
Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scalable
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	specification according to PROFIBUS DP 2.0 / standard (DIN 19245 part 3) / RS485 driver galvanically isolated
Protocol	Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a CLASS 2-master, default address: 125
Termination	active termination can only be switched on externally

Profibus encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The encoder profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

The following functionality is integrated

- Galvanic isolation of the bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_VDC	PB_A OUT	PB_B OUT
		Core marking:	1	2	4	5	6	7	8	9

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Absolute encoders – multiturn

**Standard, ATEX/IECEX – zone 1/21
mechanical multiturn, optical**

Sendix 7068 / 7088 (shaft / hollow shaft)

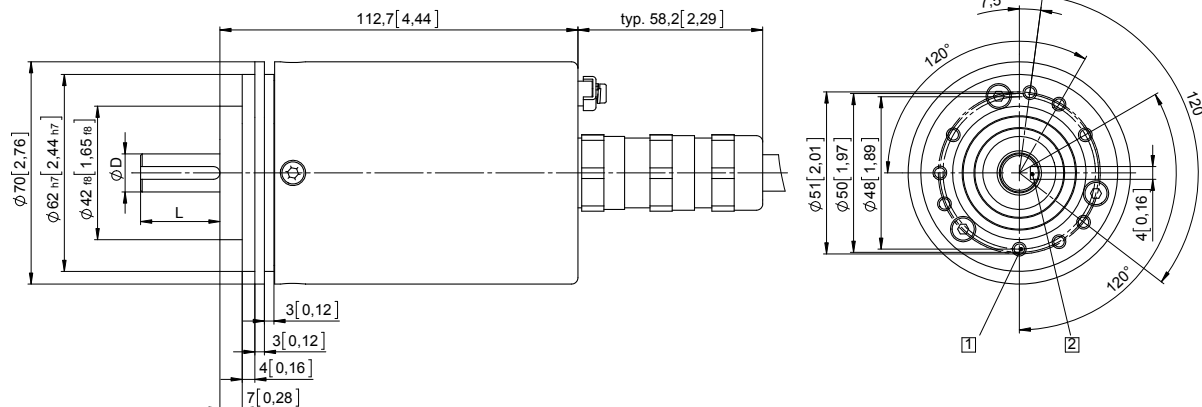
PROFIBUS DP

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

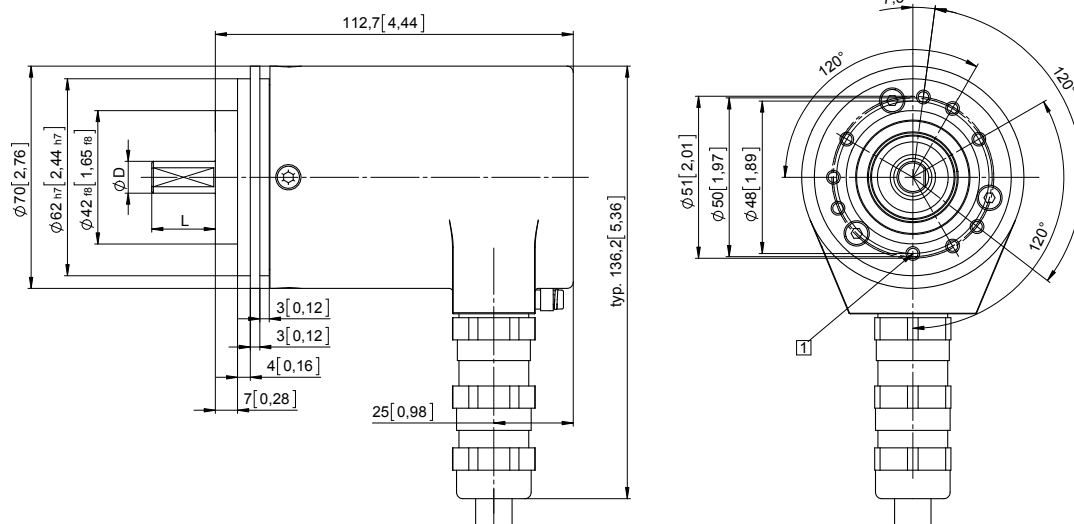
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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**Standard, ATEX/IECEx – zone 1/21
mechanical multiturn, optical**

Sendix 7068 / 7088 (shaft / hollow shaft)

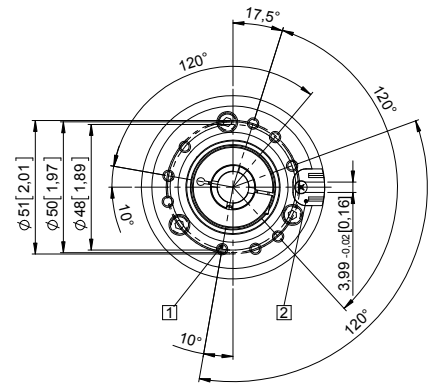
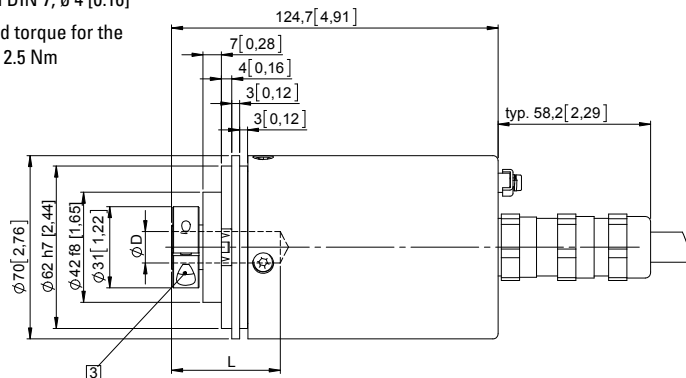
PROFIBUS DP

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



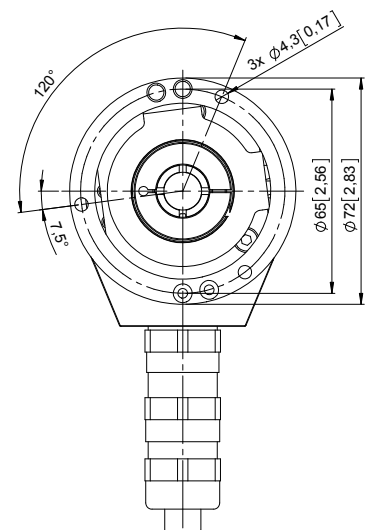
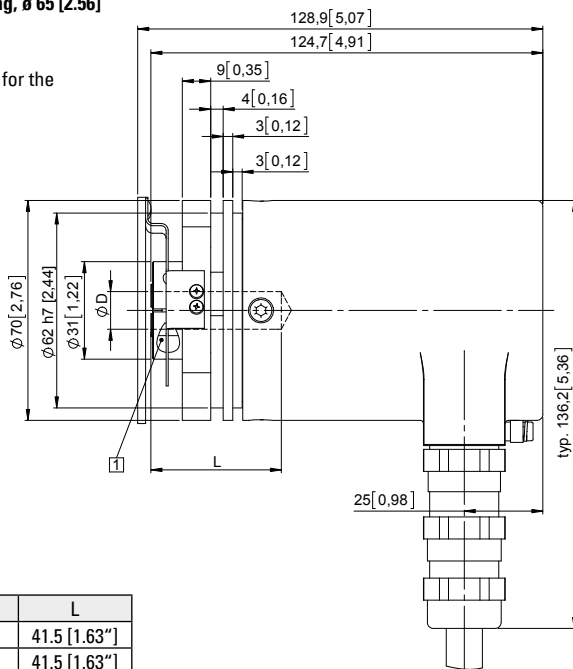
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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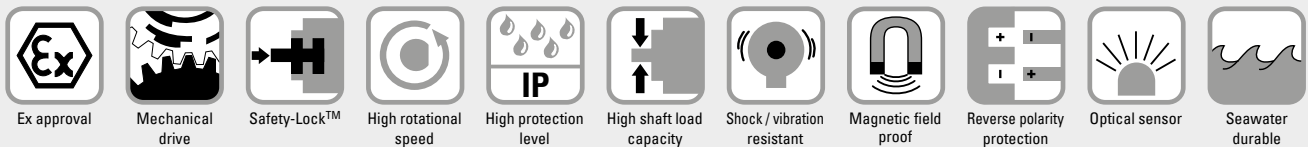
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Absolute encoders – multiturn

Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical **Sendix 7068 / 7088 (shaft / hollow shaft)** **CANopen**



The Sendix 7068 / 7088 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater durable aluminum housing, with a CANopen interface and optical sensor technology. These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Can be operated in marine environments – housing and flange manufactured from seawater durable aluminum.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- “Flameproof-enclosure” version.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Order code **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, ø 70 mm [2.76"]

b Shaft (ø x L)
 2 = 10 x 20 mm [0.39 x 0.79"], with flat
 1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c Interface / power supply
 2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d Type of connection
 1 = axial cable, 2 m [6.56'] PUR
 2 = radial cable, 2 m [6.56'] PUR
 A = axial cable, length > 2 m [6.56']
 B = radial cable, length > 2 m [6.56']

e Fieldbus profile
 21 = CANopen

f Cable length in dm ¹⁾
 0050 = 5 m [16.40']
 0100 = 10 m [32.81']
 0150 = 15 m [49.21']

Optional on request
 - special cable length
 - IP65 version for T6
 - seawater resistant (stainless steel V4A)

Stainless steel V4A as standard types (deliverable as from 1 unit)

V4A 8.7068.2221.2121.V4A
 1.4404 8.7068.222A.2121.XXXX-V4A

1) Not applicable with connection types 1 and 2.

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Standard, ATEX/IECEX – zone 1/21 mechanical multitrans, optical	Sendix 7068 / 7088 (shaft / hollow shaft)	CANopen
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Order code Hollow shaft	8.7088 Type	.XX2X.2121.XXXX a b c d e f 1)	<p>a Flange 1 = with spring element, short 5 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p>b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]</p> <p>c Interface / power supply 2 = CANopen DS301 V4.02 / 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 Fieldbus profile 21 = CANopen</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> - special cable length - IP65 version for T6 - seawater resistant (stainless steel V4A)</p> <p><i>Stainless steel V4A as standard types (deliverable as from 1 unit)</i> 8.7088.2221.2121.V4A 8.7088.222A.2121.XXXX-V4A</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> V4A 1.4404 </div>
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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.

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Explosion protection Sendix 7068	
ATEX	
EC type-examination certificate	PTB09 ATEX 1106 X
Category (gas)	Ex II 2 G Ex d IIC T4 - T6 Gb
Category (dust)	Ex II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2014; EN 60079-31:2009
IECEX	
Certificate of Conformity (CoC)	IECEX PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2008

Explosion protection Sendix 7088	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1091 X
Category (gas)	Ex II 2 G Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex II 2 D Ex tb IIIC T135°C - T85°C Db
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014; EN 60079-31:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0020 X
Category (gas)	Ex db IIC T4/120°C (T4)/T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014; IEC 60079-31:2013

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.5 kg [52.91 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing seawater durable Al, type AlSiMgMn (EN AW-6082) cable PUR
Shock resistance to EN/IEC 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 100 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Interface characteristics CANopen	
Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position**, **speed**, **acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min⁻¹).
- Factor for speed calculation (e.g. measuring wheel circumference)
Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core marking:	1	2	4	5	6	7	8	9

Absolute encoders – multiturn

**Standard, ATEX/IECEX – zone 1/21
mechanical multiturn, optical**

Sendix 7068 / 7088 (shaft / hollow shaft)

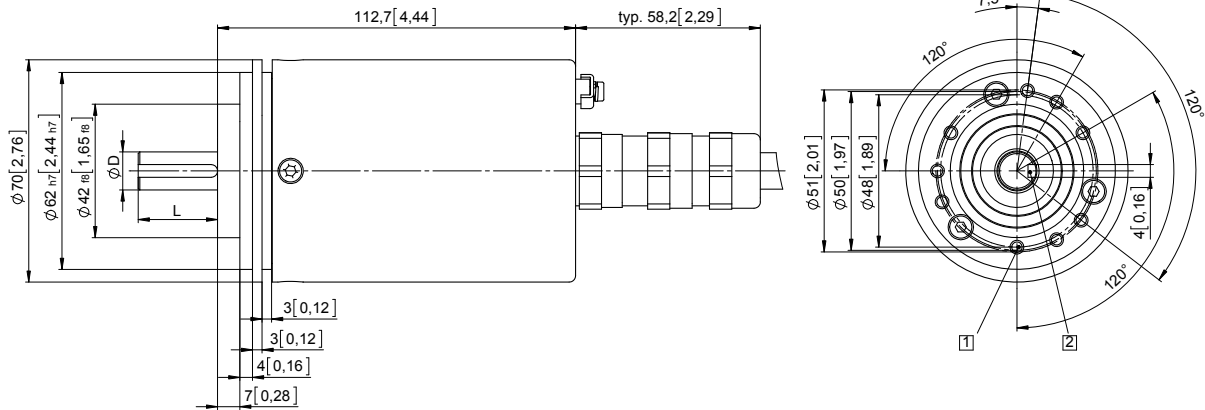
CANopen

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

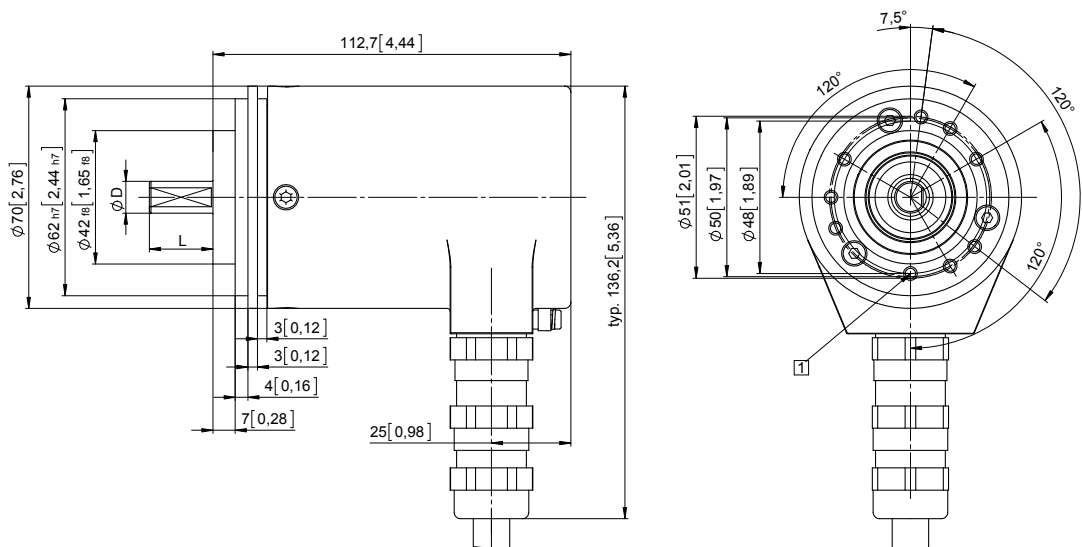
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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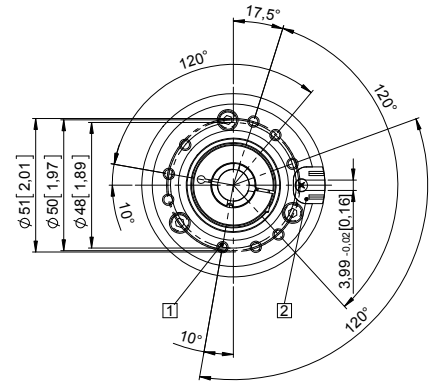
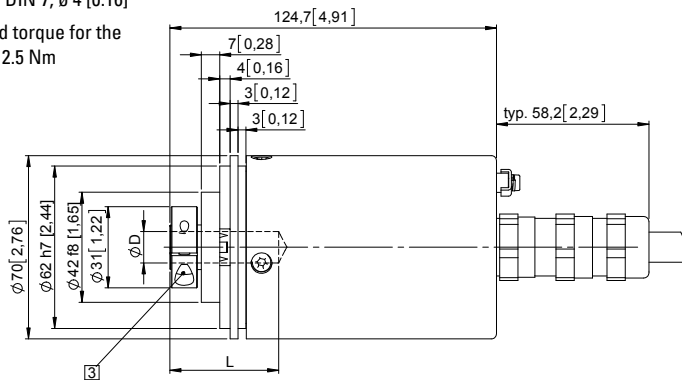
Standard, ATEX/IECEX – zone 1/21 mechanical multiturn, optical	Sendix 7068 / 7088 (shaft / hollow shaft)	CANopen
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 1

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



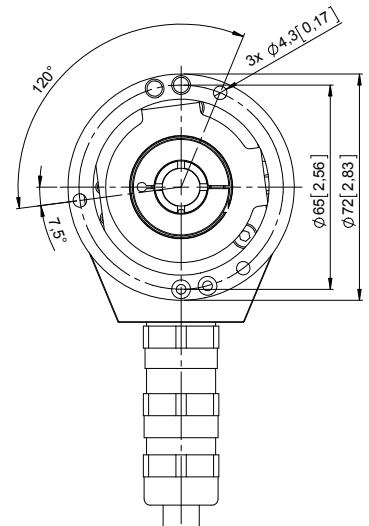
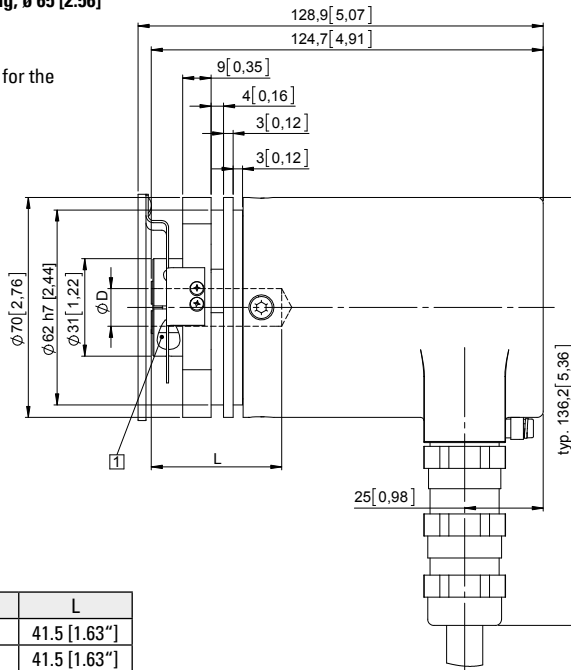
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 5

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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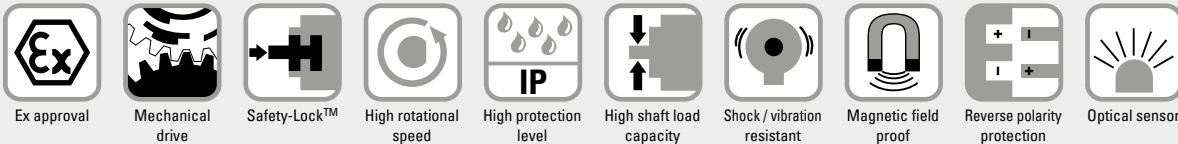
Sendix 7163 / 7183 (shaft / hollow shaft)

SSI / BiSS



The Sendix 7163 / 7183 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.



Compact and safe

- Can be used even when space is tight.
- Minimal installation depth, diameter 70 mm.
- Compact cable outlet axial or radial.
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection).

Explosion protection

- Mining approval.
- “Flame-proof enclosure” construction.
- ATEX with EC type examination certificate.
- IECEX with certificate of conformity (CoC).

Order code Shaft version

8.7163 . 2 X 2 X . X X 2 1 . XXXX
Type a b c d e f g h i ¹⁾

a Flange

2 = clamping / synchronous flange, IP67, ø 70 mm [2.76"]

b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway
for 4 x 4 mm [0.16 x 0.16"] key

c Interface / power supply

2 = SSI, BiSS / 10 ... 30 V DC

d Type of connection

1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']

e Code

B = SSI, binary
C = BiSS, binary
G = SSI, gray

f Resolution ²⁾

A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT

g Inputs / outputs ²⁾

2 = SET, DIR input
additional status output

h Options

1 = no option

i Cable length in dm ¹⁾

0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length
- other singleturn resolutions

1) Not applicable with connection types 1 and 2.

2) Resolution, preset value and counting direction factory-programmable.

Absolute encoders – multiturn

Standard, ATEX/IECEX – mining mechanical multiturn, optical	Sendix 7163 / 7183 (shaft / hollow shaft)	SSI/BiSS
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Order code	8.7183	.XX2X.XX21.XXXX
Hollow shaft	Type	a b c d e f g h i ¹⁾

<p>a Flange 2 = with spring element, short 6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p>b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"]) 1 = ø 12 mm [0.47"] 2 = ø 14 mm [0.55"]</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']</p>	<p>e Code B = SSI, binary C = BiSS, binary G = SSI, gray</p> <p>f Resolution²⁾ 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 / outputs²⁾ 2 = SET, DIR input additional status output</p> <p>h Options 1 = no option</p> <p>i Cable length in dm¹⁾ 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 - other singleturn resolutions</p>
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Technical data

Explosion protection 7163	
ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	⊕ I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; EN 60079-1:2007
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 14.0023 X
Category	Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; ATEX guideline 94/9/EC IEC 60079-1:2007

Explosion protection 7183	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1057 X
Category	⊕ I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	EN 60079-0:2012 + A11:2013; ATEX guideline 2014/34/EU EN 60079-1:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0019 X
Category	Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Mechanical characteristics		
Maximum speed	shaft	6000 min ⁻¹ (continuous)
	hollow shaft	3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]		< 0.05 Nm
Mass moment of inertia		4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight		approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529		IP67
Ambient temperature		-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft	stainless steel
	flange / housing	stainless steel
	cable	PUR
Shock resistance	acc. to EN/IEC 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance	acc. to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply	yes
Short-circuit proof outputs	yes ³⁾
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

1) Not applicable with connection types 1 and 2
2) Resolution, preset value and counting direction factory-programmable.
3) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied.

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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 (multitrurn)	4096 (12 bit)
Code	binary or gray
SSI clock rate	50 kHz ... 2 MHz
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 µs ST resolution ≥ 15 bit 4 µs
Monoflop time	≤ 15 µs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	

BiSS interface	
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 (multitrurn)	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	ST resolution ≤ 14 bit ≤ 1 µs ST resolution 17 bit 2.4 µs
Note: – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification	

Status output	
Output driver	open collector, internal pull-up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH +V LOW < 1 V
Active at	LOW
The status output serves to display various alarm or error messages. The status output is HIGH (open collector with internal pull-up 22 kOhm) in normal operation.	

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused cores individually before initial start-up)												
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥	⊥	
2	1, 2, A, B	SET, DIR	Core 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

SET input	
Input	HIGH active
Input type	comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	

DIR input	
Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed. If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW. If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.	
Response time (DIR input)	1 ms

Power-ON	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read.	
Hot plugging of the encoder should be avoided.	

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Standard, ATEX/IECEX – mining mechanical multiturn, optical	Sendix 7163 / 7183 (shaft / hollow shaft)	SSI/BiSS
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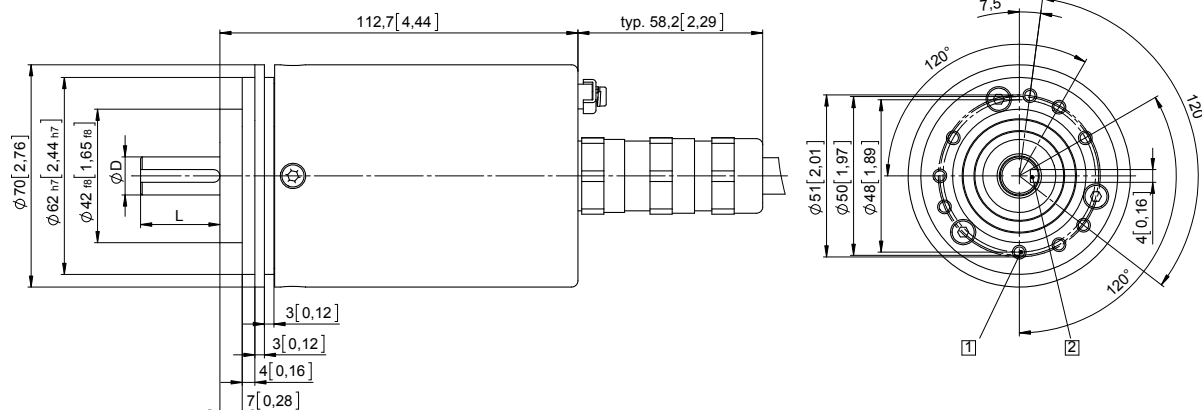
Dimensions shaft version

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

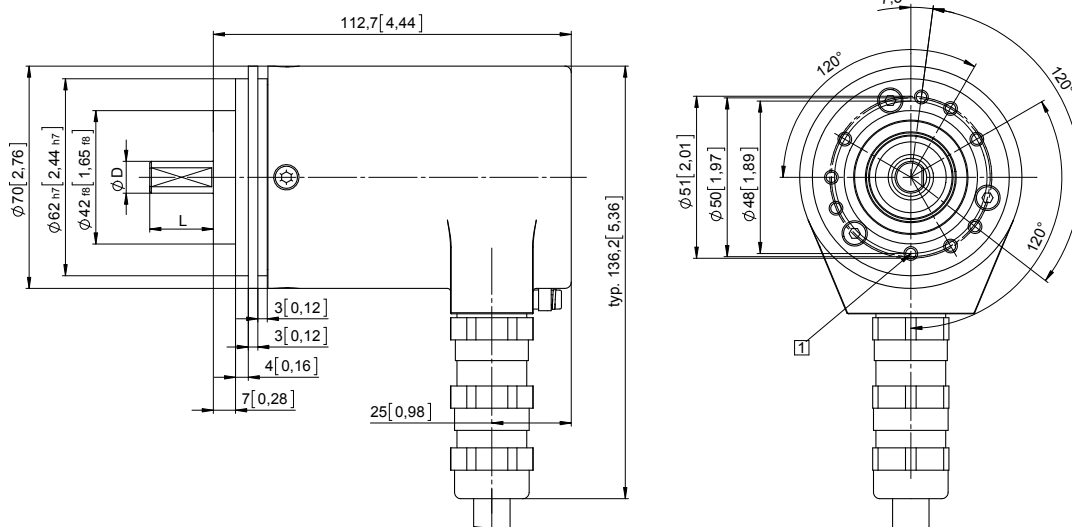


D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]

Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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**Standard, ATEX/IECEx – mining
mechanical multiturn, optical**

Sendix 7163 / 7183 (shaft / hollow shaft)

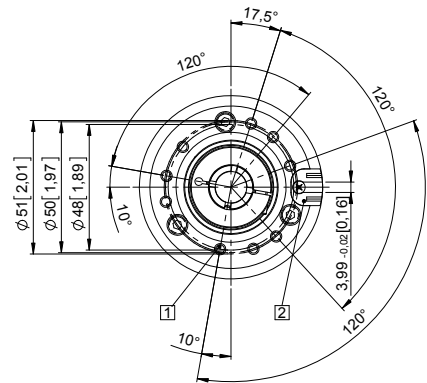
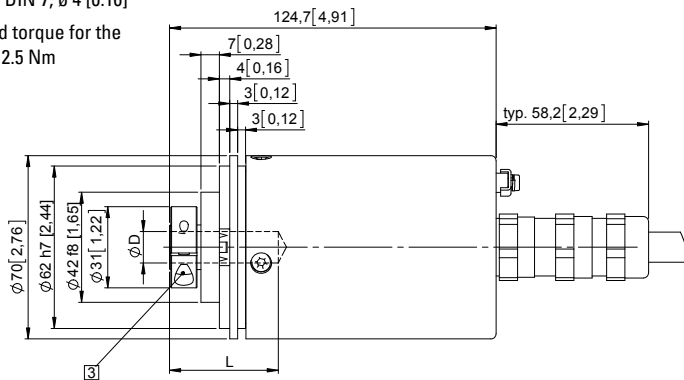
SSI / BiSS

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm

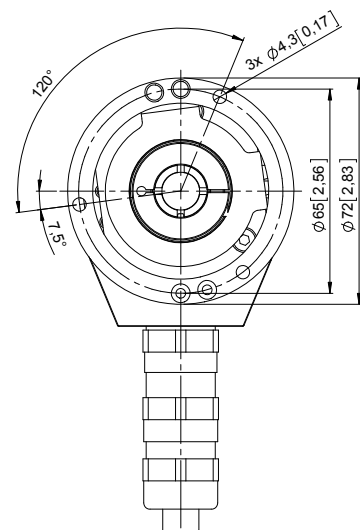
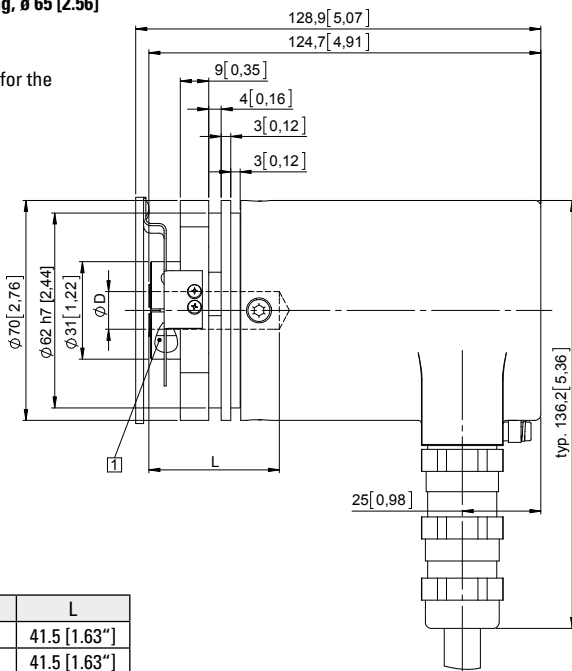


D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56] Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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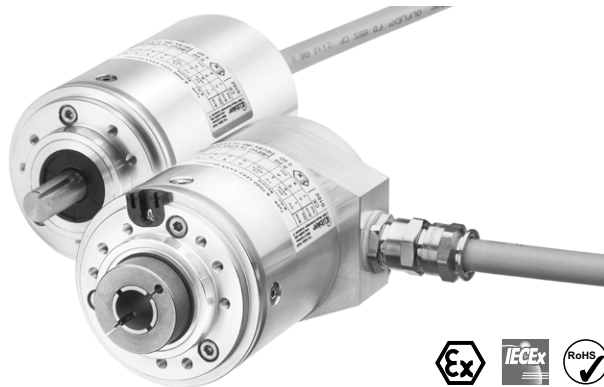
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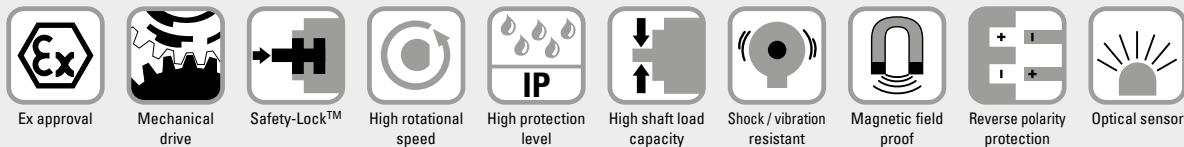
Absolute encoders – multiturn

Standard, ATEX/IECEX – mining mechanical multiturn, optical **Sendix 7168 / 7188 (shaft / hollow shaft)** **PROFIBUS DP**



The Sendix 7168 / 7188 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a PROFIBUS interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



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 **8.7168** . **2X3X** . **3111** . **XXXX**
Shaft version Type a b c d e 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
3 = PROFIBUS DP V0 / 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 Fieldbus profile
31 = PROFIBUS DP V0 encoder profile class 2</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 - special cable length</i></p> |
|--|---|---|

Order code **8.7188** . **XX3X** . **3111** . **XXXX**
Hollow shaft Type a b c d e i ¹⁾

- | | | |
|--|---|---|
| <p>a Flange
2 = with spring element, short
6 = with stator coupling, IP67, ø 65 mm [2.56"]</p> <p>b Blind hollow shaft (insertion depth max. 41.5 mm [1.63"])
1 = ø 12 mm [0.47"]
2 = ø 14 mm [0.55"]</p> <p>c Interface / power supply
3 = PROFIBUS DP V0 / 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 Fieldbus profile
31 = PROFIBUS DP V0 encoder profile class 2</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 - special cable length</i></p> |
|--|---|---|

1) Not applicable with connection types 1 and 2.

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Technical data

Explosion protection 7168	
ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards	EN 60079-0:2012; ATEX guideline 94/9/EC EN 60079-1:2007
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 14.0023 X
Category	Ex d I/IIC T4 - T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2007

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Materials	shaft stainless steel flange / housing stainless steel cable PUR
Shock resistance	acc. to EN/IEC 60068-2-27 1000 m/s ² , 6 ms
Vibration resistance	acc. to EN/IEC 60068-2-6 100 m/s ² , 55 ... 2000 Hz

Explosion protection 7188	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1057 X
Category	I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	EN 60079-0:2012 + A11:2013; ATEX guideline 2014/34/EU EN 60079-1:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0019 X
Category	Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 120 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Standard, ATEX/IECEX – mining mechanical multiturn, optical	Sendix 7168 / 7188 (shaft / hollow shaft)	PROFIBUS DP
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Interface characteristics PROFIBUS DP	
Resolution singleturn	1 ... 65536 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	1 ... 4096 (12 bit), scalable
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	specification according to PROFIBUS DP 2.0 / standard (DIN 19245 Part 3) / RS485 driver galvanically isolated
Protocol	Profibus encoder profile V1.1 class 1 and class 2 with manufacturer-specific add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a CLASS 2-master, default address: 125
Termination	active termination can only be switched on externally

PROFIBUS encoder profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS fieldbus system. The Encoder Profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

The following parameters can be programmed

- Direction of rotation.
- Scaling – number of steps per revolution.
- Preset value.
- Diagnostics mode.

The following functionality is integrated

- Galvanic isolation of the Bus stage with DC/DC converter.
- Line driver acc. to RS485 max. 12 MB.
- Full class 1 and class 2 functionality.
- Speed value.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Core marking:	1	2	4	5	6	7	8	9

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Absolute encoders – multiturn

**Standard, ATEX/IECEX – mining
mechanical multiturn, optical**

Sendix 7168 / 7188 (shaft / hollow shaft)

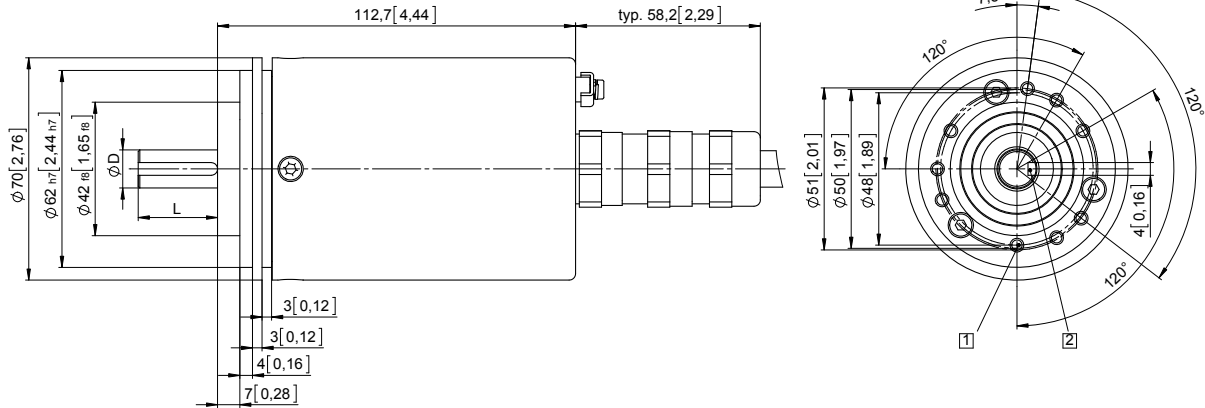
PROFIBUS DP

Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

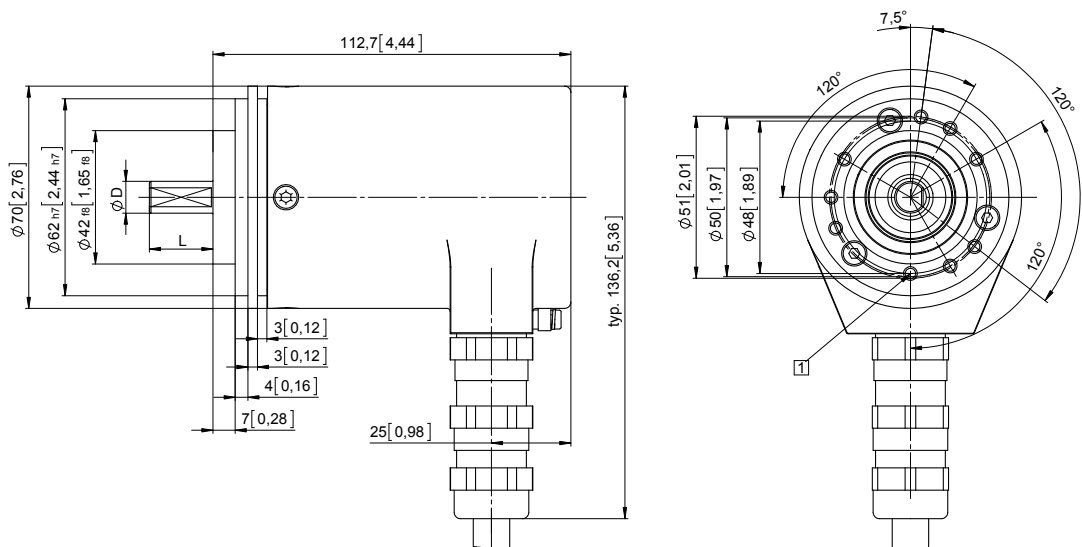
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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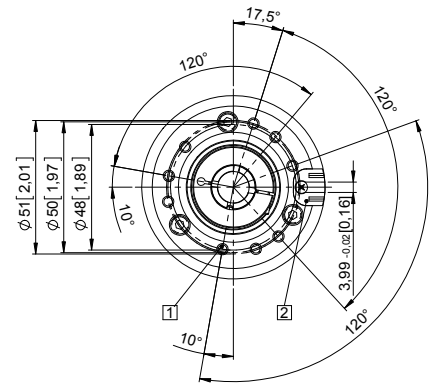
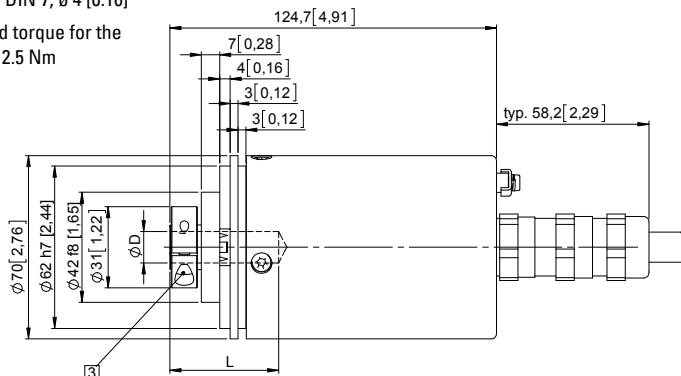
Standard, ATEX/IECEX – mining mechanical multiturn, optical	Sendix 7168 / 7188 (shaft / hollow shaft)	PROFIBUS DP
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm



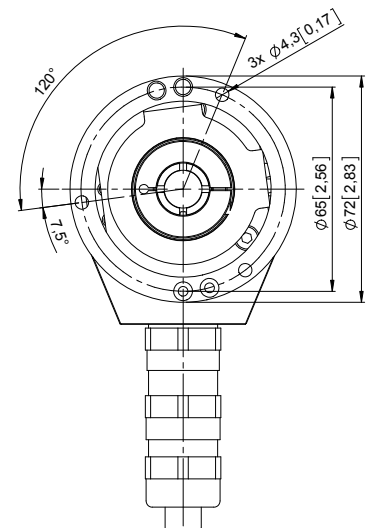
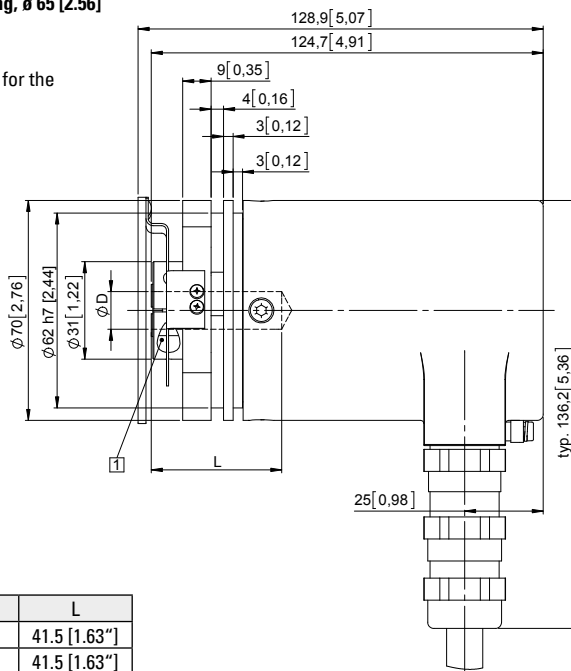
D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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Standard, ATEX/IECEX – mining
mechanical multiturn, optical

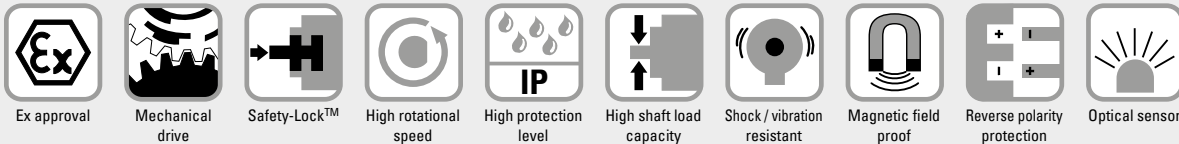
Sendix 7168 / 7188 (shaft / hollow shaft)

CANopen



The Sendix 7168 / 7188 absolute multiturn encoders in a compact 70 mm stainless-steel housing, with a CANopen interface and optical sensor technology have an ATEX/IECEX mining approval.

These shock and vibration-resistant encoders operate flexibly with a resolution of up to 28 bits; they are also available with axial and radial cable outlets.



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 8.7168 . 2 X 2 X . 21 21 . XXXX
Shaft version

- 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
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d** Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
- e** Fieldbus profile
21 = CANopen

- f** Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

Order code 8.7188 . X X 2 X . 21 21 . XXXX
Hollow shaft

- a** Flange
2 = with spring element, short
6 = with stator coupling, IP67, \varnothing 65 mm [2.56"]
- b** Blind hollow shaft
(insertion depth max. 41.5 mm [1.63"])
1 = \varnothing 12 mm [0.47"]
2 = \varnothing 14 mm [0.55"]
- c** Interface / power supply
2 = CANopen DS301 V4.02 / 10 ... 30 V DC

- d** Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
- e** Fieldbus profile
21 = CANopen

- f** Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']

Optional on request
- special cable length

1) Not applicable with connection types 1 and 2.

Absolute encoders – multiturn

Standard, ATEX/IECEX – mining mechanical multiturn, optical	Sendix 7168 / 7188 (shaft / hollow shaft)	CANopen
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Technical data

Explosion protection 7168	
ATEX	
EC type-examination certificate	IBExU 14 ATEX 1047 X
Category	⊕ I M2 Ex d I/IIC T4 - T6 Mb
Relevant standards ATEX guideline 94/9/EC	EN 60079-0:2012; EN 60079-1:2007
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 14.0023 X
Category	Ex d I/IIC T4 - T6 Mb
Relevant standards ATEX guideline 94/9/EC	IEC 60079-0:2011; IEC 60079-1:2007

Mechanical characteristics	
Maximum speed	shaft 6000 min ⁻¹ (continuous) hollow shaft 3000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	< 0.05 Nm
Mass moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 2.8 kg [98.77 oz]
Protection acc. to EN 60529	IP67
Ambient temperature	-40°C ... +60°C [-40 ... +140°F] Please note the specifications for temperature class in EC type-examination certificate!
Material	shaft stainless steel flange / housing stainless steel cable PUR
Shock resistance acc. to EN/IEC 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN/IEC 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Explosion protection 7188	
ATEX	
EU type-examination certificate	IBExU 15 ATEX 1057 X
Category	⊕ I M2 Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards ATEX guideline 2014/34/EU	EN 60079-0:2012 + A11:2013; EN 60079-1:2014
IECEX	
Certificate of Conformity (CoC)	IECEX IBE 15.0019 X
Category	Ex db I/IIC T4/120°C (T4)/T6 Mb
Relevant standards	IEC 60079-0:2011; IEC 60079-1:2014

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 100 mA
Reverse polarity protection for power supply	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

EMC	
Relevant standards	EN 55011 class B:2009 / A1:2010 EN 61000-6-2:2005 / AC:2005 EN 61000-6-3:2007 / A1:2011 EN 61326-1:2013

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Standard, ATEX/IECEX – mining mechanical multiturn, optical	Sendix 7168 / 7188 (shaft / hollow shaft)	CANopen
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Interface characteristics CANopen	
Resolution singleturn	1 ... 65535 (16 bit), scalable default: 8192 (13 bit)
Number of revolutions (multiturn)	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable default: 33.554.432 (25 bit)
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN, CAN specification 2.0 B
Protocol	CANopen profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s software configurable
Node address	1 ... 127 software configurable
Switchable termination	software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02.

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen communication profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT slave.
- Heartbeat protocol.
- High resolution sync protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping self-start programmable (power on to operational), 3 Sending PDO's.
- Node address, baud rate and CANbus programmable termination.

CANopen encoder profile DS406 V3.2

The following parameters can be programmed:

- Event mode.
- Units for speed selectable (steps/sec or min⁻¹).
- Factor for speed calculation (e.g. measuring wheel circumference) Integration time for speed value of 1...32.
- 2 work areas with 2 upper and lower limits and the corresponding output states.
- Variable PDO mapping of position, speed, acceleration, working area status.
- Extended failure management for position sensing with integrated temperature control.
- User interface with visual display of bus and failure status - 3 LED's.
- Optional - 32 CAMs programmable.
- Customer-specific memory - 16 Bytes.

Universal scaling function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The universal scaling function remedies this problem.

Terminal assignment

Interface	Type of connection	Cable (isolate unused cores 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	Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
		Core marking:	1	2	4	5	6	7	8	9

Absolute encoders – multiturn

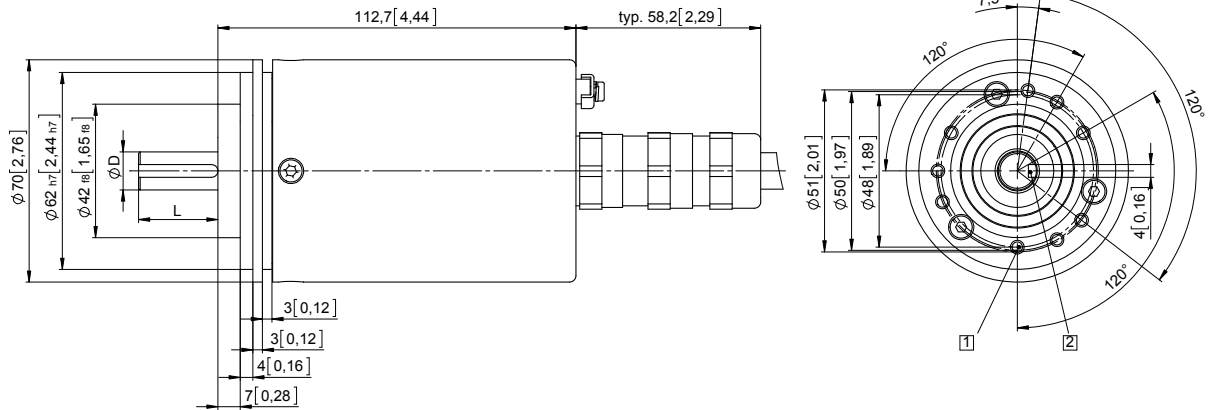
Standard, ATEX/IECEX – mining mechanical multiturn, optical	Sendix 7168 / 7188 (shaft / hollow shaft)	CANopen
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Dimensions shaft version

Dimensions in mm [inch]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

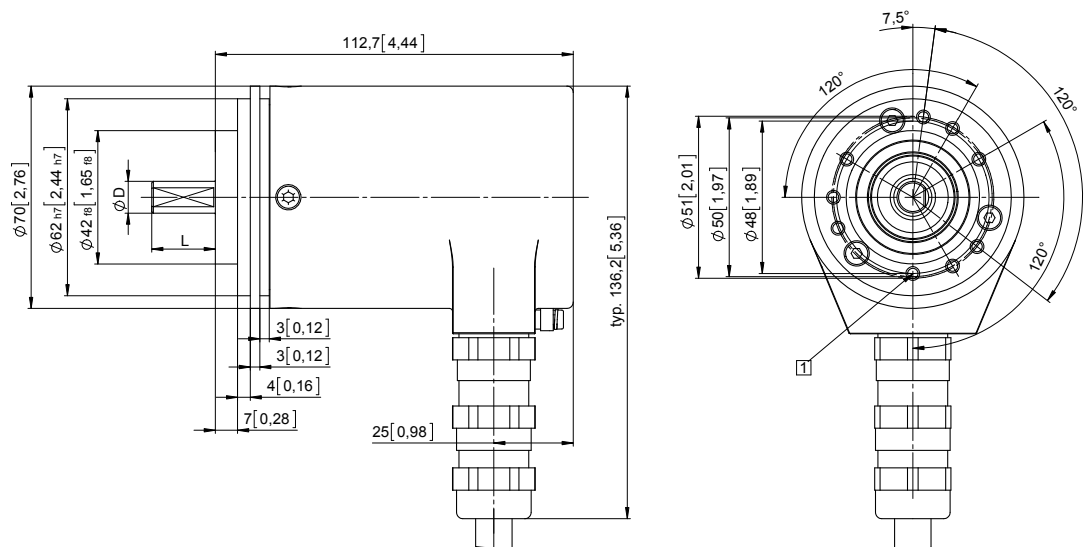
- 1 9 x M4, 10 [0.39] deep
- 2 Keyway for DIN 6885-A-4x4x25 key



D	Fit	L
12 [0.47]	g6	25 [0.98]

Clamping / synchronous flange, \varnothing 70 [2.76]
Shaft type 2 with radial cable outlet

- 1 9 x M4, 10 [0.39] deep



D	Fit	L
10 [0.39]	f7	20 [0.79]

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**Standard, ATEX/IECEx – mining
mechanical multiturn, optical**

Sendix 7168 / 7188 (shaft / hollow shaft)

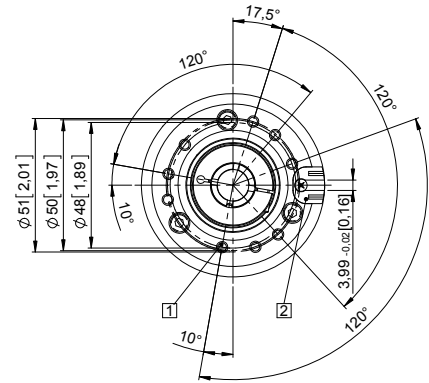
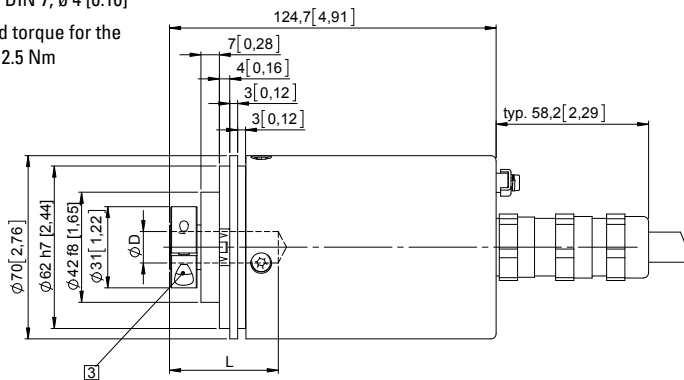
CANopen

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element, short Flange type 2

- 1 9 x M4, 10 [0.39] deep
- 2 Slot spring element, recommendation: cylindrical pin DIN 7, ϕ 4 [0.16]
- 3 Recommended torque for the clamping ring 2.5 Nm

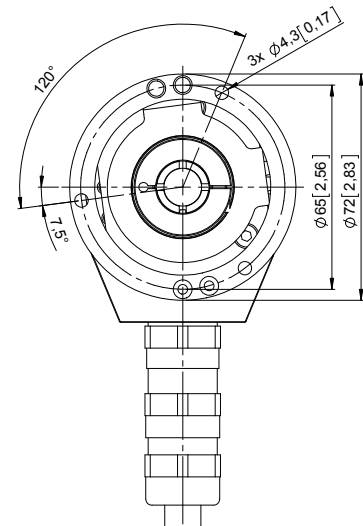
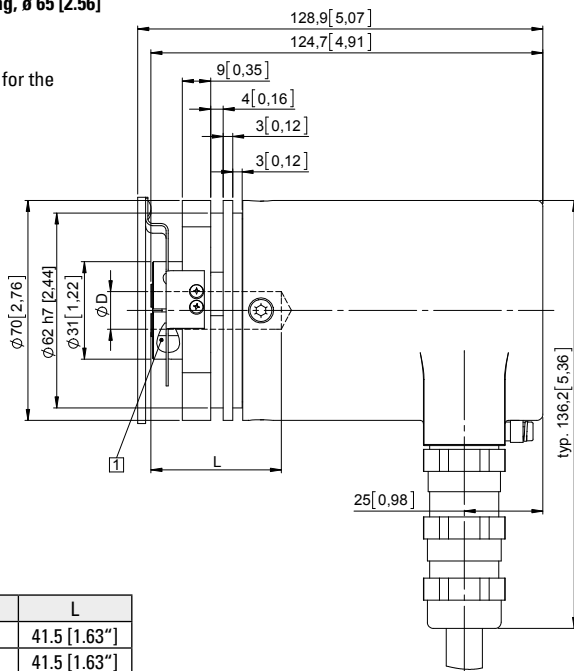


D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

Flange with stator coupling, ϕ 65 [2.56] Flange type 6

- 1 Recommended torque for the clamping ring 2.5 Nm



D	Fit	L
12 [0.47]	H7	41.5 [1.63"]
14 [0.55]	H7	41.5 [1.63"]

L = insertion depth max. blind hollow shaft

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Absolute encoders – multiturn

Large hollow shaft	AX	Hollow shaft \varnothing 16 mm ... 45 mm
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The absolute encoder AX can be mounted on shafts from \varnothing 16 mm up to max. \varnothing 45 mm. It can be combined with the proven Kübler Sendix encoders with absolute interface.



<p>Robust</p> <ul style="list-style-type: none"> Decoupling of hollow shaft and encoder. Solid housing. Prove torque stop. 	<p>Flexible</p> <ul style="list-style-type: none"> Can be combined with all \varnothing 58 mm solid shaft encoders. Various variants for clamping ring attachment. Three different torque stop lengths.
--	--

Order code	8 . A X X X . X X X X . X X X X <small>a b c d e f g</small>		
<p>a Clamping ring 1 = on the encoder side 2 = on the torque stop side</p> <p>b Torque stop 2 = with fastening arm 70 mm [2.76"] 4 = with fastening arm 100 mm [3.93"] 6 = with fastening arm 150 mm [5.91"]</p>	<p>c Through hollow shaft 9 = \varnothing 5/8" 1 = \varnothing 16 mm [0.63"] 2 = \varnothing 20 mm [0.79"] 4 = \varnothing 24 mm [0.94"] 5 = \varnothing 25 mm [0.98"] 6 = \varnothing 1" 7 = \varnothing 28 mm [1.10"] 8 = \varnothing 30 mm [1.18"] A = \varnothing 38 mm [1.50"] D = \varnothing 42 mm [1.65"] C = \varnothing 45 mm [1.77"]</p>	<p>d Encoder used M1 = Sendix M5861 F3 = Sendix F5863 F8 = Sendix F5868 68 = Sendix 5868</p>	<p>e Output circuit depends on the encoder used *)</p> <p>f Type of connection depends on the encoder used *)</p> <p>g Others depends on the encoder used *)</p> <p>*) Standard variants see below. Further variants see encoder data sheets.</p>

Recommended standard variants (with absolute encoder)						
Order no.	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
8.Axxx.M134.3412	Sendix M5861 (8.M5861.3534.3412)	Analog, 4 ... 20 mA	10 ... 30 V DC	1 x radial M12 connector	12 bit / 4 ... 20 mA	scalable without limit switch function
8.Axxx.M144.4412	Sendix M5861 (8.M5861.3544.4412)	Analog, 0 ... 10 V	15 ... 30 V DC	1 x radial M12 connector	12 bit / 0 ... 10 V	scalable without limit switch function
8.Axxx.F324.G323	Sendix F5863 (8.F5863.1224.G323)	SSI	10 ... 30 V DC	1 x radial M12 connector	13 bit ST + 12 bit MT/SSI-Gray-Code	SET button + status LED
8.Axxx.F8AN.A222	Sendix F5868 (8.F5868.12AN.A222)	Ethernet/IP	10 ... 30 V DC	3 x axial M12 connector	Ethernet/IP	-
8.Axxx.F82F.2123	Sendix F5868 (8.F5868.122F.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
8.Axxx.F86E.6112	Sendix F5868 (8.F5868.126E.6112)	Modbus	10 ... 30 V DC	1 x radial M12 connector	Modbus RTU application protocol V1.1b3	-
8.Axxx.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
8.Axxx.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT mit CoE 3.2.10	-
8.Axxx.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-

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Large hollow shaft	AX	Hollow shaft \varnothing 16 mm ... 45 mm
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Technical data

Mechanical characteristics		
Maximum speed (continuous operation)	25°C [77°F]	2500 min ⁻¹
	40°C [104°F]	1750 min ⁻¹
	55°C [131°F]	1000 min ⁻¹
	70°C [158°F]	250 min ⁻¹
Maximum speed (short-term operation) ¹⁾	25°C [77°F]	4500 min ⁻¹
	40°C [104°F]	3250 min ⁻¹
	55°C [131°F]	2000 min ⁻¹
	70°C [158°F]	750 min ⁻¹
Starting torque at 23°C [73.4°F]	max. 15 Nm	
Weight	approx. 3.5 kg [105.8 oz]	
Protection acc. to EN 60529/DIN 40050-9	IP64	
Material	housing	Aluminum
	shaft	stainless steel

Electrical characteristics / Terminal assignment

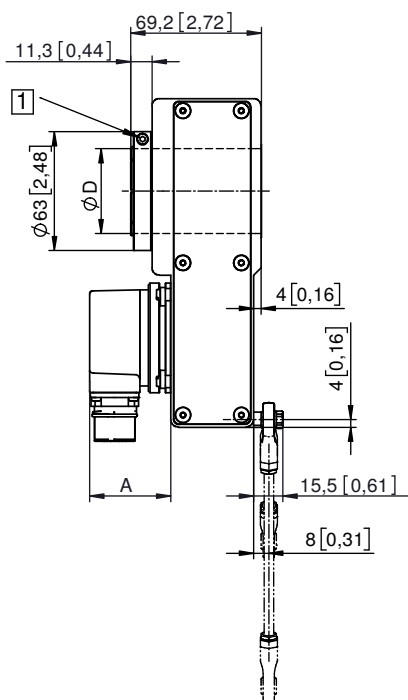
The electrical characteristics and the connection can be found in the data sheets of the relevant encoder.

Dimensions

Dimensions in mm [inch]

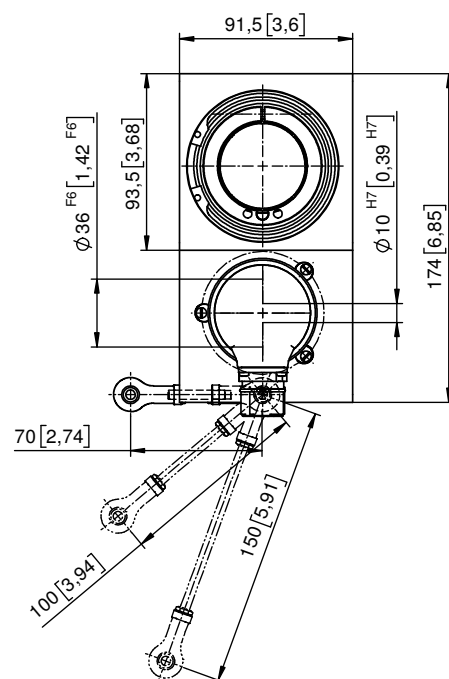
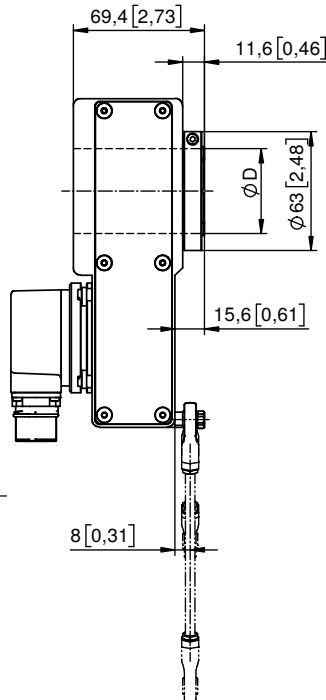
Version 8.A1

Clamping ring on the encoder side



Version 8.A2

Clamping ring on the torque stop side (fastening arm)



- 1** Recommended torque for
 clamping ring with M3 (1,0 Nm) with hollow shaft $\geq \varnothing$ 38 mm
 clamping ring with M4 (2,0 Nm) with hollow shaft $\leq \varnothing$ 30 mm

A Dimension A depends on the encoder used

D	Fit
5/8"	H7
16 [0.63]	H7
20 [0.79]	H7
24 [0.94]	H7
25 [0.98]	H7
1"	H7
28 [1.10]	H7
30 [1.18]	H7
38 [1.50]	H7
42 [1.65]	H7
45 [1.77]	H7

¹⁾ 50% duty cycle, switch-on time max. 5 min.

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Kubler
Fritz Kubler GmbH
www.kubler.com

Made in Germany

Type: B L150 1111 2000
S-Nr: 1604711987
4.8-25 VDC 50 mA

+	0V	WH	B	0V
-	+V	BN	Bl	0V
A	A	GN	0	PK
Al	YE	YE	01	SU
				RD

Lin. Res. 5.000
Imp. Res. 1000

CE

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Bearingless encoders

Series		Type	Interface	Page
Incremental, standard	Magnetic	 RLI20 (hollow shaft)	Push-pull / RS422	472
	Zero pulse, magnetic	 RLI50 (hollow shaft)	Push-pull / RS422	475
Incremental, standard	Magnetic	RI20 / Limes LI20 (hollow shaft)	Push-pull / RS422	478
	Zero pulse, magnetic	RI50 / Limes LI50 (hollow shaft)	Push-pull / RS422	482
Incremental, large hollow shaft	Magnetic	 RLI200 (hollow shaft)	Push-pull / RS422	485
	Zero pulse, magnetic	 RLI500 (hollow shaft)	Push-pull / RS422	489
Absolute, standard singleturn	Magnetic	 RLA50 (hollow shaft)	SSI / CANopen	492

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Bearingless encoders

Incremental, standard magnetic

RLI20 (hollow shaft)

Push-pull / RS422



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RLI20, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 30 mm.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

Order code

RLI20

8.RLI20.X1XX.XXXX.XXXX

Type

a

b

c

d

e

a Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

c Type of connection

- 1 = radial cable, 2 m [6.56'] PUR
- A = radial cable, special length PUR *)

*) Available special lengths (connection type A):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI20.111A.0250.0080.0030 (for cable length 3 m)

d Pulses per revolution ¹⁾

0250, 0360, 1000, 1024, 2500, 3600

e Bore diameter

0080 = 8 mm [0.32"] 0095 = 3/8"
0100 = 10 mm [0.39"] 0158 = 5/8"
0120 = 12 mm [0.47"] 0254 = 1" ²⁾
0150 = 15 mm [0.59"]
0180 = 18 mm [0.71"]
0200 = 20 mm [0.79"]
0250 = 25 mm [0.98"] ²⁾
0300 = 30 mm [1.18"] ²⁾

Accessories / Display type 572

Order no.

Position display, 6-digit

with 4 fast switch outputs and serial interface

6.572.0116.D05

with 4 fast switch outputs and serial interface and scalable analog output

6.572.0116.D95

Position display, 8-digit

with 4 fast switch outputs and serial interface

6.572.0118.D05

with 4 fast switch outputs and serial interface and scalable analog output

6.572.0118.D95

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

1) Other pulse rates on request.

2) Only possible for pulse rates 0360 and 3600.

Bearingless encoders

Incremental, standard magnetic	RLI20 (hollow shaft)	Push-pull / RS422
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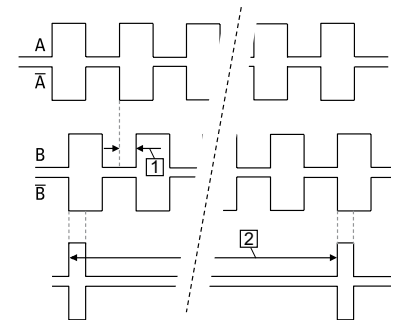
Technical data

Mechanical characteristics	
Maximum speed	12000 min ⁻¹
Protection	Model 1 IP67 acc. to EN 60529 Model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Shock resistance	5000 m/s ² , 1 ms
Vibration resistance	300 m/s ² , 10 ... 2000 Hz
Pole gap	2 mm from pole to pole
Housing (sensor head)	aluminum
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse-index red error; speed too high or magnetic fields too weak
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics		
Output circuit	RS422	Push-pull
Power supply	4.8 ... 26 VDC	4.8 ... 30 VDC
Power consumption (no load)	typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA
Permissible load / channel	120 Ohm	+/- 20 mA
Min. pulse edge interval	1 μs	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 ¹⁾	
System accuracy	typ. 0.3° with shaft tolerance g6	
Pulse rate [ppr] ²⁾	250, 360	1000, 1024, 2500, 3600
max. speed min ⁻¹	12000	2400, 7000, 3900, 2700

Signal figures

- 1) Pulse edge interval: Pay attention to the instructions in the technical data
- 2) Periodic index signal every 2 mm [0.08"]; the logical assignment A, B and 0-signal can change



Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	Ā	B	B̄	0	0̄	⊥
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield ³⁾

- +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) At every pole change. The signal is generated by the sensor.
 2) With an input frequency of the evaluation unit of 250 kHz.
 3) Shield is attached to connector housing.

Bearingless encoders

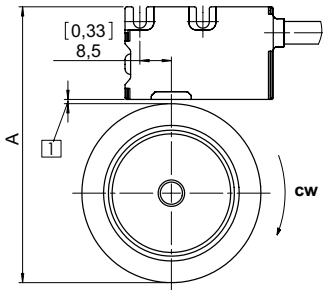
Incremental, standard magnetic

RLI20 (hollow shaft)

Push-pull / RS422

Mounting orientation and permissible mounting tolerances

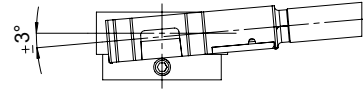
Distances



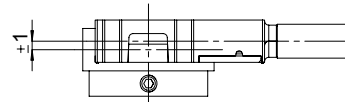
1 Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

Pulse rate	A for distance sensor head / magnetic ring: = 0.4 [0.02]
250, 1000, 2500	56.4 [2.22]
1024	66.6 [2.62]
360, 3600	70.4 [2.77]

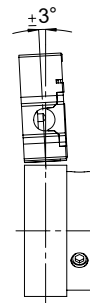
Torsion



Offset



Tilting

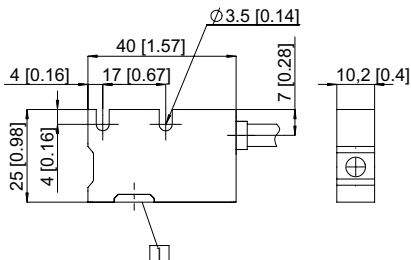


Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

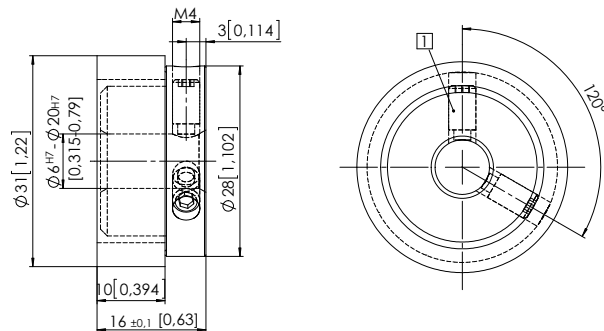
Dimensions

Dimensions in mm [inch]

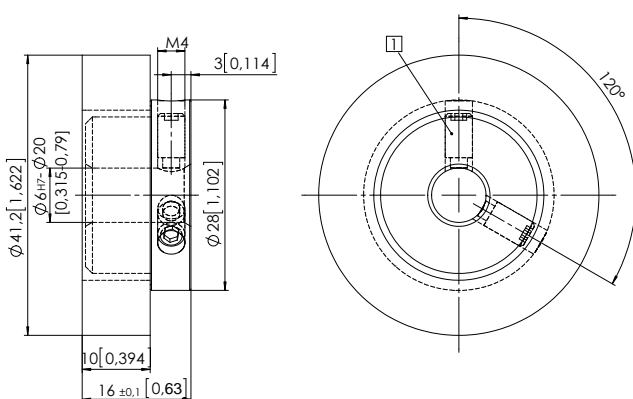
Sensor head



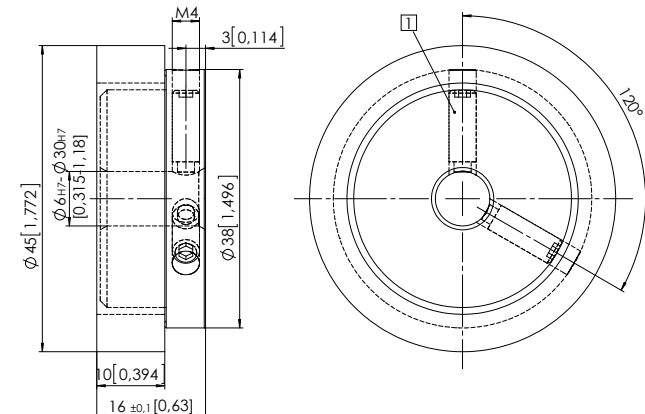
Magnetic ring for pulse rate 250, 1000 or 2500



Magnetic ring for pulse rate 1024



Magnetic ring for pulse rate 360 or 3600



1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

Bearingless encoders

Incremental, standard zero pulse, magnetic	RLI50 (hollow shaft)	Push-pull / RS422
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Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RLI50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RLI20, a single zero pulse is also implemented here.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 35 mm.

High rotational speed	High protection level	Shock / vibration resistant	Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Order code

8.RLI50	. X 1 X X .	XXXX .	XXXX
Type	a b c	d	e

a Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

c Type of connection

- 1 = radial cable, 2 m [6.56'] PUR
- A = radial cable, special length PUR *)
- *) Available special lengths (connection type A): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI50.111A.2000.0080.0030 (for cable length 3 m)

d Pulses per revolution¹⁾

- 1000, 1024, 2000, 2048, 3600

e Bore diameter

- 0060 = 6 mm [0.24"]
- 0080 = 8 mm [0.32"]
- 0100 = 10 mm [0.39"]
- 0120 = 12 mm [0.47"]
- 0150 = 15 mm [0.59"]
- 0200 = 20 mm [0.79"]
- 0250 = 25 mm [0.98"]²⁾
- 0300 = 30 mm [1.18"]²⁾
- 0350 = 35 mm [1.34"]³⁾

1) Other pulse rates on request.
2) Only possible for pulse rates 1024, 2048 and 3600.
3) Only possible for pulse rate 3600.

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Bearingless encoders

Incremental, standard zero pulse, magnetic	RLI50 (hollow shaft)	Push-pull / RS422
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Accessories / Display type 572	Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface 6.572.0116.D05
	with 4 fast switch outputs and serial interface and scalable analog output 6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface 6.572.0118.D05
	with 4 fast switch outputs and serial interface and scalable analog output 6.572.0118.D95

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics	
Maximum speed	12000 min ⁻¹
Protection	model 1 IP67 acc. to EN 60529 model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Shock resistance	5000 m/s ² , 1 ms
Vibration resistance	300 m/s ² , 10 ... 2000 Hz
Pole gap	5 mm from pole to pole
Housing (sensor head)	aluminum
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse index red error; speed too high or magnetic fields too weak
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics					
Output circuit	RS422	Push-pull			
Power supply	4.8 ... 26 V DC	4.8 ... 30 V DC			
Power consumption (no load)	typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA			
Permissible load/channel	120 ohm	+/- 20 mA			
Min. pulse edge interval	1 µs	1 µs			
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.0 V max. 0.5 V			
Reference signal	1 x per revolution				
System accuracy	typ. 0.3° with shaft tolerance g6				
Pulse rate [ppr]¹⁾	1000	1024	2000	2048	3600
max. speed min ⁻¹ without using zero pulse	9000	9000	4000	4000	2500
max. speed min ⁻¹ using zero pulse	3000	2000	3000	2000	1700

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield ²⁾

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Incremental output channel A / sine signal
- B, \bar{B} : Incremental output channel B / cosine signal
- 0, $\bar{0}$: Reference signal
- \perp : Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.
2) Shield is attached to connector housing.

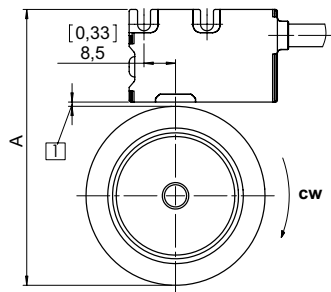
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Incremental, standard zero pulse, magnetic	RLI50 (hollow shaft)	Push-pull / RS422
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Mounting orientation and permissible mounting tolerances

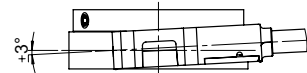
Distances



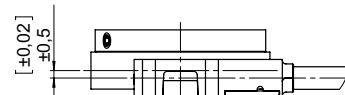
1 Distance sensor head / magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

Pulse rate	A for distance sensor head / magnetic ring = 1 [0.04]
1000, 2000	57.0 [2.24]
1024, 2048	74.3 [2.93]
3600	80.7 [3.18]

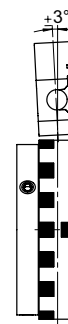
Torsion



Offset



Tilting

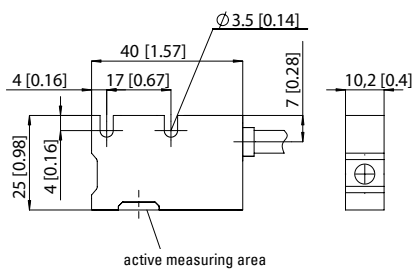


Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

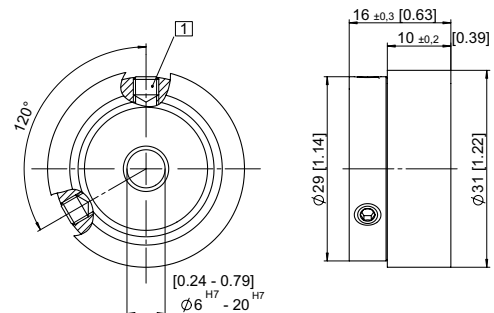
Dimensions

Dimensions in mm [inch]

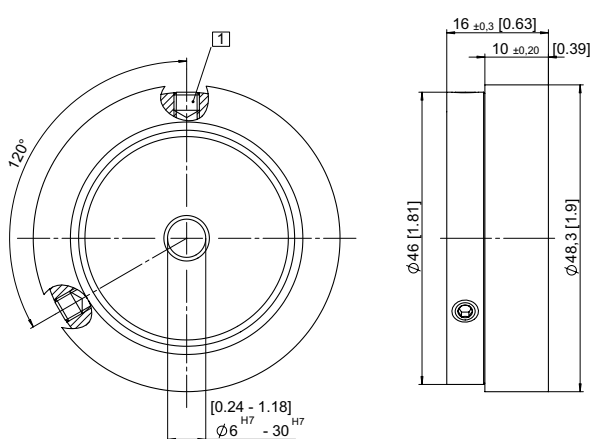
Sensor head



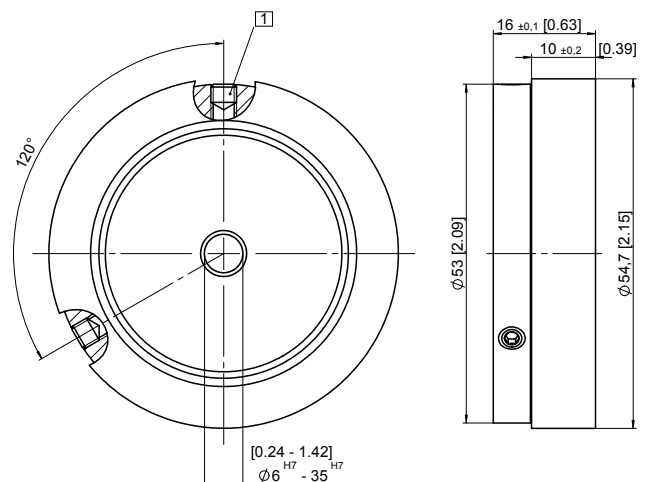
Magnetic ring for pulse rate 1000 or 2000



Magnetic ring for pulse rate 1024 or 2048



Magnetic ring for pulse rate 3600



1 M4 set screw

Bearingless encoders

Incremental, standard magnetic

RI20 / Limes LI20 (hollow shaft)

Push-pull / RS422



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI20 / Limes LI20, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

For outdoor use with extremely sturdy aluminum housing and stainless steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

Selection guide magnetic ring RI20 / Limes LI20

Pulses per revolution ¹⁾ (further ppr on request)	Order code magnetic ring RI20	Order code sensor head Limes LI20	Max. rotational speed min ⁻¹ ²⁾
250	8.RI20.031.XXXX.111	8.LI20.11X1.2005	12 000
1 000	8.RI20.031.XXXX.111	8.LI20.11X1.2020	2 400
2 500	8.RI20.031.XXXX.111	8.LI20.11X1.2050	3 900
1 024	8.RI20.041.XXXX.111	8.LI20.11X1.2016	7 000
360	8.RI20.045.XXXX.111	8.LI20.11X1.2005	12 000
3 600	8.RI20.045.XXXX.111	8.LI20.11X1.2050	2 700

Order code Magnetic ring RI20

8.RI20 . XXX . XXXX . 111
Type a b

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.

Bearingless encoders

Incremental, standard magnetic	RI20 / Limes LI20 (hollow shaft)	Push-pull / RS422
---------------------------------------	---	--------------------------

Order code Sensor head Limes LI20	8.LI20 . X1XX . 2XXX <small>Type</small> <small>a</small> <small>b</small> <small>c</small> <small>d</small> <small>e</small>
---	---

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
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Accessories / Display type 572	Order no.
Position display, 6-digit with 4 fast switch outputs and serial interface with 4 fast switch outputs and serial interface and scalable analog output	6.572.0116.D05 6.572.0116.D95
Position display, 8-digit with 4 fast switch outputs and serial interface with 4 fast switch outputs and serial interface and scalable analog output	6.572.0118.D05 6.572.0118.D95

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

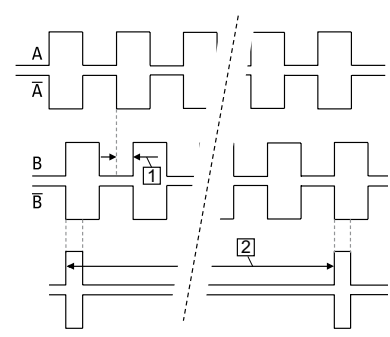
Technical data

Mechanical characteristics	
Maximum speed	12000 min ⁻¹
Protection	Model 1 IP67 acc. to EN 60529 Model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Shock resistance	5000 m/s ² , 1 ms
Vibration resistance	300 m/s ² , 10 ... 2000 Hz
Pole gap	2 mm from pole to pole
Housing (sensor head)	aluminum
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse-index red error; speed too high or magnetic fields too weak (8.LI20.XXXX.X050 and 8.LI20.XXXX.X250)
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Signal figures

1) Pulse edge interval: Pay attention to the instructions in the technical data

2) Periodic index signal every 2 mm [0.08"]; the logical assignment A, B and 0-signal can change



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	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 ¹⁾	
System accuracy	typ. 0.3' with shaft tolerance g6	

1) At every pole change. The signal is generated by the sensor.

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclinoimeters
 Connection technology
 Accessories
 Addresses

Bearingless encoders

Incremental, standard magnetic

RI20 / Limes LI20 (hollow shaft)

Push-pull / RS422

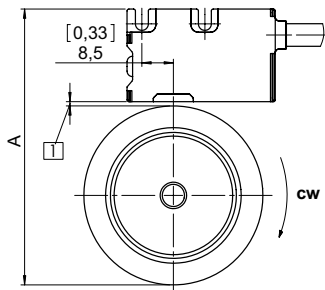
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)									
		Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
1, 2	1, A	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \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)

Mounting orientation and permissible mounting tolerances

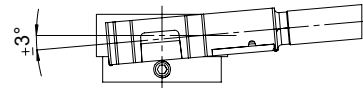
Distances



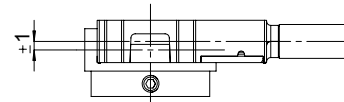
- 1** Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

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]

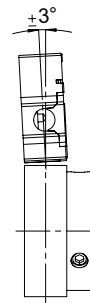
Torsion



Offset



Tilting



Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

1) Shield is attached to connector housing.

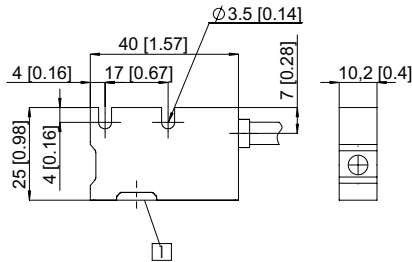
Bearingless encoders

Incremental, standard magnetic	RI20 / Limes LI20 (hollow shaft)	Push-pull / RS422
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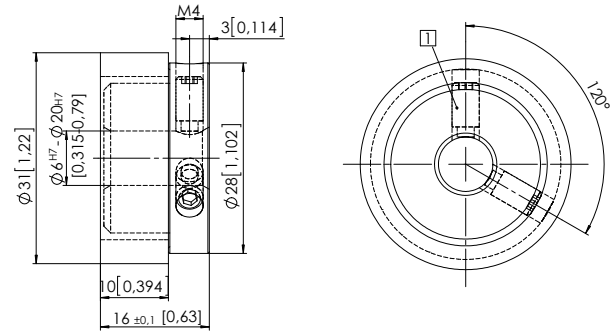
Dimensions

Dimensions in mm [inch]

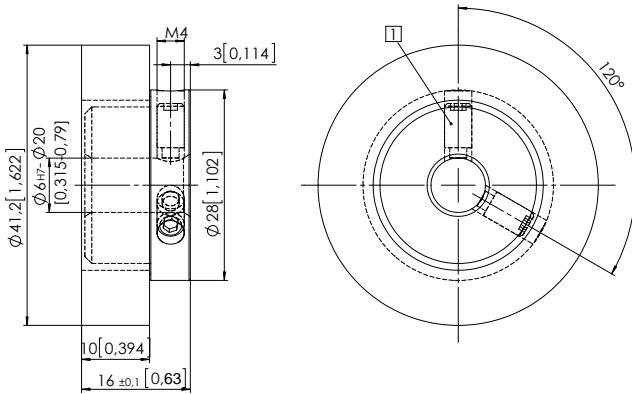
Sensor head Limes LI20



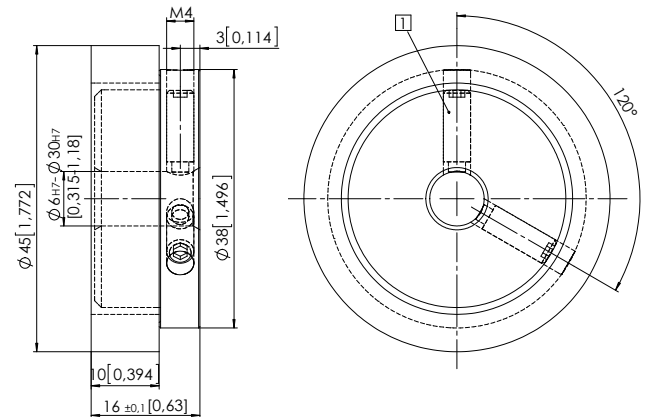
Magnetic ring, ø 31 [1.22], 8.RI20.031.XXXX.111



Magnetic ring, ø 41.2 [1.62], 8.RI20.041.XXXX.111



Magnetic ring, ø 45 [1.77], 8.RI20.045.XXXX.111



1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Bearingless encoders

Incremental, standard zero pulse, magnetic

RI50 / Limes LI50 (hollow shaft)

Push-pull / RS422



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI50 / Limes LI50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RI20 / Limes LI20, a single zero pulse is also implemented here.

For outdoor use with extremely sturdy aluminum housing and stainless steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Selection guide magnetic ring RI50 / Limes LI50

Pulse per revolution ¹⁾	Order code magnetic ring RI50	Order code sensor head Limes LI50	Max. rotational speed min ⁻¹ (electronic) ²⁾	
			without using index signal	using index signal
1000	8.RI50.031.XXXX.112	8.LI50.11X1.1050	9000	3000
2000	8.RI50.031.XXXX.112	8.LI50.11X1.1100	4000	3000
1024	8.RI50.048.XXXX.112	8.LI50.11X1.1032	9000	2000
2048	8.RI50.048.XXXX.112	8.LI50.11X1.1064	4000	2000
3600	8.RI50.055.XXXX.112	8.LI50.11X1.1100	2500	1700

Order code Magnetic ring RI50

8.RI50 . XXX . XXXX . 112
Type 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"]
0800 = 8 mm [0.32"] 2000 = 20 mm [0.79"]
1000 = 10 mm [0.39"] 2500 = 25 mm [0.98"] ³⁾
1200 = 12 mm [0.47"] 3000 = 30 mm [1.18"] ³⁾

3500 = 35 mm [1.34"] ⁴⁾
1587 = 5/8"
2540 = 1" ³⁾

Stock types
8.RI50.048.2000.112

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters.
2) With an input frequency of the evaluation unit of 250 kHz.
3) Only possible for outer diameters 048 and 055.
4) Only possible for outer diameter 055.

Bearingless encoders

Incremental, standard zero pulse, magnetic	RI50 / Limes LI50 (hollow shaft)	Push-pull / RS422
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Order code Sensor head Limes LI50	<table border="1" style="border-collapse: collapse;"> <tr> <td style="padding: 2px;">8.LI50</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;">1</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</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> <td></td> <td></td> </tr> </table>	8.LI50	.	X	1	X	X	.	1	X	X	X	Type		a		b	c		d	e		
8.LI50	.	X	1	X	X	.	1	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 = radial cable, 2 m [6.56'] PUR A = radial cable, special length PUR *) *) Available special lengths (connection type A): 3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.LI50.111A.1032.0030 (for cable length 3 m)	d Reference signal 1 = separate index signal (linked with A and B) e Interpolation factor 032, 050, 064, 100	Stock types 8.LI50.1121.1032
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Accessories / Display type 572	Order no.
Position display, 6-digit with 4 fast switch outputs and serial interface with 4 fast switch outputs and serial interface and scalable analog output	6.572.0116.D05
	6.572.0116.D95
Position display, 8-digit with 4 fast switch outputs and serial interface with 4 fast switch outputs and serial interface and scalable analog output	6.572.0118.D05
	6.572.0118.D95

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics	
Maximum speed	12000 min ⁻¹
Protection	model 1 IP67 acc. to EN 60529 model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Shock resistance	5000 m/s ² , 1 ms
Vibration resistance	300 m/s ² , 10 ... 2000 Hz
Pole gap	5 mm from pole to pole
Housing (sensor head)	aluminum
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse index red error; speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics			
Output circuit	RS422	Push-Pull	
Power supply	4.8 ... 26 V DC	4.8 ... 30 V DC	
Power consumption (no load)	typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA	
Permissible load/channel	120 ohm	+/- 20 mA	
Min. pulse edge interval	1 µs	1 µs	
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.0 V max. 0.5 V	
Reference signal	1 x per revolution		
System accuracy	typ. 0.3° with shaft tolerance g6		

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)										
1, 2	1, A	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield 1)	

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Incremental output channel A / sine signal
- B, \bar{B} : Incremental output channel B / cosine signal
- 0, $\bar{0}$: Reference signal
- \perp : Plug connector housing (shield)

1) Shield is attached to connector housing.

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclination meters
 Connection technology
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 Addresses

Bearingless encoders

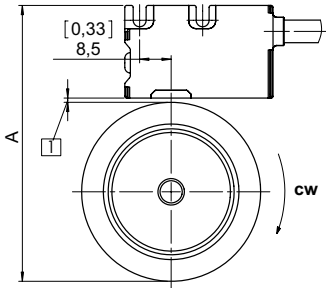
Incremental, standard zero pulse, magnetic

RI50 / Limes LI50 (hollow shaft)

Push-pull / RS422

Mounting orientation and permissible mounting tolerances

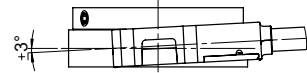
Distances



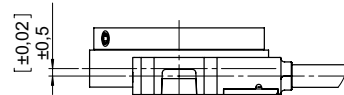
- 1 Distance sensor head / magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

Magnetic ring	A for distance sensor head / magnetic ring = 1 [0.04]
8.RI50.031.XXXX.112	57.0 [2.24]
8.RI50.048.XXXX.112	74.3 [2.93]
8.RI50.055.XXXX.112	80.7 [3.18]

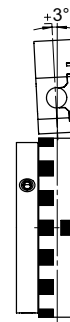
Torsion



Offset



Tilting

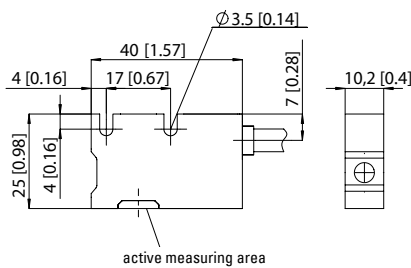


Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

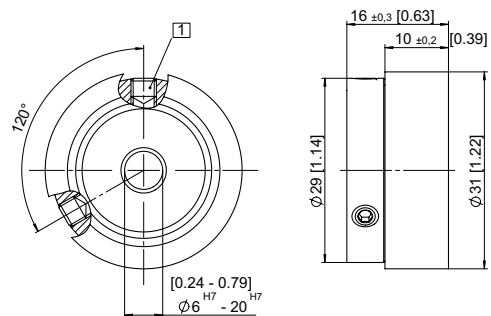
Dimensions

Dimensions in mm [inch]

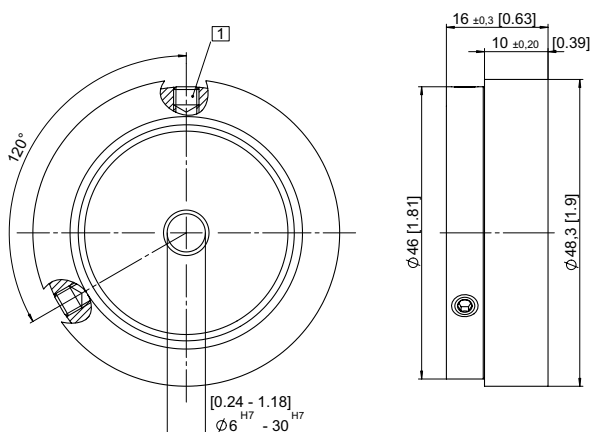
Sensor head Limes LI50



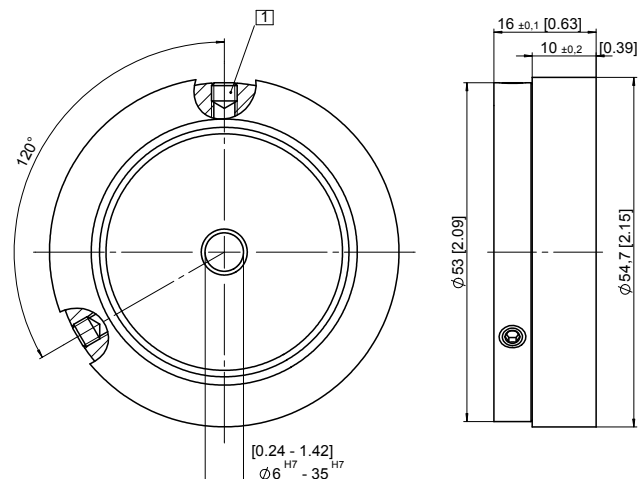
Magnetic ring, ø 31 [1.22], 8.RI50.031.XXXX.112



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

Bearingless encoders

Incremental, large hollow shaft magnetic	RLI200 (hollow shaft)	Push-pull / RS422
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Thanks to its installation depth of min. 10 mm, the bearingless magnetic rotary encoder RLI200, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 390 mm.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Requires very little installation space.
- Large mounting tolerance between magnetic band and sensor head.
- Slotted hole fixing ensures simple alignment.
- Function display via LED.

Order code

RLI200	8.RLI200	. XX 1 XX . XXXXX . XXXX						
	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> <td style="text-align: center;">f</td> </tr> </table>	a	b	c	d	e	f
a	b	c	d	e	f			

a Magnetic ring mounting method

- 1 = Press fit
- 2 = Hub screw ¹⁾
- 3 = Screwed flange ¹⁾

b Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

c Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

d Type of connection

- 1 = radial cable, 2 m [6.56'] PUR
- A = radial cable, special length PUR *)

*) Available special lengths (connection type A):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI200.1111A.07000.0760.0030 (for cable length 3 m)

e Pulses per revolution

- 700, 2240, 2800, 7000 (for hollow shaft ø 76 mm)
- 1600, 5120, 6400, 16000 (for hollow shaft ø 180 mm)
- (e.g.: 1600 pulses => 016000)

f Hollow shaft diameter

- 0760 = 76 mm [2.99"] ²⁾
- 1800 = 180 mm [7.09"] ²⁾

Optional on request
- other pulse rates
- other hollow shaft diameter (up to max. 390 mm)

Press fit



Hub screw



Screwed flange



1) On request.
2) With magnetic ring mounting method 2 or 3 on request.

Bearingless encoders

Incremental, large hollow shaft magnetic	RLI200 (hollow shaft)	Push-pull / RS422
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Accessories / Display type 572	Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface 6.572.0116.D05
	with 4 fast switch outputs and serial interface and scalable analog output 6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface 6.572.0118.D05
	with 4 fast switch outputs and serial interface and scalable analog output 6.572.0118.D95

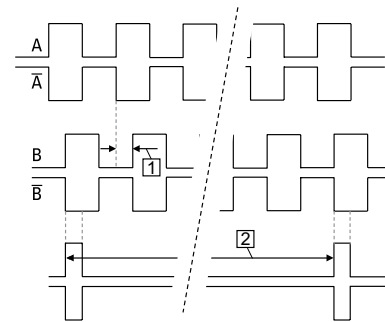
Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics	
Maximum speed	12000 min ⁻¹
Protection	Model 1 IP67 acc. to EN 60529 Model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Shock resistance	5000 m/s ² , 1 ms
Vibration resistance	300 m/s ² , 10 ... 2000 Hz
Pole gap	2 mm from pole to pole
Housing (sensor head)	aluminum
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse-index red error; speed too high or magnetic fields too weak
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Signal figures

- 1 Pulse edge interval: Pay attention to the instructions in the technical data
- 2 Periodic index signal every 2 mm [0.08"]; the logical assignment A, B and 0-signal can change



Electrical characteristics		RS422	Push-pull
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	1 µs
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Reference signal		index periodical ¹⁾	
System accuracy		typ. 0.3° with shaft tolerance g6	
Pulse rate [ppr] ²⁾	700	2240	2800
max. speed min ⁻¹	12000	6600	5300
	1600	5120	6400
max. speed min ⁻¹	9300	2900	2300

1) At every pole change. The signal is generated by the sensor.
2) With an input frequency of the evaluation unit of 250 kHz.

Bearingless encoders

Incremental, large hollow shaft magnetic	RLI200 (hollow shaft)	Push-pull / RS422
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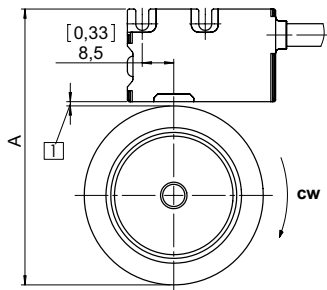
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)									
		1, 2	1, A	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \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)

Mounting orientation and permissible mounting tolerances

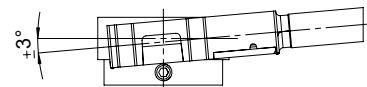
Distances



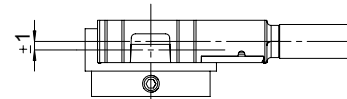
A Distance sensor head / magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

Pulse rate	A for distance sensor head / magnetic ring = 0.4 mm [0.02]
700, 2240, 2800, 7000	112.5 [4.43]
1600, 5120, 6400, 16000	227.7 [8.96]

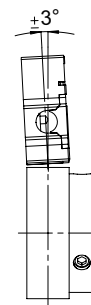
Torsion



Offset



Tilting



Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

1) Shield is attached to connector housing.

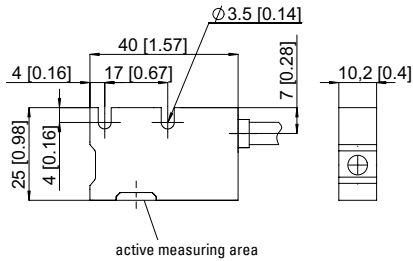
Bearingless encoders

Incremental, large hollow shaft magnetic	RLI200 (hollow shaft)	Push-pull / RS422
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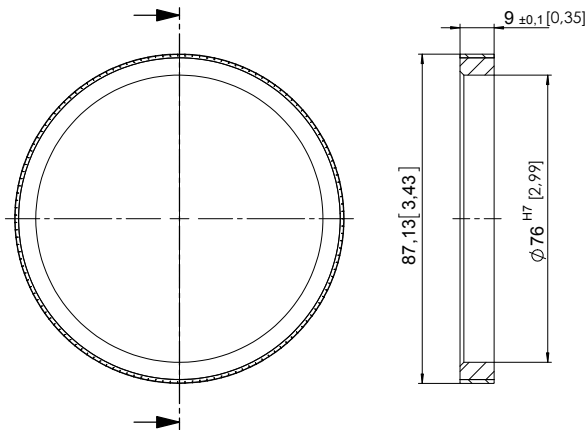
Dimensions

Dimensions in mm [inch]

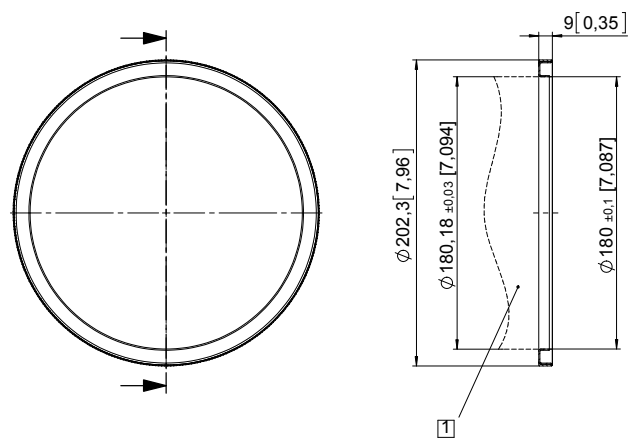
Sensor head



Magnetic ring (press fit) for pulse rate 700, 2240, 2800, 7000



Magnetic ring (press fit) for pulse rate 1600, 5120, 6400, 16000



1 Customer shaft

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singleturn

Absolute encoders
multiturn

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technology

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technology

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Bearingless encoders

Incremental, large hollow shaft zero pulse, magnetic	RLI500 (hollow shaft)	Push-pull / RS422
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Thanks to its installation depth of min. 10 mm, the bearingless magnetic rotary encoder RLI500, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life. In contrast to our measuring system RLI200, a single zero pulse is also implemented here.

IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

This bearingless encoder can be mounted on shafts with a diameter up to max. 350 mm.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance.
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system, free from wear, ensures a long service life.

Fast start-up

- Function display via LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Slotted hole fixing ensures simple alignment.

Order code RLI500

8.RLI500 . XX1XX . XXXXX . 0700

Type

a

b

c

d

e

f

a Magnetic ring mounting method

- 1 = Press fit ¹⁾
- 2 = Hub screw
- 3 = Screwed flange ¹⁾

b Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

c Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

d Type of connection

- 1 = radial cable, 2 m [6.56'] PUR
- A = radial cable, special length PUR *)

*) Available special lengths (connection type A):
3, 5, 8, 10, 15 m [9.84, 16.40, 26.25, 32.80, 49.21']
order code expansion .XXXX = length in dm
ex.: 8.RLI500.2112A.04096.0700.0030 (for cable length 3 m)

e Pulses per revolution

- 2048, 3200, 4096, 6400 (for hollow shaft \varnothing 70 mm)
(e.g.: 2048 pulses => 02048)

f Hollow shaft diameter

- 0700 = 70 mm [2.76"] ²⁾

Optional on request

- other pulse rates
- other hollow shaft diameter (up to max. 350 mm)

Press fit



Hub screw



Screwed flange



1) On request.

2) With magnetic ring mounting method 1 or 3 on request.

Bearingless encoders

Incremental, large hollow shaft zero pulse, magnetic	RLI500 (hollow shaft)	Push-pull / RS422
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Accessories / Display type 572	Order no.
Position display, 6-digit	with 4 fast switch outputs and serial interface 6.572.0116.D05
	with 4 fast switch outputs and serial interface and scalable analog output 6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface 6.572.0118.D05
	with 4 fast switch outputs and serial interface and scalable analog output 6.572.0118.D95

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Technical data

Mechanical characteristics	
Maximum speed	12000 min ⁻¹
Protection	model 1 IP67 acc. to EN 60529 model 2 IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Shock resistance	5000 m/s ² , 1 ms
Vibration resistance	300 m/s ² , 10 ... 2000 Hz
Pole gap	5 mm from pole to pole
Housing (sensor head)	aluminum
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse index red error; speed too high or magnetic fields too weak
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Electrical characteristics				
Output circuit	RS422	Push-pull		
Power supply	4.8 ... 26 V DC	4.8 ... 30 V DC		
Power consumption (no load)	typ. 25 mA max. 60 mA	typ. 25 mA max. 60 mA		
Permissible load/channel	120 ohm	+/- 20 mA		
Min. pulse edge interval	1 µs	1 µs		
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.0 V max. 0.5 V		
Reference signal	1 x per revolution			
System accuracy	typ. 0.3° with shaft tolerance g6			
Pulse rate [ppr]¹⁾	2048	3200	4096	6400
max. speed min ⁻¹	7300	4600	3600	2300

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused cores individually before initial start-up)									
1, 2	1, A	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield ²⁾

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Incremental output channel A / sine signal
- B, \bar{B} : Incremental output channel B / cosine signal
- 0, $\bar{0}$: Reference signal
- \perp : Plug connector housing (shield)

1) With an input frequency of the evaluation unit of 250 kHz.
2) Shield is attached to connector housing.

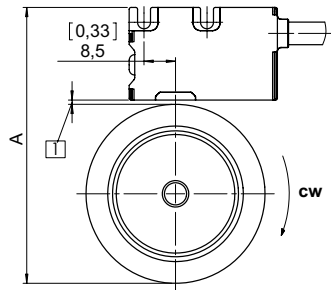
Product overview Basics
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Absolute encoders singleturn
Absolute encoders multiturn
Bearingless encoders
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Bearingless encoders

Incremental, large hollow shaft zero pulse, magnetic	RLI500 (hollow shaft)	Push-pull / RS422
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Mounting orientation and permissible mounting tolerances

Distances



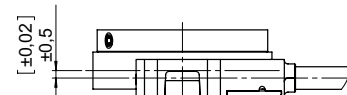
1 Distance sensor head / magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

Impulsions par tour	A for distance sensor head / magnetic ring = 1 mm [0.04]
2048, 3200, 4096, 6400	128.0 [5.04]

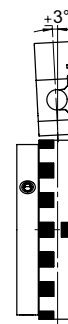
Torsion



Offset



Tilting

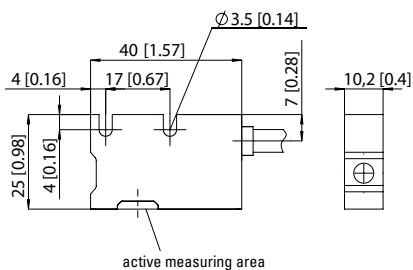


Warning: When mounting the sensor head, please ensure its correct orientation to the magnetic ring!

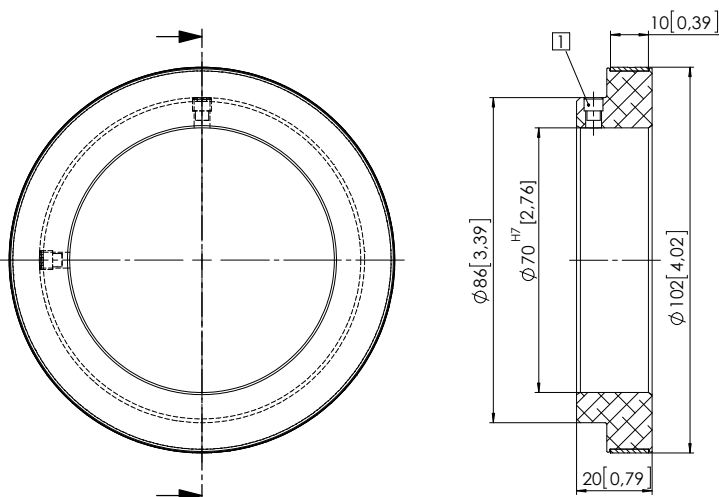
Dimensions

Dimensions in mm [inch]

Sensor head



Magnetic ring (hub screw) pulse rate 2048, 3200, 4096, 6400



1 M5 set screw M4

Bearingless encoders

**Absolut, standard
singleturn, magnetic**

RLA50 (hollow shaft)

SSI / CANopen



Thanks to its installation depth of only 20 mm, the bearingless magnetic rotary encoder RLA50, comprising a magnetic ring and sensor head, is ideally suited for plants and machinery where space is very tight. The non-contact measuring principle allows for error-free use even under harsh environmental conditions, as well as ensuring a long service life.

This bearingless encoder can be mounted on shafts with a diameter of 30 mm.



SSI CANopen



High rotational speed



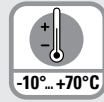
Protection level



Shock / vibration resistant



Reverse polarity protection



Temperature range

Powerful

- High shock and vibration resistance.
- Non-contact measuring system, free from wear, ensures a long service life.
- High resolution, 16,000 measuring steps/revolution.
- Direct measurement on shaft or axis.

Fast start-up

- Distance monitoring by LED.
- Large mounting tolerance between magnetic band and sensor head.
- Requires very little installation space.
- Connection by M12 connector.

Order code

8.RLA50 . 1 3 1 X 2 . 16000 . 0300

Type

a Magnetic ring mounting method
1 = Press fit

b Model
3 = IP40

c Number of poles
1 = 32 poles, pole length 5 mm [0.2"]

d Interface
1 = SSI
3 = CANopen

e Type of connection
2 = M12 connector, 12-pin

f Measuring steps per revolution
16000

g Bore diameter
0300 = 30 mm

Optional on request
- other bore diameters
- other number of measuring steps
- additional incremental signals (HTL, TTL or SinCos)
- other baud rate

Connection technology

Order no.

Connector, self-assembly (straight)

M12 female connector with coupling nut, 12 pin, A coded

8.0000.5162.0000

Cordset, pre-assembled

M12 female connector with coupling nut, 12 pin,
5 m [16.4'] PUR cable 6 x 2 x 0.14 mm² [AWG 26]

05.00.60B1.B211.005M

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Bearingless encoders

Absolut, standard singleturn, magnetic	RLA50 (hollow shaft)	SSI / CANopen
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Technical data

Mechanical characteristics	
Maximum speed	1000 min ⁻¹
Working temperature	-10°C ... +70°C [+14°F ... +158°F] (non condensing)
Storage temperature	-25°C ... +85°C [-13°F ... +185°F]
Protection acc. to EN 60529	IP40
Housing	zinc die-cast
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	0.5 ... 1.0 mm (recommended 0.8 mm)
Type of connection (standard)	M12 connector, 12-pin

Electrical characteristics	
Power supply	10 ... 30 V DC ±10 %
Residual ripple	< 10 %
Current consumption	max. 150 mA
Reverse polarity protection	yes
Short circuit proof	yes
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Accuracy	
Measuring principle	absolute
System accuracy at 20°C [+68°F]	±0.35°
Repeat accuracy	±1 increment
Resolution	0.0225°
LED, red	lights up when distance too large

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. ±20 mA
Signal level	HIGH typ. 3.8 V LOW at I _{Load} = 20 mA typ. 1.3 V
Clock rate	25 bit (24 + 1 failurebit for distance)
Code	binary / gray (default) switchable
SSI clock rate	80 kHz ... 0.4 MHz
Monoflop time	≤ 40 μs
Data refresh rate	≤ 250 μs

CANopen interface	
Interface	CAN High-Speed acc. to ISO 11898, Basic and Full CAN, CAN specification 2.0 B
Protocol	CANopen
Baud rate	standard 250 kbit/s on request other baud rate (125 ... 1000 kbit/s)
Node address	default 1
LSS protocol	CIA LSS protocol DS305 global command support for node address and baud rate selective commands via attributes of the identity object

Terminal assignment sensor head

Interface	Type of connection	M12 connector, 12-pin												
1	2	Signal:	0 V	+V	C+	C-	D+	D-	-	-	-	-	-	-
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

Interface	Type of connection	M12 connector, 12-pin												
3	2	Signal:	0 V	+V	CAN_L	CAN_H	-	-	-	-	-	-	-	-
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal

Terminal assignment connection cable (accessory)

Connection cable color assignment with M12 female connector	Connection cable with M12 connector, 12 pin (accessory) – 05.00.60B1.B211.005M												
	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU
	Pin:	1	2	3	4	5	6	7	8	9	10	11	12

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Bearingless encoders

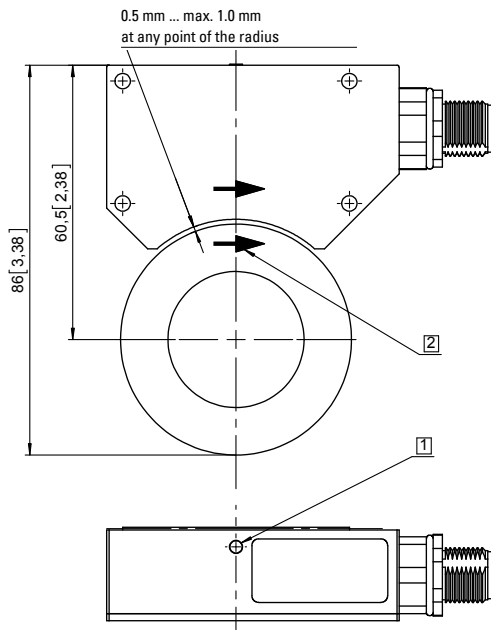
**Absolut, standard
singleturn, magnetic**

RLA50 (hollow shaft)

SSI / CANopen

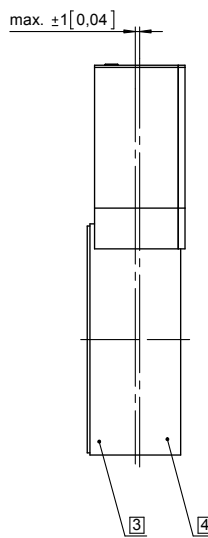
Mounting position and permissible mounting tolerances

Sensor distance

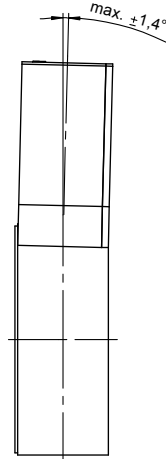


- 1 LED for distance monitoring
- 2 Direction arrows for the assembly
- 3 Fine interpolation track
- 4 Absolute track

Offset



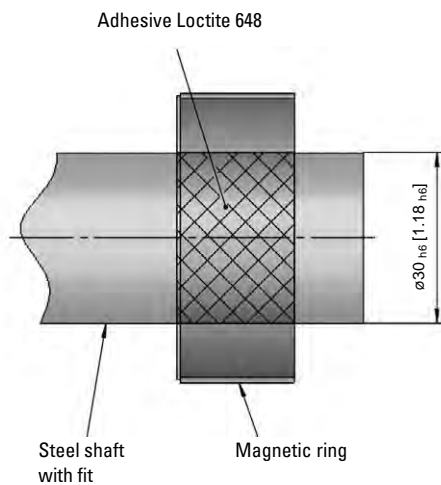
Tilting



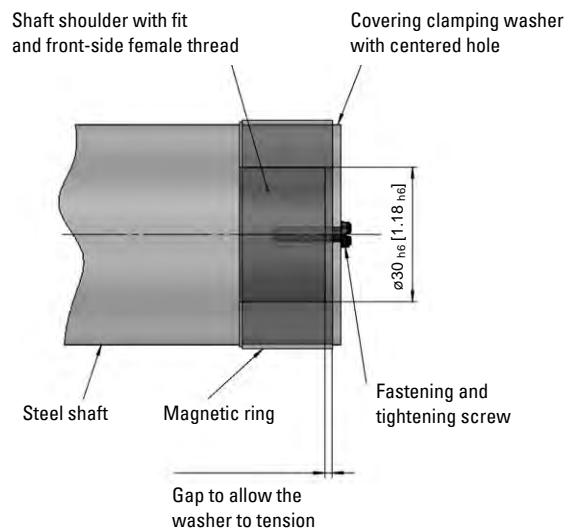
Caution: imperatively comply with the mounting position of the sensor head with respect to the magnetic ring!

Mounting recommendation

Glued assembly



Screwed assembly



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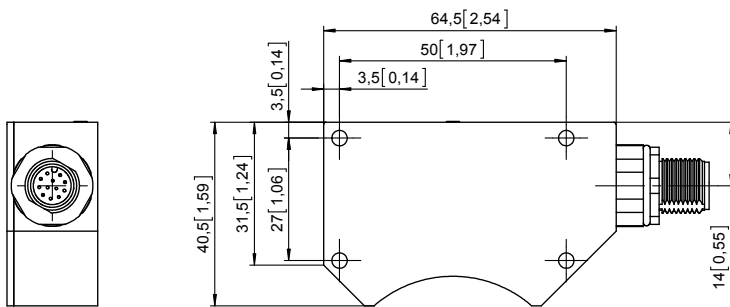
Bearingless encoders

Absolut, standard singleturn, magnetic	RLA50 (hollow shaft)	SSI / CANopen
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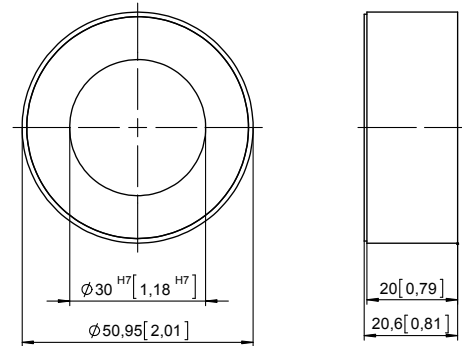
Dimensions

Dimensions in mm [inch]

Sensor head



Magnetic ring



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Linear measuring technology

		Type	Description	Page	
Incremental magnetic measurement system	Sensor head, magnetic band	Limes LI20 / B1	Resolution min. 10 µm	498	Product overview Basics
	Sensor head, magnetic band	Limes LI50 / B2	Resolution min. 5 µm	501	
Absolute magnetic measurement system	Sensor head, magnetic band	Limes LA10 / BA1	Resolution min. 1 µm	504	Product overview Basics
	Sensor head, magnetic band	Limes LA50 / BA5	Resolution min. 10 µm	508	
Draw wire mechanics	With analog sensor	Draw wire encoder A30	Measuring length max. 0,6 m	512	Incremental encoders
	With analog sensor	Draw wire encoder A40	Measuring length max. 1 m	514	
	With encoder or analog sensor	Draw wire encoder A50	Measuring length max. 1,25 m	516	
	With encoder or analog sensor	Draw wire encoder A40	Measuring length max. 2 m	521	Absolute encoders singleturn
	With analog sensor	Draw wire encoder A41	Measuring length max. 2 m	514	
	With absolute encoder	Draw wire encoder A41	Measuring length max. 2 m	523	
	With encoder or analog sensor	Draw wire encoder B75	Measuring length max. 3 m	526	Absolute encoders multiturn
	With encoder or analog sensor	Draw wire encoder B80	Measuring length max. 3 m	530	
	For outdoor applications	 Draw wire encoder C60	Measuring length max. 4 m	536	
	With redundant sensors	 Draw wire encoder C100	Measuring length max. 5 m	542	Absolute encoders multiturn
	With encoder	Draw wire encoder C105	Measuring length max. 6 m	547	
	With encoder or analog sensor	Draw wire encoder C120	Measuring length max. 6 m	550	
	For outdoor applications	 Draw wire encoder D120	Measuring length max. 10 m	556	Bearingsless encoders
	With redundant sensors	 Draw wire encoder D125	Measuring length max. 10 m	563	
	With encoder or analog sensor	Draw wire encoder D135	Measuring length max. 42,5 m	567	
Length measuring kit	With spring encoder arm	 Limes kit TB1	Measuring length max. 400 m	574	Linear measuring technology
	With encoder	Mini measurement system	Incremental	579	
	With encoder / preset counter	With rack and pinion	Incremental / absolute	580	
	With encoder / preset counter	Measuring wheelsystem	Incremental / absolute	581	
	Flexible fastening	Spring encoder arm		582	
	Measuring wheels	Various wheel coatings		583	
Elevator measuring systems for shaft copying	Absolute shaft copying system	 LEB01	Measuring range up to 392 m	585	Inclinometers
	Encoder mounting fixture, guided-belt	LM3	Max. height 53 m	589	

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingsless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

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 aluminum housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



Temperature range



High protection level



Shock / vibration resistant



Reverse polarity protection

Robust

- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system – free from wear.
- Masking tape protecting the magnetic band.

Easy installation

- Simple glued assembly of the magnetic 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 acc. to EN 60068-3-38, EN 60068-3-78

b Pulse edge interval

- 1 = standard

c Output circuit / power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-pull / 4.8 ... 30 V DC

d Type of connection

- 1 = cable, 2 m [6.56'] PUR

e Reference signal

- 2 = index periodic

f Code (resolution)¹⁾

- 005 = 100 µm
- 020 = 25 µm
- 050 = 10 µm

Stock types

- 8.LI20.1111.2005
- 8.LI20.1111.2020
- 8.LI20.1111.2050
- 8.LI20.1121.2005
- 8.LI20.1121.2020
- 8.LI20.1121.2050

Order code magnetic band Limes B1

8.B1 . 10 . 010 . XXXX
Type a b

a Width

- 10 = 10 mm

b Length

- 0010 = 1 m 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 70 m

Stock types

- 8.B1.10.010.0010

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	Product overview Basics
Accessories / display type 572			Order no.	
Position display, 8-digit	with 4 fast switch outputs and serial interface		6.572.0116.D05	Incremental encoders
	with 4 fast switch outputs, serial interface and scalable analog output		6.572.0116.D95	
Position display, 8-digit	with 4 fast switch outputs and serial interface		6.572.0118.D05	Absolute encoders singleturn
	with 4 fast switch outputs, serial interface and scalable analog output		6.572.0118.D95	

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics sensor head LI20		
Working temperature	-20°C ... +80°C [-4°F ... +176°F]	
Storage 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	aluminum	
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 (at 8.LI20.XXXX.X020 and 8.LI20.XXXX.X050)

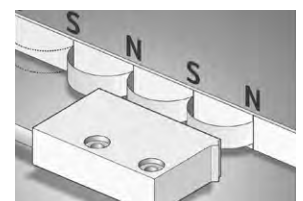
Electrical characteristics sensor head LI20		
Output circuit	Push-pull	RS422
Power supply	4,8 ... 30 V DC	4,8 ... 26 V DC
Permissible load / channel	±20 mA	120 Ω
Max. cable length	max. 30 m [98.43']	RS422 standard
Power consumption (no load)	typ. 25 mA, max. 60 mA	
Short circuit proof ¹⁾	yes	yes ²⁾
Min. 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 ³⁾	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Magnetic band Limes B1	
Pole gap	2 mm from pole to pole
Dimensions	width 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] ⁴⁾
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 1.4310 acc. to EN 10088-3

Accuracy	
Magnetic band	± (0,025 + 0,02 x L) mm – L in [m], up to L _{max} = 70 m
Sensor head	± 0,01 mm interpolation error accuracy: at T = 20°C and gap sensor head/magnetic band 0,4 mm
Repeat accuracy	±1 increment
Resolution and speed ⁵⁾	100 µm (quadruple), max. 25 m/s 25 µm (quadruple), max. 4 m/s 10 µm (quadruple), max. 6,5 m/s

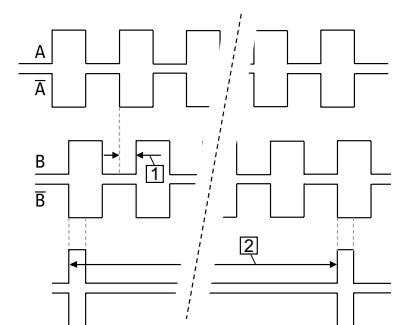
Permissible alignment tolerance (see draft „mounting tolerances“)	
Gap sensor head / magnetic band	0,1 ... 1,0 mm (recommended 0,4 mm)
Offset	max. ±1 mm
Tilting	max. 3°
Torsion	max. 3°

Function principle



Signal figures

- 1) Pulse edge interval: Pay attention to the instructions in the technical data
- 2) 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 every pole change. The signal is generated by the sensor.
- 4) Magnetic band (ends) attached by screwing, clamping or equivalent.
- 5) 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

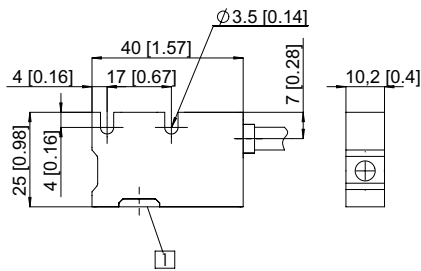
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

Dimensions

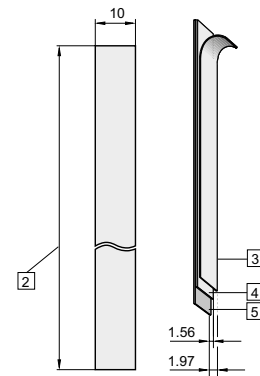
Dimensions in mm [inch]

Sensor head Limes LI20



1 Active measuring area

Magnetic band Limes B1



2 Length L, max. 70 m

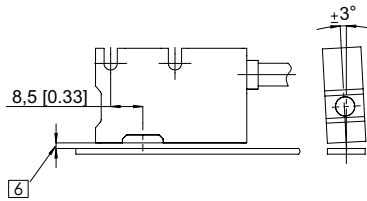
3 Masking tape

4 Magnetic band

5 Carrier band

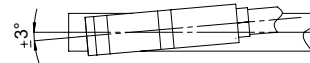
Permissible mounting tolerances

Tilting

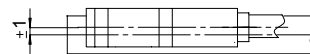


6 Distance sensor head / magnetic band:
0.1 ... 1.0 mm (recommended 0.4 mm)

Torsion



Offset



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
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The non-contact incremental magnetic linear measurement system Limes LI50 / B2 - made up of the sensor head LI50 and of the magnetic band B2 - reaches a resolution up to 5 µm with a maximum distance of 2 mm between the sensor and the band.

For outdoor use with extremely sturdy aluminum housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.

Product overview Basics
Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearingless encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Temperature range	High protection level	Shock / vibration resistant	Reverse polarity protection

Robust

- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).
- Non-contact measuring system – free from wear.
- Masking tape protecting the magnetic band.

Easy installation

- Simple glued assembly of the magnetic tape.
- Large mounting tolerances.
- Requires very little installation space.
- Warning signals via status LED if the magnetic field is too weak.

Order code sensor head Limes LI50		8.LI50.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	c Output circuit / power supply	1 = RS422 / 4.8 ... 26 V DC 2 = Push-pull / 4.8 ... 30 V DC	e Reference signal	2 = index periodic	Stock types 8.LI50.1111.2050 8.LI50.1111.2250 8.LI50.1121.2050 8.LI50.1121.2250	
b Pulse edge interval	1 = standard	d Type of connection	1 = cable, 2 m [6.56'] PUR	f Code (resolution) ¹⁾	050 = 25 µm 250 = 5 µm		

Order code magnetic band Limes B2		8.B2.10.010.XXXX				
Type		a			b	
a Width	10 = 10 mm	b Length	0010 = 1 m 0020 = 2 m 0040 = 4 m 0050 = 5 m	Optional on request	- other lengths up to 70 m	Stock types 8.B2.10.010.0020

1) With quadruple evaluation (only connected with magnetic band Limes B2)

Linear measuring technology

Incremental magnetic measurement system sensor head, magnetic band	Limes LI50 / B2	Resolution min. 5 µm
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Accessories / display type 572		Order no.
Position display, 8-digit	with 4 fast switch outputs and serial interface	6.572.0116.D05
	with 4 fast switch outputs, serial interface and scalable analog output	6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface	6.572.0118.D05
	with 4 fast switch outputs, serial interface and scalable analog output	6.572.0118.D95

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics sensor head LI50		
Working temperature	-20°C ... +80°C [-4°F ... +176°F]	
Storage 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	aluminum	
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 error; speed too high or magnetic fields too weak (at 8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)
	red	

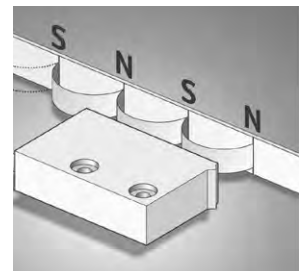
Electrical characteristics sensor head LI50		
Output circuit	Push-pull	RS422
Power supply	4,8 ... 30 V DC	4,8 ... 26 V DC
Permissible load / channel	±20 mA	120 Ω
Max. cable length	max. 30 m [98.43']	RS422 standard
Power consumption (no load)	typ. 25 mA, max. 60 mA	
Short circuit proof ¹⁾	yes	yes ²⁾
Min. 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 ³⁾	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

Magnetic band Limes B2		
Pole gap	5 mm from pole to pole	
Dimensions	width	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] ⁴⁾	
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 1.4310 acc. to EN 10088-3	

Accuracy	
Magnetic band	± (0,025 + 0,02 x L) mm – L in [m], up to L _{max} = 70 m
Sensor head	± 0,025 mm interpolation error accuracy: at T = 20°C and gap sensor head/magnetic band 1 mm
Repeat accuracy	±1 increment
Resolution and speed ⁵⁾	25 µm (quadruple), max. 16,25 m/s 5 µm (quadruple), max. 3,25 m/s

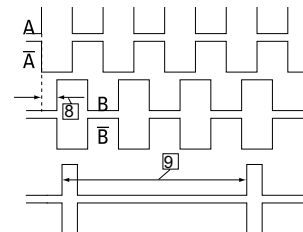
Permissible alignment tolerance (see draft „mounting tolerances“)	
Gap sensor head / magnetic band	0,1 ... 2,0 mm (recommended 1,0 mm)
Offset	max. ±1 mm
Tilting	max. 3°
Torsion	max. 3°

Function principle



Signal figures

- 8** Pulse edge interval: pay attention to the instructions in the technical data
- 9** Periodic index signal every 5 mm [0.20"]; the logical assignment A, B and 0-Signal can change



- 1) If power supply correctly applied.
- 2) Only one channel allowed to be shorted-out.
If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted.
If +V = 5 ... 30 V, short-circuit to channel or 0 V is permitted.
- 3) At every pole change. The signal is generated by the sensor.
- 4) Magnetic band (ends) attached by screwing, clamping or equivalent.
- 5) 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
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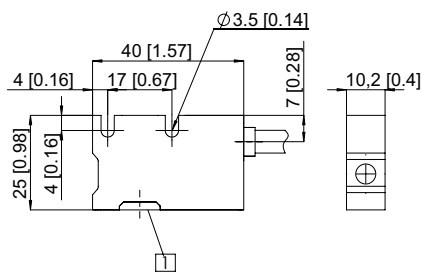
Terminal assignment

Output circuit	Type of connection	Cable	0 V	+V	A	Ā	B	B̄	0	0̄	⊥
1, 2	1	Signal:	0 V	+V	A	Ā	B	B̄	0	0̄	⊥
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

Dimensions

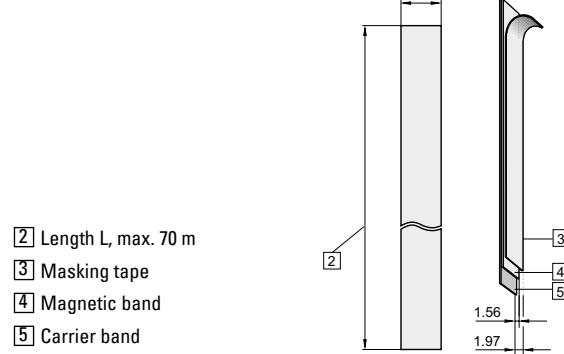
Dimensions in mm [inch]

Sensor head Limes LI50



1 Active measuring area

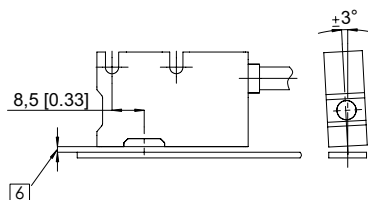
Magnetic band Limes B2



- 2 Length L, max. 70 m
- 3 Masking tape
- 4 Magnetic band
- 5 Carrier band

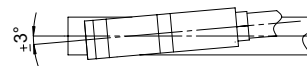
Permissible mounting tolerances

Tilting

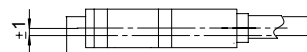


6 Distance sensor head / magnetic band:
0.1 ... 2.0 mm (recommended 1 mm)

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
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Robust and versatile

- High resolution - 1 µm / measuring length max. 8 m.
- Non-contact magnetic absolute measuring technology – therefore no wear – no referencing movement required.
- Sturdy housing with IP64 protection.
- For highly dynamic control.
- Optional SinCos signal (1 Vpp) for dynamic movement control with 1 mm pole pitch.
- Masking tape protecting the magnetic band.

Easy installation

- Simple glued assembly of the magnetic band.
- Requires very little installation space.
- Robust measuring principle – insensitive to dirt, smoke and humidity.

Order code sensor head Limes LA10

8.LA10 . 1 2 X 2
Type a b c d

- | | | |
|--------------------------------------|--|--|
| a Model
1 = IP64, standard | c Output circuit / Power supply
1 = SSI, 25 bit Gray-Code / 10 ... 30 V DC
2 = SSI, 25 bit Gray-Code, SinCos 1 Vpp / 10 ... 30 V DC
3 = CANopen, without bus terminating resistor / 10 ... 30 V DC
4 = CANopen, with bus terminating resistor / 10 ... 30 V DC
5 = CANopen, SinCos 1 Vpp, without bus terminating resistor / 10 ... 30 V DC
6 = CANopen, SinCos 1 Vpp, with bus terminating resistor / 10 ... 30 V DC | d Type of connection
2 = standard, M12 connector, 12 pin |
|--------------------------------------|--|--|

Stock types
8.LA10.1212 8.LA10.1232
8.LA10.1242

Scope of delivery
sensor head + spacing template

Optional on request
- other baud rate

Order code magnetic band Limes BA1

8.BA1 . 10 . 010 . XXXX
Type a b

- | | | |
|------------------------------|--|---|
| a Width
10 = 10 mm | b Length (measuring range = length - 0.1 m)
0005 = 0.5 m 0040 = 4 m
0010 = 1 m 0060 = 6 m
0020 = 2 m 0080 = 8 m
0030 = 3 m | Optional on request
- other lengths |
|------------------------------|--|---|

Stock types
8.BA11.10.010.0080

Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

Linear measuring technology

Absolute magnetic measurement system sensor head, magnetic band	Limes LA10 / BA1	Measuring length max. 8 m Resolution min. 1 µm
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Accessories		Order no.
SSI display type 570 Position display, 6-digit	with 2 relay outputs and serial interface DC power supply	0.570.010.305
	with 2 fast switch outputs AC/DC power supply	0.570.011.E00
	with scalable analog output AC/DC power supply	0.570.012.E90
	RS232 / RS485 interface AC/DC power supply	0.570.012.E05

Connection technology		Order no.
Connector, self-assembly (straight)	M12 female connector with coupling nut, 12 pin, A coded	8.0000.5162.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 12 pin, 5 m [16.4'] PUR cable 6 x 2 x 0.14 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	aluminum
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 2014/30/EU RoHS guideline 2011/65/EU

Accuracy	
Measuring principle	absolute + incremental (option)
System accuracy at 20°C [+68°F]	max. ± (10 + 20 x L) µm L = measuring length in meters
Repeat accuracy	±1 increment
Resolution	0.001 mm
LED, red	lights up when distance too large

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. ±20 mA
Signal level	HIGH typ. 3.8 V
	LOW at I _{Load} = 20 mA typ. 1.3 V
Clock rate	25 bit (24 + 1 failurebit for distance)
Code	Gray
SSI clock rate	80 kHz ... 0.4 MHz
Monoflop time	≤ 40 µs
Data refresh rate	≤ 250 µs

CANopen interface	
Interface	CAN High-Speed acc. to ISO 11898, Basic and Full CAN, CAN specification 2.0 B
Protocol	CANopen
Baud rate	standard 250 kbit/s
	on request other baud rate (125 ... 1000 kbit/s)
Termination	selectable via order code
Node address	1 (standard); others on request

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).

Product overview
Basics
Incremental encoders
Absolute encoders
singleturn
Absolute encoders
multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Linear measuring technology

Absolute magnetic measurement system sensor head, magnetic band	Limes LA10 / BA1	Measuring length max. 8 m Resolution min. 1 µm
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Magnetic band Limes BA1	
Pole gap	basic pole pitch 1 mm
Dimensions	width 10 mm
	thickness 1.97 mm incl. masking tape
Relative linear expansion	$\Delta L = L \times \alpha \times \Delta \delta$ L = measuring length in meters α = $16 \times 10^{-6} 1/K$ temperature coefficient $\Delta \delta$ = relative temperature change based on 20°C [+68°F] in °K

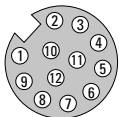
Working temperature	-20°C ... +80°C [-4°F ... +176°F] ¹⁾
Mounting	adhesive joint
Additional length	100 mm in order to obtain an optimal measuring result, the magnetic band should be about 0.1 m longer than the required measuring length
Min. bending radius for storage	≥ 150 mm
Material metal tape	precision 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
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
3, 4	2	Signal: 0 V +V CAN_L CAN_H - - - - - -
		Pin: 1 2 3 4 5 6 7 8 9 10 11 12
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 color assignment with M12 female connector	Connection cable with M12 connector, 12 pin (accessory) – for example 05.00.60B1.B211.005M												
	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU
	Pin:	1	2	3	4	5	6	7	8	9	10	11	12



1) Magnetic band (ends) attached by screwing, clamping or equivalent.

Product overview Basics
Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

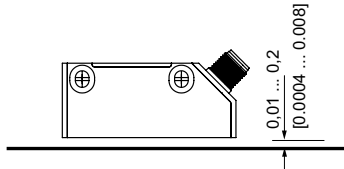
Linear measuring technology

Absolute magnetic measurement system sensor head, magnetic band	Limes LA10 / BA1	Measuring length max. 8 m Resolution min. 1 µm
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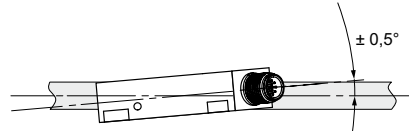
Permissible mounting tolerances

Dimensions in mm [inch]

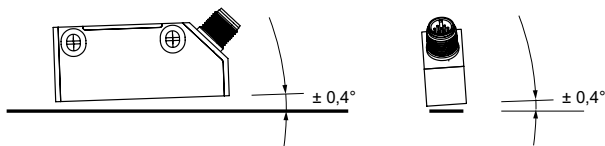
Distance sensor head / magnetic band (incl. masking tape)



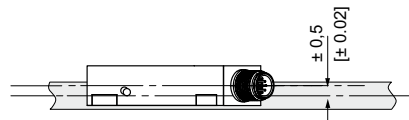
Torsion



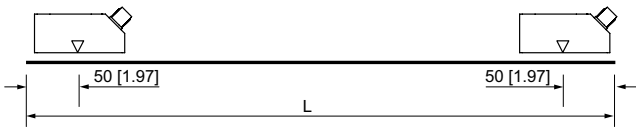
Tilting



Offset



Measuring range



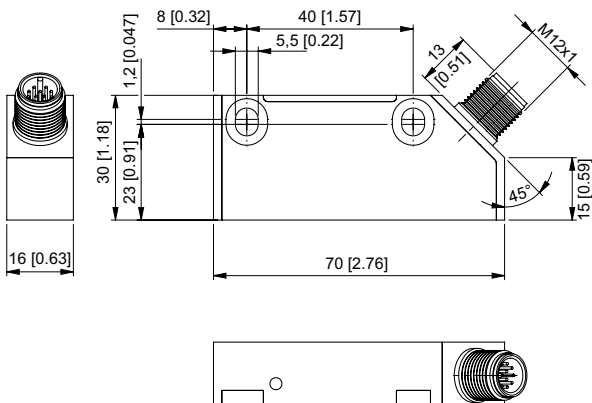
Observe mounting direction



Dimensions

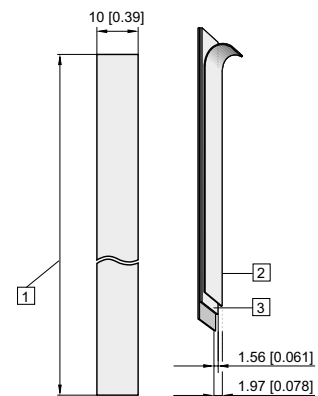
Dimensions in mm [inch]

Sensor head Limes LA10



Magnetic band Limes BA1

- 1 Length L, max. 8 m
- 2 Masking tape
- 3 Magnetic band



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**Absolute magnetic measurement system
sensor head, magnetic band**

Limes LA50 / BA5

**Measuring length max. 20 m
Resolution min. 10 µm**



The non-contact absolute magnetic linear measurement system Limes LA50 / BA5 - made up of the sensor head LA50 and of the magnetic band BA5 - reaches a resolution up to 10 µm with a maximum distance of 1.5 mm between the sensor and the band.



DC 10 ... 30 V Power supply	20 m Max. measuring length	1,5 mm Max. distance to measuring tape	4 m/s Max. speed	0.01 mm High resolution	IP40 Protection	Reverse polarity protection	Shock / vibration resistant	-10° ... +70°C Temperature range	Magnetic sensor
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Robust and versatile

- Resolution 0.01 mm / measuring lengths max. 20 m.
- Rugged die-cast zinc housing.
- Positions changes are also detected when de-energized no referencing movement required – no wear.
- Automatic distance detection in case of too high distance between the sensor and the magnetic band.
- Masking tape protecting the magnetic band.
- Address, baud rate, bus termination can be modified via microswitches.
- Interfaces: SSI, CANopen.

Easy installation

- Simple glued assembly of the magnetic band.
- Large mounting tolerances.
- Requires very little installation space.
- LED warning signals in case of too weak magnetic field.

Order code sensor head Limes LA50

8.LA50 . 1 2 X 1
Type a b c d

a Model 1 = IP40, standard	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
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Linear measuring technology

Absolute magnetic measurement system sensor head, magnetic band	Limes LA50 / BA5	Measuring length max. 20 m Resolution min. 10 µm
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Accessories	Order no.
SSI display type 570 Position display, 6-digit with 2 relay outputs and serial interface DC power supply	0.570.010.305
with 2 fast switch outputs AC/DC power supply	0.570.011.E00
with scalable analog output AC/DC power supply	0.570.012.E90
RS232 / RS485 interface AC/DC power supply	0.570.012.E05

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Mechanical characteristics	
Weight	ca. 0.19 kg [6.70 oz]
Working temperature	-10°C ... +70°C [+14°F ... +158°F] (non condensing)
Storage temperature	-25°C ... +85°C [-13°F ... +185°F]
Protection acc. to EN 60529	IP40
Housing	zinc die-cast
Max. traverse speed permanent absolute positions reading	4 m/s
Shock resistance acc. to EN 60068-2-27	5000 m/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 2014/30/EU RoHS guideline 2011/65/EU

Accuracy	
Measuring principle	absolute
System accuracy at 20°C [+68°F]	max. ± (150 + 20 x L) µm L = measuring length in meters
Repeat accuracy	±1 increment
Resolution	0.01 mm
LED, red	lights up when distance too large

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. ±20 mA
Signal level	HIGH typ. 3.8 V LOW at I _{Load} = 20 mA typ. 1.3 V
Clock rate	25 bit (24 + 1 failurebit for distance)
Code	binary / gray (default) switchable
SSI clock rate	80 kHz ... 0.4 MHz
Monoflop time	≤ 40 µs
Data refresh rate	≤ 250 µs

CANopen interface	
Interface	CAN High-Speed acc. to ISO 11898, Basic and Full CAN, CAN specification 2.0 B
Protocol	CANopen
Baud rate	125 ... 1000 kbit/s adjustable with a rotary switch
Termination	yes/no with a 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
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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 ... +80°C [-4°F ... +176°F] ¹⁾
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- - - \perp
		Core color: WH BN YE OR GN VT GY BK shield ²⁾

Output circuit	Type of connection	Cable
3 (CANopen)	1	Signal: 0 V +V CAN_H CAN_L - - - - \perp
		Core color: WH BN YE OR GN VT GY BK shield ²⁾

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0V)
- C+, C-: Clock signal
- D+, D-: Data signal

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Absolute encoders
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Absolute encoders
multiturn

Bearingless encoders

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Addresses

1) Magnetic band (ends) attached by screwing, clamping or equivalent.
2) Connect shielding only machine side

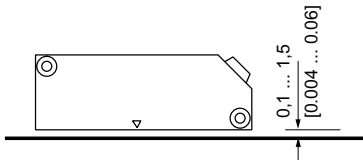
Linear measuring technology

Absolute magnetic measurement system Sensor head, magnetic band	Limes LA50 / BA5	Measuring length max. 20 m Resolution min. 10 µm
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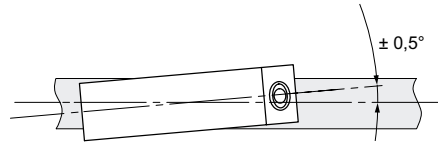
Permissible mounting tolerances

Dimensions in mm [inch]

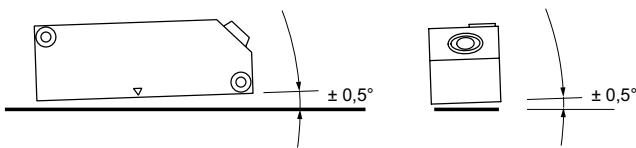
Distance sensor head / magnetic band (incl. masking tape)



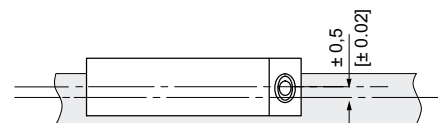
Torsion



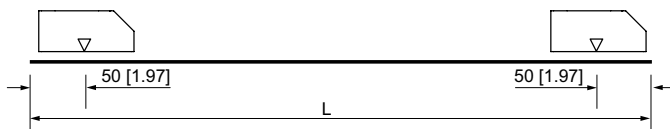
Tilting



Offset



Measuring range



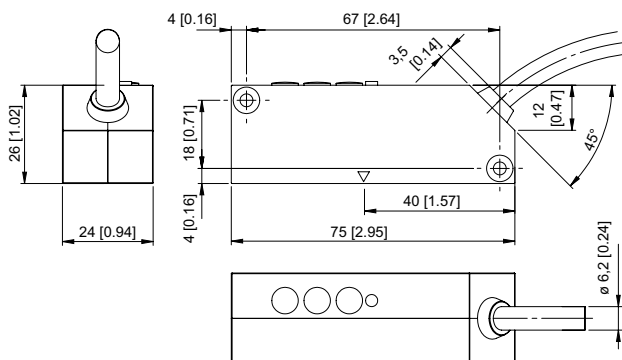
Observe mounting direction



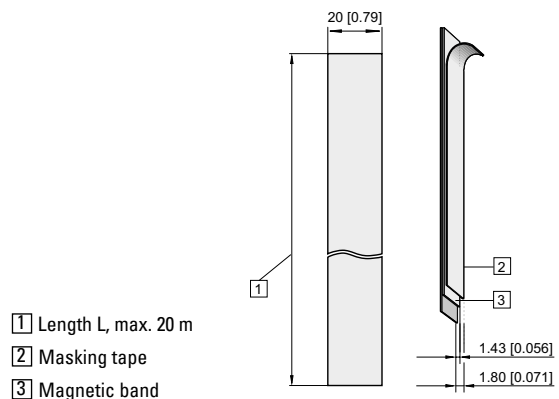
Dimensions

Dimensions in mm [inch]

Sensor head Limes LA50



Magnetic band Limes BA5



Linear measuring technology

Draw wire mechanics with analog sensor

Draw wire encoder A30

**Measuring length max. 0.6 m
Traverse speed max. 0.8 m/s**

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses



The draw wire mechanics A30 with analog output stands out with its miniaturized design. It is available with potentiometer, voltage or current output.



Analog output

Miniaturized 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 = analog output 4 ... 20 mA
22 = analog output 0 ... 10 V DC
power supply 15 ... 28 V DC
33 = potentiometer output 10 kΩ

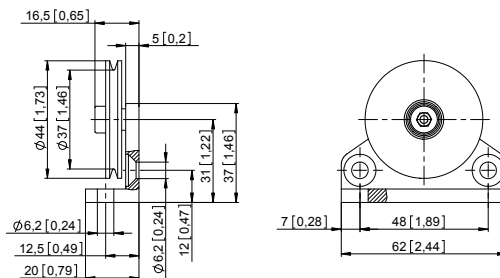
c Type of connection
4 = radial cable, 0.5 m [1.64']

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

8.0000.7000.0045

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

1) Not suitable for potentiometer output.

Linear measuring technology

Draw wire mechanics with analog sensor	Draw wire encoder A30	Measuring length max. 0.6 m Traverse speed max. 0.8 m/s
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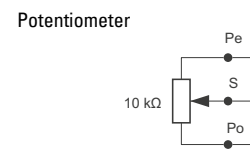
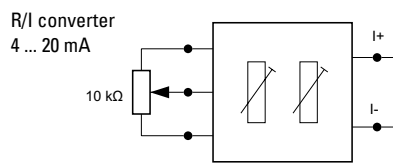
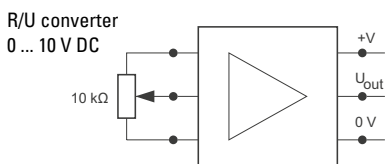
Technical data

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	<table style="width: 100%; border: none;"> <tr> <td style="padding-right: 10px;">housing</td> <td>plastic</td> </tr> <tr> <td>wire</td> <td>stainless-steel \varnothing 0.4 mm</td> </tr> <tr> <td></td> <td>plastic-coated</td> </tr> </table>	housing	plastic	wire	stainless-steel \varnothing 0.4 mm		plastic-coated
housing	plastic						
wire	stainless-steel \varnothing 0.4 mm						
	plastic-coated						

Electrical characteristics			
Analog 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 2014/30/EU RoHS guideline 2011/65/EU		

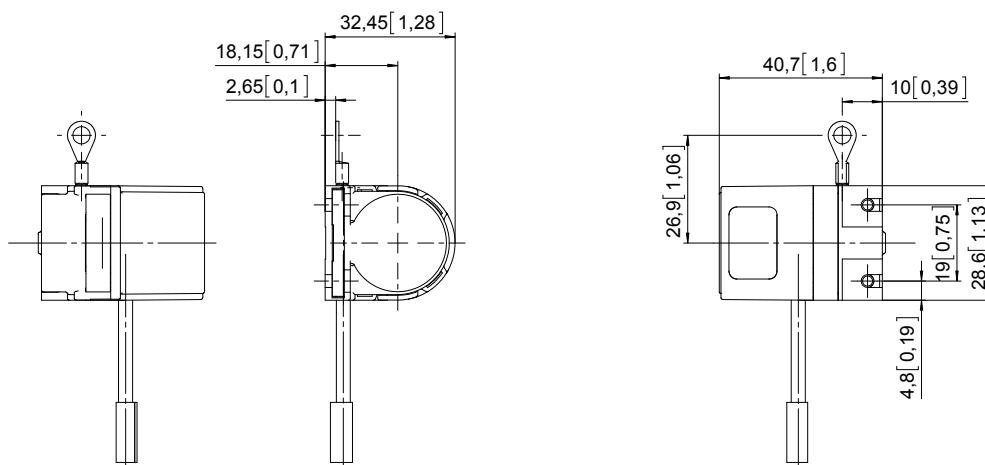
Terminal assignment

Core color	BN	WH	GN
0 ... 10 V DC	+ 24 V DC	0 V	U_{out}
4 ... 20 mA	+I	-I	n.c.
Potentiometer	Po	Pe	S



Dimensions

Dimensions in mm [inch]



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Draw wire mechanics with analog sensor

**Draw wire encoder A40, 1 m
Draw wire encoder A41, 2 m**

**Measuring length max. 2 m
Traverse speed max. 1 m/s**



The draw wire encoders A40 and A41 with analog output is characterized by its compact design. They are available with a potentiometer, voltage or current output.



Analog output

Compact and simple

- Measuring length up to 2000 mm.
- For applications with a low traversing speed.
- Easy to install.

Order code draw wire encoder

D5.350 X . A XX X . 0000

a Measuring range

- 1 = 1000 mm
- 2 = 2000 mm

b Output circuit

- 11 = analog output 4 ... 20 mA
- 22 = analog output 0 ... 10 V DC power supply 15 ... 28 V DC
- 33 = potentiometer output 10 kΩ

c Type of connection

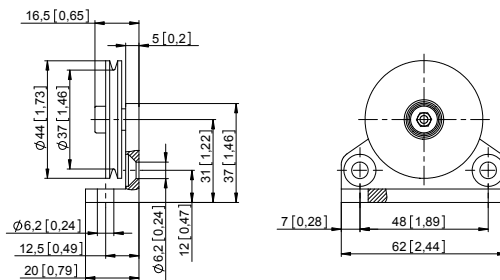
- 1 = cable 2 m [6.56'] for measuring range 1000 mm: axial for measuring range 2000 mm: radial
- 2 = radial M12 connector, 4-pin (only available for measuring range 2000 mm)

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley

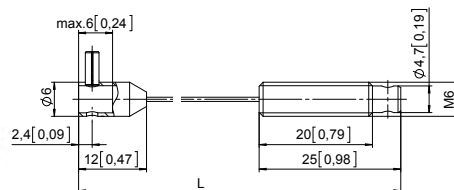


Technical data:
- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



- Steel wire 2 m [6.56']
- 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 analog sensor	Draw wire encoder A40, 1 m Draw wire encoder A41, 2 m	Measuring length max. 2 m Traverse speed max. 1 m/s
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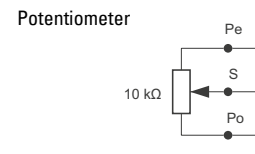
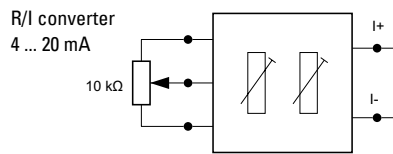
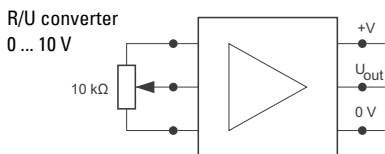
Technical data

Mechanical characteristics (draw wire mechanics)		
Measuring range	1000 mm (A40)	2000 mm (A41)
Speed max.	0.8 m/s	1 m/s
Working temperature	0°C ... 50°C [+32°F ... +122°F]	-10°C ... +80°C [+14°F ... +176°F]
Protection (sensor)	IP50	IP65
acc. to EN 60529		
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			
Analog 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 2014/30/EU RoHS guideline 2011/65/EU		

Terminal assignment

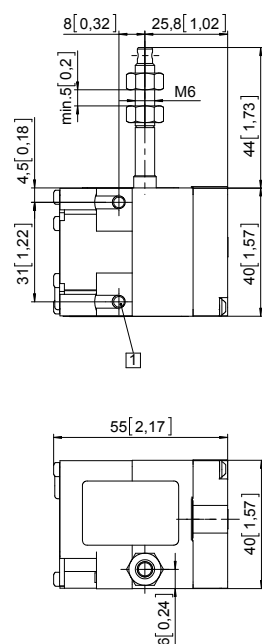
Core color	BN	WH	GN	
Pin M12	1	2	3	4
0 ... 10 V	+ 24 V DC	0 V	U_{out}	n.c.
0 ... 20 mA	I+	I-	n.c.	n.c.
Potentiometer	Po	Pe	S	n.c.



Dimensions

Dimensions in mm [inch]

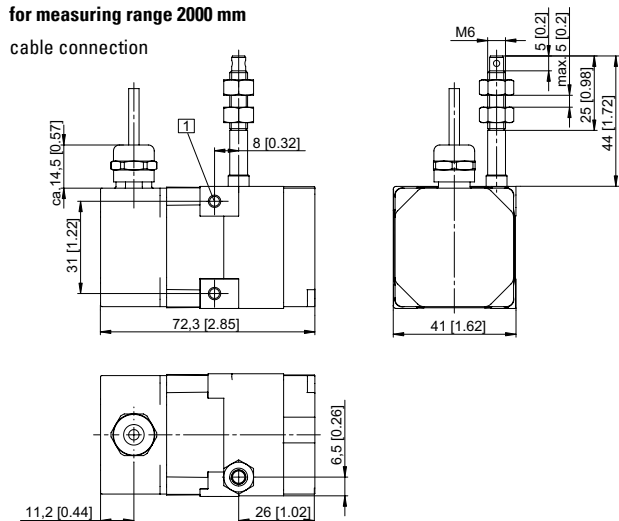
for measuring range 1000 mm



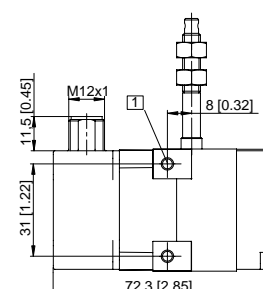
1 2 x M4, max. screw-in depth 8 mm [0.32"]

for measuring range 2000 mm

cable connection



M12 connector



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Draw wire mechanics with encoder or analog sensor

Draw wire encoder A50

**Measuring length max. 1.25 m
Traverse speed max. 10 m/s**



The draw wire mechanics A50 boast both a compact design and high dynamics.

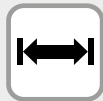
The draw wire mechanics may be equipped with encoders with an analog, incremental or absolute output. The maximum measuring length is 1.25 m.



Analog output



Max. acceleration



Long service life



Wide temperature range



High protection level



Reverse polarity protection

Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 300 m/s².
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Scalable analog output with limit switch function.

Order code with encoder (incremental, absolute)

D8.6A1 . XXXX . XXXX . XXXX
Type a b c d e

a Measuring range
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm

b Encoder used
36 = Sendix 3610, incremental
M3 = Sendix M3663, absolute, SSI
F3 = Sendix F3663, absolute, SSI
M8 = Sendix M3668, absolute, CANopen
F8 = Sendix F3668, absolute, CANopen

c Output circuit
depends on the encoder used

d Type of connection
depends on the encoder used

e Resolution / Protocol / Options
depends on the encoder used

Optional on request

- Other measuring ranges
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 3610

Drum circumference [mm]	125	125	125
Pulses / revolution [ppr]	125	1250	2500
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix F3663/M3663 (12 bit ST) or F3668/M3668 (12 bit ST, programmable via bus)

Drum circumference [mm]	125
Pulses / revolution [ppr]	4096
Pulses / mm	32.8
Resolution [mm]	0.03

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Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

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Addresses

Draw wire mechanics with encoder or analog sensor	Draw wire encoder A50	Measuring length max. 1.25 m Traverse speed max. 10 m/s
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Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.6A1.xxxx.3642.1250	3610 (8.3610.2342.1250)	Push-pull with inverted signal	8 ... 30 V DC	radial cable, 2 m	1250 ppr	-
D8.6A1.xxxx.M324.G222	Sendix M3663 (8.M3663.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.6A1.xxxx.M824.2122	Sendix M3668 (8.M3668.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.6A1.xxxx.F321.G222	Sendix F3663 (8.F3663.4121.G222)	SSI	10 ... 30 V DC	tangential cable, 1 m	4096 ppr / SSI-Gray-Code	-
D8.6A1.xxxx.F821.2122	Sendix F3668 (8.F3668.4121.2122)	CANopen	10 ... 30 V DC	tangential cable, 1 m	CANopen encoder profile DS406 V3.2	-

Order code with encoder (analog, scalable with limit switch function)

D8.6A1 . XXXX . M1XX . XXXX
Type a b c d e

- a** *Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm
 - b** *Encoder used*
M1 = Sendix M3661, absolute ¹⁾
 - c** *Output circuit*
depends on the encoder used
 - d** *Type of connection*
depends on the encoder used
 - e** *Resolution / Protocol / Options*
depends on the encoder used
- Optional on request*
- Other measuring ranges
 - Eyelet or M4 wire fastening instead of wire clip
 - Modified cable and/or connector orientation
 - Modified cable outlet direction
 - Sensor protection level IP67
 - Improved linearity (0.02 %)

Recommended standard variants (with analog encoder, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.6A1.xxxx.M134.3612	Sendix M3661 (8.M3661.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	M12-Stecker radial	12 Bit / 4 ... 20 mA	scalable without limit switch function ²⁾
D8.6A1.xxxx.M144.4612	Sendix M3661 (8.M3661.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	M12-Stecker radial	12 Bit / 0 ... 10 V	scalable without limit switch function ²⁾
D8.6A1.xxxx.M134.3512	Sendix M3661 (8.M3661.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	M12-Stecker radial	12 Bit / 4 ... 20 mA	scalable with limit switch function ³⁾
D8.6A1.xxxx.M144.4512	Sendix M3661 (8.M3661.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	M12-Stecker radial	12 Bit / 0 ... 10 V	scalable with limit switch function ³⁾

Order code with analog sensor (scaled to measuring range)

D8.3A1 . XXXX . XXX X . 0000
Type a b c 0000

- a** *Measuring range*
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm
 - b** *Analog sensor output / power supply*
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC
 - c** *Type of connection*
1 = axial cable, 2 m PVC
3 = axial M12 connector, 4-pin
- Optional on request*
- Other measuring ranges
 - Eyelet or M4 wire fastening instead of wire clip
 - Modified cable and/or connector orientation
 - Modified cable outlet direction
 - Sensor protection level IP67
 - Improved linearity (0.02 %)
 - Increased temperature range -40°C ... +85°C and -20°C ... +120°C

1) With ccw option.
 2) Delivery condition: scaled to measuring range.
 Description for scaling and limit switch function see data sheet M3661.
 3) Delivery condition: unscaled.
 Description for scaling and limit switch function see data sheet M3661.

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclinoimeters
 Connection technology
 Accessories
 Addresses

Linear measuring technology

Draw wire mechanics with encoder or analog sensor

Draw wire encoder A50

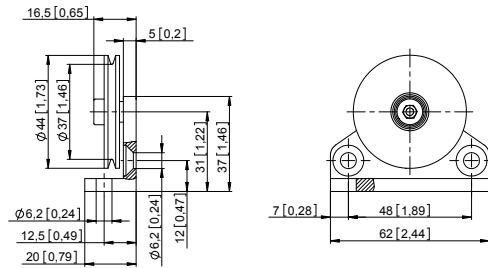
**Measuring length max. 1.25 m
Traverse speed max. 10 m/s**

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:

- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:

- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analog sensor

Order no.

Cordset, pre-assembled

M12 female connector with coupling nut, 5-pin
2 m [6.56'] PVC cable

05.00.6081.2211.002M

Connector, self-assembly (straight)

M12 female connector with coupling nut, 5-pin

8.0000.5116.0000

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range	250 mm	500 mm	1250 mm
Extension force	F _{min} 6.8 N	3.4 N	4.1 N
	F _{max} 7.9 N	4.0 N	5.4 N
Max. speed	8 m/s	8 m/s	10 m/s
Max. acceleration	200 m/s ²	200 m/s ²	300 m/s ²
Linearity (of the measuring range)	with analog sensor	±0.1 %	±0.1 %
	with encoder	±0.05 %	±0.05 %
		±0.02 % ¹⁾	±0.02 % ¹⁾
Weight	approx. 330 g [11.64 oz] (depending on the sensor / encoder used)		
Material	housing wire	titanium-anodized aluminum stainless steel Ø 0.5 mm (other wire types on request)	
Protection acc. to EN 60529	IP65 (sensor)		

Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

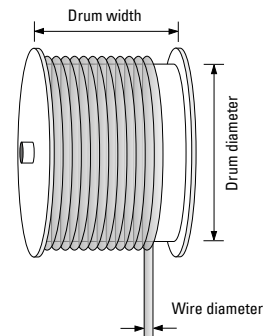
Operating principle

Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note

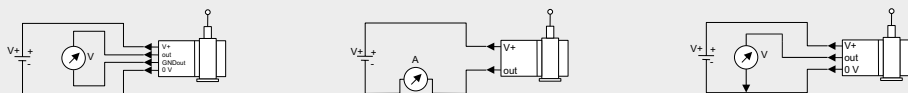
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Electrical characteristics (analog sensor, scaled to measuring range)

Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +85°C [-4°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F]
	-40°C ... +85°C [-40°F ... +185°F] ²⁾	-40°C ... +85°C [-40°F ... +185°F] ²⁾	-40°C ... +85°C [-40°F ... +185°F] ²⁾
			-20°C ... +120°C [-4°F ... +248°F] ²⁾

Connection diagrams



CE compliant acc. to

EMC guideline 2014/30/EU
RoHS guideline 2011/65/EU

1) On request for encoder version: 36 (see order code **b**).
2) Optional on request.

Linear measuring technology

Draw wire mechanics with encoder or analog sensor	Draw wire encoder A50	Measuring length max. 1.25 m Traverse speed max. 10 m/s
--	------------------------------	--

Technology in detail

Various wire types and wire fastenings

Wire types:
 - 0.5 mm (V2A) ¹⁾
 - 0.51 mm (V4A)
 - 0.6 mm (Coramid)

Wire fastenings:
 Clip ¹⁾ M4 thread Eyelet

Individual wire outlet and Cable / connector orientation

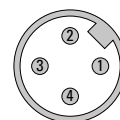
Extension wire

Application-specific installation possibilities

Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Core color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

1) Standard.

Linear measuring technology

Draw wire mechanics with encoder or analog sensor

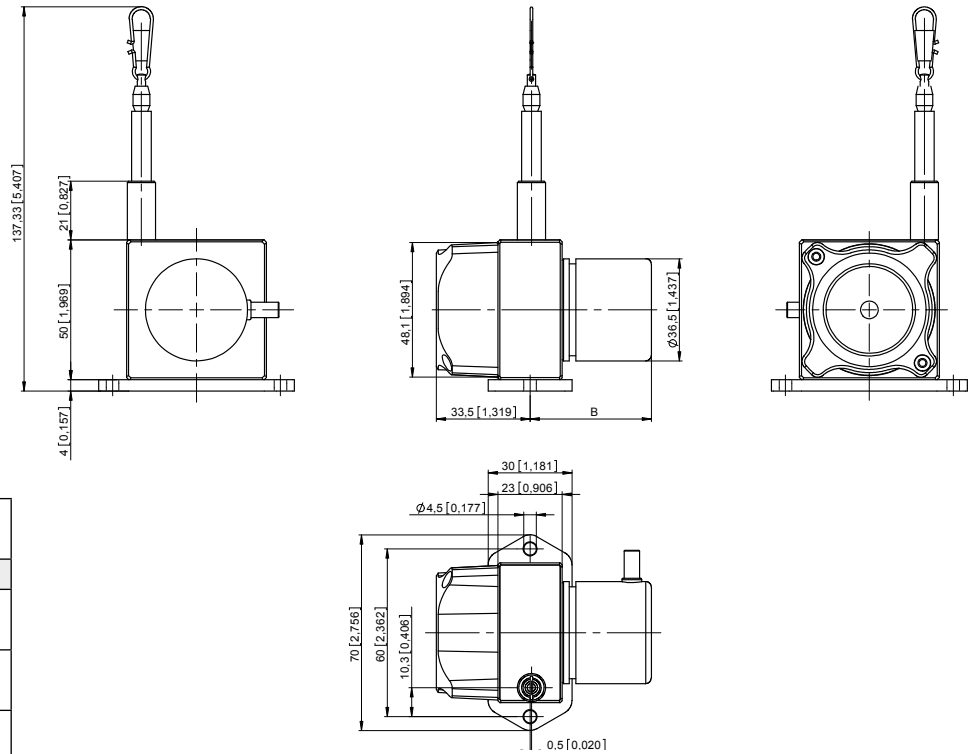
Draw wire encoder A50

**Measuring length max. 1.25 m
Traverse speed max. 10 m/s**

Dimensions

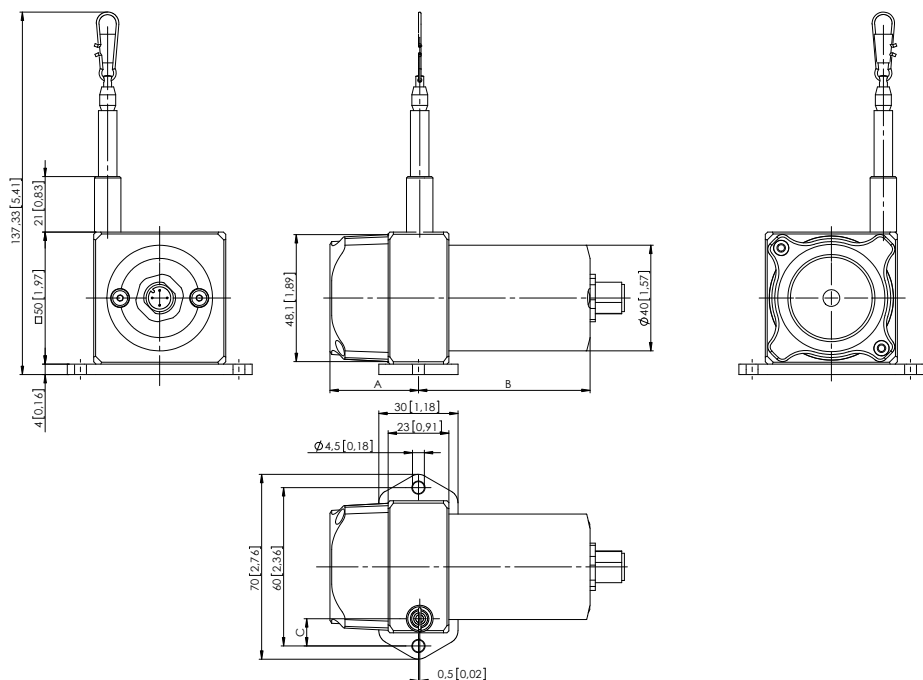
Dimensions in mm [inch]

Draw wire mechanics with encoder



Dimension B depends on the encoder used	
Encoder	B
Sendix incremental 3610 D8.6A1.xxxx.36xx.xxxx	43.00 [1.69]
Sendix absolute M366x D8.6A1.xxxx.Mxxx.xxxx	62.45 [2.46]
Sendix absolute F366x D8.6A1.xxxx.Fxxx.xxxx	51.20 [2.02]

Draw wire mechanics with analog sensor (scaled on measuring range)



Sensor type	Measuring length	A	B	C
Potentiometer	250 mm	26.5 [1.04]	65 [2.56]	21.30 [0.84]
	500 mm	26.5 [1.04]	65 [2.56]	12.75 [0.50]
	1250 mm	33.5 [1.32]	65 [2.56]	10.30 [0.41]

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

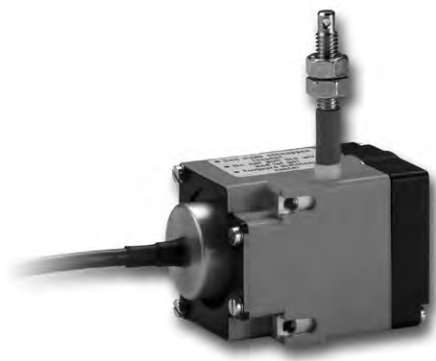
Connection technology

Accessories

Addresses

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
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The draw wire system A40 with incremental encoder excels with its compact construction.



Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Compact and simple

- Measuring length up to 2000 mm.
- For applications with low traverse speeds.
- Easy mounting.

Order code draw wire encoder	D5.2 Type	XXX a	. 24	XX b	. 1000		
a Steel wire, length 501 = 1000 mm 102 = 2000 mm	b Output circuit / power supply 21 = Push-pull with inverted signal / 5 ... 24 V DC 41 = Push-pull with inverted signal / 8 ... 30 V DC	Stock types		D5.2102.2421.1000	D5.2501.2421.1000		
				D5.2102.2441.1000	D5.2501.2441.1000		

Accessories for draw wire encoder	Dimensions in mm [inch]	Order no.
Guide pulley 		8.0000.7000.0045 Technical data: - mounting bracket (anodized alum.) - guide pulley (plastic POM) - ball bearing (type 696-2R5) Scope of delivery: - 2 x countersunk screws for lateral fixing - 2 x hexagonal screws for fixing on a flat surface
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 Paraline 2 m [6.56'] 8.0000.7000.0032

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]

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

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 2014/30/EU RoHS guideline 2011/65/EU	

Description of the incremental encoder (connected on load side)

- Compensation for temperature and ageing
- Short-circuit protected outputs
- Reverse polarity protected power supply input
- Push-pull output

Terminal assignment of the encoder

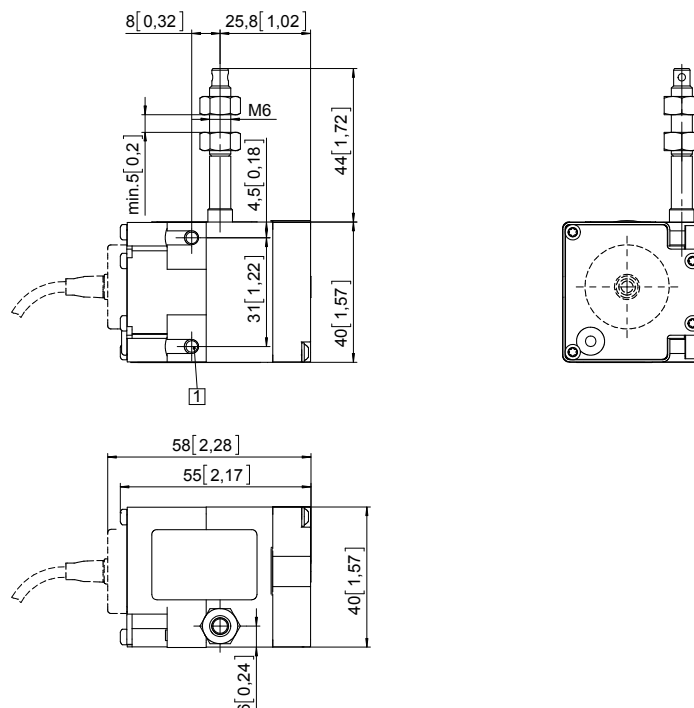
Signal	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$
Core color	WH	BN	GN	YE	GY	PK	BU	RD

Isolate unused outputs before initial start-up.

Dimensions

Dimensions in mm [inch]

1 2 x M4, max. screw-in depth 8 mm [0.32"]



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singleturn

Absolute encoders
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Inclinometers

Connection
technology

Accessories

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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 meters.



Analog output



Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Compact and simple

- Measuring length up to 2000 mm.
- Scalable analog output with limit switch function.
- For applications with low traverse speeds.
- Easy mounting.
- Robust design.

Order code with encoder (absolute)

D5.55	02	.	XX	XX	.	XXXX
Type	a		b	c	d	e

- | | | | |
|---|---|---|--|
| <p>a <i>Measuring range</i>
02 = 2000 mm</p> | <p>b <i>Encoder used</i>
M3 = Sendix M3663, absolute, SSI
F3 = Sendix F3663, absolute, SSI
M8 = Sendix M3668, absolute, CANopen
F8 = Sendix F3668, absolute, 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/ M3663 (12 bit ST) or F3668/M3668 (12 bit ST, programmable via bus)	
Drum circumference [mm]	100
Pulses / revolution [ppr]	4096
Pulses / mm	41
Resolution [mm]	0.02

Recommended standard variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D5.5502.M324.G222	Sendix M3663 (8.M3663.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D5.5502.M824.2122	Sendix M3668 (8.M3668.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-
D5.5502.F321.G222	Sendix F3663 (8.F3663.4121.G222)	SSI	10 ... 30 V DC	tangential cable, 1 m	4096 ppr / SSI-Gray-Code	-
D5.5502.F821.2122	Sendix F3668 (8.F3668.4121.2122)	CANopen	10 ... 30 V DC	tangential cable, 1 m	CANopen encoder profile DS406 V3.2	-

Linear measuring technology

Draw wire mechanics with absolute encoder

Draw wire encoder A41

**Measuring length max. 2 m
Traverse speed max. 1 m/s**

**Order code with encoder
(analog, scalable with limit switch function)**

D5.55 02 . M1XX . XXXX
Type a b c d e

a Measuring range
02 = 2000 mm

b Encoder used
M1 = Sendix M3661, absolute, analog ¹⁾

c Output circuit
depends on the encoder used

e Resolution / Protocol / Options
depends on the encoder used

d Type of connection
depends on the encoder used

Recommended standard variants (with encoder analog, scalable with limit switch function)

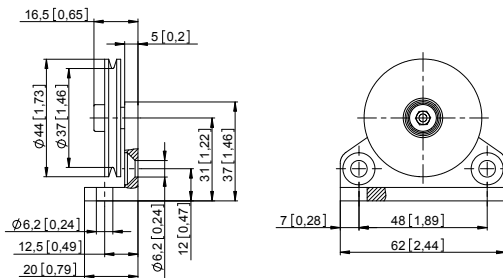
Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D5.5502.M134.3512	Sendix M3661 (8.M3661.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function ²⁾
D5.5502.M144.4512	Sendix M3661 (8.M3661.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function ²⁾
D5.5502.M134.3612	Sendix M3661 (8.M3661.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function ²⁾
D5.5502.M144.4612	Sendix M3661 (8.M3661.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function ²⁾

Accessories for draw wire encoder

Dimensions in mm [inch]

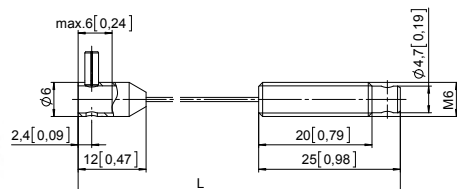
Order no.

Guide pulley



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

Technical data

Mechanical characteristics (draw wire mechanics)	
Measuring range	up to 2000 mm
Traversing speed	max. 1000 mm/s
Working temperature	-10°C ... +80°C [+14°F ... +176°F]
Weight	approx. 200 g [7.06 oz]
Required force	≥ 2 N (on wire)
Linearity	±0.35 % for the whole measuring range
Repetition accuracy	±0.15 mm per direction of travel
Material	housing zinc die-cast wire stainless steel ø 0.45 mm

Electrical characteristics (encoder)	
The electrical characteristics can be found in the data sheets of the encoders.	

1) With ccw option.
 2) Delivery condition: unscaled.
 Description for scaling and limit switch function see data sheet M3661.

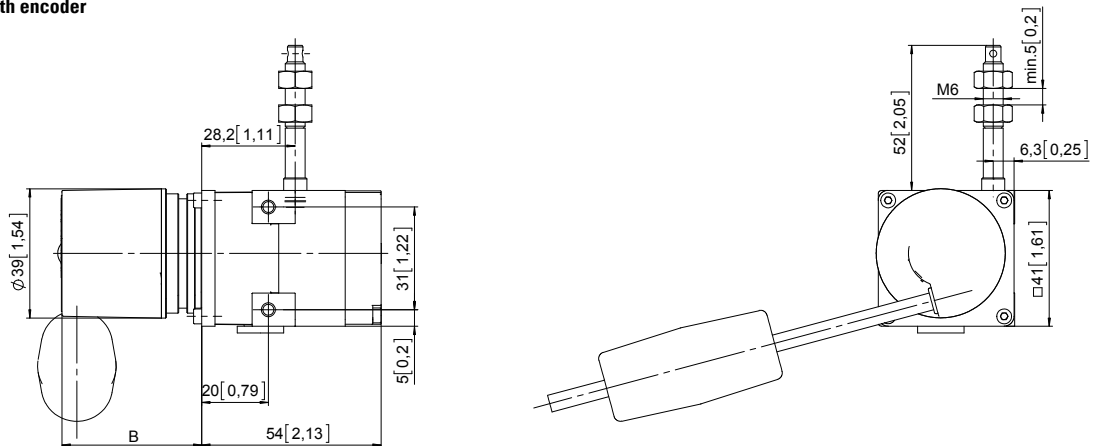
Linear measuring technology

Draw wire mechanics with absolute encoder	Draw wire encoder A41	Measuring length max. 2 m Traverse speed max. 1 m/s
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Dimensions

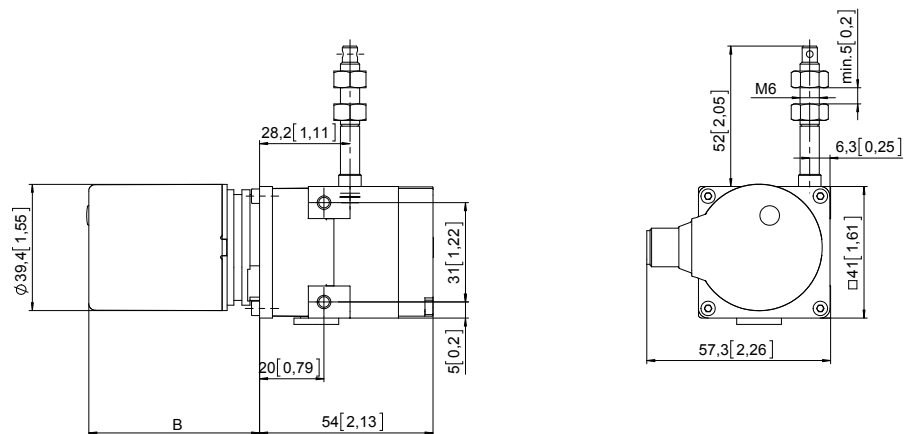
Dimensions in mm [inch]

Draw wire mechanics with encoder (tangential cable)



Dimension B depends on the encoder used	
Encoder	B
Sendix absolute (M366x) D5.5502.Mxxx.xxxx	50.25 [1.98]
Sendix absolute (F366x) D5.5502.Fxxx.xxxx	39.70 [1.56]

Draw wire mechanics with encoder (M12 connector)



Dimension B depends on the encoder used	
Encoder	B
Sendix absolute (F3663, SSI) D5.5502.Fxxx.xxxx	42,20 [1.66]
Sendix absolute (F3668, CANopen) D5.5502.Fxxx.xxxx	42,20 [1.66]
Sendix absolute (M3661, analog) D5.5502.Mxxx.xxxx	53,25 [2.10]

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder B75

**Measuring length max. 3 m
Traverse speed max. 0.8 m/s**



The draw wire mechanics B75 can be used up to a measuring length of 3 meters.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.



Compact and versatile

- Compact housing.
- Variable mounting possibilities.
- Low-wear wire exit.
- Scalable analog interface with limit switch function.
- Various field bus interfaces.

Order code with encoder (incremental, absolute)

D8.15 **03** . **XX****XX** . **XXXX**
Type **a** **b** **c** **d** **e**

- a** *Measuring range*
03 = 3000 mm
- b** *Encoder used*
2Z = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
M8 = Sendix M5868, absolute
63 = Sendix 5863, absolute
F8 = Sendix F5868, absolute
68 = Sendix 5868, absolute
- c** *Output circuit*
depends on the encoder used
- d** *Type of connection*
depends on the encoder used
- e** *Resolution / Protocol / Options*
depends on the encoder used
Optional on request
- Other measuring ranges

Standard resolutions for draw wire with incremental encoder Sendix 5000			
Drum circumference [mm]	200	200	200
Pulses / revolution [ppr]	200	2000	4000
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	200
Pulses / revolution [ppr]	4096
Pulses / mm	20.5
Resolution [mm]	0.05

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1503.2Z54.2000	Sendix 5000 (8.5000.B154.2000)	Push-pull with inverted signal	10 ... 30 V DC	radial M12 connector	2000 ppr	-
D8.1503.M324.G222	Sendix M5863 (8.M5863.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.1503.M824.2122	Sendix M5868 (8.M5868.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1503.F326.G223	Sendix F5863 (8.F5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1503.6326.G223	Sendix 5863 (8.5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1503.F82E.2123	Sendix F5868 (8.F5868.212E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1503.6822.2123	Sendix 5868 (8.5868.2122.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1503.6832.3113	Sendix 5868 (8.5868.2132.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.1503.68B2.B212	Sendix 5868 (8.5868.21B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.1503.68C2.C212	Sendix 5868 (8.5868.21C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.1503.F8AN.A222	Sendix F5868 (8.F5868.21AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Linear measuring technology

Draw wire mechanics with encoder or analog sensor | **Draw wire encoder B75** | **Measuring length max. 3 m**
Traverse speed max. 0.8 m/s

Order code with encoder (analog, scalable with limit switch function) | **D8.15** | **03** | **M1XX** | **XXXX**

- a** Measuring range
03 = 3000 mm
 - b** Encoder used
M1 = Sendix M5861, absolute ¹⁾
 - c** Output circuit
depends on the encoder used
 - d** Type of connection
depends on the encoder used
 - e** Resolution / Protocol / Options
depends on the encoder used
- Optional on request*
- Other measuring ranges

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1503.M134.3512	Sendix M5861 (8.M5861.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function ²⁾
D8.1503.M144.4512	Sendix M5861 (8.M5861.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function ²⁾
D8.1503.M134.3612	Sendix M5861 (8.M5861.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function ²⁾
D8.1503.M144.4612	Sendix M5861 (8.M5861.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function ²⁾

Order code with analog sensor (scaled to measuring range) | **D8.35** | **03** | **XXX** | **2** | **0000**

- a** Measuring range
03 = 3000 mm
 - b** Analog sensor output / power supply
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V DC / 12 ... 30 V DC
A33 = potentiometer 10 kΩ / max. 30 V DC
 - c** Type of connection
2 = radial M12 connector, 4-pin (wire outlet direction)
- Optional on request*
- Other measuring ranges

Accessories for draw wire encoder | Dimensions in mm [inch] | Order no.

Guide pulley

Technical data:
 - mounting bracket (anodized alum.)
 - guide pulley (plastic POM)
 - ball bearing (type 696-2R5)

Scope of delivery:
 - 2 x countersunk screws for lateral fixing
 - 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable

Steel wire 2 m [6.56'] | **8.0000.7000.0033**
 Steel wire 5 m [16.40'] | **8.0000.7000.0034**
 Steel wire 10 m [32.81'] | **8.0000.7000.0035**
 Paraline 2 m [6.56'] | **8.0000.7000.0032**

Connection technology for analog sensor | Order no.

Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	05.00.6081.2211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

1) With ccw option.
 2) Delivery condition: unscaled.
 Description for scaling and limit switch function see data sheet M5861.

Linear measuring technology

Draw wire mechanics with encoder or analog sensor

Draw wire encoder B75

**Measuring length max. 3 m
Traverse speed max. 0.8 m/s**

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range	3000 mm
Traversing speed	max. 0.8 m/s
Working temperature	-40°C ... +80°C [-40°F ... +176°F]
Protection acc. to EN 60529	IP65
Weight	approx. 500 g [17.67 oz]
Required force F_{min}	3 N
Linearity	±0.35 %
Repetition accuracy	±0.15 mm
Material	housing plastic / zinc die-cast wire stainless steel \varnothing 0.9 mm, plastic-coated

Electrical characteristics

Analog 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
Load	max. 500 Ω	max. 500 Ω	–
Temperature range	-40°C ... +80°C [-40°F ... +176°F]		
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Terminal assignment (analog output)

Core color	BN	WH	GN	
Pin M12	1	2	3	4
0 ... 10 V DC	+24 V DC	0 V	U_{out}	n.c.
4 ... 20 mA	+I	-I	n.c.	n.c.
Potentiometer 10 k Ω	Po	Pe	S	n.c.

Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Core color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 k Ω	+V	Slider	0 V	n. c.

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.

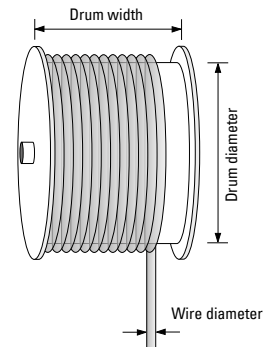
Operating principle

Construction

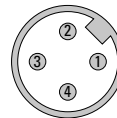
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Top view of mating side, male contact base



M12 connector, 4-pin

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

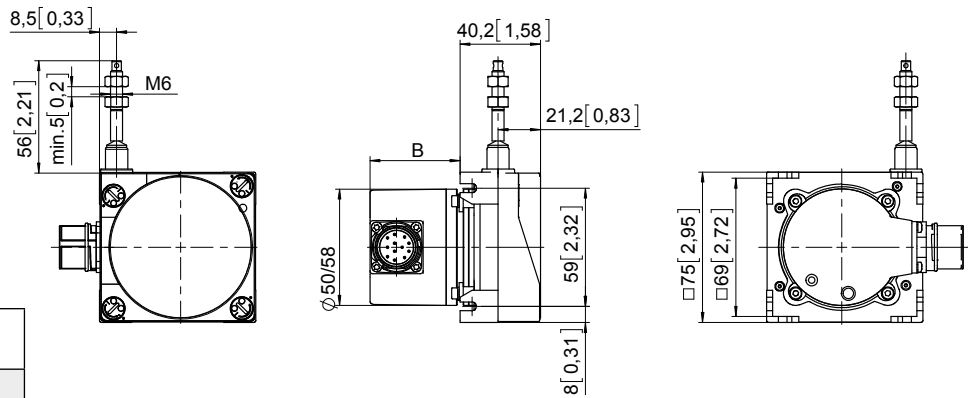
Linear measuring technology

Draw wire mechanics with encoder or analog sensor	Draw wire encoder B75	Measuring length max. 3 m Traverse speed max. 0.8 m/s
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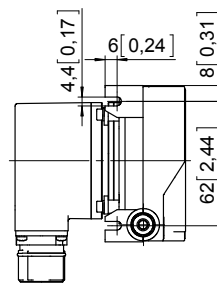
Dimensions

Dimensions in mm [inch]

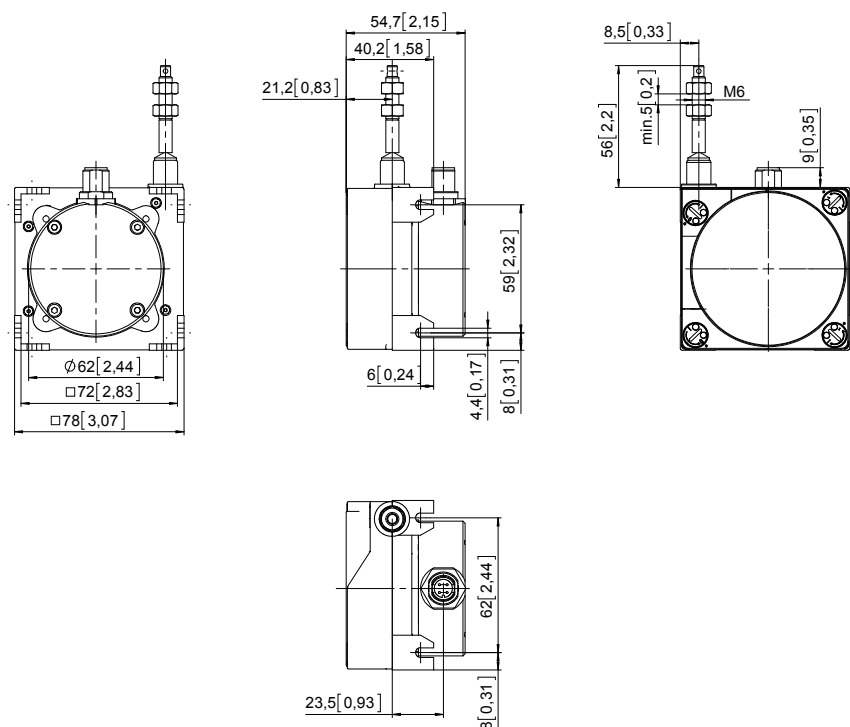
Draw wire mechanics with encoder



Dimension B depends on the encoder used	
Encoder	B
Sendix incremental (5000) D8.1503.xxxx.2Zxx.xxxx	43.00 [1.69]
Sendix absolute (F5863) D8.1503.xxxx.F3xx.xxxx	55.50 [2.19]
Sendix absolute (5863) D8.1503.xxxx.63xx.xxxx	55.50 [2.19]
Sendix absolute (F5868, CANopen) D8.1503.xxxx.F8xx.21xx	65.50 [2.58]
Sendix absolute (F5868, EtherNet/IP) D8.1503.xxxx.F8xx.A2xx	65.50 [2.58]
Sendix absolute (5868) D8.1503.xxxx.68xx.xxxx	83.20 [3.28]
Sendix absolute (M586x) D8.1503.xxxx.Mxxx.xxxx	50.55 [1.99]



Draw wire mechanics with analog sensor (scalable on measuring range)



Linear measuring technology

Draw wire mechanics with encoder or analog sensor

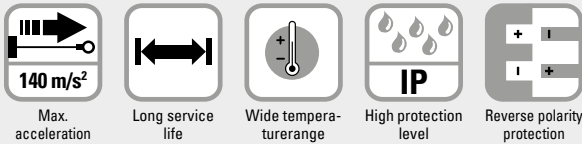
Draw wire encoder B80

**Measuring length max. 3 m
Traverse speed max. 10 m/s**



The draw wire mechanics B80 can be used up to a measuring length of 3 meters.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.



Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 140 m/s².
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Interchangeable encoders (Interchangeable installation).

Order code with encoder (incremental, absolute)

D8.XB1.XXXX.XXX.XXX

- a** *Mechanics*
2 = interchangeable installation ¹⁾
4 = fixed installation ²⁾
- b** *Measuring range*
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm

- c** *Encoder used*
00 = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
63 = Sendix 5863, absolute
M8 = Sendix M5868, absolute
F8 = Sendix F5868 absolute
68 = Sendix 5868, absolute

- d** *Output circuit*
depends on the encoder used
- e** *Type of connection*
depends on the encoder used
- f** *Resolution / Protocol / Options*
depends on the encoder used

- Optional on request*
- Other measuring ranges
 - Cable diameter 1 mm
 - Eyelet or M4 wire fastening instead of wire clip
 - Modified cable and/or connector orientation
 - Modified cable outlet direction
 - Sensor protection level IP67
 - Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 5000			
Drum circumference [mm]	200	200	200
Pulses / revolution [ppr]	200	2000	4000
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	200
Pulses / revolution [ppr]	4096
Pulses / mm	20.5
Resolution [mm]	0.05

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.
2) The encoder can only be replaced at the factory.

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Absolute encoders singleturn
Absolute encoders multiturn
Bearingless encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Draw wire mechanics with encoder or analog sensor	Draw wire encoder B80	Measuring length max. 3 m Traverse speed max. 10 m/s
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Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xB1.xxxx.0054.2000	Sendix 5000 (8.5000.8354.2000)	Push-pull with inverted signal	10 ... 30 V DC	radial M12 connector	2000 ppr	-
D8.xB1.xxxx.M324.G222	Sendix M5863 (8.M5863.3524.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.xB1.xxxx.M824.2122	Sendix M5868 (8.M5868.3524.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profile DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xB1.xxxx.F326.G223	Sendix F5863 (8.F5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xB1.xxxx.6326.G223	Sendix 5863 (8.5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xB1.xxxx.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xB1.xxxx.6822.2123	Sendix 5868 (8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xB1.xxxx.6832.3113	Sendix 5868 (8.5868.1232.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.xB1.xxxx.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.xB1.xxxx.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.xB1.xxxx.F8AN.A222	Sendix F5868 (8.F5868.12AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Order code with encoder (analog, scalable with limit switch function)

D8.XB1.XXXX.M1XX.XXXX

- | | | |
|--|--|---|
| <p>a <i>Mechanics</i>
2 = interchangeable installation ¹⁾
4 = fixed installation ²⁾</p> <p>b <i>Measuring range</i>
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm</p> <p>c <i>Encoder used</i>
M1 = Sendix M5861, absolute ³⁾</p> | <p>d <i>Output circuit</i>
depends on the encoder used</p> <p>e <i>Type of connection</i>
depends on the encoder used</p> <p>f <i>Resolution / Protocol / Options</i>
depends on the encoder used</p> | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - Other measuring ranges - Cable diameter 1 mm - Eyelet or M4 wire fastening instead of wire clip - Modified cable and/or connector orientation - Modified cable outlet direction - Sensor protection level IP67 |
|--|--|---|

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xB1.xxxx.M134.3612	Sendix M5861 (8.M5861.3534.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function ⁴⁾
D8.xB1.xxxx.M144.4612	Sendix M5861 (8.M5861.3544.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function ⁴⁾
D8.xB1.xxxx.M134.3512	Sendix M5861 (8.M5861.3534.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function ⁵⁾
D8.xB1.xxxx.M144.4512	Sendix M5861 (8.M5861.3544.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function ⁵⁾

Order code with analog sensor (scaled to measuring range)

D8.3B1.XXXX.XXX X.0000

- | | | |
|---|---|--|
| <p>a <i>Measuring range</i>
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm</p> | <p>b <i>Analog sensor output / power supply</i>
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC</p> <p>c <i>Type of connection</i>
1 = axial cable, 2 m PVC
3 = axial M12 connector, 4-pin</p> | <p><i>Optional on request</i></p> <ul style="list-style-type: none"> - Other measuring ranges - Cable diameter 1 mm - Eyelet or M4 wire fastening instead of wire clip - Modified cable and/or connector orientation - Modified cable outlet direction - Sensor protection level IP67 - Improved linearity (0.02 %) - Increased temperature range -40°C ... +85°C and -20°C ... +120°C |
|---|---|--|

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer.
 2) The encoder can only be replaced at the factory.
 3) With ccw option.
 4) Delivery condition: scaled to measuring range. Description for scaling and limit switch function see data sheet M5861.
 5) Delivery condition: unscaled. Description for scaling and limit switch function see data sheet M3661.

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Absolute encoders multiturn
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Linear measuring technology

Draw wire mechanics with encoder or analog sensor

Draw wire encoder B80

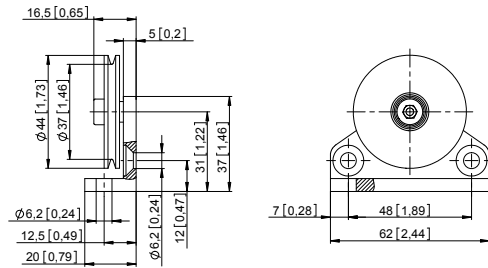
**Measuring length max. 3 m
Traverse speed max. 10 m/s**

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

Guide pulley



Technical data:

- mounting bracket (anodized alum.)
- guide pulley (plastic POM)
- ball bearing (type 696-2R5)

Scope of delivery:

- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analog sensor

Order no.

Cordset, pre-assembled

M12 female connector with coupling nut, 5-pin
2 m [6.56'] PVC cable

05.00.6081.2211.002M

Connector, self-assembly (straight)

M12 female connector with coupling nut, 5-pin

8.0000.5116.0000

Technical data

Mechanical characteristics (draw wire mechanics)				
Measuring range		1000 mm	2000 mm	3000 mm
Extension force	F_{min}	6.9 N	6.4 N	6.9 N
	F_{max}	8.3 N	7.8 N	9.8 N
Max. speed		10 m/s	10 m/s	10 m/s
Max. acceleration		140 m/s ²	140 m/s ²	140 m/s ²
Linearity (of the measuring range)	with analog sensor	±0.15 %	±0.1 %	±0.1 %
	with encoder	±0.05 %	±0.05 %	±0.05 %
		±0.02 % ¹⁾	±0.02 % ¹⁾	±0.02 % ¹⁾
Weight		approx. 750 g [26.45 oz] (dep. on the sensor/encoder used)		
Material	housing	titanium-anodized aluminum		
	wire	stainless steel ø 0.5 mm ø 1 mm can be supplied as a special up to measuring range 1500 mm (other wire types on request)		
Protection acc. to EN 60529		IP65 (sensor)		

Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

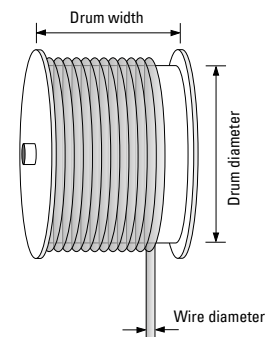
Operating principle

Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note

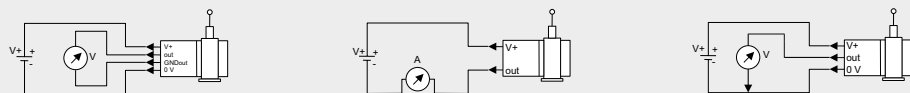
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Electrical characteristics (analog sensor, scaled to measuring range)

Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +85°C [-40°F ... +185°]	-20°C ... +85°C [-40°F ... +185°]	-20°C ... +85°C [-40°F ... +185°]
	-40°C ... +85°C [-40°F ... +185°F] ²⁾	-40°C ... +85°C [-40°F ... +185°F] ²⁾	-40°C ... +85°C [-40°F ... +185°F] ²⁾
			-20°C ... +120°C [-4°F ... +248°F] ²⁾

Connection diagrams



CE compliant acc. to

EMC guideline 2014/30/EU
RoHS guideline 2011/65/EU

1) On request for encoder version (see order code **Ⓢ**):
00 in combination with interchangeable installation (order code **Ⓢ** = 2) or fixed installation (order code **Ⓢ** = 4)
F3, G3, F8, G8 in combination with interchangeable installation (order code **Ⓢ** = 2)

2) Optional on request.

Linear measuring technology

Draw wire mechanics with encoder or analog sensor	Draw wire encoder B80	Measuring length max. 3 m Traverse speed max. 10 m/s
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Technology in detail


Various wire types and wire fastenings

Wire types:

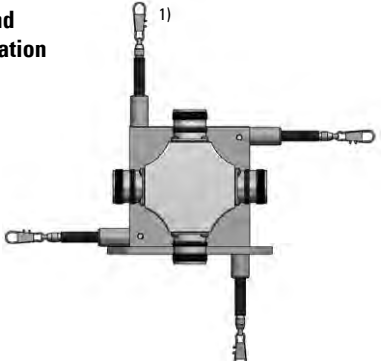
- 0.5 mm (V2A) ¹⁾
- 0.51 mm (V4A)
- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:


Clip ¹⁾	M4 thread	Eyelet
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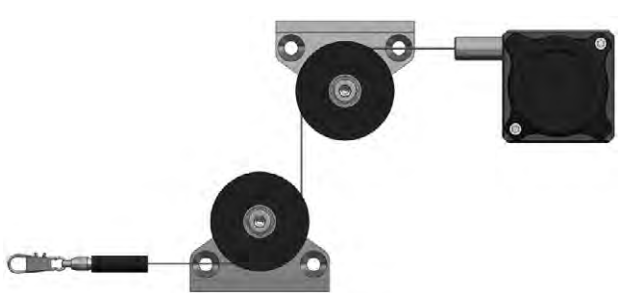
Individual wire outlet and cable / connector orientation



Extension wire



Application-specific installation possibilities



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Basics
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Absolute encoders singleturn
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1) Standard.

Draw wire mechanics with encoder or analog sensor

Draw wire encoder B80

Measuring length max. 3 m
Traverse speed max. 10 m/s

Dimensions

Dimensions in mm [inch]

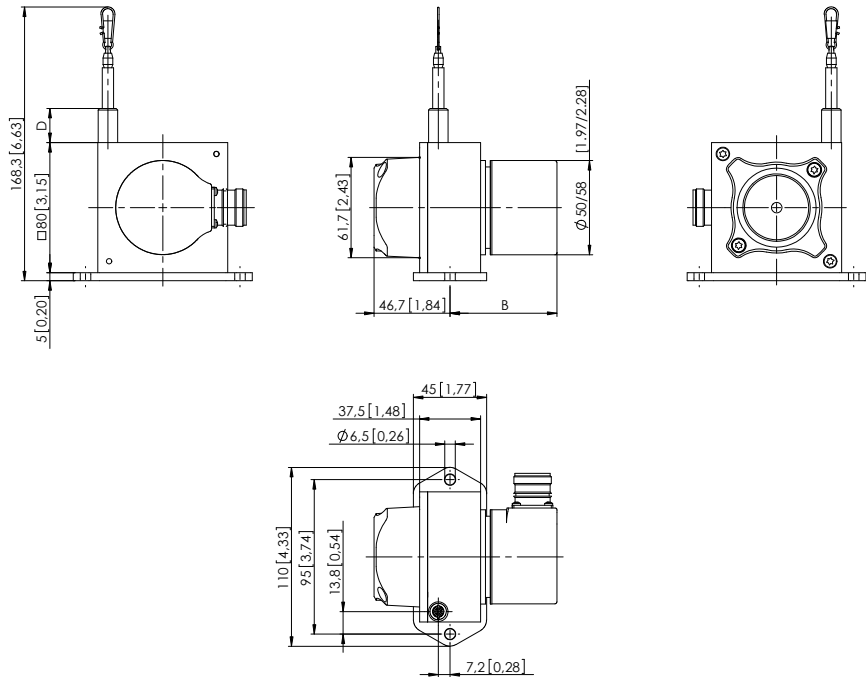
Draw wire mechanics with encoder Fixed installation

Dimension D depends on the measuring range of the draw wire

Measuring range	D
1000 mm	21 [0.83]
2000 mm	21 [0.83]
3000 mm	35 [1.38]

Dimension B depends on the encoder used

Encoder	B
Sendix incremental (5000) D8.4B1.xxxx.00xx.xxxx	55.75 [2.19]
Sendix absolute (F5863) D8.4B1.xxxx.F3xx.xxxx	68.25 [2.69]
Sendix absolute (5863) D8.4B1.xxxx.63xx.xxxx	68.25 [2.69]
Sendix absolute (F5868, CANopen) D8.4B1.xxxx.F8xx.21xx	88.25 [3.47]
Sendix absolute (F5868, EtherNet/IP) D8.4B1.xxxx.F8xx.A2xx	76.75 [3.02]
Sendix absolute (5868) D8.4B1.xxxx.68xx.xxxx	95.35 [3.75]
Sendix absolute (M586x) D8.4B1.xxxx.Mxxx.xxxx	68.45 [2.69]



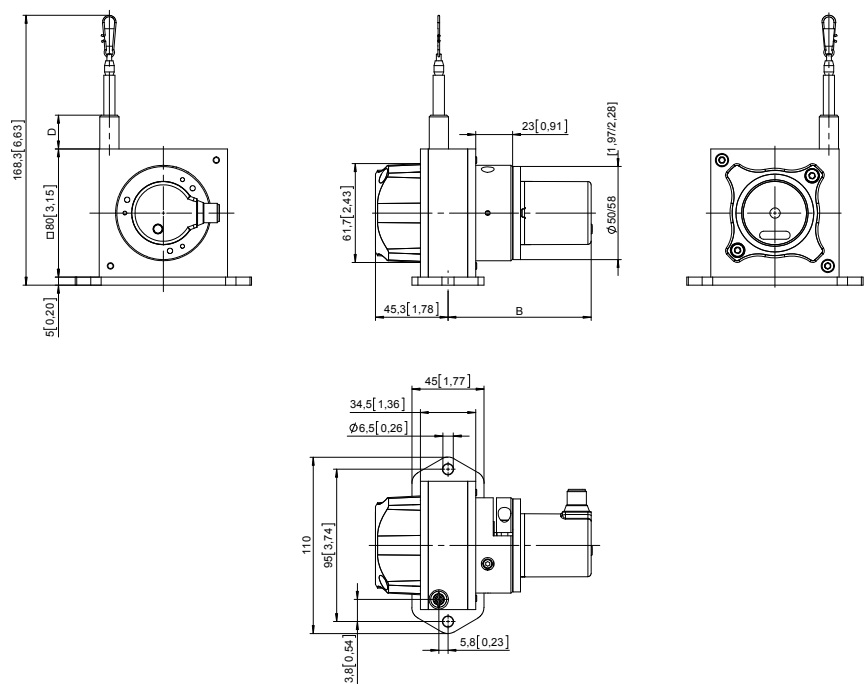
Draw wire mechanics with encoder Interchangeable installation, clamping flange

Dimension D depends on the measuring range of the draw wire

Measuring range	D
1000 mm	21 [0.83]
2000 mm	21 [0.83]
3000 mm	35 [1.38]

Dimension B depends on the encoder used

Encoder	B
Sendix incremental (5000) D8.2B1.xxxx.00xx.xxxx	78.75 [3.10]
Sendix absolute (F5863) D8.2B1.xxxx.F3xx.xxxx	91.25 [3.59]
Sendix absolute (5863) D8.2B1.xxxx.63xx.xxxx	91.25 [3.59]
Sendix absolute (F5868, CANopen) D8.2B1.xxxx.F8xx.21xx	111.25 [4.40]
Sendix absolute (F5868, EtherNet/IP) D8.2B1.xxxx.F8xx.A2xx	99.75 [3.93]
Sendix absolute (5868) D8.2B1.xxxx.68xx.xxxx	118.35 [4.66]
Sendix absolute (M586x) D8.2B1.xxxx.Mxxx.xxxx	91.45 [3.60]



Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

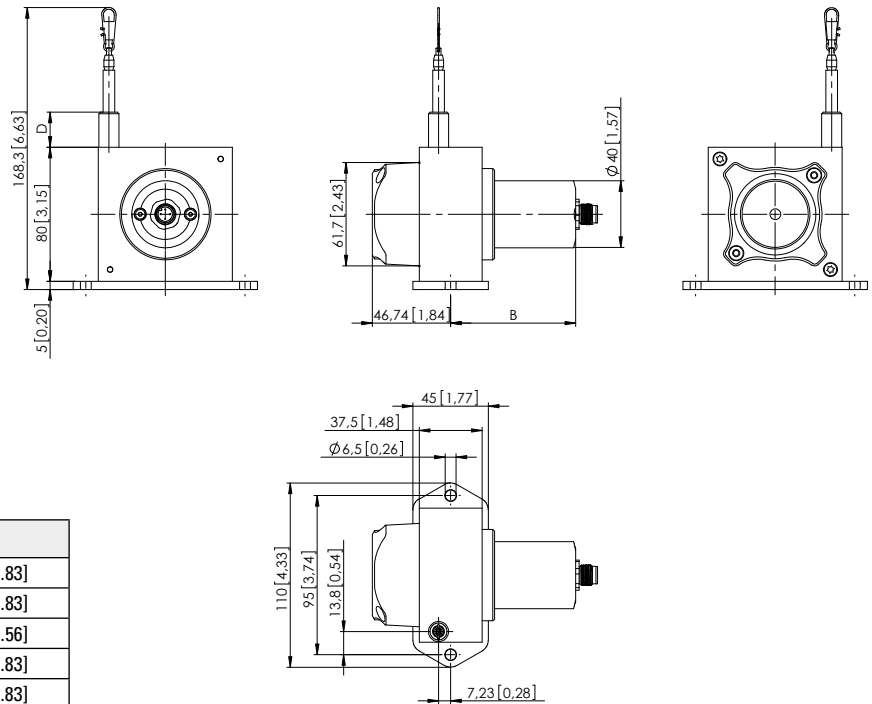
Linear measuring technology

Draw wire mechanics with encoder or analog sensor	Draw wire encoder B80	Measuring length max. 3 m Traverse speed max. 10 m/s
--	------------------------------	---

Dimensions

Dimensions in mm [inch]

Draw wire mechanics with analog sensor
(scaled on measuring range)

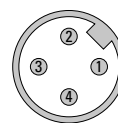


Sensor type	Measuring length	B	D
Potentiometer	1000 mm	74 [2.91]	21 [0.83]
	2000 mm	74 [2.91]	21 [0.83]
	3000 mm	102.5 [4.04]	65 [2.56]
4 ... 20 mA 0 ... 10 V	1000 mm	87.5 [3.44]	21 [0.83]
	2000 mm	87.5 [3.44]	21 [0.83]
	3000 mm	102.3 [4.03]	78.5 [3.09]

Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Core color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

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Draw wire mechanics for outdoor applications

Draw wire encoder C60

**Measuring length up to 4 m
Linearity up to $\pm 0.1\%$**

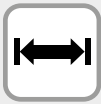


Their extremely robust construction, their high IP69k protection level and their wide temperature range up to $-40^\circ \dots +85^\circ\text{C}$ ¹⁾ make these new draw wire encoders C60 particularly reliable and durable. Their flexibility and adaptability reflects in the wide range of housing and wire types, the long measuring range and the various interfaces. The possibility of redundancy must be particularly pointed out.

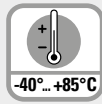


Analog output

CANopen



Long service life



Wide temperature range



High protection level



Redundancy



V4A

Robust

- Protection level up to IP69k and wide temperature range from $-40^\circ\text{C} \dots +85^\circ\text{C}$ ¹⁾.
- The titanium-anodized aluminum housing and the stainless steel wires allow using the mechanics even in harsh conditions.
- Wire diameter (stainless steel, V4A) up to $\varnothing 1\text{ mm}$ - ideal for outdoor applications.

Versatile

- Measuring length up to 4 m.
- Redundant outputs (mA, V, R, CANopen).
- The right measuring wire and the right wire fastening for every application.
- Linearity up to $\pm 0.1\%$ of the measuring range.
- Various constructions: open, closed housing or housing with perforated sheet steel cover.

Order code

D8.C60 . XXXXX . XXXX . 0000
Type a b c d e f

See also extended order options on page 538.

a Measuring length

- 2 = 1.0 m
- 3 = 1.5 m
- 4 = 2.0 m
- 5 = 2.5 m
- 6 = 3.0 m
- 7 = 3.5 m
- 8 = 4.0 m

b Wire types (plastic coated)

- 1 = V4A, $\varnothing 0.5\text{ mm}$
- 2 = V4A, $\varnothing 0.7\text{ mm}$
- 3 = V4A, $\varnothing 1.0\text{ mm}$

c Linearity

- 1 = standard linearity
- 2 = improved linearity 0.25 %
- 3 = improved linearity 0.1 %

d Housing

- 1 = open housing
- 3 = housing with perforated sheet metal cover
- 6 = closed housing

e Sensor type

- A11 = 4 ... 20 mA / 12 ... 30 VDC
- A22 = 0 ... 10 V / 12 ... 30 VDC
- A33 = 1 k Ω / max. 30 VDC
- CC1 = CANopen
- R11 = 2 x 4 ... 20 mA / 12 ... 30 VDC
- R22 = 2 x 0 ... 10 V / 12 ... 30 VDC
- R33 = 2 x 1 k Ω / max. 30 V
- RC1 = 2 x CANopen

f Type of connection / protection level sensor

- 1 = axial cable, 2 m [6.56"] TPE / IP69k²⁾
- 3 = axial M12 connector / IP67
- 4-pin for sensor type A11 ... A33
- 5-pin for sensor type CC1 ... RC1
- 8-pin for sensor type R11 ... R33

Relationship measuring length – wire types – linearity

Measuring length	[m]	1.0		1.5			2.0			2.5			3.0			3.5		4.0	
		order code a	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	
Wire type	\varnothing [m]	0.5	0.7	1.0	0.5	0.7	1.0	0.5	0.7	1.0	0.5	0.7	1.0	0.5	0.7	1.0	0.5	0.7	
	order code b	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	
Standard linearity	order code c = 1	$\pm 0.5\%$		$\pm 0.5\%$			$\pm 0.5\%$	$\pm 1\%$	$\pm 0.5\%$	$\pm 1\%$	$\pm 0.5\%$	$\pm 1\%$	$\pm 0.5\%$	$\pm 1\%$	$\pm 0.5\%$	$\pm 1\%$	$\pm 0.5\%$	$\pm 1\%$	
Improved linearity $\pm 0.25\%$	order code c = 2	✓	✓	✓	✓	✓	✓	✓	–	✓	–	–	✓	–	–	–	–	–	
Improved linearity $\pm 0.1\%$	order code c = 3	✓	✓	✓	✓	✓	✓	✓	–	✓	–	–	✓	–	–	–	–	–	

✓ feasible / – not feasible

1) As optional order code extension see page 538.

2) Other cable length on request.

Draw wire mechanics for outdoor applications	Draw wire encoder C60	Measuring length up to 4 m Linearity up to ±0.1 %
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Electrical characteristics (analog sensor, scaled to measuring range)			
Version	A11 / R11	A22 / R22	A33 / R33
Output	4 ... 20 mA	0 ... 10 V	1 kΩ, potentiometer
Output current	max. 50 mA in case of a failure	max. 10 mA, min. load 10 kΩ	–
Max. current consumption	–	22.5 mA (non load)	–
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Response time	< 1 ms from 0 ... 100 % and 100 ... 0 %	< 3 ms from 0 ... 100 % and 100 ... 0 %	–
Resolution	limited by the noise	limited by the noise	theoretically unlimited
Noise	0.03 mA _{pp} = 6 mV _{pp} at 200 Ω	typ. 3 mV _{pp} , max. 37 mV _{pp}	depending on the supply voltage
Recommended slider current	–	–	< 1 μA
Reverse polarity protection	yes	yes	–
Working temperature	standard: -20°C ... +85°C [-4°F ... +185°F] as optional order code extension (s. below): -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]
Short circuit proof	–	yes, sustained short-circuit proof	–
Temperature coefficient	0.0079 %/K	0.0037 %/K	±0.0025 %/K
Connection diagrams			
Electromagnetic compatibility	acc. to EN 61326-1:2013	acc. to EN 61326-1:2013	acc. to EN 61326-1:2013
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen – Sensor type CC1, RC1	
CAN specification	Full CAN 2.0B (ISO11898)
Communication profile	CANopen CiA 301 V 4.2.0
Device profile	encoder, absolute linear; CiA 406 V 3.2.0
Error monitoring	Producer Heartbeat, Emergency Message, Node Guarding
Node ID	default: 7, adjustable via SDO
PDO	1 x TPDO, static mapping
PDO functions	event-triggered, time-triggered, Sync-cyclic, Sync-acyclic
Transmission rate	Default 250 kbit/s, 1 Mbps, 800, 500, 250, 125, 50, 20 kbps adjustable via SDO
Bus connection	M12 connector, 5-pin
Integrated bus terminating resistor	120 ohms ready-to-activate via SDO
Bus, galvanic isolation	no
Power supply	8 ... 30 V DC
Working temperature	standard: -20°C ... +85°C [-4°F ... +185°F] as optional order code extension (s. below): -40°C ... +85°C [-40°F ... +185°F]
Current consumption	typ. 10 mA at 24 V, typ. 20 mA at 12 V
Measuring rate	1 kHz with 16 bit resolution
Repeat accuracy	±0.5 %, ±0.25 % or ±0.1 % (according to the selected linearity)
Resolution	0.002 % of the measuring range
Reverse polarity protection	yes
Electromagnetic compatibility	acc. to EN 61326-1:2013
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Options	
Protection class IP69k	All relevant sensor components are entirely encapsulated. Suitable for steam and high-pressure cleaning (only in connection with cable outlet)
Extended temperature range	The use of special components allows an operating temperature of -40°C ... +85°C [-40°F ... +185°F]
Redundant output signal	The use of two potentiometers allows the sensor to provide two independent output signals: <ul style="list-style-type: none"> • 2 x 4 ... 20 mA • 2 x 0 ... 10 V • 2 x 1 kΩ • 2 x CANopen
Wire fastening (with swivel, on ball bearing)	standard: <ul style="list-style-type: none"> • straight pin, M6 through hole and snap ring optional: <ul style="list-style-type: none"> • eyelet, internal diameter 20 mm • M4 thread, length 22 mm • clip (on request)

Order code extensions for the following options	
Wire fastening M4	D8.C60.xxxx.xxxx.xxxx.V001
Wire fastening eyelet	D8.C60.xxxx.xxxx.xxxx.V002
Extended temperature range -40 ... +85°C [-40°F ... +185°F]	D8.C60.xxxx.xxxx.xxxx.V003
Wire fastening M4 and -40 ... +85°C [-40°F ... +185°F]	D8.C60.xxxx.xxxx.xxxx.V004
Wire fastening eyelet and -40 ... +85°C [-40°F ... +185°F]	D8.C60.xxxx.xxxx.xxxx.V005

Draw wire mechanics for outdoor applications	Draw wire encoder C60	Measuring length up to 4 m Linearity up to $\pm 0.1\%$
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Terminal assignment

Type of connection	Sensor type	M12 connector, 4-pin					
3	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	\perp
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	\perp
	A33 (1 k Ω)	Signal:	+V	Slider	0 V	n.c.	\perp
		Pin:	1	2	3	4	PH

Type of connection	Sensor type	M12 connector, 5-pin					
3	CC1, RC1	Signal:	+V	0 V	CAN_GND	CAN-H	CAN-L
		Pin:	2	3	1	4	5

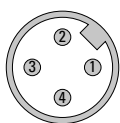
Type of connection	Sensor type	M12 connector, 8-pin									
3	R11 (4 ... 20 mA)	Signal:	+V ₁	n.c.	Signal 1	n.c.	+V ₂	n.c.	Signal 2	n.c.	\perp
	R22 (0 ... 10 V)	Signal:	+V ₁	Signal 1	0 V ₁	0 V Signal 1	+V ₂	Signal 2	0 V ₂	0 V Signal 2	\perp
	R33 (1 k Ω)	Signal:	+V ₁	Slider 1	0 V ₁	n.c.	+V ₂	Slider 2	0 V ₂	n.c.	\perp
		Pin:	1	2	3	4	5	6	7	8	PH

Type of connection	Sensor type	Cable (isolate unused cores individually before initial start-up)					
1	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	\perp
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	\perp
	A33 (1 k Ω)	Signal:	+V	Slider	0 V	n.c.	\perp
		Core color:	BN	WH	BU	BK	shield

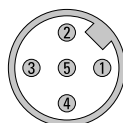
Type of connection	Sensor type	Cable (isolate unused cores individually before initial start-up)					
1	CC1, RC1	Signal:	+V	0 V	CAN_GND	CAN-H	CAN-L
		Core color:	WH	BU	BN	BK	GY

Type of connection	Sensor type	Cable (isolate unused cores individually before initial start-up)									
1	R11 (4 ... 20 mA)	Signal:	+V ₁	n.c.	Signal 1	n.c.	+V ₂	n.c.	Signal 2	n.c.	\perp
	R22 (0 ... 10 V)	Signal:	+V ₁	Signal 1	0 V ₁	0 V Signal 1	+V ₂	Signal 2	0 V ₂	0 V Signal 2	\perp
	R33 (1 k Ω)	Signal:	+V ₁	Slider 1	0 V ₁	n.c.	+V ₂	Slider 2	0 V ₂	n.c.	\perp
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Top view of mating side, male contact base



M12 connector, 4-pin



M12 connector, 5-pin



M12 connector, 8-pin

Product overview Basics
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Absolute encoders singleturn
Absolute encoders multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

**Draw wire mechanics
for outdoor applications**

Draw wire encoder C60

**Measuring length up to 4 m
Linearity up to $\pm 0.1\%$**

Technology in detail

Various wire types and wire fastenings

Wire types:

- V4A plastic coated, \varnothing 0.5 mm, order option **b** = 1 (standard)
- V4A plastic coated, \varnothing 0.7 mm, order option **b** = 2
- V4A plastic coated, \varnothing 1.0 mm, order option **b** = 3

Wire fastenings:

straight pin with snap ring (standard)	eyelet (order code extension V002)	M4 thread (order code extension V001)	clip (on request)
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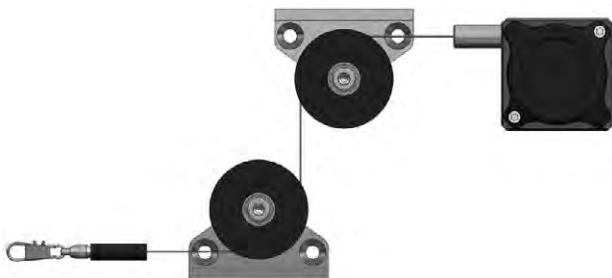


Extension wire

available on request with all wire fastening types
(straight pin with snap ring, eyelet, M4 thread, clip)



Application-specific installation possibilities



Housing types (the suitable housing type for every application)

Open housing,
order option **d** = 1 (standard)



Housing with perforated sheet metal cover,
order option **d** = 3



Closed housing,
order option **d** = 6



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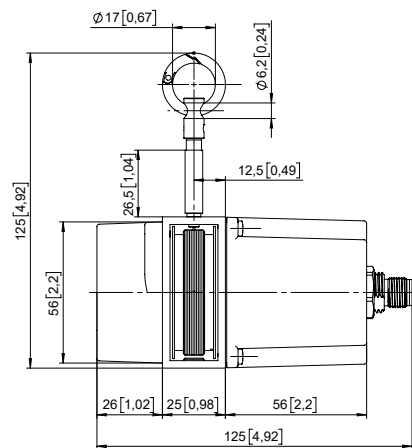
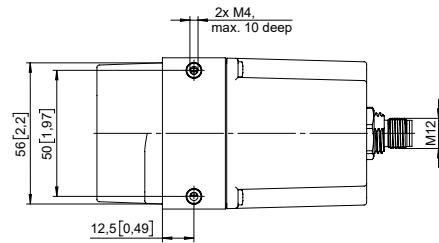
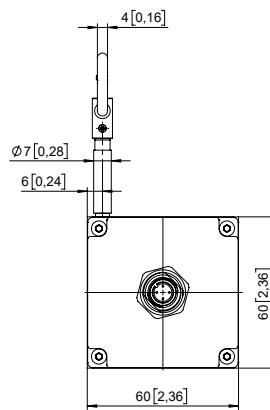
Draw wire mechanics for outdoor applications	Draw wire encoder C60	Measuring length up to 4 m Linearity up to $\pm 0.1\%$
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Dimensions

Dimensions in mm [inch]

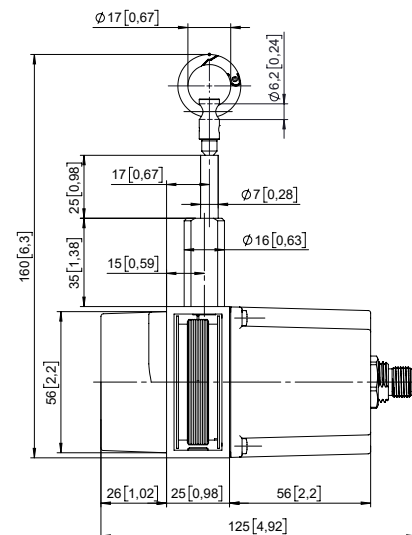
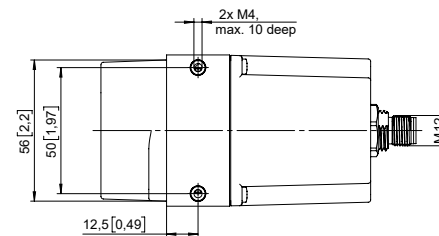
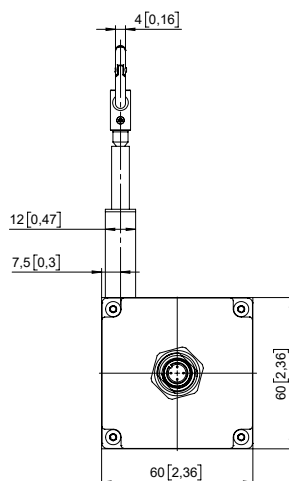
With standard linearity (without wire guide)

order option **C** = 1



With improved linearity (with wire guide)

order option **C** = 2, 3



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Draw wire mechanics with redundant sensors

Draw wire encoder C100

Measuring length up to 5 m integrated inclinometer



Thanks to its robust design and its high IP67 protection level, the draw wire encoder C100 reliably provides accurate length measurement. Its simple and optimal integration in the application is a particular highlight of this product. Many additional options, ranging from the integrated inclinometer up to the relay output, are available.

To increase plant availability, this draw wire encoder allows combining a redundant system in a very compact housing.



Analog output

CANopen



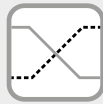
Wide temperature range



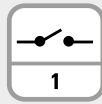
High protection level



Shock / vibration resistant



Redundancy



Relay output



Switching outputs

Characteristics

- Measuring length up to 5 m.
- Integrated inclinometer.
- Redundant sensors.
- Different types of sensors (analog, incremental, CANopen, relay output, switch output).
- Linearity up to $\pm 0.1\%$ of the measuring range.
- High protection level IP67 and wide temperature range from -40°C ... $+85^\circ\text{C}$.

Advantages

- The suitable measuring length for every application.
- Cost, space and installation work saving.
- For even higher plant availability.
- Simple selection and fast installation.
- High accuracy at economic prices.
- Reliability and long service life for outdoor applications.

Order code with analog sensor

D8. C100 . XXXX . XXX 1 . X 000

a Measuring length

0100 = 1 m
0200 = 2 m
0300 = 3 m
0400 = 4 m
0500 = 5 m

b Sensor type

A44 = 0.5 ... 4.5 V
R44 = 0.5 ... 4.5 V, redundant

c Type of connection

1 = M12 connector, 5-pin

d Power supply

1 = 9 ... 30 V DC
2 = 5 V DC ¹⁾

Order code with CANopen and inclinometer

D8. C100 . XXXX . RC1 1 . 1 X 00

a Measuring length

0100 = 1 m
0200 = 2 m
0300 = 3 m
0400 = 4 m
0500 = 5 m

b Sensor type

RC1 = CANopen redundant

c Type of connection

1 = M12 connector, 5-pin

d Power supply

1 = 9 ... 30 V DC

e Inclinometers

0 = none
1 = 1 inclinometer
2 = 2 inclinometers

1) Only in conjunction with type of sensor A44 and R44.

Linear measuring technology

Draw wire mechanics with redundant sensors	Draw wire encoder C100	Measuring length up to 5 m integrated inclinometer
---	-------------------------------	---

Order code with incremental output	D8.C100.XXXX.XXX.X.1000
a <i>Measuring length</i> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	b <i>Sensor type</i> I11 = incremental AB, 512 ppr I12 = incremental ABZ, 512 ppr I21 = incremental AB, 1024 ppr I22 = incremental ABZ, 1024 ppr
c <i>Type of connection</i> 1 = M12 connector, 5-pin 3 = radial cable, 2 m [6.56']	
d <i>Output circuit / Power supply</i> 1 = TTL / 9 ... 30 V DC	

Order code with relais output	D8.C100.XXXX.RL1.1.1000
a <i>Measuring length</i> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	b <i>Sensor type</i> RL1 = relay output
c <i>Type of connection</i> 1 = M12 connector, 5-pin	
d <i>Power supply</i> 1 = 9 ... 30 V DC	

Order code with switch output	D8.C100.XXXX.SW3.4.1000
a <i>Measuring length</i> 0100 = 1 m 0200 = 2 m 0300 = 3 m 0400 = 4 m 0500 = 5 m	b <i>Sensor type</i> SW3 = 3 switch outputs
c <i>Type of connection</i> 4 = M12 connector, 12-pin	
d <i>Power supply</i> 1 = 9 ... 30 V DC	

Accessories relais output	Order no.
Teach adapter (for sensor type RL1)	M12 connector, 5-pin adapter with button D8.C100.RL1.TEACH
Accessories switch output	Order no.
Visualization adapter (for sensor type SW3)	M12 connector, 12-pin D8.C100.SW3.VISUAL
Connection technology for analog sensor	Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable 05.00.6081.2211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin 8.0000.5116.0000

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Draw wire mechanics with redundant sensors

Draw wire encoder C100

Measuring length up to 5 m integrated inclinometer

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range	1.0 ... 5.0 m
Measuring wire	material AISI304 steel wire Nylon coated diameter \varnothing 0.9 mm \varnothing 0.61 mm (ABZ Incremental)
Wire fastening	eyelet internal diameter \varnothing 8 mm outer diameter \varnothing 15 mm height 2 mm
Wire pull-out speed max.	max. 1 m/s
Acceleration	max. 10 m/s ²
Linearity (whole measuring range)	analog \pm 0.8 % incremental (1 - 2 m) \pm 0.1 % incremental (3 - 5 m) \pm 0.3 % CANopen / relay \pm 0.5 %
Repetition accuracy (whole measuring range)	analog \pm 0.1 % incremental (1, 2 m) \pm 0.1 % incremental (3 - 5 m) \pm 0.15 % CANopen / relay \pm 0.1 %
Pull-back force	typ. 2 N ¹⁾
Pull-out force	typ. 8 N
Drum circumference	245 mm
Type of connection	M12 connector, 5-pin cable, 2 m [6.56'] (only incremental)
Housing	polycarbonate reinforced with glass fibers
Protection	IP67
Temperature range	-40°C ... +85°C [-40°F ... +185°F]
Weight	approx. 0.5 kg [17.67 oz]
Shock resistance acc. to EN 60068-2-27	300 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 500 Hz

Analog sensor

Output signal	analog
Resolution	12 bit

Incremental output

Output signal	AB (Z optional)
Resolution	512 / 1024 ppr
Current consumption (non load)	max. 100 mA
Output current	max. 50 mA
Circuit	TTL

CANopen

Output signal	CANopen (DS301)
Resolution	14 bit
Resolution inclinometer	0.1°
Accuracy inclinometer	\pm 0.6°
Temperature drift inclinometer	\pm 0.01 % / °C

Electrical characteristics

Power supply	9 ... 30 V DC 5 V DC \pm 10 % ²⁾
Electromagnetic compatibility	EN 61326-1, EN 61326-3-1
CE compliant	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

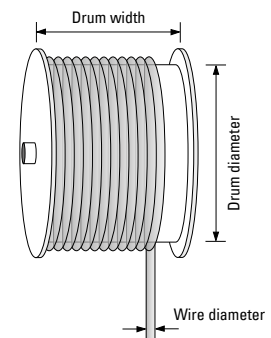
Operating principle

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.



Relay output

Output signal	1x relay (Normally Open)
Maximum current	50 mA
Hysteresis	20 mm (factory setting)

Switch output

Output signal	switch
Maximum current	0.5 A

Mechanical service life

without load	min. 1,000,000 switching operations (60 switching operations/ min.)
under load	min. 30,000 switching operations (30 switching operations/ min.)

1) May be lower at low temperatures.

2) Only in conjunction with type of sensor A44 and R44.

Draw wire mechanics with redundant sensors	Draw wire encoder C100	Measuring length up to 5 m integrated inclinometer
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Terminal assignment

Sensor type	Type of connection	M12 connector, 5-pin					
A44, R44 (analog sensor)	1	Signal:	+V	0 V	U _{out 1}	U _{out 2} ¹⁾	AGND
		Pin:	1	2	3	4	5

Sensor type	Type of connection	M12 connector, 5-pin					
I11, I12, I21, I22 (incremental output)	1	Signal:	+V	0 V	A	B	0
		Pin:	1	2	3	4	5

Sensor type	Type of connection	Cable (isolate unused cores individually before initial start-up)					
I11, I12, I21, I22 (incremental output)	3	Signal:	+V	0 V	A	B	0
		Core color:	WH	YE	BN	GN	GY

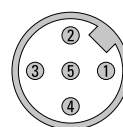
Sensor type	Type of connection	M12 connector, 5-pin					
RC1 (CANopen)	1	Signal:	0 V	+V	CAN-GND	CAN-H	CAN-L
		Pin:	3	2	1	4	5

Sensor type	Type of connection	M12 connector, 5-pin					
RL1 (relay)	1	Signal:	Teach	+V	0 V	C	NO
		Pin:	1	2	3	4	5
		<p>The switching point of the relay can be set by means of a button connected to pin 1 (Teach). To do so, position the draw wire mechanic at the desired switching point and then press the button once.</p>					

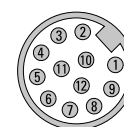
Sensor type	Type of connection	M12 connector, 12-pin												
SW3 (switching output)	4	Signal:	NC 1	NO 1	C 1	NC 2	NO 2	C 2	NC 3	NO 3	C 3	n.c.	n.c.	n.c.
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12

- +V : Power supply +V DC
- 0 V : Power supply GND (0V)
- U_{out 1} : Voltage output 1
- U_{out 2} : Voltage output 2
- A : Incremental output channel A
- B : Incremental output channel B
- 0 : Reference signal
- Teach : Teach function input
- C : Relay contact C
- NO : Relay contact N.O.
- C 1 : Switching contact C.1
- C 2 : Switching contact C.2
- C 3 : Switching contact C.3
- NO 1 : Switching contact N.O.1
- NO 2 : Switching contact N.O.2
- NO 3 : Switching contact N.O.3
- NC 1 : Switching contact N.C.1
- NC 2 : Switching contact N.C.2
- NC 3 : Switching contact N.C.3
- n.c. : not connected
- AGND : Analog Ground

Top view of mating side, male contact base



M12 connector, 5-pin



M12 connector, 12-pin

1) Only in case of redundant ordering option sensor type R44 (otherwise n.c.).

Draw wire mechanics with redundant sensors

Draw wire encoder C100

Measuring length up to 5 m integrated inclinometer

Technology in detail

Inclinometer with option RC1

Setting possibility 360°



Setting possibility ±180°



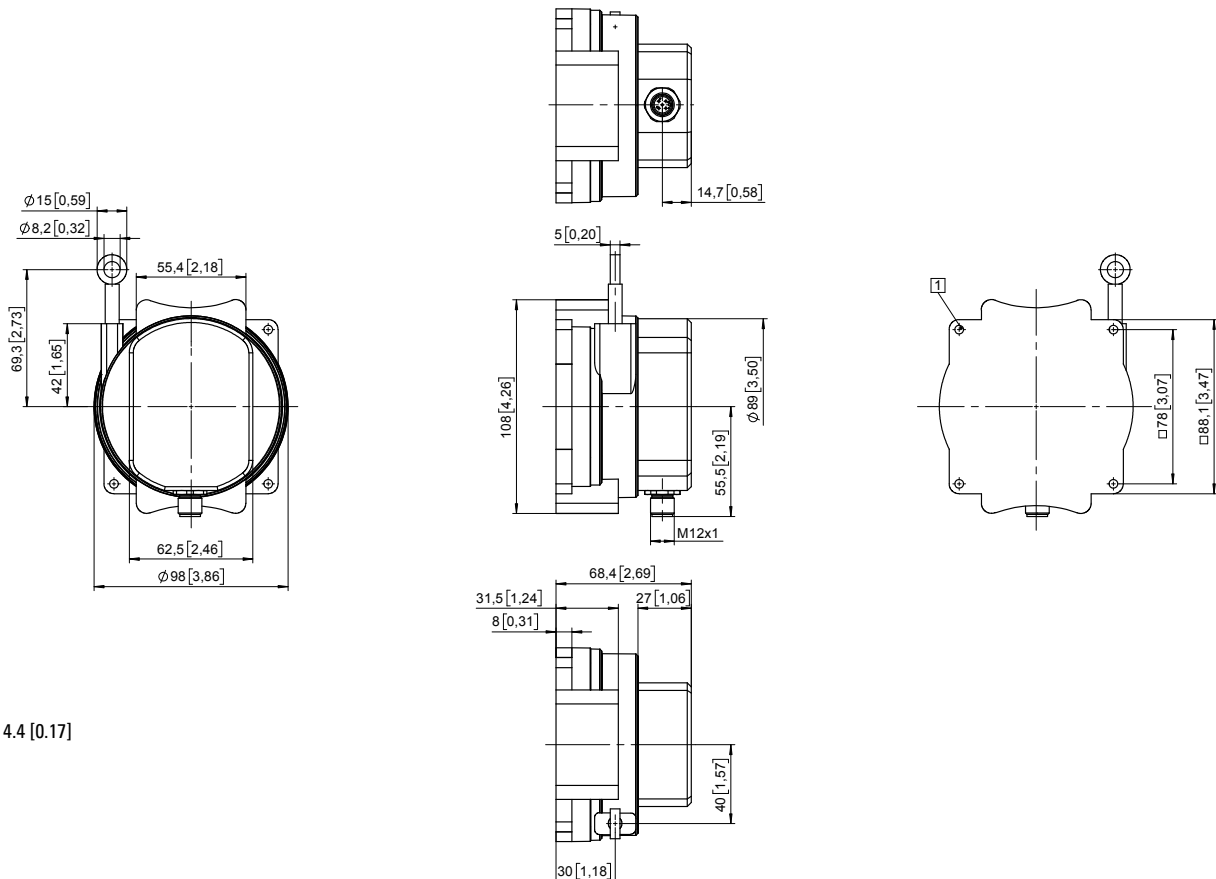
Redundant signals possible.

Setting possibilities:

- Switching between setting possibilities 180° and 360°.
- Switching between synchronous and asynchronous output.
- Change of direction of rotation (cw/ccw).
- Setting and resetting an offset.

Dimensions

Dimensions in mm [inch]



1 4 x ϕ 4.4 [0.17]

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

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.

Kübler's encoders portfolio offers the suitable Sendix encoder for every application.



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Flexible and simple

- Possibility for user to exchange encoder.
- Measuring lengths 2800 mm or 6000 mm.
- Simple installation.
- Scalable analog output with limit switch function.

Order code with encoder (incremental, absolute)

D8.1	XXX	.	XX	XX	.	XXXX
Type	a		b	c	d	e

<p>a Measuring range</p> <p>106 = 6000 mm 2A1 = 2800 mm</p>	<p>b Encoder used</p> <p>Z2 = Sendix 5000, incremental M3 = Sendix M5863, absolute F3 = Sendix F5863, absolute 63 = Sendix 5863, absolute M8 = Sendix M5868, absolute F8 = Sendix F5868 absolute 68 = Sendix 5868, absolute</p>	<p>c Output circuit</p> <p>depends on the encoder used</p> <p>d Type of connection</p> <p>depends on the encoder used</p> <p>e Resolution / Protocol / Options</p> <p>depends on the encoder used</p>
--	--	--

	200	200	200
Drum circumference [mm]	200	200	200
Pulses / revolution [ppr]	200	2000	4000
Pulses / mm	1	10	20
Resolution [mm]	1	0.1	0.05

	200
Drum circumference [mm]	200
Pulses / revolution [ppr]	4096
Pulses / mm	20.5
Resolution [mm]	0.05

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1xxx.2Z54.2000	Sendix 5000 (8.5000.B154.2000)	Push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	-
D8.1xxx.M324.G222	Sendix M5863 (8.M5863.4124.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.1xxx.M824.2122	Sendix M5868 (8.M5868.4124.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoderprofil DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1xxx.F326.G223	Sendix F5863 (8.F5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1xxx.6326.G223	Sendix 5863 (8.5863.2126.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.1xxx.F82E.2123	Sendix F5868 (8.F5868.212E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1xxx.6822.2123	Sendix 5868 (8.5868.2122.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.1xxx.6832.3113	Sendix 5868 (8.5868.2132.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.1xxx.68B2.B212	Sendix 5868 (8.5868.21B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.1xxx.68C2.C212	Sendix 5868 (8.5868.21C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.1xxx.F8AN.A222	Sendix F5868 (8.F5868.21AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Draw wire mechanics with encoder

Draw wire encoder C105

Measuring length max. 6 m
Traverse speed max. 3 m/s

Order code with encoder (analog, scalable with limit switch function)

D8.1 XXX . M1XX . XXXX
Type a b c d e

- a** *Measuring range*
106 = 6000 mm
2A1 = 2800 mm
- b** *Encoder used*
M1 = Sendix M5861, absolute ¹⁾
- c** *Output circuit*
depends on the encoder used
- d** *Type of connection*
depends on the encoder used
- e** *Resolution / Protocol / Options*
depends on the encoder used

Recommended standard variants (with encoder analog, scalable with limit switch function)

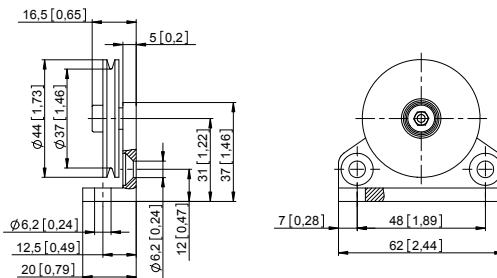
Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.1xxx.M134.3512	Sendix M5861 (8.M5861.4134.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function ²⁾
D8.1xxx.M144.4512	Sendix M5861 (8.M5861.4144.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function ²⁾
D8.1xxx.M134.3612	Sendix M5861 (8.M5861.4134.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function ²⁾
D8.1xxx.M144.4612	Sendix M5861 (8.M5861.4144.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function ²⁾

Accessories for draw wire encoder

Dimensions in mm [inch]

Order no.

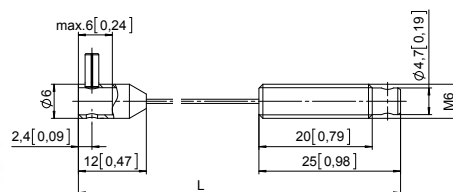
Guide pulley



- Technical data:**
- mounting bracket (anodized alum.)
 - guide pulley (plastic POM)
 - ball bearing (type 696-2R5)
- Scope of delivery:**
- 2 x countersunk screws for lateral fixing
 - 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



- Steel wire 2 m [6.56']
- 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

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.

¹⁾ With ccw option.

²⁾ Delivery condition: unscaled.

Description for scaling and limit switch function see data sheet M5861.

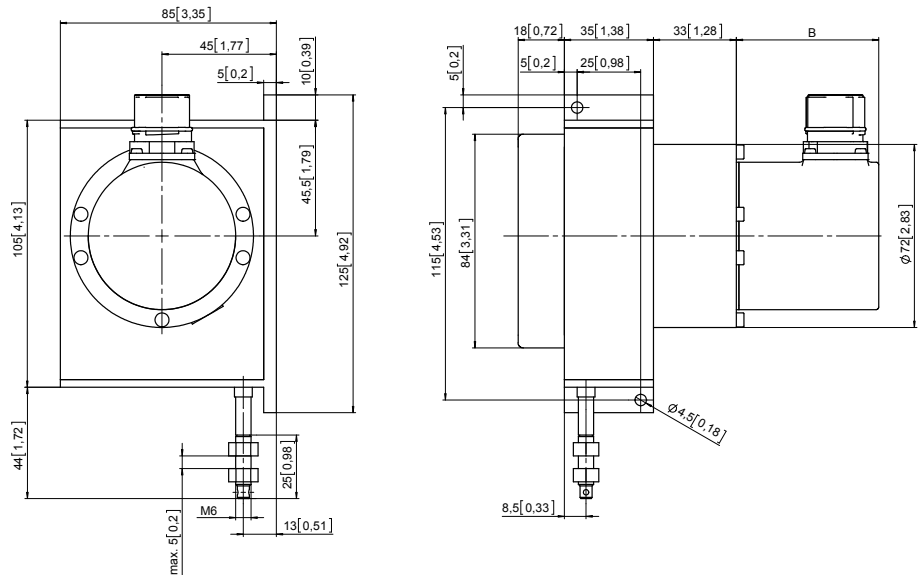
Draw wire mechanics with encoder	Draw wire encoder C105	Measuring length max. 6 m Traverse speed max. 3 m/s
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Dimensions

Dimensions in mm [inch]

Draw wire mechanics with encoder

Dimension B depends on the encoder used	
Encoder	B
Sendix incremental (5000) D8.1xxx.2Zxx.xxxx	37.0 [1.46]
Sendix absolute (F5863) D8.1xxx.F3xx.xxxx	49.5 [1.95]
Sendix absolute (5863) D8.1xxx.63xx.xxxx	49.5 [1.95]
Sendix absolute (F5868, CANopen) D8.1xxx.F8xx.21xx	70.0 [2.76]
Sendix absolute (F5868, EtherNet/IP) D8.1xxx.F8xx.A2xx	59.5 [2.34]
Sendix absolute (F5868, EtherNet/IP) D8.1xxx.68xx.A2xx	77.2 [3.04]
Sendix absolute (F5868, EtherNet/IP) D8.1xxx.Mxxx.xxxx	49.8 [1.96]



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multiturn

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Draw wire mechanics with encoder or analog sensor

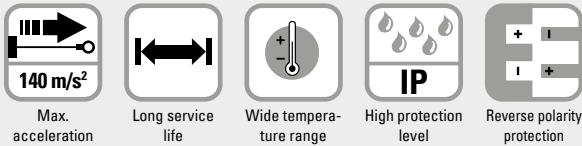
Draw wire encoder C120

**Measuring length max. 6 m
Traverse speed max. 10 m/s**



These draw wire mechanics C120 can be used up to a measuring length of 6 meters.

This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.



Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed, up to 10 m/s.
- High acceleration, up to 140 m/s².
- Quick fastening by means of 2 screws.
- Various connection possibilities available.
- Interchangeable encoders (interchangeable installation).

Order code with encoder (incremental, absolute)

D8.XC1.XXXX.XXX.XXXX

- a** *Mechanics*
2 = interchangeable installation ¹⁾
4 = fixed installation ²⁾
- b** *Measuring range*
0400 = 4000 mm
0500 = 5000 mm
0600 = 6000 mm

- c** *Encoder used*
00 = Sendix 5000, incremental
M3 = Sendix M5863, absolute
F3 = Sendix F5863, absolute
63 = Sendix 5863, absolute
M8 = Sendix M5868, absolute
F8 = Sendix F5868 absolute
68 = Sendix 5868, absolute

- d** *Output circuit*
depends on the encoder used
- e** *Type of connection*
depends on the encoder used
- f** *Resolution / Protocol / Options*
depends on the encoder used

Optional on request

- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 5000			
Drum circumference [mm]	317.68	317.68	317.68
Pulses / revolution [ppr]	1000	2000	4000
Pulses / mm	3.1	6.3	12.6
Resolution [mm]	0.32	0.16	0.08

Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)	
Drum circumference [mm]	317.68
Pulses / revolution [ppr]	4096
Pulses / mm	12.9
Resolution [mm]	0.08

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer. (Order option available for measuring ranges 4000 m and 5000 m).
2) The encoder can only be replaced at the factory.

Draw wire mechanics with encoder or analog sensor	Draw wire encoder C120	Measuring length max. 6 m Traverse speed max. 10 m/s
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Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xC1.0600.0054.2000	Sendix 5000 (8.5000.8354.2000)	Push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	-
D8.xC1.0600.M324.G222	Sendix M5863 (8.M5863.3524.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.xC1.0600.M824.2122	Sendix M5868 (8.M5868.3524.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoderprofil DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xC1.0600.F326.G223	Sendix F5863 (8.F5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xC1.0600.6326.G223	Sendix 5863 (8.5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xC1.0600.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xC1.0600.6822.2123	Sendix 5868 (8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xC1.0600.6832.3113	Sendix 5868 (8.5868.1232.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.xC1.0600.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.xC1.0600.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.xC1.0600.F8AN.A222	Sendix F5868 (8.F5868.12AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Order code with encoder (analog, scalable with limit switch function)



- a** *Mechanics*
2 = interchangeable installation ¹⁾
4 = fixed installation ²⁾
 - b** *Measuring range*
0400 = 4000 mm
0500 = 5000 mm
0600 = 6000 mm
 - c** *Encoder used*
M1 = Sendix M5861, absolute ³⁾
 - d** *Output circuit*
depends on the encoder used
 - e** *Type of connection*
depends on the encoder used
 - f** *Resolution / Protocol / Options*
depends on the encoder used
- Optional on request*
- Other measuring ranges
 - Cable diameter 1 mm
 - Eyelet or M4 wire fastening instead of wire clip
 - Modified cable and/or connector orientation
 - Modified cable outlet direction
 - Sensor protection level IP67

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xC1.0600.M134.3612	Sendix M5861 (8.M5861.3534.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function ⁴⁾
D8.xC1.0600.M144.4612	Sendix M5861 (8.M5861.3544.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function ⁴⁾
D8.xC1.0600.M134.3512	Sendix M5861 (8.M5861.3534.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function ⁵⁾
D8.xC1.0600.M144.4512	Sendix M5861 (8.M5861.3544.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function ⁵⁾

1) Draw wire mechanics with standard flange. The encoder can be replaced by the customer. (Order option available for measuring ranges 4000 m and 5000 m).
 2) The encoder can only be replaced at the factory.
 3) With ccw option.
 4) Delivery condition: scaled to measuring range. Description for scaling and limit switch function see data sheet M5861.
 5) Delivery condition: unscaled. Description for scaling and limit switch function see data sheet M3661.

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Draw wire mechanics with encoder or analog sensor	Draw wire encoder C120	Measuring length max. 6 m Traverse speed max. 10 m/s
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Electrical characteristics (analog sensor, scaled to measuring range)			
Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F] ¹⁾	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F] ¹⁾	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F] ¹⁾ -20°C ... +120°C [-4°F ... +248°F] ¹⁾
Connection diagrams			
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU		

Technology in detail

Various wire types and wire fastenings

Wire types:

- 0.5 mm (V2A) ²⁾
- 0.51 mm (V4A)
- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:

- Clip ²⁾
- M4 thread
- Eyelet

Individual wire outlet and cable / connector orientation

Extension wire

Application-specific installation possibilities

1) Optional on request.
2) Standard.

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Draw wire mechanics with encoder or analog sensor

Draw wire encoder C120

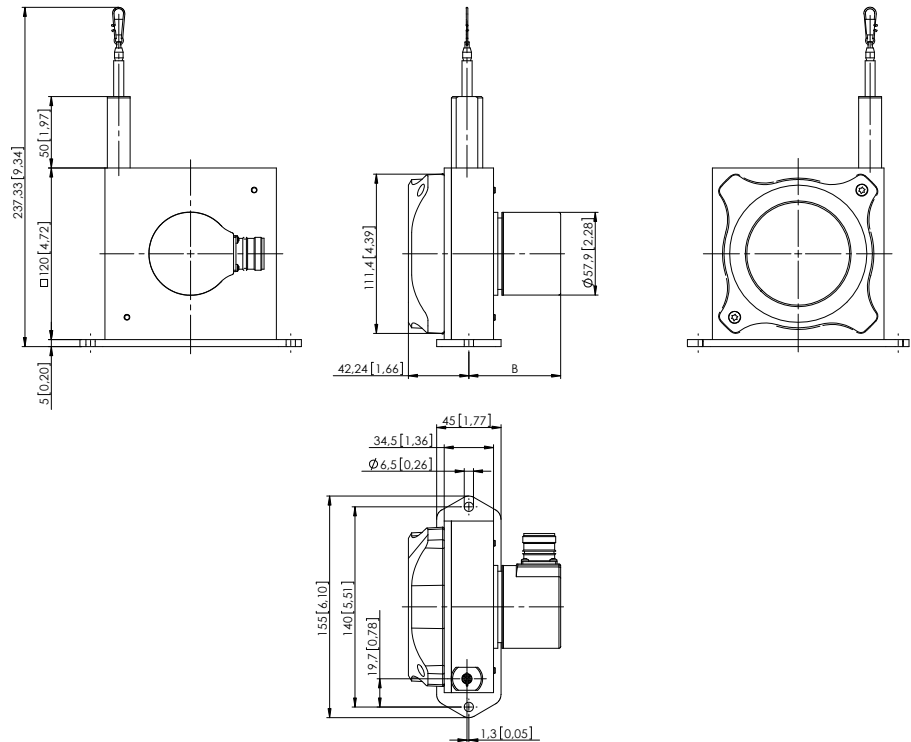
Measuring length max. 6 m
Traverse speed max. 10 m/s

Dimensions

Dimensions in mm [inch]

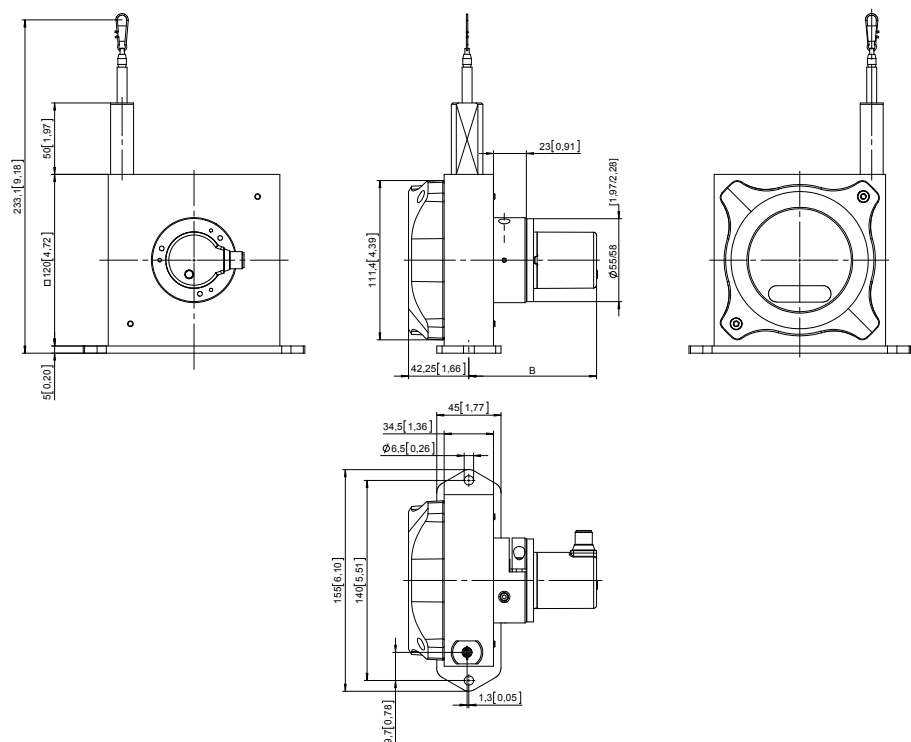
Draw wire mechanics with encoder Fixed installation

Dimension B depends on the encoder used	
Encoder	B
Sendix incremental (5000) D8.4C1.0600.00xx.xxxx	54.25 [2.14]
Sendix absolute (F5863) D8.4C1.0600.F3xx.xxxx	66.75 [2.63]
Sendix absolute (5863) D8.4C1.0600.63xx.xxxx	66.75 [2.63]
Sendix absolute (F5868, CANopen) D8.4C1.0600.F8xx.21xx	88.25 [3.47]
Sendix absolute (F5868, EtherNet/IP) D8.4C1.0600.F8xx.A2xx	76.75 [3.02]
Sendix absolute (5868) D8.4C1.0600.68xx.xxxx	67.35 [2.65]
Sendix absolute (M586x) D8.4C1.0600.Mxxx.xxxx	67.05 [2.64]



Draw wire mechanics with encoder Interchangeable installation, clamping flange

Dimension B depends on the encoder used	
Encoder	B
Sendix incremental (5000) D8.2C1.0600.00xx.xxxx	77.25 [3.04]
Sendix absolute (F5863) D8.2C1.0600.F3xx.xxxx	89.75 [3.53]
Sendix absolute (5863) D8.2C1.0600.63xx.xxxx	89.75 [3.53]
Sendix absolute (F5868, CANopen) D8.2C1.0600.F8xx.21xx	111.25 [4.38]
Sendix absolute (F5868, EtherNet/IP) D8.2C1.0600.F8xx.A2xx	99.75 [1.69]
Sendix absolute (5868) D8.2C1.0600.68xx.xxxx	90.35 [3.93]
Sendix absolute (M586x) D8.2C1.0600.Mxxx.xxxx	90.05 [3.54]



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Accessories

Addresses

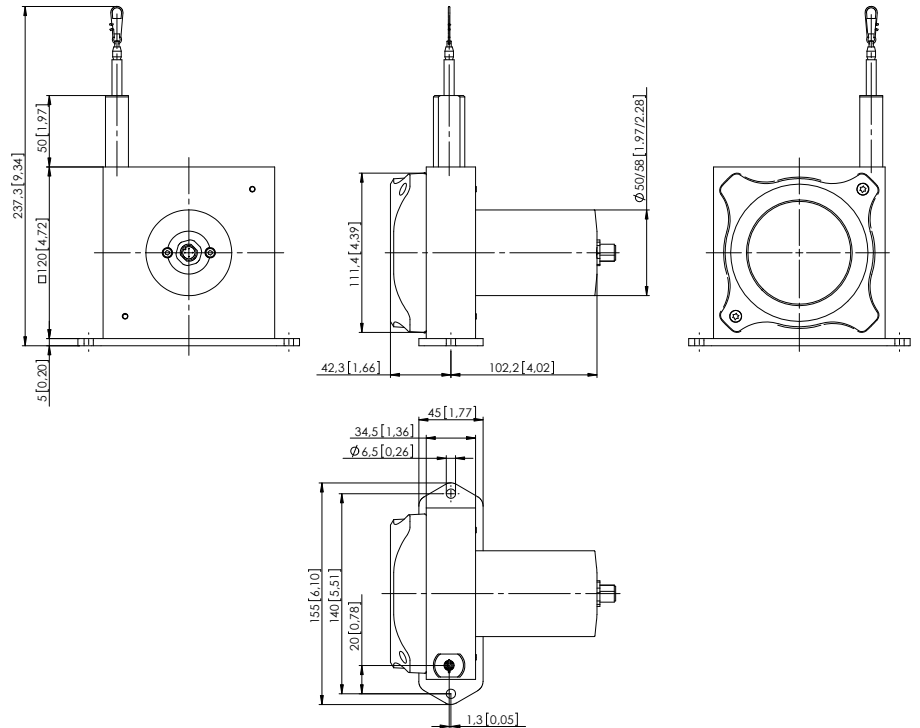
Linear measuring technology

Draw wire mechanics with encoder or analog sensor	Draw wire encoder C120	Measuring length max. 6 m Traverse speed max. 10 m/s
--	-------------------------------	---

Dimensions

Dimensions in mm [inch]

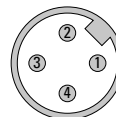
**Draw wire mechanics with analog sensor
(scaled on measuring range)**



Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Core color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

Linear measuring technology

Draw wire mechanics for outdoor applications

Draw wire encoder D120

**Measuring length up to 10 m
Linearity up to $\pm 0.1\%$**

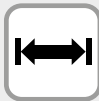


Their extremely robust construction, their high IP69k protection level and their wide temperature range make these new draw wire encoders particularly reliable and durable. Their flexibility and adaptability reflects in the wide range of housing and wire types, the long measuring range and the various interfaces. The possibility of redundancy must be particularly pointed out.

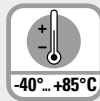


Analog output

CANopen



Long service life



Wide temperature range



High protection level



Redundancy



V4A

Robust

- Protection level up to IP69k and wide temperature range from -40°C ... $+85^{\circ}\text{C}$ ¹⁾.
- The titanium-anodized aluminum housing and the stainless steel wires allow using the mechanics even in harsh conditions.
- Wire diameter (stainless steel, V4A) up to $\varnothing 1.5\text{ mm}$ - ideal for outdoor applications.

Versatile

- Measuring length up to 10 m.
- Redundant outputs (mA, V, R, CANopen).
- The right measuring wire and the right wire fastening for every application.
- Linearity up to $\pm 0.1\%$ of the measuring range.
- Various constructions: open, closed housing or housing with perforated sheet steel cover.

Order code

D8.D120 . XXXXX . XXXX . 0000

Type

a

b

c

d

e

f

a Measuring length

- 3 = 3 m
- 4 = 4 m
- 5 = 5 m
- 6 = 6 m
- 7 = 7 m
- 8 = 8 m
- 9 = 9 m
- A = 10 m

b Wire types ²⁾

- 1 = V4A, $\varnothing 0.5\text{ mm}$
- 2 = V4A, $\varnothing 1.0\text{ mm}$ (measuring length 3 ... 8 m)
- 3 = V4A, $\varnothing 1.5\text{ mm}$ (measuring length 3 ... 6 m)

c Linearity

- 1 = 0.5 %
- 2 = 0.25 %
- 3 = 0.1 %

d Housing

- 1 = open housing, open wire guide
- 3 = housing with perforated sheet metal cover, open wire guide
- 4 = housing with perforated sheet metal cover, closed wire guide
- 6 = closed housing, closed wire guide

e Sensor type

- A11 = 4 ... 20 mA / 12 ... 30 VDC
- A22 = 0 ... 10 V / 12 ... 30 VDC
- A33 = 1 k Ω / max. 30 VDC
- CC1 = CANopen
- R11 = 2 x 4 ... 20 mA / 12 ... 30 VDC
- R22 = 2 x 0 ... 10 V / 12 ... 30 VDC
- R33 = 2 x 1 k Ω / max. 30 V
- RC1 = 2 x CANopen

f Type of connection / protection level sensor

- 1 = radial cable, 2 m [6.56'] TPE / IP69k ³⁾
- 3 = radial M12 connector / IP67
- 4-pin for sensor type A11 ... A33
- 5-pin for sensor type CC1 ... RC1
- 8-pin for sensor type R11 ... R33


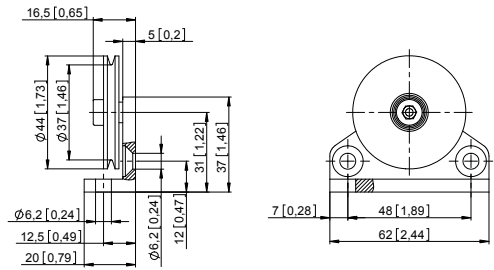
1) As optional order code extension see page 558.

2) Wire type availability depends on the selected measuring range, refer to the technical data.

3) Other cable length on request.

Linear measuring technology

Draw wire mechanics for outdoor applications	Draw wire encoder D120	Measuring length up to 10 m Linearity up to ±0.1 %
---	-------------------------------	---

Accessories for draw wire encoder	Dimensions in mm [inch]	Order no.
Guide pulley 		8.0000.7000.0045 Technical data: - mounting bracket (anodized alum.) - guide pulley (plastic POM) - ball bearing (type 696-2R5) Scope of delivery: - 2 x countersunk screws for lateral fixing - 2 x hexagonal screws for fixing on a flat surface

Technical data

General technical data	
Linearity	±0.5 %
Improved linearity	±0.25 % or ±0.1 %
Resolution	see electrical characteristics
Sensor element	potentiometer
Output signal (others on request)	4 ... 20 mA, 0 ... 10 V, potentiometer, CANopen (in preparation)
Redundant output signal	optional for: 4 ... 20 mA, 0 ... 10 V, potentiometer, CANopen (in preparation)
Connection	radial M12 connector or radial cable outlet (TPE cable), standard length 2 m
Protection	IP67, optional IP69k (only with cable outlet)
Humidity	max. 90 % relative, no condensing
Wire pull-out speed	max. 3.0 m/s
Acceleration	max. 50 m/s ²
Weight	1300 ... 1600 g [45.87 ... 56.44 oz] depending on measuring range
Housing	aluminum, spring housing PA6
Spring force	min. 7 N / max. 13 N ¹⁾

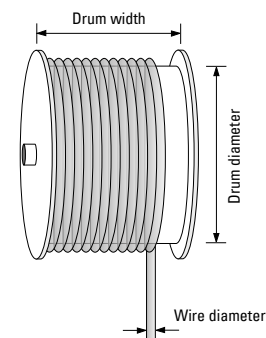
Operating principle

Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device. The single-layer wire winding ensuring the best linearity possible is a specific feature of Kübler draw wire encoders.

Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Characteristics measuring wire		
V4A, ø 0.5 mm	measuring range	3 ... 10 m
	no.	1.4401
	breaking force	280 N
	TK	16 x 10 ⁻⁶ K ⁻¹
V4A, ø 1.0 mm	measuring range	3 ... 8 m
	no.	1.4401
	breaking force	942 N
	TK	16 x 10 ⁻⁶ K ⁻¹
V4A, ø 1.5 mm	measuring range	3 ... 6 m
	no.	1.4401
	breaking force	1.890 N
	TK	16 x 10 ⁻⁶ K ⁻¹

1) Depends on the measuring length.

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 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclometers
 Connection technology
 Accessories
 Addresses

Draw wire mechanics for outdoor applications	Draw wire encoder D120	Measuring length up to 10 m Linearity up to ±0.1 %
---	-------------------------------	---

Electrical characteristics (analog sensor, scaled to measuring range)			
Sensor type	A11 / R11	A22 / R22	A33 / R33
Output	4 ... 20 mA	0 ... 10 V	1 kΩ, potentiometer
Output current	max. 50 mA in case of a failure	max. 10 mA, min. load 10 kΩ	–
Max. current consumption	–	22.5 mA (non load)	–
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Response time	< 1 ms from 0 ... 100 % and 100 ... 0 %	< 3 ms from 0 ... 100 % and 100 ... 0 %	–
Resolution	limited by the noise	limited by the noise	theoretically unlimited
Noise	0.03 mA _{pp} = 6 mV _{pp} at 200 Ω	typ. 3 mV _{pp} , max. 37 mV _{pp}	depending on the supply voltage
Recommended slider current	–	–	< 1 μA
Reverse polarity protection	yes	yes	–
Working temperature	standard: -20°C ... +85°C [-4°F ... +185°F] as optional order code extension (s. below): -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F]
Short circuit proof	–	yes, sustained short-circuit proof	–
Temperature coefficient	0.0079 %/K	0.0037 %/K	±0.0025 %/K
Connection diagrams			
Electromagnetic compatibility	acc. to EN 61326-1:2013	acc. to EN 61326-1:2013	acc. to EN 61326-1:2013
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface characteristics CANopen – Sensor type CC1, RC1	
CAN specification	Full CAN 2.0B (ISO11898)
Communication profile	CANopen CiA 301 V 4.2.0
Device profile	encoder, absolute linear; CiA 406 V 3.2.0
Error monitoring	Producer Heartbeat, Emergency Message, Node Guarding
Node ID	default: 7, adjustable via SDO
PDO	1 x TPDO, static mapping
PDO functions	event-triggered, time-triggered, Sync-cyclic, Sync-acyclic
Transmission rate	Default 250 kbit/s, 1 Mbps, 800, 500, 250, 125, 50, 20 kbps adjustable via SDO
Bus connection	M12 connector, 5-pin
Integrated bus terminating resistor	120 ohms ready-to-activate via SDO
Bus, galvanic isolation	no
Power supply	8 ... 30 V DC
Working temperature	standard: -20°C ... +85°C [-4°F ... +185°F] as optional order code extension (s. below): -40°C ... +85°C [-40°F ... +185°F]
Current consumption	typ. 10 mA at 24 V, typ. 20 mA at 12 V
Measuring rate	1 kHz with 16 bit resolution
Repeat accuracy	±0.5 %, ±0.25 % or ±0.1 % (according to the selected linearity)
Resolution	0.002 % of the measuring range
Reverse polarity protection	yes
Electromagnetic compatibility	acc. to EN 61326-1:2013
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Options	
Protection class IP69k	All relevant sensor components are entirely encapsulated. Suitable for steam and high-pressure cleaning (only in connection with cable outlet).
Extended temperature range	The use of special components allows an operating temperature of -40°C ... +85°C [-40°F ... +185°F]
Redundant output signal	The use of two potentiometers allows the sensor to provide two independent output signals: <ul style="list-style-type: none"> 2 x 4 ... 20 mA 2 x 0 ... 10 V 2 x 1 kΩ 2 x CANopen
Wire fastening (with swivel, on ball bearing)	standard: <ul style="list-style-type: none"> straight pin, M6 through hole and snap ring optional: <ul style="list-style-type: none"> eyelet, internal diameter 20 mm M4 thread, length 22 mm clip (on request)

Order code – extensions for the following options	
Wire fastening M4 thread ¹⁾	D8.D120.xxxx.xxxx.xxxx.V001
Wire fastening eyelet	D8.D120.xxxx.xxxx.xxxx.V002
Extended temperature range -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.V003
Wire fastening M4 thread ¹⁾ and -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.V004
Wire fastening eyelet and -40 ... +85°C [-40°F ... +185°F]	D8.D120.xxxx.xxxx.xxxx.V005

1) Not available with wire type V4A, ø 1.5 mm – order option **1** = 3.

Linear measuring technology

Draw wire mechanics for outdoor applications	Draw wire encoder D120	Measuring length up to 10 m Linearity up to ±0.1 %
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Terminal assignment

Type of connection	Sensor type	M12 connector, 4-pin					
3	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	⊥
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	⊥
	A33 (1 kΩ)	Signal:	+V	Slider	0 V	n.c.	⊥
		Pin:	1	2	3	4	PH

Type of connection	Sensor type	M12 connector, 5-pin					
3	CC1, RC1	Signal:	+V	0 V	CAN_GND	CAN-H	CAN-L
		Pin:	2	3	1	4	5

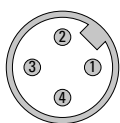
Type of connection	Sensor type	M12 connector, 8-pin									
3	R11 (4 ... 20 mA)	Signal:	+V ₁	n.c.	Signal 1	n.c.	+V ₂	n.c.	Signal 2	n.c.	⊥
	R22 (0 ... 10 V)	Signal:	+V ₁	Signal 1	0 V ₁	0 V Signal 1	+V ₂	Signal 2	0 V ₂	0 V Signal 2	⊥
	R33 (1 kΩ)	Signal:	+V ₁	Slider 1	0 V ₁	n.c.	+V ₂	Slider 2	0 V ₂	n.c.	⊥
		Pin:	1	2	3	4	5	6	7	8	PH

Type of connection	Sensor type	Cable (isolate unused cores individually before initial start-up)					
1	A11 (4 ... 20 mA)	Signal:	+V	n.c.	Signal	n.c.	⊥
	A22 (0 ... 10 V)	Signal:	+V	Signal	0 V	0 V Signal	⊥
	A33 (1 kΩ)	Signal:	+V	Slider	0 V	n.c.	⊥
		Core color:	BN	WH	BU	BK	shield

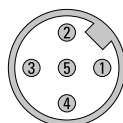
Type of connection	Sensor type	Cable (isolate unused cores individually before initial start-up)					
1	CC1, RC1	Signal:	+V	0 V	CAN_GND	CAN-H	CAN-L
		Core color:	WH	BU	BN	BK	GY

Type of connection	Sensor type	Cable (isolate unused cores individually before initial start-up)									
1	R11 (4 ... 20 mA)	Signal:	+V ₁	n.c.	Signal 1	n.c.	+V ₂	n.c.	Signal 2	n.c.	⊥
	R22 (0 ... 10 V)	Signal:	+V ₁	Signal 1	0 V ₁	0 V Signal 1	+V ₂	Signal 2	0 V ₂	0 V Signal 2	⊥
	R33 (1 kΩ)	Signal:	+V ₁	Slider 1	0 V ₁	n.c.	+V ₂	Slider 2	0 V ₂	n.c.	⊥
		Core color:	WH	BN	GN	YE	GY	PK	BU	RD	shield

Top view of mating side, male contact base



M12 connector, 4-pin



M12 connector, 5-pin



M12 connector, 8-pin

**Draw wire mechanics
for outdoor applications**

Draw wire encoder D120

**Measuring length up to 10 m
Linearity up to $\pm 0.1\%$**

Technology in detail

Various wire types and wire fastenings

Wire types:

- V4A plastic coated, \varnothing 0.5 mm, order option **b** = 1 (standard)
- V4A plastic coated, \varnothing 1.0 mm, order option **b** = 2
- V4A plastic coated, \varnothing 1.5 mm, order option **b** = 3

Wire fastenings:

- | | | | |
|--|--|---|----------------------|
| straight pin with
snap ring
(standard) | eyelet
(order code
extension V002) | M4 thread
(order code
extension V001) | clip
(on request) |
|--|--|---|----------------------|

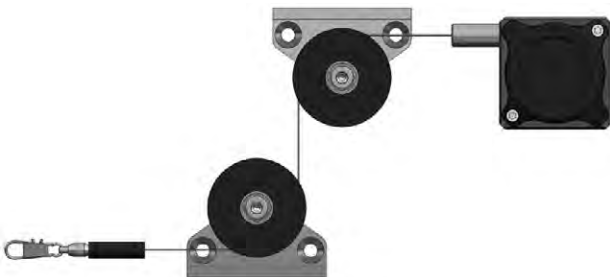


Extension wire

available on request with all wire fastening types
(straight pin with snap ring, eyelet, M4 thread, clip)



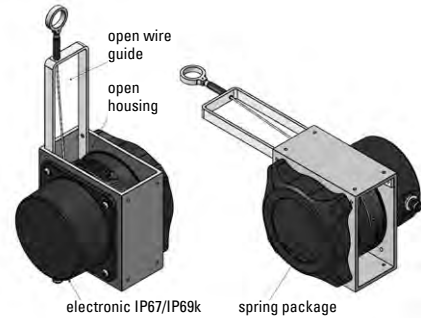
Application-specific installation possibilities



Housing types (the suitable housing type for every application)

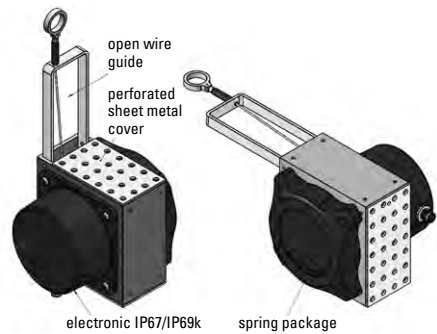
Open housing, open wire guide

For use in the presence of
fine dust and liquids.



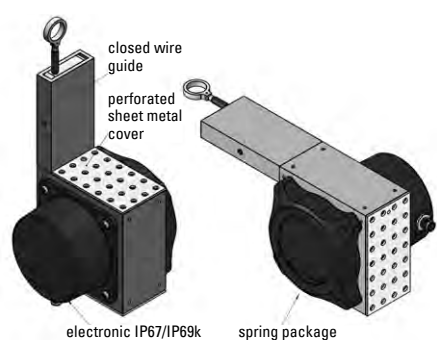
Housing with perforated sheet metal cover, open wire guide

For use in the presence of
dirt, particles size > 2mm
and liquids



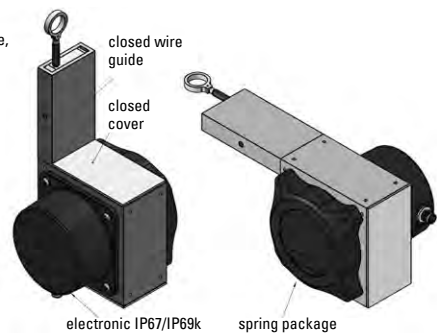
Housing with perforated sheet metal cover, closed wire guide

For use in the presence of
dirt, particles size > 2mm
and liquids.
Shock protection,
wire cleaning device
(in preparation).



Closed housing, closed wire guide

For use in the presence of
sticky dust, cement, concrete,
clay.
Shock protection,
wire cleaning device
(in preparation).



Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
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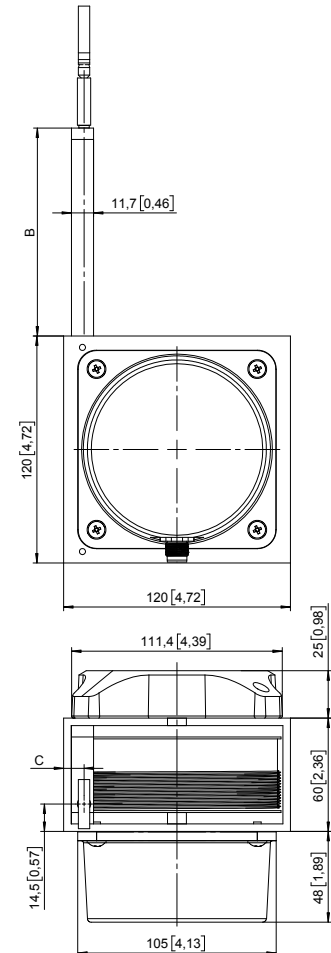
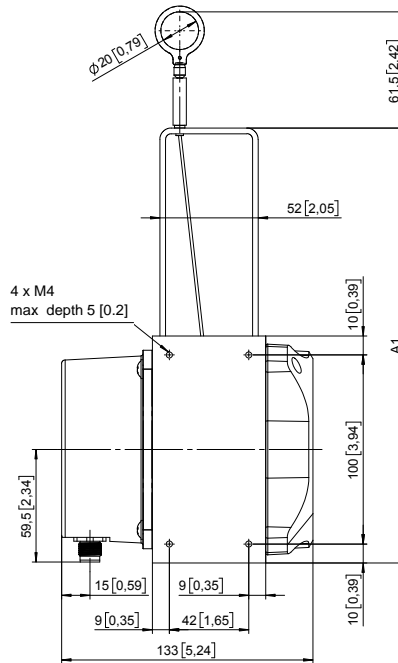
Linear measuring technology

Draw wire mechanics for outdoor applications	Draw wire encoder D120	Measuring length up to 10 m Linearity up to $\pm 0.1\%$
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Dimensions

Dimensions in mm [inch]

**Open housing,
open wire guide**



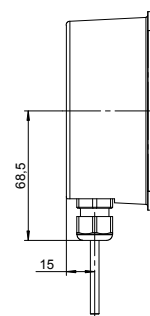
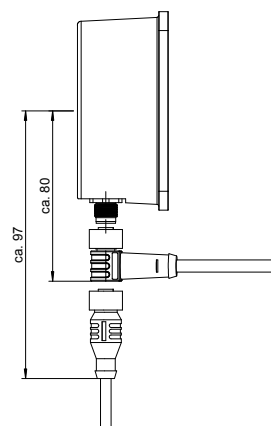
Wire diameter \varnothing 0.5 mm – drum pitch circumference: 335.2 [13.2]			
Measuring length	A1	B	C
3 ... 10 m	230 [9.06]	110 [4.33]	10.75 [0.42]

Wire diameter \varnothing 1.0 mm – drum pitch circumference: 336.8 [13.26]			
Measuring length	A1	B	C
3 ... 5 m	230 [9.06]	110 [4.33]	10.75 [0.42]
6 ... 8 m	320 [12.6]	200 [7.87]	12.25 [0.48]

Wire diameter \varnothing 1.5 mm – drum pitch circumference: 338.3 [13.32]			
Measuring length	A1	B	C
3 ... 4 m	230 [9.06]	110 [4.33]	10.75 [0.42]
5 ... 6 m	320 [12.6]	200 [7.87]	12.25 [0.48]

Connector output / Cable outlet

The cable must be protected in case of steam and high-pressure cleaning.



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Draw wire mechanics for outdoor applications

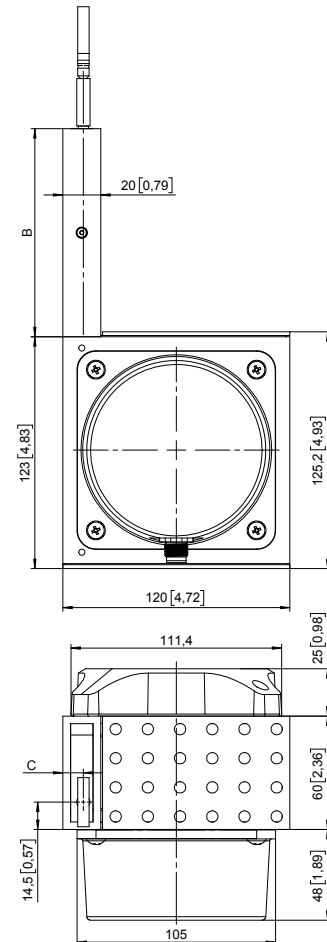
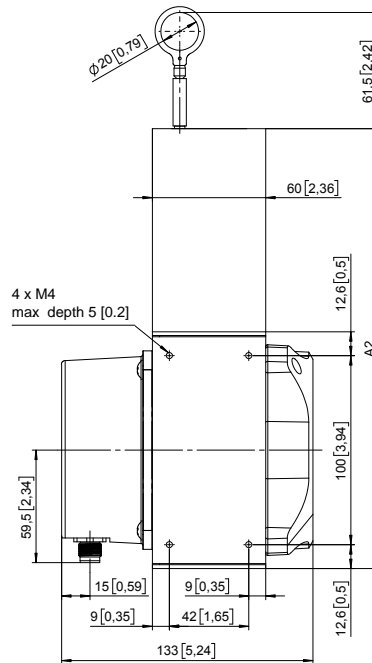
Draw wire encoder D120

Measuring length up to 10 m
Linearity up to $\pm 0.1\%$

Dimensions

Dimensions in mm [inch]

Housing with perforated sheet metal cover, closed wire guide



Wire diameter \varnothing 0.5 mm – drum pitch circumference: 335.2 [13.2]			
Measuring length	A2	B	C
3 ... 10 m	233 [9.17]	110 [4.33]	10.75 [0.42]

Wire diameter \varnothing 1.0 mm – drum pitch circumference: 336.8 [13.26]			
Measuring length	A2	B	C
3 ... 5 m	233 [9.17]	110 [4.33]	10.75 [0.42]
6 ... 8 m	323 [12.7]	200 [7.87]	12.25 [0.48]

Wire diameter \varnothing 1.5 mm – drum pitch circumference: 338.3 [13.32]			
Measuring length	A2	B	C
3 ... 4 m	233 [9.17]	110 [4.33]	10.75 [0.42]
5 ... 6 m	323 [12.7]	200 [7.87]	12.25 [0.48]

Product overview
Basics

Incremental encoders

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singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Draw wire mechanics with redundant sensors	Draw wire encoder D125	Measuring length up to 10 m integrated inclinometer
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Thanks to its robust design and its high IP67 protection level, the draw wire encoder D125 reliably provides accurate length measurement. Its simple and optimal integration in the application is a particular highlight of this product. Many additional options, ranging from the integrated inclinometer up to the relay output, are available.

To increase plant availability, this draw wire encoder allows combining a redundant system in a very compact housing.



Analog output

CANopen



-40... +85°C
Wide temperature range



IP67
High protection level



Shock / vibration resistant



Redundancy

Characteristics

- Measuring length 6 ... 10 m.
- Integrated inclinometer.
- Redundant sensors.
- Different types of sensors (analog, CANopen).
- Linearity up to $\pm 0.5\%$ of the measuring range.
- High protection level IP67 and wide temperature range from -40°C ... +85°C.

Advantages

- The suitable measuring length for every application.
- Cost, space and installation work saving.
- For even higher plant availability.
- Simple selection and fast installation.
- High accuracy at economic prices.
- Reliability and long service life for outdoor applications.

Order code with analog sensor

D8 . D125 . XXXX . XXX 1 . X 000

a Measuring length

0600 = 6 m
0700 = 7 m
0800 = 8 m
0900 = 9 m
1000 = 10 m

b Sensor type

A44 = 0,5 ... 4,5 V
R44 = 0,5 ... 4,5 V, redundant

c Type of connection

1 = M12 male connector, 5-pin

d Power supply

1 = 9 ... 30 V DC
2 = 5 V DC ¹⁾

Order code with CANopen and inclinometer

D8 . D125 . XXXX . RC1 1 . 1 X 00

a Measuring length

0600 = 6 m
0700 = 7 m
0800 = 8 m
0900 = 9 m
1000 = 10 m

b Sensor type

RC1 = CANopen redundant

c Type of connection

1 = M12 male connector, 5-pin

d Power supply

1 = 9 ... 30 V DC

e Inclinometers

0 = none
1 = 1 inclinometer
2 = 2 inclinometers

1) Only in conjunction with type of sensor A44 and R44.

Linear measuring technology

Draw wire mechanics with redundant sensors		Draw wire encoder D125	Measuring length up to 10 m integrated inclinometer
Connection technology for analog sensor			Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable		05.00.6081.2211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin		8.0000.5116.0000

Technical data

Mechanical characteristics (draw wire mechanics)	
Measuring range	6.0 ... 10.0 m
Measuring wire	material AISI304 steel wire Nylon coated diameter \varnothing 0.9 mm
Wire fastening	eyelet internal diameter \varnothing 8 mm outer diameter \varnothing 15 mm height 2 mm
Wire pull-out speed max.	max. 1 m/s
Acceleration	max. 10 m/s ²
Linearity (whole measuring range)	analog \pm 0.8 % CANopen \pm 0.5 %
Repetition accuracy (whole measuring range)	analog \pm 0.1 % CANopen \pm 0.2 %
Pull-back force	typ. 4.5 N ¹⁾
Pull-out force	typ. 9 N
Type of connection	M12 connector, 5-pin
Housing	polycarbonate reinforced with glass fibers
Protection	IP67
Temperature range	-40°C ... +85°C [-40°F ... +185°F]
Weight	approx. 0.97 kg [34.2 oz]
Shock resistance acc. to EN 60068-2-27	300 m/s ² , 11 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 500 Hz

Analog sensor	
Output signal	analog
Resolution	12 bit

CANopen	
Output signal	CANopen (DS301)
Resolution	14 bit
Resolution inclinometer	0.1°
Accuracy inclinometer	\pm 0.6°
Temperature drift inclinometer	\pm 0,01 % / °C

Electrical characteristics	
Power supply	9 ... 30 V DC 5 V DC \pm 10 % ²⁾
Electromagnetic compatibility	EN 61326-1, EN 61326-3-1
CE compliant	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

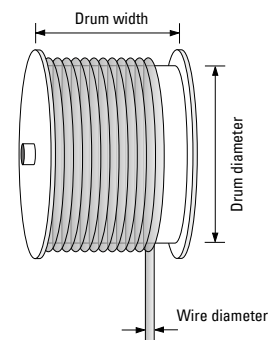
Operating principle

Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



1) May be lower at low temperatures.
2) Only in conjunction with type of sensor A44 and R44.

Draw wire mechanics with redundant sensors	Draw wire encoder D125	Measuring length up to 10 m integrated inclinometer
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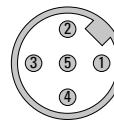
Terminal assignment

Sensor type	Type of connection	M12 connector, 5-pin					
A44, R44 (analog sensor)	1	Signal:	+V	0 V	U _{out 1}	U _{out 2} ¹⁾	AGND
		Pin:	1	2	3	4	5

Sensor type	Type of connection	M12 connector, 5-pin					
RC1 (CANopen)	1	Signal:	0 V	+V	CAN-GND	CAN-H	CAN-L
		Pin:	3	2	1	4	5

- +V : Power supply +V DC
- 0 V : Power supply GND (0V)
- U_{out 1} : Voltage output 1
- U_{out 2} : Voltage output 2
- n.c. : not connected
- AGND : Analog Ground

Top view of mating side, male contact base



M12 connector, 5-pin

Technology in detail

Inclinometer with option RC1

Setting possibility 360°



Setting possibility ±180°



Redundant signals possible.

Setting possibilities:

- Switching between setting possibilities 180° and 360°.
- Switching between synchronous and asynchronous output.
- Change of direction of rotation (cw/ccw).
- Setting and resetting an offset.

1) Only in case of redundant ordering option sensor type R44 (otherwise n.c.).

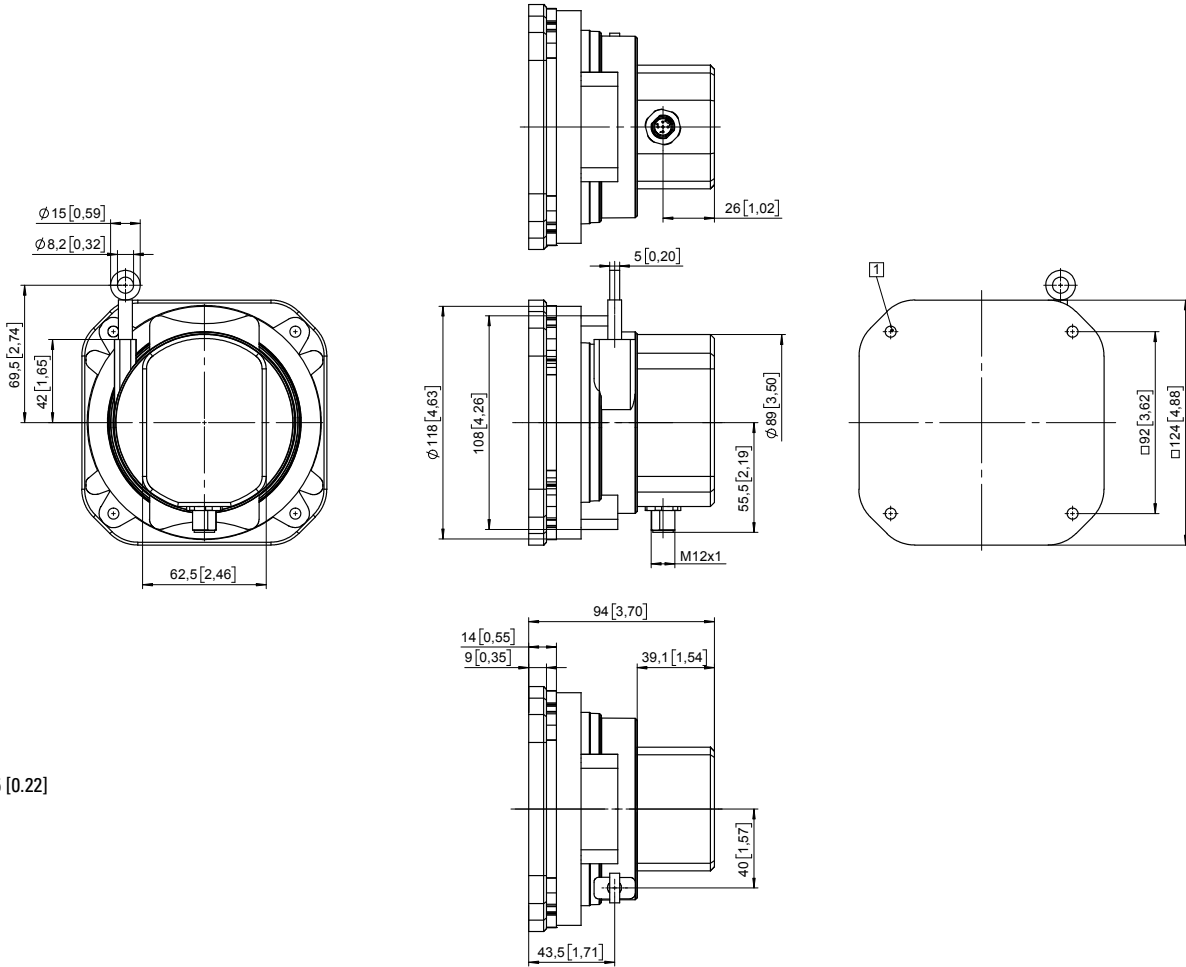
Draw wire mechanics with redundant sensors

Draw wire encoder D125

Measuring length up to 10 m integrated inclinometer

Dimensions

Dimensions in mm [inch]



1 4 x $\phi 5.5 [0.22]$

Product overview
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Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Linear measuring technology

Draw wire mechanics with encoder or analog sensor

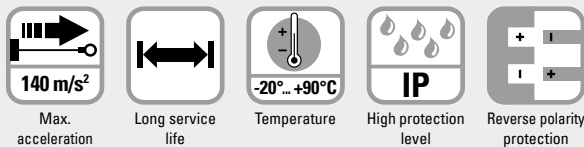
Draw wire encoder D135

**Measuring length max. 42.5 m
Traverse speed max. 5 m/s**



These draw wire mechanics D135 can be used up to a measuring length of 42.5 meters. This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analog sensors.

With its compact construction, the D135 suits perfectly all measuring tasks from 8 up to 42.5 meters.



Robust

- The titanium-anodized aluminum housing and the stainless steel wires allow for using the mechanics even in harsh conditions.
- Wear-free wire exit thanks to special plain bearing guide.
- Various wire types and wire fastenings.

Versatile

- High traverse speed and high acceleration.
- Flexible mounting thanks to fastening tabs or fastening grooves.
- Various connection possibilities available.
- Interchangeable encoders (interchangeable installation).

Order code with encoder (incremental, absolute)

D8.4D1 . XXXX . XXXX . XXXX
Type a b c d e

a Measuring range

- 0800 = 8 000 mm
- 1000 = 10 000 mm
- 1200 = 12 000 mm
- 1500 = 15 000 mm
- 2000 = 20 000 mm
- 2500 = 25 000 mm
- 3000 = 30 000 mm
- 3500 = 35 000 mm
- 4000 = 40 000 mm
- 4250 = 42 500 mm

b Encoder used

- 00 = Sendix 5000, incremental
- M3 = Sendix M5863, absolute
- F3 = Sendix F5863, absolute
- 63 = Sendix 5863, absolute
- M8 = Sendix M5868, absolute
- F8 = Sendix F5868 absolute
- 68 = Sendix 5868, absolute

c Output circuit

depends on the encoder used

d Type of connection

depends on the encoder used

e Resolution / Protocol / Options

depends on the encoder used

Optional on request

- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)

Standard resolutions for draw wire with incremental encoder Sendix 5000

Drum circumference [mm]	333.33	333.33	333.33
Pulses / revolution [ppr]	1000	2000	4000
Pulses / mm	3	6	12
Resolution [mm]	0.33	0.17	0.08

Standard resolutions for draw wire with absolute encoder Sendix M5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)

Drum circumference [mm]	333.33
Pulses / revolution [ppr]	4096
Pulses / mm	12.3
Resolution [mm]	0.08

Draw wire mechanics with encoder or analog sensor

Draw wire encoder D135

Measuring length max. 42.5 m
Traverse speed max. 5 m/s

Recommended standard variants (with incremental, absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xD1.xxxx.0054.2000	Sendix 5000 (8.5000.8354.2000)	Push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	2000 ppr	-
D8.xD1.xxxx.M324.G222	Sendix M5863 (8.M5863.3524.G222)	SSI	10 ... 30 V DC	radial M12 connector	4096 ppr / SSI-Gray-Code	-
D8.xD1.xxxx.M824.2122	Sendix M5868 (8.M5868.3524.2122)	CANopen	10 ... 30 V DC	radial M12 connector	CANopen encoder profil DS406 V4.0	-

Other variants (with absolute encoder)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xD1.xxxx.F326.G223	Sendix F5863 (8.F5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xD1.xxxx.6326.G223	Sendix 5863 (8.5863.1226.G223)	SSI	10 ... 30 V DC	1 x radial M12 connector	4096 ppr / SSI-Gray-Code	SET button + status LED
D8.xD1.xxxx.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10 ... 30 V DC	1 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xD1.xxxx.6822.2123	Sendix 5868 (8.5868.1222.2123)	CANopen	10 ... 30 V DC	2 x radial M12 connector	CANopen encoder profile DS406 V3.2	SET button
D8.xD1.xxxx.6832.3113	Sendix 5868 (8.5868.1232.3113)	PROFIBUS	10 ... 30 V DC	3 x radial M12 connector	Profibus-DP V0 encoder profile Class 2	SET button
D8.xD1.xxxx.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10 ... 30 V DC	3 x radial M12 connector	EtherCAT with CoE 3.2.10	-
D8.xD1.xxxx.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	PROFINET IO	10 ... 30 V DC	3 x radial M12 connector	PROFINET encoder profile version 4.1	-
D8.xD1.xxxx.F8AN.A222	Sendix F5868 (8.F5868.12AN.A222)	EtherNet/IP	10 ... 30 V DC	3 x axial M12 connector	EtherNet/IP	-

Order code with encoder (analog, scalable with limit switch function)

D8.4D1 . XXXX . M1XX . XXXX
Type a b c d e

a Measuring range
0800 = 8 000 mm
1000 = 10 000 mm
1200 = 12 000 mm
1500 = 15 000 mm
2000 = 20 000 mm
2500 = 25 000 mm
3000 = 30 000 mm
3500 = 35 000 mm
4000 = 40 000 mm
4250 = 42 500 mm

b Encoder used
M1 = Sendix M5861, absolute ¹⁾

c Output circuit
depends on the encoder used

d Type of connection
depends on the encoder used

e Resolution / Protocol / Options
depends on the encoder used

Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67

Recommended standard variants (with encoder analog, scalable with limit switch function)

Order no. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option
D8.xD1.xxxx.M134.3612	Sendix M5861 (8.M5861.3534.3612)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable without limit switch function ²⁾
D8.xD1.xxxx.M144.4612	Sendix M5861 (8.M5861.3544.4612)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable without limit switch function ²⁾
D8.xD1.xxxx.M134.3512	Sendix M5861 (8.M5861.3534.3512)	Analog, 4 ... 20 mA	10 ... 30 V DC	radial M12 connector	12 Bit / 4 ... 20 mA	scalable with limit switch function ³⁾
D8.xD1.xxxx.M144.4512	Sendix M5861 (8.M5861.3544.4512)	Analog, 0 ... 10 V	15 ... 30 V DC	radial M12 connector	12 Bit / 0 ... 10 V	scalable with limit switch function ³⁾

Order code with analog sensor (scaled to measuring range)

D8.3D1 . XXXX . XXX X . 0000
Type a b c 0000

a Measuring range
0800 = 8 000 mm
1000 = 10 000 mm
1500 = 15 000 mm
2000 = 20 000 mm
2500 = 25 000 mm
3000 = 30 000 mm
3500 = 35 000 mm
4000 = 40 000 mm

b Analog sensor output / power supply
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = potentiometer 1 kΩ / max. 30 V DC

c Type of connection
1 = axial cable, 2 m [6.56'] PVC
3 = axial M12 connector, 4-pin


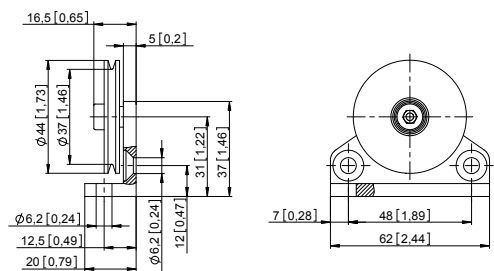
Optional on request
- Other measuring ranges
- Cable diameter 1 mm
- Eyelet or M4 wire fastening instead of wire clip
- Modified cable and/or connector orientation
- Modified cable outlet direction
- Sensor protection level IP67
- Improved linearity (0.02 %)
- Increased temperature range -40°C ... +85°C and -20°C ... +120°C

1) With ccw option.
2) Delivery condition: scaled to measuring range.
Description for scaling and limit switch function see data sheet M5861.

3) Delivery condition: unscaled.
Description for scaling and limit switch function see data sheet M3661.

Linear measuring technology

Draw wire mechanics with encoder or analog sensor Draw wire encoder D135 Measuring length max. 42.5 m Traverse speed max. 5 m/s

Accessories for draw wire encoder	Dimensions in mm [inch]	Order no.
Guide pulley 		8.0000.7000.0045 Technical data: - mounting bracket (anodized alum.) - guide pulley (plastic POM) - ball bearing (type 696-2R5) Scope of delivery: - 2 x countersunk screws for lateral fixing - 2 x hexagonal screws for fixing on a flat surface
Connection technology for analog sensor		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	05.00.6081.2211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

Technical data

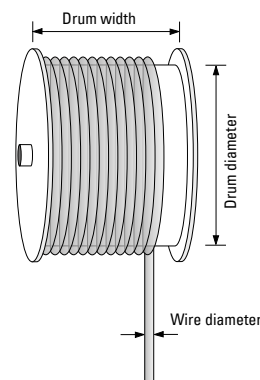
Mechanical characteristics (draw wire mechanics)						
Measuring range		8000 mm	10000 mm 12000 mm 15000 mm	20000 mm	25000 mm 30000 mm	35000 mm 40000 mm 42500 mm
Extension force	F_{min}	7.2 N	8.7 N	7.0 N	7.3 N	7.0 N
	F_{max}	16.0 N	16.9 N	12.4 N	15.7 N	14.1 N
Max. speed		10 m/s	6 m/s	5 m/s	5 m/s	5 m/s
Max. acceleration		140 m/s ²	80 m/s ²	60 m/s ²	60 m/s ²	60 m/s ²
Linearity	with analog output	±0.1 % (of the measuring range)				
	with encoder	±0.05 % (of the measuring range) ±0.02 % (of the measuring range) ¹⁾				
Weight		depending on the measuring and the sensor/encoder used				
Material	housing	titanium-anodized aluminum				
	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.



1) On request for encoder version: 00, F3, G3, F8, 68 (see order code).

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Absolute encoders multiturn
Bearings encoders
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Inclinometers
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Draw wire mechanics with encoder or analog sensor

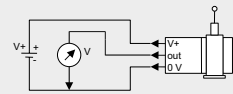
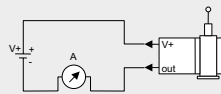
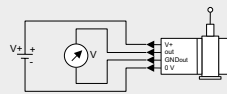
Draw wire encoder D135

**Measuring length max. 42.5 m
Traverse speed max. 5 m/s**

Electrical characteristics (analog sensor, scaled to measuring range)

Version	A22	A11	A33
Analog output	0 ... 10 V	4 ... 20 mA	potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F] ¹⁾	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F] ¹⁾	-20°C ... +85°C [-4°F ... +185°F] -40°C ... +85°C [-40°F ... +185°F] ¹⁾ -20°C ... +120°C [-4°F ... +248°F] ¹⁾

Connection diagrams



CE compliant acc. to

EMC guideline 2014/30/EU
RoHS guideline 2011/65/EU

Technology in detail

Various wire types and wire fastenings

Wire types:

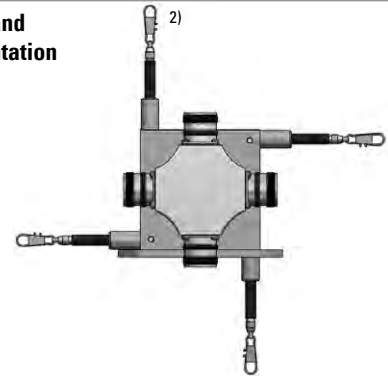
- 0.5 mm (V2A) ²⁾
- 0.51 mm (V4A)
- 1.0 mm (V4A)
- 1.0 mm plastic-coated (V4A = 0.81 mm, plastic 0.19 mm)
- 0.6 mm (Coramid)

Wire fastenings:

- Clip ²⁾
- M4 thread
- Eyelet



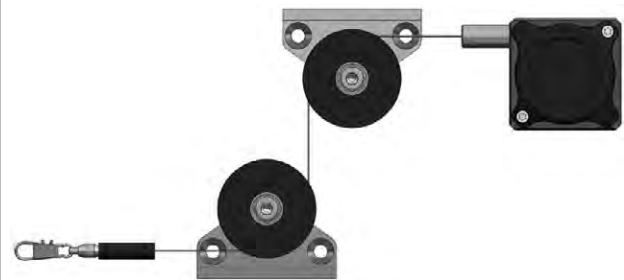
Individual wire outlet and cable / connector orientation



Extension wire



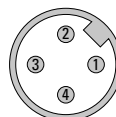
Application-specific installation possibilities



Terminal assignment (analog sensor A11, A22, A33)

Pin	1	2	3	4
Core color	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Top view of mating side, male contact base



M12 connector, 4-pin

1) Optional on request.
2) Standard.

Linear measuring technology

Draw wire mechanics with encoder or analog sensor

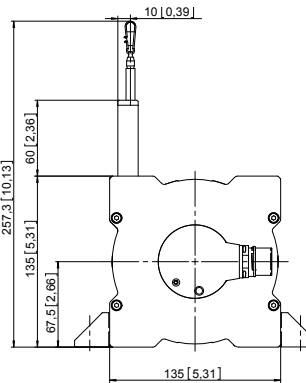
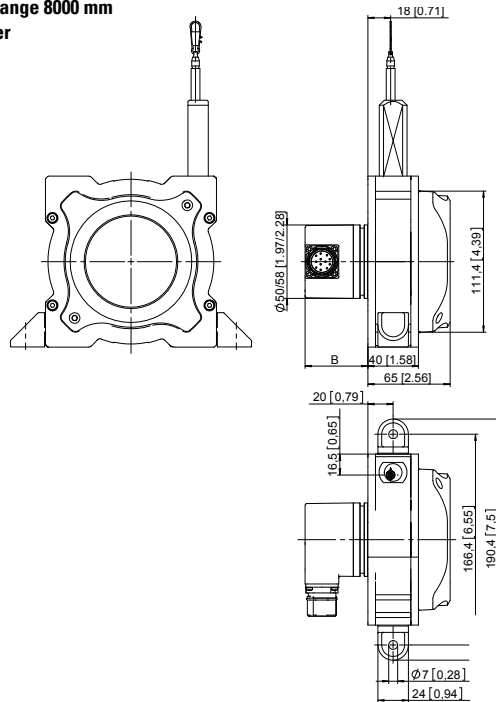
Draw wire encoder D135

**Measuring length max. 42.5 m
Traverse speed max. 5 m/s**

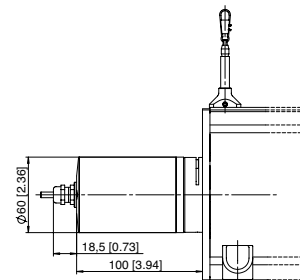
Dimensions

Dimensions in mm [inch]

Draw wire mechanics, measuring range 8000 mm with encoder



with analog output



Dimension B depends on the encoder used		
Encoder		B
Sendix incremental (5000)	D8.4D1.xxxx.00xx.xxxx	37.0 [1.46]
Sendix absolute (F5863)	D8.4D1.xxxx.F3xx.xxxx	49.5 [1.95]
Sendix absolute (5863)	D8.4D1.xxxx.63xx.xxxx	49.5 [1.95]
Sendix absolute (F5868, CANopen)	D8.4D1.xxxx.F8xx.21xx	70.0 [2.76]
Sendix absolute (F5868, EtherNet/IP)	D8.4D1.xxxx.F8xx.A2xx	59.5 [2.34]
Sendix absolute (5868)	D8.4D1.xxxx.68xx.xxxx	77.2 [3.04]
Sendix absolute (M586x)	D8.4D1.xxxx.Mxxx.xxxx	49.8 [1.96]

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Draw wire mechanics with encoder or analog sensor

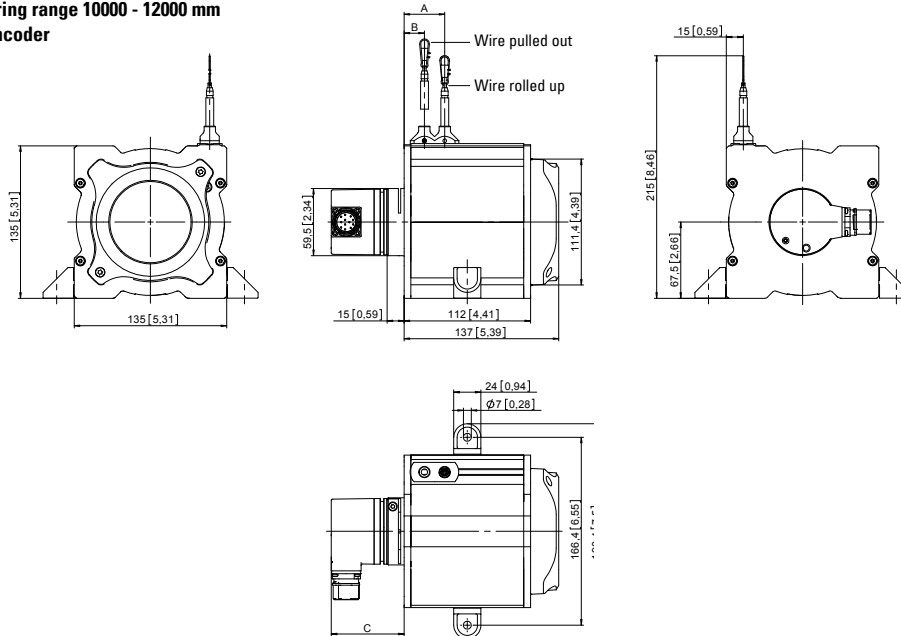
Draw wire encoder D135

Measuring length max. 42.5 m
Traverse speed max. 5 m/s

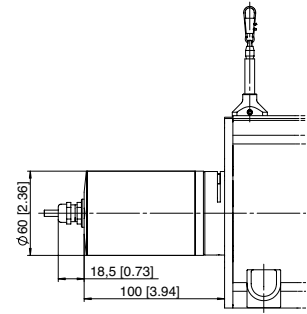
Dimensions

Dimensions in mm [inch]

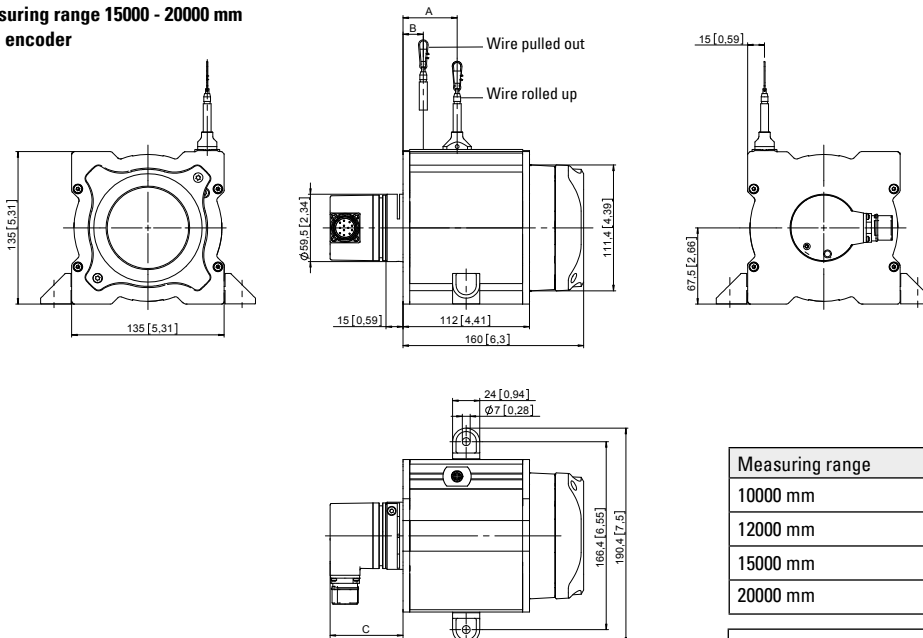
Draw wire mechanics, measuring range 10000 - 12000 mm with encoder



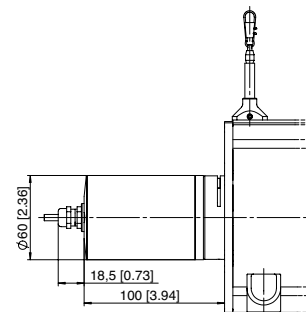
with analog output



Draw wire mechanics, measuring range 15000 - 20000 mm with encoder



with analog output



Measuring range	A - Wire rolled up	B - Wire pulled out
10000 mm	33 [1.30]	18 [0.71]
12000 mm	36 [1.42]	18 [0.71]
15000 mm	41 [1.61]	18 [0.71]
20000 mm	48 [1.89]	18 [0.71]

Dimension C depends on the encoder used		
Encoder		C
Sendix incremental (5000)	D8.4D1.xxxx.00xx.xxxx	60.0 [2.36]
Sendix absolute (F5863)	D8.4D1.xxxx.F3xx.xxxx	72.5 [2.85]
Sendix absolute (5863)	D8.4D1.xxxx.63xx.xxxx	72.5 [2.85]
Sendix absolute (F5868, CANopen)	D8.4D1.xxxx.F8xx.21xx	93.0 [3.66]
Sendix absolute (F5868, EtherNet/IP)	D8.4D1.xxxx.F8xx.A2xx	82.5 [3.25]
Sendix absolute (5868)	D8.4D1.xxxx.68xx.xxxx	100.2 [3.94]
Sendix absolute (M586x)	D8.4D1.xxxx.Mxxx.xxxx	72.8 [2.87]

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Draw wire mechanics with encoder or analog sensor

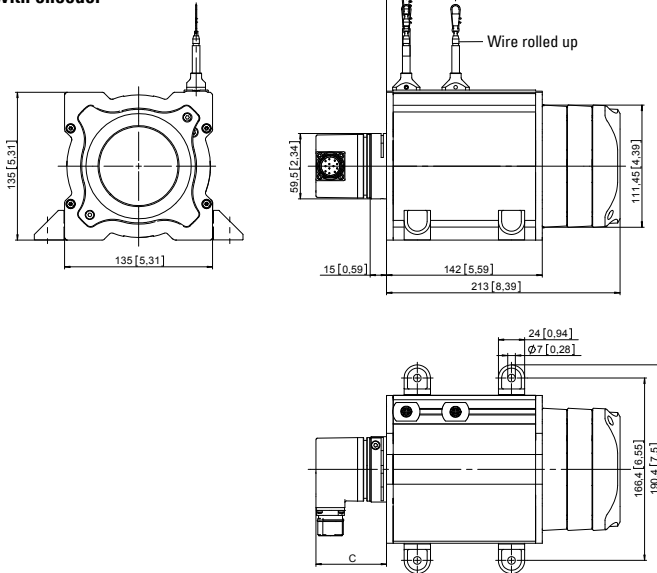
Draw wire encoder D135

**Measuring length max. 42.5 m
Traverse speed max. 5 m/s**

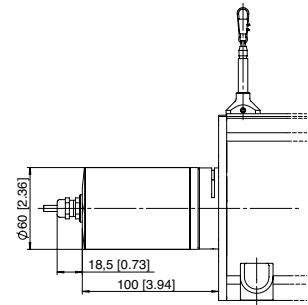
Dimensions

Dimensions in mm [inch]

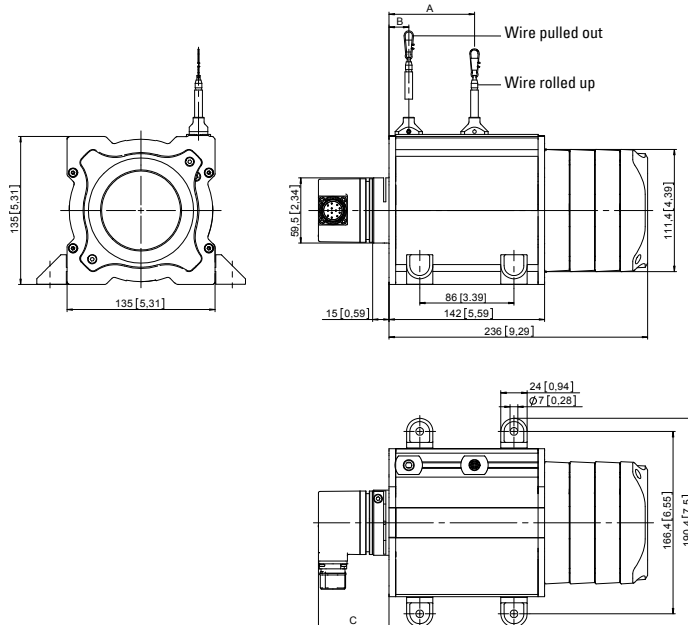
Draw wire mechanics, measuring range 25000 - 30000 mm with encoder



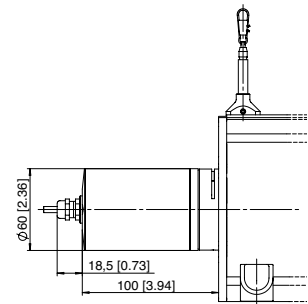
with analog output



Draw wire mechanics measuring range 35000 - 42500 mm with encoder



with analog output



Measuring range	A - Wire rolled up	B - Wire pulled out
25000 mm	56 [2.02]	18 [0.71]
30000 mm	63 [2.48]	18 [0.71]
35000 mm	71 [2.80]	18 [0.71]
40000 mm	78 [3.07]	18 [0.71]
42500 mm	82 [3.23]	18 [0.71]

Dimension C depends on the encoder used		
Encoder		C
Sendix incremental (5000)	D8.4D1.xxxx.00xx.xxxx	60.0 [2.36]
Sendix absolute (F5863)	D8.4D1.xxxx.F3xx.xxxx	72.5 [2.85]
Sendix absolute (5863)	D8.4D1.xxxx.63xx.xxxx	72.5 [2.85]
Sendix absolute (F5868, CANopen)	D8.4D1.xxxx.F8xx.21xx	93.0 [3.66]
Sendix absolute (F5868, EtherNet/IP)	D8.4D1.xxxx.F8xx.A2xx	82.5 [3.25]
Sendix absolute (5868)	D8.4D1.xxxx.68xx.xxxx	100.2 [3.94]
Sendix absolute (M586x)	D8.4D1.xxxx.Mxxx.xxxx	72.8 [2.87]

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Length measuring kit with spring encoder arm

Limes Kit TB1

**Standard measuring length up to 100 m¹⁾
Application-specific adaptation**



Limes Kit TB is a flexible length measuring kit for the measurement of positions and speeds. The complete system is easy to mount and compensates unevennesses and mounting tolerances in the application.

The length measuring kit is available in many variants and can be adapted for the specific requirements of your application. Moreover, our Sendix encoder portfolio offers the suitable interface for every application. Both incremental and absolute encoders can be used.

Versatile

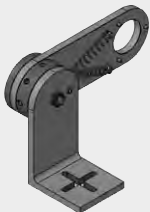
- Large measuring range (standard measuring length up to 100 m¹⁾).
- Usable for linear and rotary movements.
- Incremental or absolute measurement.
- All usual interfaces/field buses.
- Application-specific adaptation of the spring encoder arm (adjustable pressing force).
- Compensation of application tolerances.

Robust and cost-efficient

- Simple mounting.
- Steel-reinforced plastic belt.
- Robust Sendix encoders.
- Wide temperature range of -25°C ... +80 °C.
- High traversing speed up to 5 m/s.

Single components Limes Kit TB1:

Spring encoder arm 8.0010 . 7000 . 0010



Encoder (See the table of recommended encoders)

All incremental or absolute Sendix encoders with clamping flange (centering collar 36 mm) and 10 mm shaft diameter (shaft 10x20 mm) can be used.

Pulley 8.0000 . **A** **X** **X** **1** . **XXXX**

Preferred types with short delivery time are shown in **bold underlined**



a Material
1 = aluminum
2 = plastic

b Width
1 = 10 mm [0.39"]
2 = 20 mm [0.79"]

c Pitch circumference
0360 = 360 mm

c Other pitch circumferences on request
0300 = 300 mm 0150 = 150 mm
0240 = 240 mm 0120 = 120 mm
0220 = 220 mm 0100 = 100 mm

Toothed belt 8.0000 . **B** **1** **X** **1** . **XXXX**

Preferred types with short delivery time are shown in **bold underlined**



a Width
1 = 10 mm [0.39"]
3 = 25 mm [0.94"]
4 = 50 mm [1.97"]

b Length [in dm]¹⁾, ex.:
0010 = 1 m [3.28"]
0020 = 2 m [6.56"]
...
1000 = 100 m [328"]

Optional on request:
length > 100 m

1) Yard ware (1 m, 2 m, ... 100 m), lengths > 100 m on request.

Length measuring kit with spring encoder arm	Limes Kit TB1	Standard measuring length up to 100 m Application-specific adaptation
---	----------------------	--

Recommended encoders, incremental

Encoder	Interface	Power supply	Type of connection	Pulley circumference [mm]	Recommended encoder resolution (pulse number)	mm / pulse	Order no.
Sendix 5000	push-pull with inverted signal	10 ... 30 V DC	1 x radial M12 connector	360	3600	0.1	8.5000.8354.3600
				300	3000	0.1	8.5000.8354.3000
				240	240	1.0	8.5000.8354.0240
				220	2500	0.088	8.5000.8354.2500
				150	1500	0.1	8.5000.8354.1500
				120	1200	0.1	8.5000.8354.1200
				100	1000	0.1	8.5000.8354.1000

Recommended encoders, absolute

Encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option	Order no.
Sendix M5861	analog, 4 ... 20 mA	10 ... 30 V DC	1x radial M12 connector	12 bit (4096)	scalable with limit switch function	8.M5861.3534.3312
	analog, 0 ... 10 V	10 ... 30 V DC	1x radial M12 connector	12 bit (4096)	scalable with limit switch function	8.M5861.3544.4312
	analog, 0 ... 5 V	10 ... 30 V DC	1x radial M12 connector	11 bit (2048)	scalable with limit switch function	8.M5861.3544.5312
Sendix M5863	SSI	10 ... 30 V DC	1x radial M12 connector	4096 ppr / SSI Gray code	-	8.M5863.3524.G222
Sendix M5868	CANopen	10 ... 30 V DC	1x radial M12 connector	CANopen encoder profil DS406 V4.0	-	8.M5868.3524.2122

Further encoders, absolut

Encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Option	Order no.
Sendix F5863	SSI	10 ... 30 V DC	1x radial M12 connector	4096ppr / SSI Gray code	SET button + status LED	8.F5863.1226.G223
Sendix 5863	SSI	10 ... 30 V DC	1x radial M12 connector	4096ppr / SSI Gray code	SET button + status LED	8.5863.1226.G233
Sendix F5868	CANopen	10 ... 30 V DC	1x radial M12 connector	CANopen encoder profil DS406 V3.2	SET button	8.F5868.122E.2123
Sendix 5868	CANopen	10 ... 30 V DC	2x radial M12 connector	CANopen encoder profil DS406 V3.2	SET button	8.5868.1222.2123
Sendix 5868	PROFIBUS	10 ... 30 V DC	3x radial M12 connector	Profibus-DP V0 encoder profil class 2	SET button	8.5868.1232.3113
Sendix 5868	EtherCAT	10 ... 30 V DC	3x radial M12 connector	EtherCAT with CoE 3.2.10	-	8.5868.12B2.B212
Sendix 5868	PROFINET IO	10 ... 30 V DC	3x radial M12 connector	PROFINET encoder profil version 4.1	-	8.5868.12C2.C212
Sendix F5868	EtherNet/IP	10 ... 30 V DC	3x radial M12 connector	EtherNet/IP	-	8.F5868.12AN.A222

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclometers
 Connection technology
 Accessories
 Addresses

Linear measuring technology

Length measuring kit with spring encoder arm	Limes Kit TB1	Standard measuring length up to 100 m Application-specific adaptation
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Technical data

Total system	
Temperature range	-25°C ... +80°C [-13°F ... +176°F]
Max. traversing speed	5 m/s
IP protection	depends on the encoder used (refer to the encoder data sheet)

Spring encoder arm	
Material	aluminum
Spring force = maximum pressing force on the toothed belt	max. 40 N
Minimum pressing force of the pulley on the toothed belt	min. 20 N (ca. 20 N = 1 notch/position)

Encoder	
Technical data	depends on the encoder used (refer to the encoder data sheet)
Flange type	All encoders with clamping flange (centering collar 36 mm) and 10 mm shaft can be used

Pulley	
Material	aluminum or plastic (POM-C)
Width	10 / 20 mm
Pitch circumference	100 ... 360 mm
Number of teeth	20 ... 72
Toothing type	HD60 – 5M
Pitch	5 mm

Toothed belt							
Material	steel-reinforced PU with polyamide fabric on the teeth side						
Adhesive basis	Modified acrylate						
Toothing type	RTD 5M						
Tooth strength	37.8 N/cm belt width						
Bend radius	min. 30 mm						
Width	10 mm, 25 mm, 50 mm (others on request)						
Height	3.8 mm						
Length tolerance	± 0.8 mm/m						
Width tolerance	± 0.5 mm						
Weight	<table border="0"> <tr> <td>10 mm width</td> <td>40 g/m</td> </tr> <tr> <td>25 mm width</td> <td>100 g/m</td> </tr> <tr> <td>50 mm width</td> <td>195 g/m</td> </tr> </table>	10 mm width	40 g/m	25 mm width	100 g/m	50 mm width	195 g/m
10 mm width	40 g/m						
25 mm width	100 g/m						
50 mm width	195 g/m						

Technic in detail

Overview belt pulley

Number of teeth	Pitch [mm]	Diameter in mm ["]	Pitch diameter ¹⁾ in mm ["] (pitch x no of teeth) / π	Pitch circumference in mm (pitch x no of teeth) or (Pitch diameter x π)	Order no. B = pulley width x = material (1 = aluminum, 2 = plastic)	
					B = 10 mm	B = 20 mm
72	5	113.45 [4.47]	114.59 [4.51]	360	8.000.Ax11.0360	8.000.Ax21.0360
60	5	94.35 [3.71]	95.49 [3.76]	300	8.000.Ax11.0300	8.000.Ax21.0300
48	5	75.25 [2.96]	76.39 [3.01]	240	8.000.Ax11.0240	8.000.Ax21.0240
44	5	68.89 [2.71]	70.03 [2.76]	220	8.000.Ax11.0220	8.000.Ax21.0220
30	5	46.61 [1.84]	47.75 [1.88]	150	8.000.Ax11.0150	8.000.Ax21.0150
24	5	37.06 [1.46]	38.19 [1.50]	120	8.000.Ax11.0120	8.000.Ax21.0120
20	5	30.69 [1.21]	31.83 [1.25]	100	8.000.Ax11.0100	8.000.Ax21.0100

Resolution examples with encoder (incremental / absolut)

Incremental encoder Sendix 5000		
Pitch circumference [mm]	360	360
Pulses / revolution [ppr]	360	3600
Pulses / mm	1	10
Resolution	1	0.1

Absolut encoder Sendix 5863 (12 bit ST) or M5868 (12 bit ST, programmable via bus)		
Pitch circumference [mm]	360	
Pulses / revolution [ppr]	4096	
Pulses / mm	~ 11.5	
Resolution	~ 0.088	

1) The pitch diameter of the pulley is always larger than the diameter of the pulley, as the height of the belt must be considered

Length measuring kit with spring encoder arm

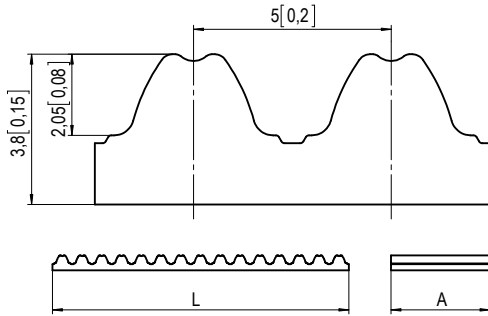
Limes Kit TB1

Standard measuring length up to 100 m
Application-specific adaptation

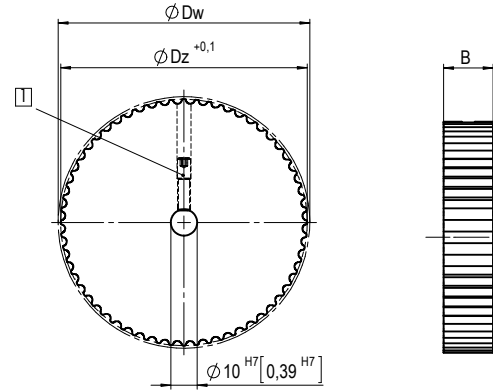
Dimensions

Dimensions in mm [inch]

Toothed belt



Pulley



1 Set screw M5 (SW.5)
recommended tightening torque 2.0 Nm

Width toothed belt A	Width pulley B	No of teeth	Pitch diameter $\varnothing Dw$	Tooth geometry $\varnothing Dz^{+0,1}$	Distance to toothed belt R ± 1
10 [0.39] 25 [0.98] 50 [1.97]	10 [0.39] 20 [0.79]	72	114.59 [4.51]	113.45 [4.47]	58.6 [2.31]
		60	95.49 [3.76]	94.35 [3.71]	49.0 [1.93]
		48	76.39 [3.01]	75.25 [2.96]	40.9 [1.61]
		44	70.03 [2.76]	68.89 [2.71]	36.3 [1.43]
		30	47.75 [1.88]	46.61 [1.84]	25.1 [0.99]
		24	38.19 [1.50]	37.06 [1.46]	20.4 [0.80]
		20	31.83 [1.25]	30.69 [1.21]	17.2 [0.68]

C = see encoder data sheet

L = yard ware (1 m, 2 m, ... 100 m)
other lengths > 100 m on request

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Absolute encoders
multiturn

Bearingless encoders

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Linear measuring technology

Length measuring kit mini measurement system	Measuring wheel system, incl. encoder	Incremental
---	--	--------------------



Very compact mini measurement system with incremental interface.

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Incremental encoders

Absolute encoders
singleturn

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Inclinometers

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Accessories

Addresses

Easy to install

- The measuring wheel, the sensor and the fastening are pre-assembled and thus easy to install:
fix – connect – ready-to-go.

Compact construction

- Dimensions of the whole unit 74 x 50 x 52 mm.
- Measuring wheel circumference 100 mm.

Order code 05.2400.0040.1000.50 **XX**
a

Resolution
0.1 mm

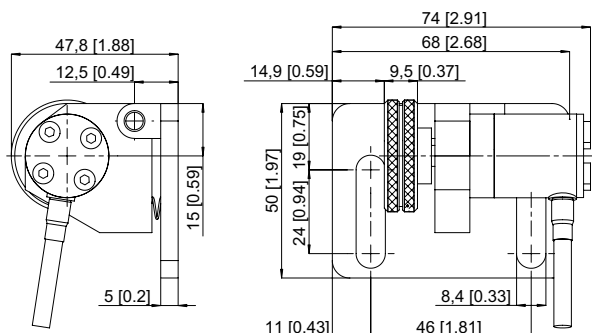
Cable outlet
radial cable, 2 m [6.56'] PVC

a *Measuring wheel*
45 = knurled aluminum
49 = rubber, Shore 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

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.

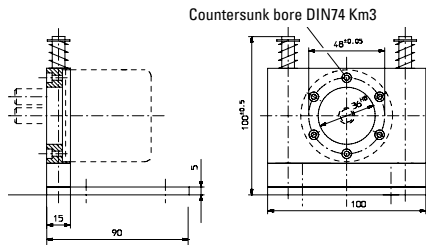
Typical areas of application are:

- Wood working industry
- Textile industry
- Handling and automation technology
- Mechanical engineering / special machines

Single components

Order no.

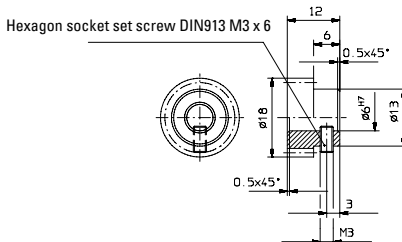
Flexible holding device for encoders



Guide rods stainless steel
Flange Al

8.0010.7000.0004

Pinion for displacement measuring device

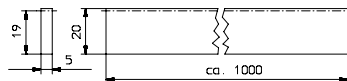


Material free-cutting steel
Surface burnished
Module pitch approx. 1
No of teeth 16

with bore diameter \varnothing 6 mm [0.24"]
with bore diameter \varnothing 10 mm [0.39"]

8.0010.7000.0002
8.0010.7000.0006

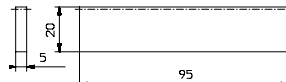
Rack



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

923 LCD preset counter, 10 ... 30 V DC, 1 preset
923 LCD preset counter 100 ... 240 V AC, 1 preset

6.923.0100.300
6.923.0100.000

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

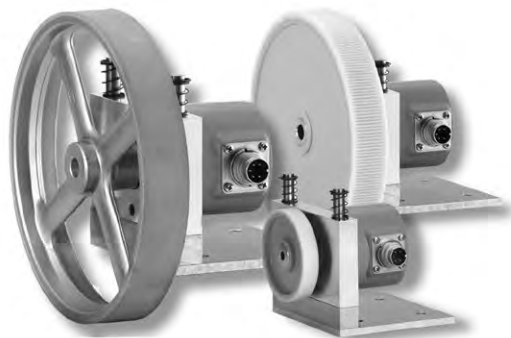
Connection technology

Accessories

Addresses

Linear measuring technology

Length measuring kits with measuring wheel	Measuring wheelsystem incl. encoder / preset counter	Incremental / absolute
---	---	-------------------------------



The (metric) measuring kit is a complete solution for the quick and simple implementation of length measurements on products in movement.

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

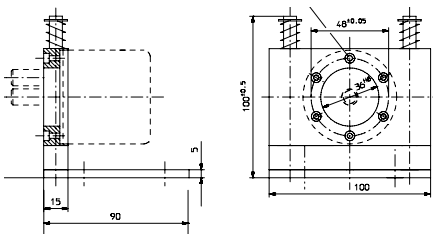
Inclinometers

Connection technology

Accessories

Addresses

Flexible	Easy operation
<ul style="list-style-type: none"> Various measuring wheels for various applications: <ul style="list-style-type: none"> - Hytrel for the textile industry. - Vulkollan for the wood, paper, metal and plastics industry. Resolution 1 mm. 	<ul style="list-style-type: none"> The encoder support ensures an optimal load on the encoder shaft. No additional power supply is required for the encoder, since it can be powered directly by the preset counter.

Single components	Order no.
Flexible holding device for encoders 	8.0010.7000.0004
Guide rods stainless steel Flange Al	8.0010.7000.0010
Spring encoder arm	8.0000.3297.0010
Measuring wheels	0.2 m measuring wheel, plastic corrugated 8.0000.3547.0010 0.5 m measuring wheel, plastic smooth 8.0000.3597.0010 0.5 m measuring wheel, plastic corrugated 8.0000.3597.0010
Encoder	Sendix 5000 for 0.2 m measuring wheel, 1 mm resolution 8.5000.8354.0200 Sendix 5000 for 0.5 m measuring wheel, 1 mm resolution 8.5000.8354.0500
Standard cordset	with 2 m [6.56'] PVC cable, M12 05.00.6041.8211.002M
Preset counter	923 LCD preset counter, 10 ... 30 V DC, 1 preset 6.923.0100.300

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.

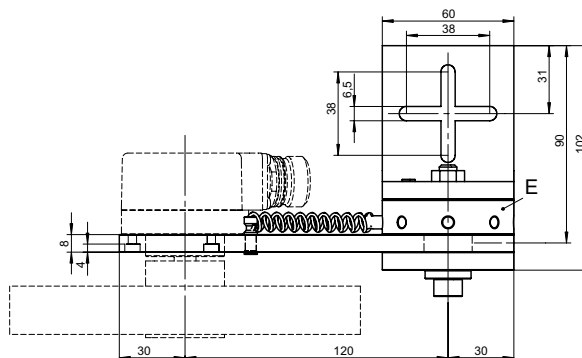
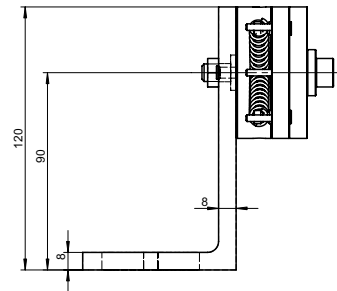
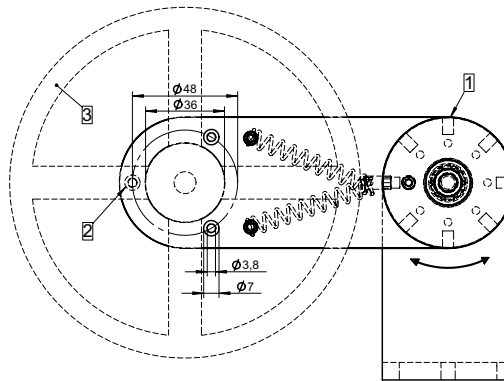
Order code

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



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multiturn

Bearingless
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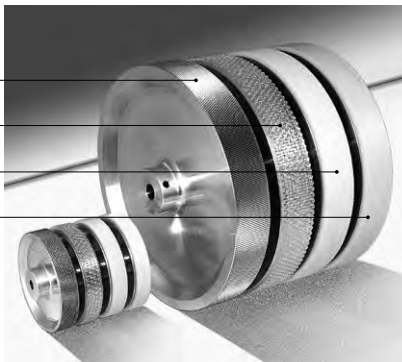
Accessories

Addresses

Linear measuring technology

Length measuring kits measuring wheels Various wheel coatings

	a
Diamond knurl	217 / 517
Tufted rubber	267 / 567
Plastic corrugated	297 / 597
Plastic smooth	247 / 547



Measuring wheels for measuring the length of products in movement, e.g. in the paper, metal, textile, wood or plastic industry.

Various tires to meet the requirements of the various surfaces of the product to be measured – various diameters, designed for use with Kübler encoders, available for metric and imperial systems.

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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 / ø / width	Profile measuring wheels (see above)	Coating	Coating hard- ness Shore A	Wheel no. a	Weight	Standard bore b ¹⁾	Material of wheel body	Working temperature
0.2 m / ø 63.7 mm / 12 mm [7.87" / ø 2.51" / 0.47"]	1	diamond knurl (aluminum)		217	60 g [2.12 oz]	06 = 6 mm [0.24"] 10 = 10 mm [0.39"]	aluminum	-30°C ... +80°C [-22°F ... +176°F]
	2	plastic (polyurethane) smooth	90	247	60 g [2.12 oz]			
	3	tufted rubber (polyurethane)	60	267	60 g [2.12 oz]			
	4	plastic (polyurethane) corrugated	90	297	60 g [2.12 oz]			
0.5 m / ø 159.2 mm / 25 mm [19.69" / ø 6.27" / 0.98"]	1	diamond knurl (aluminum)		517	775 g [27.34 oz]	10 = 10 mm [0.39"]	aluminum	-30°C ... +80°C [-22°F ... +176°F]
	2	plastic (polyurethane) smooth	90	547	700 g [24.69 oz]			
	3	tufted rubber (polyurethane)	60	567	700 g [24.69 oz]			
	4	plastic (polyurethane) corrugated	90	597	700 g [24.69 oz]			
12" / ø 3.82" / 0.38"	5	natural rubber (NR) smooth		751	100 g [3.53 oz]	10 = 10 mm [0.39"]	aluminum	-30°C ... +80°C [-22°F ... +176°F]

1) Other bore diameters on request

Linear measuring technology

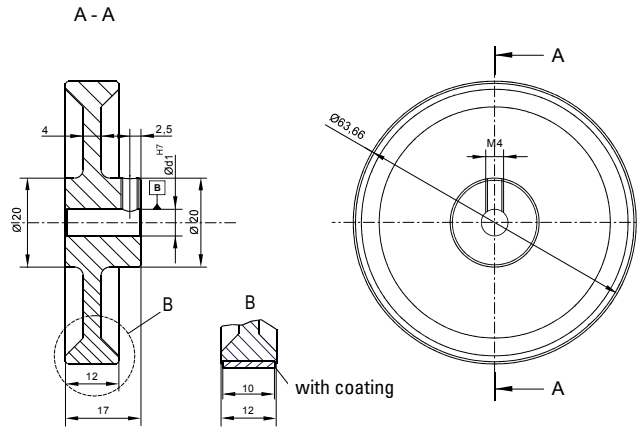
Length measuring kits measuring wheels

Various wheel coatings

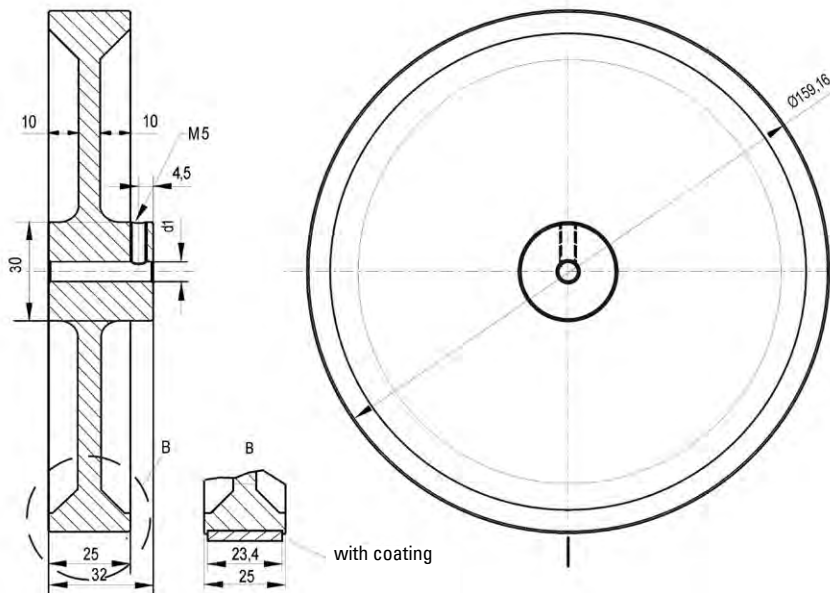
Dimensions

Dimensions in mm [inch]

Measuring wheel no. 2XX



Measuring wheel no. 5XX



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Absolute shaft copying system	LEB01	Measuring range up to 392 m Absolute position measurement
--------------------------------------	--------------	--



LEB01 is an extremely robust, compact and non-contact measuring system. Elevator car absolute position values are measured slip-free with a resolution of 1 mm and a traverse speed of 5 m/s. Additional components such as magnetic switches are no longer needed. Especially the easy mounting reduces installation time, thus contributing to overall costs reduction.



 392 m Wide measuring range	 1 mm Resolution	 Easy installation	 Compact	 Robust	 Shock / vibration resistant	 Reverse polarity protection	 -5° ... +70°C Temperature range
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Characteristics

- Absolute position measurement.
- Measuring length up to 392 m.
- Extremely robust and compact.
- Stainless steel code tape.
- Simple mounting.
- Non-contact measuring system.

Benefits

- 100% slip-free thanks to absolute position measurement directly on the elevator car.
- Elimination of additional sensors in the elevator shaft (magnetic switches).
- Highest elevator availability - no referencing required in case of power failure.
- Costs reduction thanks to lower installation and maintenance requirements.
- Suitable for tight installation spaces.
- Robust design for long service life.

Order code	8.LEB01	X	11	X
Sensor	Type	a	b	
a Interface	b Type of connection	<i>Optional on request - other interfaces</i>		
3 = CANopen LIFT (DS417)	1 = cable, 5 m [16.40'], 4-pin, shielded, open cable end (for CANopen)	<i>Stock type</i>		
4 = SSI	3 = cable, 5 m [16.40'], 6-pin, shielded, open cable end (for SSI)	8.LEB01.3111		

Order code	8.LEX.BA	.XXXX
Code tape, absolute	Type	a
a Measuring lengths	<i>Standard lengths</i>	<i>Stock types</i>
XXXX = lengths in meters	0010 = 10 m	0010 = 10 m
lengths from 30 m available in 10 m steps, max. 392 = 0392	0020 = 20 m	0015 = 15 m
lengths < 30 m – only standard lengths or stock types can be ordered	0030 = 30 m	0020 = 20 m
	0050 = 50 m	0025 = 25 m
	0070 = 70 m	
	0100 = 100 m	

Accessories	Order no.
Mounting kit, absolute shaft copying system	8.LEB.MK.0001
for LEB01	

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Absolute shaft copying system	LEB01	Measuring range up to 392 m Absolute position measurement
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Technical data

Mechanical characteristics sensor LEB01

Code	absolute, 16 bit
Max. measuring length	392 m
Speed	5 m/s
Resolution	1 mm
System accuracy	±1 mm
Repeat accuracy / relative accuracy	±1 mm
Type of connection	cable 5 m with open end
Max. acceleration	49.1 m/s ² (5 G)
Weight	500 g [17.64 oz]
Housing (material)	aluminum
Dimensions	L x W x H 135 x 45 x 33 mm [5.31 x 1.77 x 1.30"]

Electrical characteristics sensor LEB01

Power supply	10 ... 30 V DC ±10%
Reverse polarity protection	yes
Interfaces	SSI, CANopen Lift DS417 (other on request)

Environmental conditions sensor LEB01

Protection acc. to EN60529	IP30
Humidity	< 90 % (non condensing)
Working temperature	-5°C ... +70°C [+23°F ... +158°F]
Storage temperature	-10°C ... +70°C [+14°F ... +158°F]
Air pressure (operating altitude)	800 ... 1013 hPA (up to 2000 m above NN)

Technical data tape LEX.BA

Material	V2A spring-loaded stainless steel, chamfered edges
Dimensions	16 x 0.4 mm [0.63 x 0.016"]
Max. length	392 m
Weight	50 g / m [1.76 oz/m]
Thermal expansion	16 x 10 ⁻⁶ / K between 20°C ... 100°C

Technical data mounting kit LEB.MK

Dimensions	see manual
Material	see manual

Standards / Directives / Certificates

Standards	
safety rules for elevators	EN81.20, EN81.50
EMV emission	EN12015
EMV immunity	EN12016
vibration resistance	EN60068-2-6
shock resistance	EN60068-2-27
environmental conditions	EN60068-2-14
Directives	
low voltage directive	2014/35/EU
EMV directive	2014/30/EU
elevator directives	2014/33/EU
RoHs directive	2011/65/EU
CE compliant	Yes

Interface characteristics CANopen Lift (standard factory setting)

Bitrate	250 kbit/s
Identifier	0x18C
Node ID	0x04
Eventimer	10 ms
Resolution	1 mm
Heartbeat	500 ms
Terminated	yes

Interface characteristics SSI (standard factory setting)

Data transfer	in slave mode double data transmission
Resolution	0.25 mm
Data length	25 bit + 1 power failure bit (Low)
MSB	first
Code	gray
Clock rate	max. 200 kHz
Monoflop time	min. 500 µs

A position value must be read by the SSI master over 52 pulses.

- 1 ... 25: MSB first absolute position in gray code
- 26: Data low (PFB)
- 27 ... 51: Second transmission (see 1-25)
- 52: Data Low (PFB)

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Absolute shaft copying system	LEB01	Measuring range up to 392 m Absolute position measurement
--------------------------------------	--------------	--

Terminal assignment

Interface	Type of connection	Cable				
3 CANopen Lift (DS417)	1	Signal:	+V	0 V / GND	CAN_H	CAN_L
		Core color:	BN	WH	GN	YE

Interface	Type of connection	Cable						
4 SSI	3	Signal:	+V	0 V / GND	C+	C-	D+	D-
		Core color:	BN	WH	GN	YE	GY	PK

- +V: Power supply +V DC
- 0 V: Power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal

Technology in detail

Code tape fastening

LEB01 stands out in particular for its ease of installation. This saves time and costs.

Elevator functions	Standards	Base sensor
Calibration trip	-	√
Inspection operation switch (top & bottom)	EN 81-20	√
Direct drive in - depending on complete drive module / frequency converter	-	√
Switchover or shutoff points definition	-	√
Overspeed inspection drive	EN 81-20	√

Absolute shaft copying system

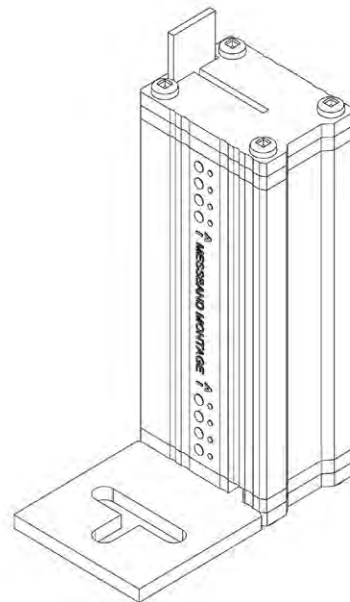
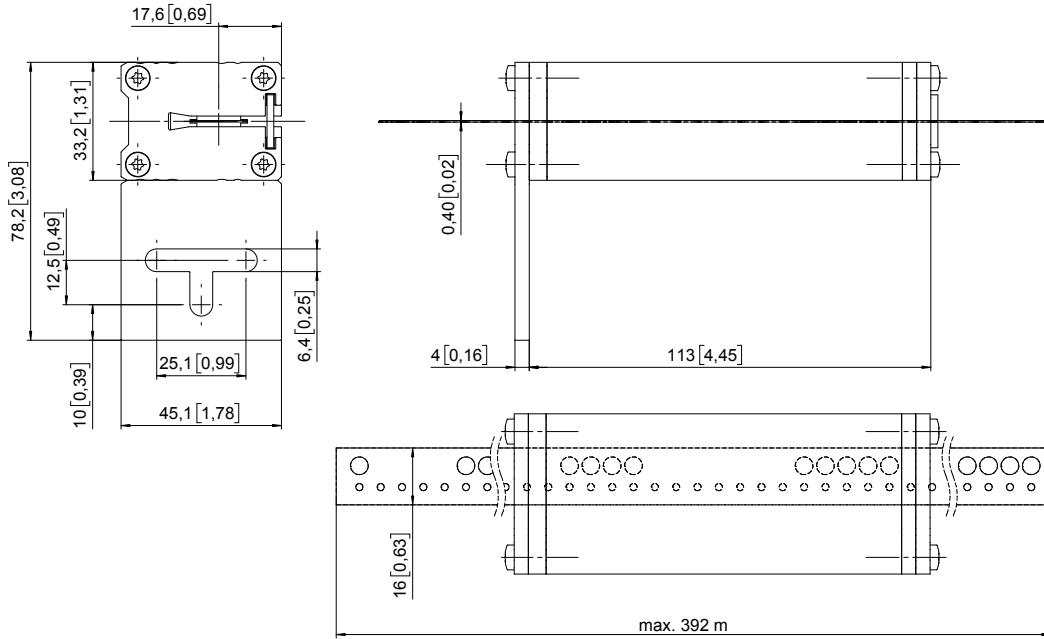
LEB01

Measuring range up to 392 m
Absolute position measurement

Dimensions

Dimensions in mm [inch]

Sensor



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Lift measuring system for shaft-copying **Encoder mounting fixture, guided-belt, LM3** **max. height 53 m**



System for shaft-copying, with complete mechanical kit in proven toothed belt technology.

A smooth-running toothed belt and a vibration-resistant encoder mounting fixture ensure quiet operation. The belt pulley benefits from separate bearing supports in the mounting fixture, so protecting the installed encoder from mechanical overloading. With the guided-belt system, the encoder mounting fixture and the measuring wheels are located on the lift car.



Ideal for use in passenger lifts, freight lifts, automatic storage systems.

Complete system

- Fast and easy installation with accessories from one single source.
- Reduced load on encoder bearings due to separate belt pulley-bearings.
- Non-slip.
- Tensioning rollers with belt guide.

Minimal noise generation

- Smooth-running toothed-belt ensures extremely quiet operation.
- Vibration-free operation.

Order code **8.LM3.01**

Encoder mounting fixture with measuring wheels for fixing on the lift car

Consists of:

- Encoder mounting fixture
- Mounted measuring wheel
- Belt guide
- Belt fixing and tensioning set
- Screws and other small components

Suitable encoders:

- Incremental encoder: 8.5000.83XX.XXXX

calculation of pulse rate ppr =

$$\frac{300 \text{ mm}}{\text{resolution, e.g. } 0.5 \text{ mm}} = 600$$

- Absolute encoders:
SSI: 8.5863.12XX.XXXX
CANopen / CANopenLift: 8.5868.12XX.XXXX



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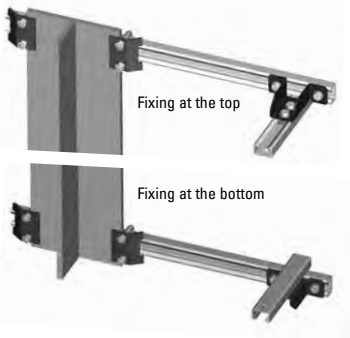

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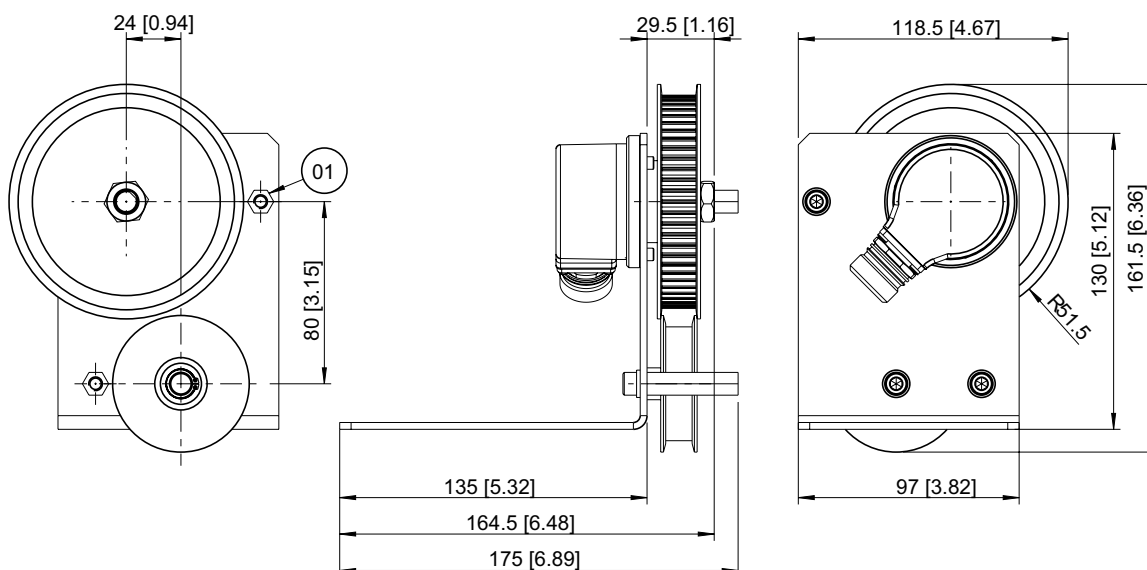
Elevator measuring system for shaft-copying	Encoder mounting fixture, guided-belt, LM3	max. height 53 m
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Accessories for encoder mounting fixture LM3	Order no.
<p>Fixing kit</p>  <p>Complete kit consists of:</p> <ul style="list-style-type: none"> - C-rails, 700 mm - Bracket - Screws - Other small components 	<p>8.BLM2.01</p>
<p>Toothed belt</p>  <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>	<p>05.ZAR1.XXX</p> <p>XXX = Length in meters Standard delivery lengths: 20 m, 25 m, 30 m, 35 m, 40 m, 45 m, 50 m, 55 m, 60 m, 70 m, 80 m, 90 m, 100 m, 120 m, 250 m, 300 m Other lengths on request</p>

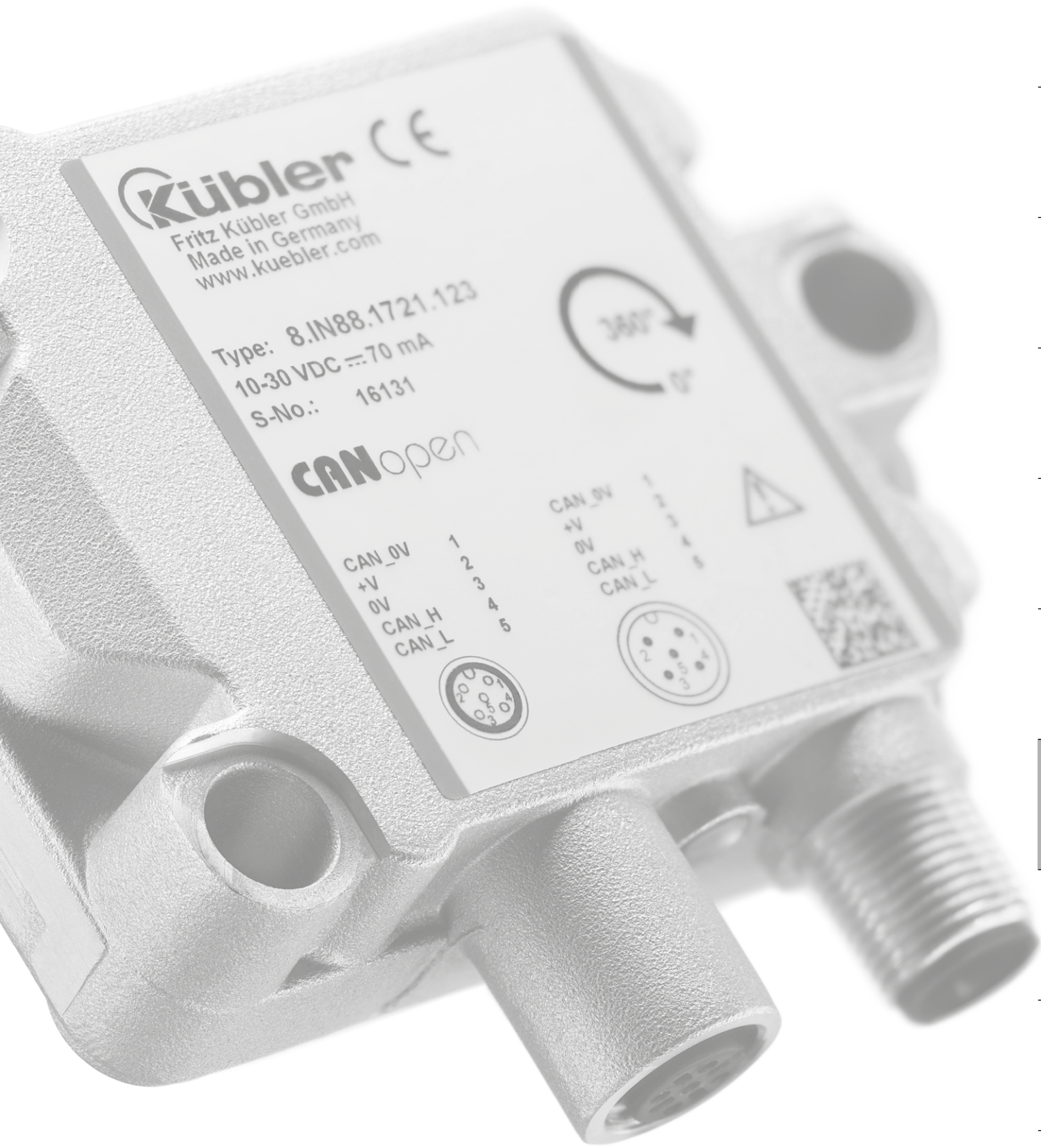
Technical data	
Resolution in the shaft	depends on the resolution of the encoder (e.g. incremental encoder with 3000 ppr = 0.1 mm; absolute encoder 12 x 12 bit < 0.1 mm)
Elevator car speed	max. 1.6 m/s
Max. height of lift	53 m
Effective circumference of belt pulley	300 mm

Dimensions

Dimensions in mm [inch]



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Kübler CE

Fritz Kübler GmbH
Made in Germany
www.kuebler.com

Type: 8.IN88.1721.123
10-30 VDC \pm 70 mA
S-No.: 16131

CANopen

CAN_0V 1
+V 2
0V 3
CAN_H 4
CAN_L 5



CAN_0V 1
+V 2
0V 3
CAN_H 4
CAN_L 5



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	 IN88, 1- and 2-dimensional	CANopen	599
	 IN88, 1- and 2-dimensional	Modbus	602
	IS40, 1-dimensional	Analog	606
	IS40, 2-dimensional	Analog	608
	IS60, 1-dimensional	CANopen	610
	IS60, 2-dimensional	CANopen	612

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**Inclinometer
MEMS / capacitive**

IN81, 1- and 2-dimensional

Analog



The inclinometers of the IN81 series allow measuring 2-dimensional inclinations in the range of $\pm 85^\circ$ or 1-dimensional inclinations up to 360° .

With their high robustness, their protection level up to max. IP69k and their wide temperature range from -40°C to $+85^\circ\text{C}$, these devices are ideally suitable for outdoor use – e.g. for mobile automation applications.



Analog
output



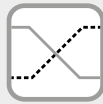
High protection level



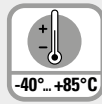
Shock / vibration resistant



Reverse polarity protection



Redundancy



Temperature range

Robust

- High protection rating IP67 and IP69k in one device.
- Highest robustness thanks to metal housing.
- Stable accuracy over the whole temperature range from -40°C up to $+85^\circ\text{C}$.
- Non long-term drift thanks to sensor array technique.

Versatile

- Preset and teach function.
- Measuring direction 1- or 2-dimensional.
- With switch outputs.
- Stacked installation possible for redundancy.

Order code

8.IN81 . XXXX . X2X
Type a b c d e f g

a Measuring direction

- 1 = 1-dimensional
- 2 = 2-dimensional

b Measuring range

- 1 = $\pm 10^\circ$ ¹⁾
- 2 = $\pm 15^\circ$ ¹⁾
- 3 = $\pm 30^\circ$ ¹⁾
- 4 = $\pm 45^\circ$ ¹⁾
- 5 = $\pm 60^\circ$ ¹⁾
- 6 = $\pm 85^\circ$ ¹⁾
- 7 = 0 ... 360° ($\pm 180^\circ$) ²⁾
- 8 = 0 ... 180° ($\pm 90^\circ$) ²⁾

c Interface

- 1 = 4 ... 20 mA / 12 bit
- 2 = 0.1 ... 4.9 V / 12 bit
- 3 = 0.5 ... 4.5 V / 12 bit
- 4 = 0 ... 5 V / 12 bit
- 5 = 0 ... 10 V / 12 bit

d Filter

- 1 = no filter
- 2 = filter value 0.1 Hz
- 3 = filter value 0.3 Hz
- 4 = filter value 0.5 Hz
- 5 = filter value 1.0 Hz
- 6 = filter value 2.0 Hz
- 7 = filter value 5.0 Hz
- 8 = filter value 10.0 Hz

e Optional switching outputs

- 1 = none
- 2 = 2 switch outputs ³⁾

f Power supply

- 2 = 10 ... 30V / 40 mA
- 15 ... 30 V for interface 5

g Type of connection


- 1 = 1 x M12 connector, 8-pin
- 3 = 2 x M12 connector, 8-pin + 5-pin ⁴⁾

1) Can only be ordered in conjunction with measuring direction 2-dimensional.
2) Can only be ordered in conjunction with measuring direction 1-dimensional.
3) Can only be ordered in connection with type of connection 3.
4) Can only be ordered in connection with option 2 switching outputs.

Inclinometers

Inclinometer MEMS / capacitive	IN81, 1- and 2-dimensional	Analog
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Accessories	Order no.
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Teach adapter 	for controlling the control inputs for the following functions: - Preset (reference point setting) - Teaching (measuring range) - Filter setting - Switching points setting	8.0010.9000.0017
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Connection technology	Order no.
------------------------------	-----------

Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 5 m [16.40'] PVC cable	05.00.6041.8211.005M
	M12 male connector with external thread, 5-pin ¹⁾ 5 m [16.40'] PVC cable	05.00.6091.A411.005M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 8-pin	05.CMB 8181-0
	M12 male connector with external thread, 5-pin ¹⁾	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

Electrical characteristics current interface		
Power supply	10 ... 30 V DC	
Current consumption (no load)	max. 40 mA ²⁾	
Reverse polarity protection of the power supply	yes	
PowerON Time (PowerOn until valid output value)	< 0.5 s	
Measuring axes	1 or 2	
Measuring range	1-dimensional	180° / 360°
	2-dimensional	max. ±85° (see order code)
Resolution	12 bit	
Accuracy at 25°C³⁾	1-dimensional	typ. ±1.0°
	2-dimensional	typ. ±0.5°
Repeat accuracy	±0.2°	
Transverse sensitivity⁴⁾	typ. ±0.3°	
Temperature coefficient	1-dimensional	typ. ±0.005 % / K
	2-dimensional	typ. ±0.015 % / K
Output load	at 10 VDC	max. 200 Ohm
	at 24 VDC	max. 900 Ohm
	at 30 VDC	max. 1200 Ohm
Setting time	< 1 ms (R _{Burden} = 900 Ohm, 25°C)	
Sampling rate	50 Hz (20 ms)	
Limit frequency with Butterworth filter	0.1 ... 10 Hz, 8th order	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	
UL approval⁶⁾	file 224618	
E1 type-approval	10R-058255	

Electrical characteristics voltage interface		
Power supply	0.1 ... 4.9 V / 0.5 ... 4.5 V / 0 ... 5 V	10 ... 30 V
	0 ... 10 V	15 ... 30 V
Current consumption (no load)	max. 40 mA ²⁾	
Reverse polarity protection of the power supply	yes	
PowerON Time (PowerOn until valid output value)	< 0.5 s	
Measuring axes	1 or 2	
Measuring range	1-dimensional	180° / 360°
	2-dimensional	max. ±85° (see order code)
Resolution	0 ... 5 V / 0 ... 10 V	12 bit
	0.1 ... 4.9 V / 0.5 ... 4.5 V	11 bit
Accuracy at 25°C⁵⁾	1-dimensional	typ. ±1.0°
	2-dimensional	typ. ±0.5°
Repeat accuracy	±0.2°	
Transverse sensitivity⁴⁾	typ. ±0.3°	
Temperature coefficient	1-dimensional	typ. ±0.0015 % / K
	2-dimensional	typ. ±0.005 % / K
Output load	max. 10 mA	
Setting time	< 1 ms (R _{Burden} = 1000 Ohm, 25°C)	
Sampling rate	50 Hz (20 ms)	
Limit frequency with Butterworth filter	0.1 ... 10 Hz, 8th order	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	
UL approval⁶⁾	file 224618	
E1 type-approval	10R-058255	

1) For variant with switching outputs.
 2) Max. 270 mA under full load on both switching outputs.
 3) Over the whole temperature and max. measuring range; 1 dim ≤ ±2.3°, 2 dim ≤ ±1.9°.
 4) Only for 2-dimensional measuring direction.

5) Over the whole temperature and max. measuring range; 1 dim ≤ ±1.2°, 2 dim ≤ ±0.8°.
 6) The IP protection class is not UL-tested. Verified by Kübler.
 A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

Inclinometers

Inclinometer MEMS / capacitive	IN81, 1- and 2-dimensional	Analog
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Mechanical characteristics		
Connection	1 x M12 connector 2 x M12 connector	8-pin, male connector 8-pin, male connector / 5-pin, female connector
Weight	approx. 185 g	
Protection acc. to EN 60529	IP67 + IP69k ¹⁾	
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]	
Material	housing	aluminum
Shock resistance	1000 m/s ² , 6 ms	
Vibration resistance	100 m/s ² , 10 ... 2000 Hz	
Dimensions	80 x 60 x 23 mm [3.15 x 2.36 x 0.91"]	

EMC		
Relevant standards	EN 61326-1	Electrical equipment for measurement, control and laboratory use
	EN 61000-6-2	Immunity for industrial environments
	EN 55011 Klasse B, EN 61000-6-3	Emitted interferences for residential environments
	EN ISO 14982	Agricultural and forestry machinery, electromagnetic compatibility, test methods and acceptance criteria ²⁾
	EN 13309	Construction machinery - Electromagnetic compatibility of machines with internal power supply ²⁾

Control inputs

Functions: Preset (reference point setting)
Teaching (measuring range)
Filter setting
Switching points setting

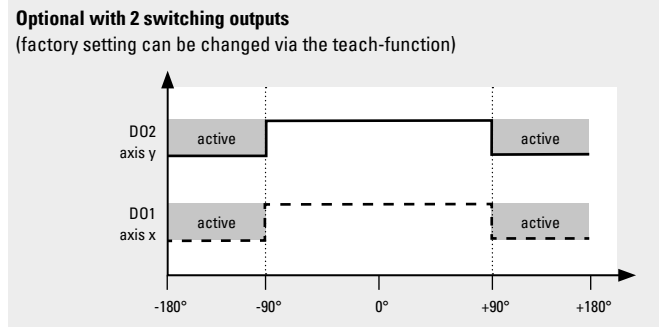
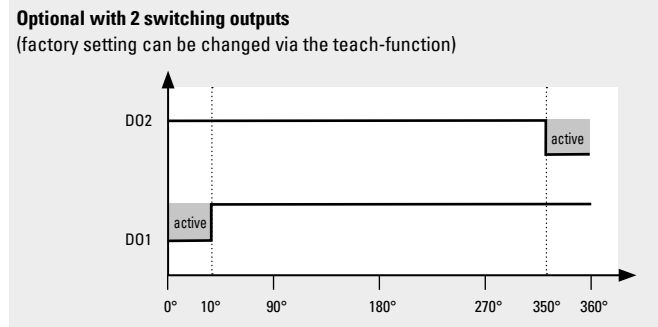
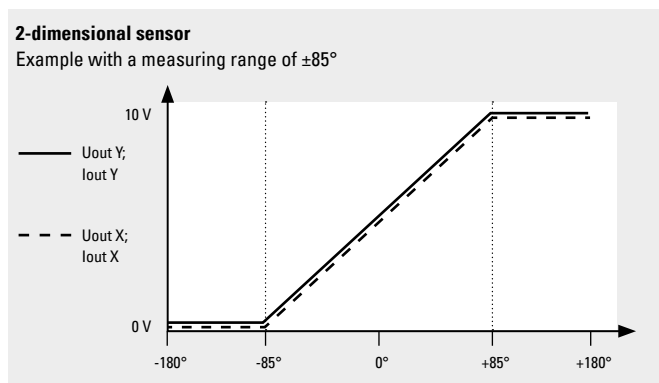
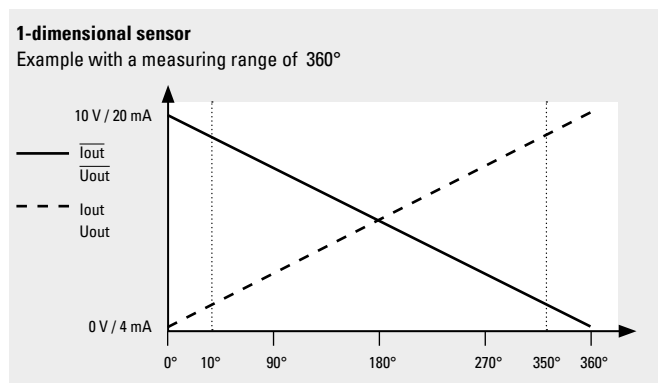
Switch output

optional: 2 switch outputs

Electrical characteristics		
Input	active HIGH	
Signal level	High Low	min. 60% of +V, max. +V max. 30% of +V
Min. pulse duration	+V for min. 1 s	

Electrical characteristics		
Permissible load	max. 100 mA	
Signal level (under max. load)	High Low	min. +V - 3.0 V max. 0.5 V
Short circuit proof outputs	yes	

Course of the output signal – factory setting



1) The IP protection class is not UL-tested. Verified by Kübler.
2) Without pulse 5.

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Terminal assignment, 1 dimensional

Interface 1 current	Type of connection 1	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	lout+	lout-	$\overline{\text{lout+}}$	$\overline{\text{lout-}}$	Pin:				1	2	3	4	5
Interface 1 current	Type of connection 3	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	lout+	lout-	$\overline{\text{lout+}}$	$\overline{\text{lout-}}$	Pin:				1	2	3	4	5
		Switching outputs option – M12 connector, 5-pin								Teach 1	Teach 2						
		Signal:	n.c.	DO1	DO2	n.c.	0 V	Pin:	1				2	3	4	5	
Interface 2, 3, 4, 5 voltage	Type of connection 1	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	Uout+	Uout-	$\overline{\text{Uout+}}$	$\overline{\text{Uout-}}$	Pin:				1	2	3	4	5
Interface 2, 3, 4, 5 voltage	Type of connection 3	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	Uout+	Uout-	$\overline{\text{Uout+}}$	$\overline{\text{Uout-}}$	Pin:				1	2	3	4	5
		Switching outputs option – M12 connector, 5-pin								Teach 1	Teach 2						
		Signal:	n.c.	DO1	DO2	n.c.	0 V	Pin:	1				2	3	4	5	

Terminal assignment, 2 dimensional

Interface 1 current	Type of connection 1	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	lout+ X	lout- X	lout+ Y	lout- Y	Pin:				1	2	3	4	5
Interface 1 current	Type of connection 3	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	lout+ X	lout- X	lout+ Y	lout- Y	Pin:				1	2	3	4	5
		Switching outputs option – M12 connector, 5-pin								Teach 1	Teach 2						
		Signal:	n.c.	DO1	DO2	n.c.	0 V	Pin:	1				2	3	4	5	
Interface 2, 3, 4, 5 voltage	Type of connection 1	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	Uout+ X	Uout- X	Uout+ Y	Uout- Y	Pin:				1	2	3	4	5
Interface 2, 3, 4, 5 voltage	Type of connection 3	M12 connector, 8-pin								Teach 1	Teach 2						
		Signal:	0 V	+V	Uout+ X	Uout- X	Uout+ Y	Uout- Y	Pin:				1	2	3	4	5
		Switching outputs option – M12 connector, 5-pin								Teach 1	Teach 2						
		Signal:	n.c.	DO1	DO2	n.c.	0 V	Pin:	1				2	3	4	5	

+V: Power supply +V DC
0V: Power supply ground GND (0 V)

Teach 1: Input 1 for various teaching functions
Teach 2: Input 2 for various teaching functions

Uout+ X: X axis voltage output
Uout- X: X axis voltage output GND
Uout+ Y: Y axis voltage output
Uout- Y: Y axis voltage output GND

lout+ X: X axis current output
lout- X: X axis current output GND
lout+ Y: Y axis current output
lout- Y: Y axis current output GND

1-axis version
DO1: Digital output 1
DO2: Digital output 2

Uout+: Voltage output
Uout-: Voltage output GND
 $\overline{\text{Uout+}}$: Inverted voltage output
 $\overline{\text{Uout-}}$: Inverted voltage output GND

1-axis version
lout+: Current output
lout-: Current output GND
 $\overline{\text{lout+}}$: Inverted current output
 $\overline{\text{lout-}}$: Inverted current output GND

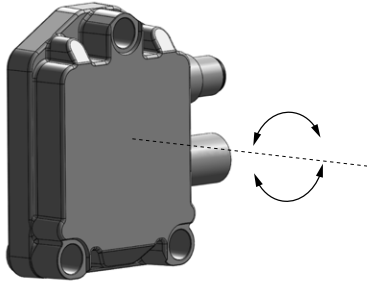
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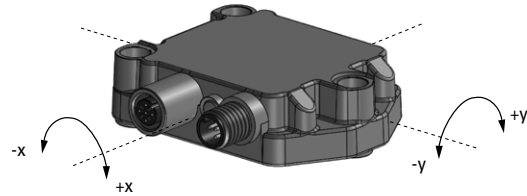
Inclinometer MEMS / capacitive	IN81, 1- and 2-dimensional	Analog
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Direction of inclination

1-dimensional



2-dimensional

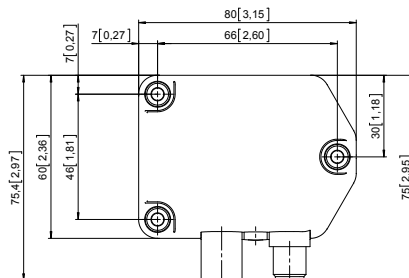
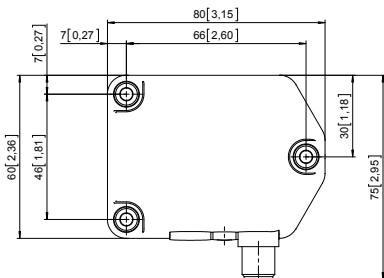
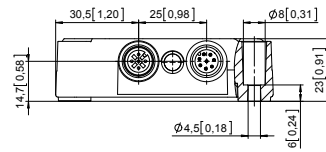
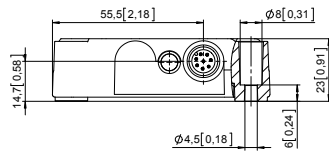


Dimensions

Dimensions in mm [inch]

1 x M12 connector 8-pin, male contacts

1 x M12 connector 8-pin, male contacts
1 x M12 connector 5-pin, female contacts



Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers

Connection
technology

Accessories

Addresses

Inclinometers

Inclinometer MEMS / capacitive	IN88, 1- and 2-dimensional	CANopen
---	-----------------------------------	----------------



The inclinometers of the IN88 series allow measuring 2-dimensional inclinations in the range of $\pm 85^\circ$ or 1-dimensional inclinations up to 360° .

With their high robustness, their protection level up to max. IP69k and their wide temperature range from -40°C to $+85^\circ\text{C}$, these devices are ideally suitable for outdoor use – e.g. for mobile automation applications.



Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

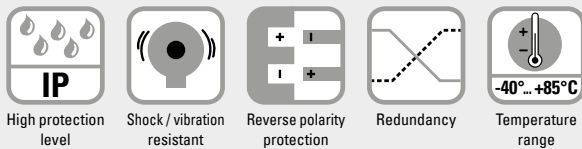
Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses



Robust

- High protection rating IP67 and IP69k in one device.
- Highest robustness thanks to metal housing.
- Stable accuracy over the whole temperature range from -40°C up to $+85^\circ\text{C}$.
- Non long-term drift thanks to sensor array technique.

Versatile

- Parameterizable filter.
- Measuring direction 1- or 2-dimensional.
- With 1 x M12 connector or 2 x M12-connector.
- Stacked installation possible for redundancy.

Order code

8.IN88.XX21.12X
Type a b c d e

- | | | | | |
|--|---|-----------------------------------|---|---|
| a Measuring direction
1 = 1-dimensional
2 = 2-dimensional | b Measuring range
6 = $\pm 85^\circ$ ¹⁾
7 = $0^\circ \dots 360^\circ$ ²⁾ | c Interface
2 = CANopen | d Power supply
2 = 10 ... 30 V DC | e Type of connection
1 = 1 x M12 connector, 5-pin
3 = 2 x M12 connector, 5-pin |
|--|---|-----------------------------------|---|---|

Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut for Bus in, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A211.005M
	M12 male connector with external thread for Bus out, 5-pin 5 m [16.40'] PVC cable	05.00.6091.A411.005M
Connector, self-assembly (straight)	M12 female connector with coupling nut for Bus in, 5-pin	05.B-8151-0/9
	M12 male connector with external thread for Bus out, 5-pin	05.BS-8151-0/9

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

1) Can only be ordered in conjunction with measuring direction 2-dimensional.
2) Can only be ordered in conjunction with measuring direction 1-dimensional.

Inclinometers

Inclinometer MEMS / capacitive	IN88, 1- and 2-dimensional	CANopen
---------------------------------------	-----------------------------------	----------------

Technical data

General electrical characteristics		
Power supply		10 ... 30 V DC
Current consumption (no load)		max. 70 mA
Reverse polarity protection of the power supply		yes
Measuring axes		1 or 2
Measuring range	1-dimensional 2-dimensional	360°, no limit stop ±85° (see order code)
Resolution		0.01°
Accuracy at 25°C¹⁾	1-dimensional 2-dimensional	typ. ±0.2° typ. ±0.4°
Repeat accuracy		±0.2°
Transverse sensitivity²⁾		typ. ±0.3°
Temperature coefficient		typ. ±0.006°/K
Sampling rate		50 Hz (20 ms)
Limit frequency with Butterworth filter factory setting		0.1 ... 10 Hz, 8th order 10 Hz
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
UL approval³⁾		file 224618
E1 type-approval		10R-058255

EMC		
Relevant standards	EN 61326-1	Electrical equipment for measurement, control and laboratory use
	EN 61000-6-2	Immunity for industrial environments
	EN 55011 Klasse B, EN 61000-6-3	Emitted interferences for residential environments
	EN ISO 14982	Agricultural and forestry machinery, electromagnetic compatibility, test methods and acceptance criteria
	EN 13309:2010-07	Construction machinery - Electromagnetic compatibility of machines with internal power supply

Mechanical characteristics		
Connection CAN	1 x M12 connector 2 x M12 connector	5-pin, male connector 5-pin, male connector / 5-pin, female connector
Weight		approx. 185 g [6.53 oz]
Protection acc. to EN 60529		IP67 / IP69k ³⁾
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	housing	aluminum
Shock resistance		1000 m/s ² , 6 ms
Vibration resistance		100 m/s ² , 10 ... 2000 Hz
Dimensions		80 x 60 x 23 mm [3.15 x 2.36 x 0.91"]

Interface characteristics CANopen	
Code	binary
Interface	CAN high-speed acc. to ISO 11898, Basic- and Full-CAN CAN specification 2.0 B
Protocol	CANopen profile DS410 V1.3 with manufacturer-specific add-ons, communication profile DS301 V4.2
Baud rate	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s software configurable
Node address	1 ... 127 software configurable
Termination switchable	software configurable
LSS protocol	DS305 layer setting services 2.2

General information on CANopen

The CANopen inclinometers support the latest CANopen communications profile according to DS301. In addition, device-specific profiles such as the inclinometer profile DS410 and DS305 (LSS) are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values and many other additional parameters can be programmed via the CAN bus. When switching the appliance on, all parameters are loaded from a flash memory. These parameters have previously been stored in a zero-voltage secure manner. The output values **position, position raw value, sensor temperature and sensor information** can be combined very variably as a PDO (PDO mapping). The inclinometers are available with one or two connectors.

The device address and baud rate can be set/modified by means of the software.

The two-color LED indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

LSS layer setting services DS305 V2.2

- Global command support for node address and baud rate configuration.
- Selective protocol via identity object (1018h).

CANopen communication profile DS301 V4.2

Among others, the following functionality is integrated (Class C2 functionality):

- NMT slave.
- Heartbeat protocol.
- Identity object.
- Error behavior object.
- Variable PDO mapping, 2 sending PDO's.
- Node address, baud rate and programmable CANbus termination.

CANopen inclinometer profile DS410 V1.3

The following parameters can be programmed:

- Variable PDO mapping of position, position raw value, sensor temperature and sensor information.
- Extended failure management.
- User interface with visual display of bus and failure status - 1 LED two-color.
- Customer-specific protocol.
- "Watchdog controlled" device.

1) Over the whole temperature and max. measuring range
1-dimensional ≤ ±0.4°; 2-dimensional ≤ ±1°.

2) Only for 2-dimensional measuring direction.

3) The IP protection class is not UL-tested. Verified by Kübler.

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

Inclinometers

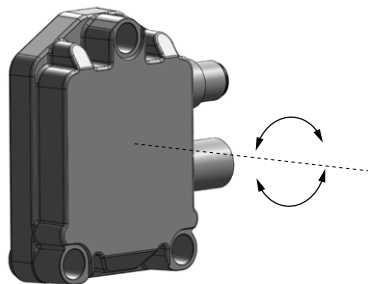
Inclinometer MEMS / capacitive	IN88, 1- and 2-dimensional	CANopen
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Terminal assignment

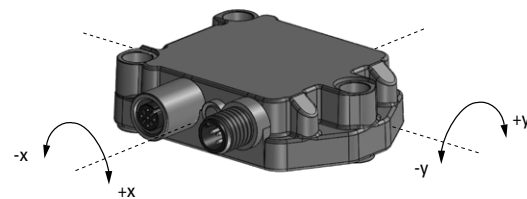
Interface	Type of connection	1 x M12 connector, 5-pin						
2	1	Bus IN						
		Signal:	+V	0 V	CAN_GND	CAN_H		CAN_L
		Pin:	2	3	1	4		5
Interface	Type of connection	2 x M12 connector, 5-pin						
2	3	Bus OUT						
		Signal:	+V	0 V	CAN_GND	CAN_H		CAN_L
		Pin:	2	3	1	4		5
		Bus IN						
		Signal:	+V	0 V	CAN_GND	CAN_H		CAN_L
		Pin:	2	3	1	4		5

Direction of inclination

1-dimensional



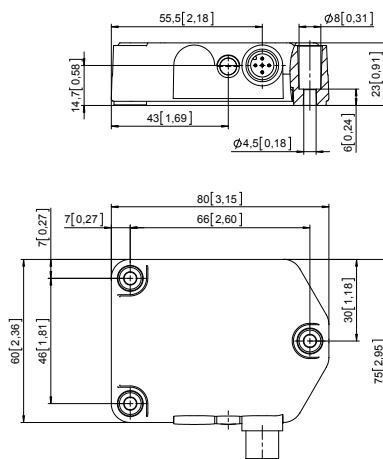
2-dimensional



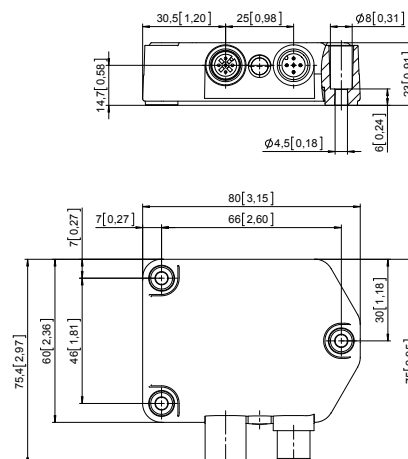
Dimensions

Dimensions in mm [inch]

1 x M12 connector 5-pin, male contacts



1 x M12 connector 5-pin, male contacts
1 x M12 connector 5-pin, female contacts



Product overview
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Inclinometers

**Inclinometer
MEMS / capacitive**

IN88, 1- and 2-dimensional

Modbus



The inclinometers of the IN88 series allow measuring 2-dimensional inclinations in the range of $\pm 85^\circ$ or 1-dimensional inclinations up to 360° .

With their high robustness, their protection level up to max. IP69k and their wide temperature range from -40°C to $+85^\circ\text{C}$, these devices are ideally suitable for outdoor use – e.g. for mobile automation or solar applications.



High protection level



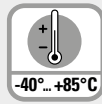
Shock / vibration resistant



Reverse polarity protection



Redundancy



Temperature range

Robust

- High protection rating IP67 and IP69k in one device.
- Highest robustness thanks to metal housing.
- Stable accuracy over the whole temperature range from -40°C up to $+85^\circ\text{C}$.
- Non long-term drift thanks to sensor array technique.

Versatile

- Parameterizable filter.
- Measuring direction 1- or 2-dimensional.
- With 1 x M12 connector or 2 x M12-connector.
- Stacked installation possible for redundancy.

Order code

8.IN88.XX61.12X
Type a b c d e

a Measuring direction
1 = 1-dimensional
2 = 2-dimensional

b Measuring range
6 = $\pm 85^\circ$ ¹⁾
7 = $0^\circ \dots 360^\circ$ ²⁾

c Interface
6 = Modbus RTU

d Power supply
2 = 10 ... 30 V DC

e Type of connection
1 = 1 x M12 connector, 5-pin
3 = 2 x M12 connector, 5-pin

Connection technology

Order no.

Cordset, pre-assembled

M12 female connector with coupling nut for Bus in, 5-pin
5 m [16.40'] PVC cable

05.00.6091.A211.005M

M12 male connector with external thread for Bus out, 5-pin
5 m [16.40'] PVC cable

05.00.6091.A411.005M

Connector, self-assembly (straight)

M12 female connector with coupling nut for Bus in, 5-pin
M12 male connector with external thread for Bus out, 5-pin

05.B-8151-0/9
05.BS-8151-0/9

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Inclinometers

Inclinometer MEMS / capacitive	IN88, 1- and 2-dimensional	Modbus
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Technical data

General electrical characteristics		
Power supply		10 ... 30 V DC
Current consumption (no load)		max. 70 mA
Reverse polarity protection of the power supply		yes
Measuring axes		1 or 2
Measuring range	1-dimensional 2-dimensional	360°, no limit stop ±85° (see order code)
Resolution		0.01°
Accuracy at 25°C¹⁾	1-dimensional 2-dimensional	typ. ±0.2° typ. ±0.4°
Repeat accuracy		±0.2°
Transverse sensitivity²⁾		typ. ±0.3°
Temperature coefficient		typ. ±0.006°/K
Sampling rate		50 Hz (20 ms)
Limit frequency	with Butterworth filter factory setting	0.1 ... 10 Hz, 8th order 10 Hz
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU
UL approval³⁾		file 224618

EMC		
Relevant standards	EN 61326-1	Electrical equipment for measurement, control and laboratory use
	EN 61000-6-2	Immunity for industrial environments
	EN 55011 Klasse B, EN 61000-6-3	Emitted interferences for residential environments
	EN ISO 14982	Agricultural and forestry machinery, electromagnetic compatibility, test methods and acceptance criteria
	EN 13309	Construction machinery - Electromagnetic compatibility of machines with internal power supply

Mechanical characteristics		
Connection MB	1 x M12 connector 2 x M12 connector	5-pin, male connector 5-pin, male connector / 5-pin, female connector
Weight		approx. 185 [6.53 oz]
Protection acc. to EN 60529		IP67 / IP69k ³⁾
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	housing	aluminum
Shock resistance		1000 m/s ² , 6 ms
Vibration resistance		100 m/s ² , 10 ... 2000 Hz
Dimensions		80 x 60 x 23 mm [3.15 x 2.36 x 0.91"]

Interface characteristics Modbus	
Code	binary
Interface	Modbus V1.02
Protocol	Modbus RTU V1.1b3
Baud rate	4800 ... 115200 kbit/s software configurable
Node address	1 ... 63 software configurable
Termination	software configurable

1) Over the whole temperature and max. measuring range
1-dimensional ≤ ±0.4°; 2-dimensional ≤ ±1°.
2) Only for 2-dimensional measuring direction.
3) The IP protection class is not UL-tested. Verified by Kübler.
A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

Product overview Basics
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Inclinometers

Inclinometer MEMS / capacitive	IN88, 1- and 2-dimensional	Modbus
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Modbus communication profile V 1.02

Node number, baudrate and bus termination programmable.

Modbus application protocol V1.1b3

Read Holding Register – Function code 03 ¹⁾				
Reg.	Data name	ATT	Value	Default
00001	LOTWINKEL X-ACHSE	I16	Inclination angle in 0.01 °	-85.00 ... +85.00
00002	LOTWINKEL Y-ACHSE	I16	Rotation angle in 0.01 °	-85.00 ... +85.00
00003	EULERWINKEL X-ACHSE	I16	Euler angle (1 axis)	0 ... 180.99°
00004	EULERWINKEL Y-ACHSE	U16	Euler angle (1 axis)	0 ... 359.99°
00007	VERSORGUNG VCC	U16	VCC in 0.1 VDC	240
00008	TEMPERATURE IN 0.1°C	U16	Temp. in 0.1°	210
00016	SIDEVIEW	U16	Back = 0, Front = 1	0
00023	SYSTEM STATE	U16	No errors = 0	0
00140	BAUDRATE	U16	Current baudrate	19200 Baud (2)
00144	NODE-ID	U16	Current node address	63
00145	TERMINIERUNG	U16	Termination on/off	2 (on)
00146	FILTER AKTIVIERUNG	U16	Filter on/off	1 (on)
00147	FILTER EINSTELLUNG	F32	Filter value in HZ	5.0
00148	SERIENNUMMER	U32	Serial number	16DDDDNNNN
00149	PRODUCT CODE	U32	Device type	x88616100
00150	AUFLÖSUNG	U16	Resolution X/Y axis	0.01° (10)
00151	OPERATING PARAMETER	U16	Setting X axis	0
00152	PRESET X-ACHSE	U16	Preset X axis	0
00153	OFFSET X-ACHSE	U16	Offset X axis	0
00154	DIFF.OFFSET X-ACHSE	U16	Differential offset	0
00155	Operating Parameter	U16	Setting Y axis	0
00156	PRESET Y-ACHSE	U16	Preset Y axis	0
00157	OFFSET Y-ACHSE	U16	Offset Y axis	0
00158	DIFF.OFFSET Y-ACHSE	U16	Differential offset	0
00159	OFFSET EULERWINKEL	U16	Offset Euler axis Y	0

Write Holding Register – Function code 16 (0x10)					
Reg.	Value	R/W	Format	Content	Default
300	VAR	W	U16	Baudrate	19200 Baud (2)
301	VAR	W	U16	Parity	1 = none 2 = odd 3 = even
302	VAR	W	U16	Stopbit	1 = 1 Stopbit 3 = 2 Stopbit
304	VAR	W	U16	Node Number	0x3F (63d)
305	VAR	W	U16	Termination	2 = ON 1 = Off
306	VAR	W	U16	Digital Filter Active	1 = ON
307	VAR	W	F32	Digital Filter Coefficient	5.0
310	VAR	W	U16	Resolution of axis	10
311	VAR	W	U16	Slope long16 operating parameter	0
312	VAR	W	I16	Slope long16 preset value	0
313	VAR	W	I16	Slope long16 offset	0
314	VAR	W	I16	Differential Slope long16 offset	0
315	VAR	W	U16	Slope lateral16 operating parameter	0
316	VAR	W	I16	Slope lateral16 preset value	0
317	VAR	W	I16	Slope lateral16 offset	0
318	VAR	W	I16	Differential Slope lateral16 offset	0
320	VAR	W	U16	Preset Euleraxis (only 0)	0
261	VAR	W	U16	Delaytime for Transmission	1
360	VAR	W	U16	Save All Application Parameters	0x1010
361	VAR	W	U16	Load All Parameters (Factory default)	0x10101

1) Reads the binary contents of holding registers (4XXXX references) in the encoder slave. Broadcast is not supported.

Inclinometers

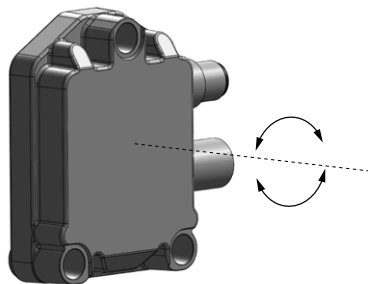
Inclinometer MEMS / capacitive	IN88, 1- and 2-dimensional	Modbus
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Terminal assignment

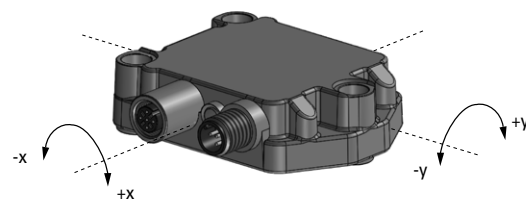
Interface	Type of connection	1 x M12 connector, 5-pin						
6	1	Bus IN						
		Signal:	+V	0 V	D0	D1		TG
		Pin:	2	3	5	4		1
Interface	Type of connection	2 x M12 connector, 5-pin						
6	3	Bus OUT						
		Signal:	+V	0 V	D0	D1		TG
		Pin:	2	3	5	4	1	
		Bus IN						
		Signal:	+V	0 V	D0	D1		TG
		Pin:	2	3	5	4		1

Direction of inclination

1-dimensional



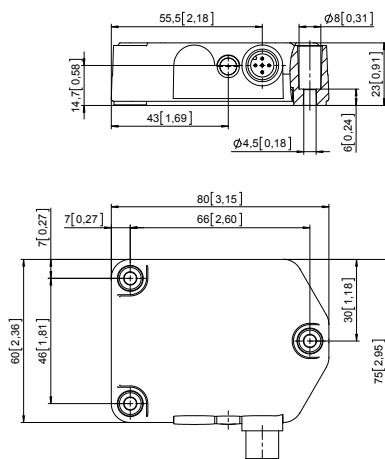
2-dimensional



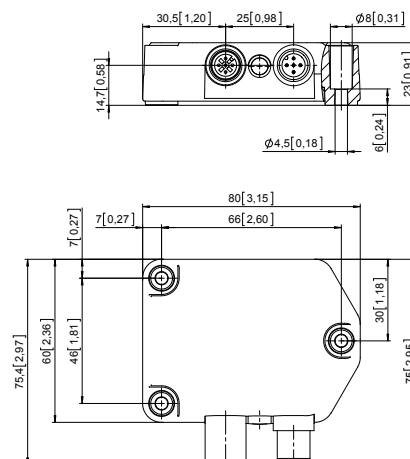
Dimensions

Dimensions in mm [inch]

1 x M12 connector 5-pin, male contacts



1 x M12 connector 5-pin, male contacts
1 x M12 connector 5-pin, female contacts



Product overview
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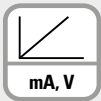
**Inclinometer
MEMS / capacitive**

IS40, 1-dimensional

Analog



With the IS40 inclinometer 1-dimensional inclinations in the measuring range 0 - 360° can be measured. The compact robust construction makes this sensor the ideal device for measuring angles in harsh environments.



Output



High protection level



Shock / vibration resistant



Reverse polarity protection

Innovative

- Rugged construction – high shock resistance.
- High resolution and accuracy.
- Current or voltage interface.
- Adjusting of the measuring range via teach adapter.

Compact / Many applications

- Small design – minimal space requirement.
- For use in vehicle technology, solar installations, cranes and hoists or in commercial vehicles.

**Order code
Inclinometer IS40**

8.IS40 . 14X21
Type a b c d e

a Measuring direction
1 = 1-dimensional

b Measuring range
4 = 0 ... 360°

c Interface
1 = 4 ... 20 mA
3 = 0.1 ... 4.9 V DC

d Power supply
2 = 10 ... 30 V DC

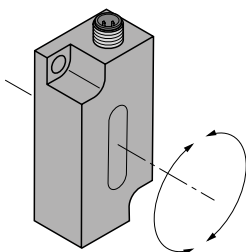
e Type of connection
1 = M12 connector

Accessories

Accessories		Order no.
Teach adapter	for inductive encoders, linear position, angle and ultrasonic sensors	05.TX40.1
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 5-pin 2 m [6.56'] PVC cable	05.00.6081.2211.002M
Connector, self-assembly (straight)	M12 female connector with coupling nut, 5-pin	8.0000.5116.0000

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



Adjusting the measuring range via 05.TX40.1 teach adapter

- Setting the angular range in CW direction:
 - Move sensor to start position
 - Press and hold Teach-GND until the output is set to < 4 mA / 0.1 V (approx. 1 s)
 - Move sensor to end position
 - Press and hold Teach-GND until the output is set to 20 mA / 4.9 V (approx. 3 s)
- Resetting the angular range:
 - Press and hold Teach-GND until the output is set to 12 mA (approx. 6 s)
 - The angular range is reset to 360°



Inclinometers

Inclinometer MEMS / capacitive	IS40, 1-dimensional	Analog
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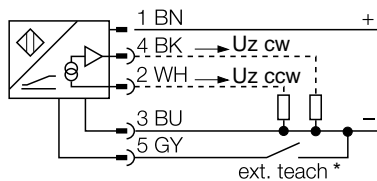
Technical data

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"]

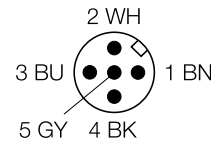
Interface characteristics	
Voltage output	0.1 ... 4.9 V DC short-circuit protected to +V
Load resistance voltage output	≥ 40 kΩ
Output impedance voltage output	99 ... 105 Ω
Current output	4 ... 20 mA
Load resistance current output	≤ 200 Ω

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 2014/30/EU RoHS guideline 2011/65/EU

Connections



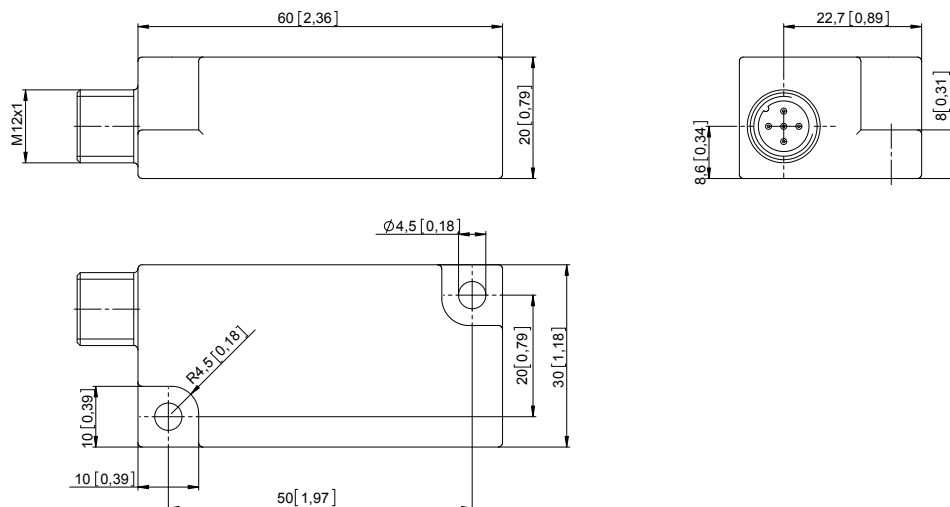
Terminal assignment



*) Teach adapter, accessory (Order no. 05.TX40.1)

Dimensions

Dimensions in mm [inch]



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Absolute encoders multiturn
Bearings encoders
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Inclinometers

**Inclinometer
MEMS / capacitive**

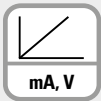
IS40, 2-dimensional

Analog



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.

Cordset, pre-assembled

M12 female connector with coupling nut, 5-pin
2 m [6.56'] PVC cable

05.00.6081.2211.002M

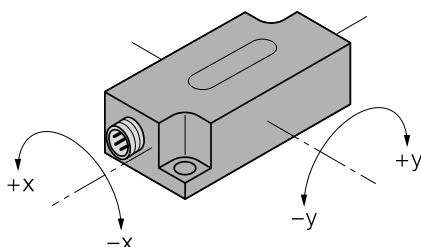
Connector, self-assembly (straight)

M12 female connector with coupling nut, 5-pin

8.0000.5116.0000

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



1) Available only in combination with power supply 10 ... 30 V DC
2) In relation to the power supply 5 V DC (available only in combination with power supply 5 V DC)

Inclinometers

Inclinometer MEMS / capacitive	IS40, 2-dimensional	Analog
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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"]

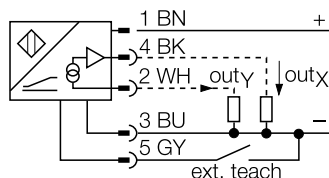
Interface characteristics

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

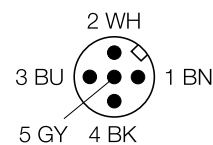
Power supply	5 V DC ±0.25 V or 10 ... 30 V DC (depending on version)
Power consumption (no load)	≤ 20 mA
Reverse polarity protection	yes
Measuring axes	2 (x/y)
Measuring range	±10°, ±45°, ±60°
Resolution	for version ±10° ≤ 0.05° for version ±45° ≤ 0.1° for version ±60° ≤ 0.15°
Repeat accuracy	≤ 0.2 % 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 2014/30/EU RoHS guideline 2011/65/EU

Connections



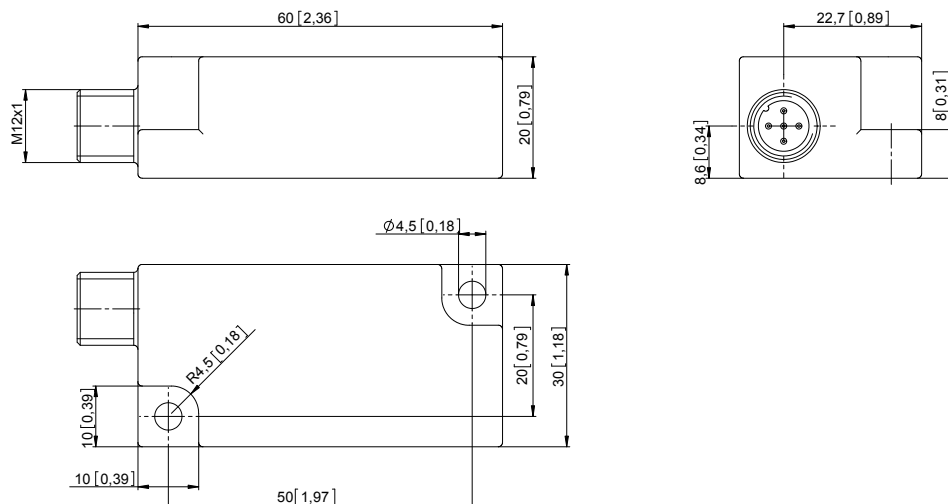
ext. teach: if this input is connected to 0 V, then the output of the inclinometer is reset to 0°.

Terminal assignment



Dimensions

Dimensions in mm [inch]



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 standardized 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.

Cordset, pre-assembled

M12 female connector with coupling nut for Bus in, 5-pin
5 m [16.40'] PUR cable

05.00.6021.2211.005M

M12 male connector with external thread for Bus out, 5-pin
5 m [16.40'] PUR cable

05.00.6021.2411.005M

Connector, self-assembly (straight)

M12 female connector with coupling nut for Bus in, 5-pin

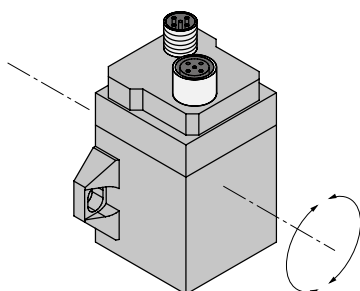
05.B-8151-0/9

M12 male connector with external thread for Bus out, 5-pin

05.BS-8151-0/9

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



Inclinometers

Inclinometer MEMS / capacitive	IS60, 1-dimensional	CANopen
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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"]

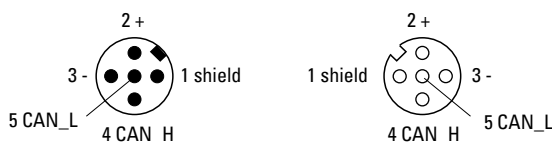
Interface characteristics CANopen	
Interface	CANopen according to CiA DS-301, Profile to CiA DSP-410
Data rates	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s
Functions	TPDO (RTR, cyclic, event-driven, synchronized), parametrization per SDO and object register, digital filter (Butterworth Low pass, 8th order), SYNC Consumer, EMCY Producer, output and control of internal device temperature (±2.0 K accuracy), failure control with the help of Heartbeat or Nodeguarding / Lifeguarding

General electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption	40 ... 105 mA
Reverse polarity protection	yes
Measuring axes	1
Measuring range	360°, no limit stop
Resolution	0.1°
Linearity deviation	max. ±0.4°
Calibration accuracy (at 25°C)	±0.1° (Zero point and final values)
Temperature drift (Zero point)	typ. ±0.008°/K
Sampling rate	100 Hz
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

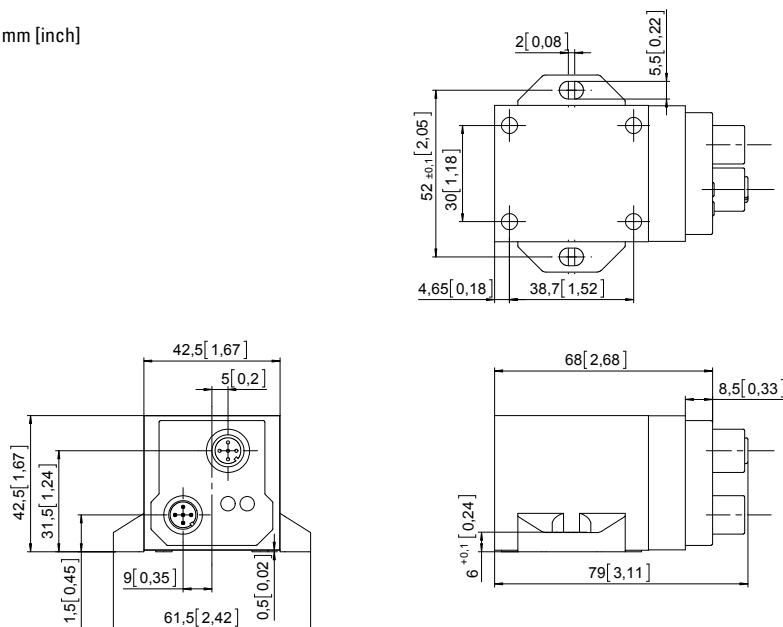
Terminal assignment

PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Supply voltage (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L-Bus cable



Dimensions

Dimensions in mm [inch]



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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 standardized CANopen interface, which enables easy configuration and start-up. All the parameters are stored in the internal permanent memory.

Can be supplied with customer-specific parametrization.



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.

Cordset, pre-assembled

M12 female connector with coupling nut for Bus in, 5-pin
5 m [16.40'] PUR cable

05.00.6021.2211.005M

M12 male connector with external thread for Bus out, 5-pin
5 m [16.40'] PUR cable

05.00.6021.2411.005M

Connector, self-assembly (straight)

M12 female connector with coupling nut for Bus in, 5-pin

05.B-8151-0/9

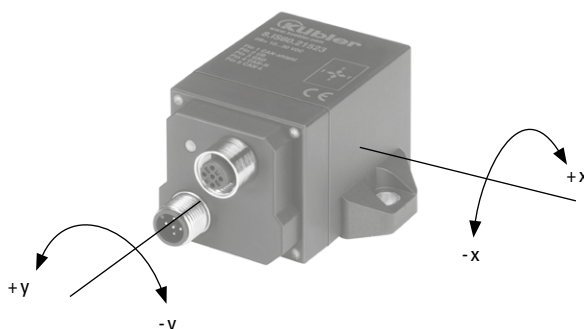
M12 male connector with external thread for Bus out, 5-pin

05.BS-8151-0/9

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories

Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology

Direction of inclination



Inclinometers

Inclinometer MEMS / capacitive	IS60, 2-dimensional	CANopen
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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"]

Interface characteristics CANopen	
Interface	CANopen according to CiA DS-301, Profile to CiA DSP-410
Data rates	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s
Functions	TPDO (RTR, cyclic, event-driven, synchronized), parameterization per SDO and object register, digital filter (Butterworth Low pass, 8th order), SYNC Consumer, EMCY Producer, output and control of internal device temperature (±2.0 K accuracy), failure control with the help of Heartbeat or Nodeguarding / Lifeguarding
Note ID	1 ... 127

Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	40 ... 105 mA
Reverse polarity protection	yes
Measuring axes	2 (x/y)
Measuring range	±10°, ±45°, ±60°
Resolution	0.1°
Linearity deviation	max. ±0.4°
Calibration accuracy – at 25°C [77°F]	±0.1° (Zero point and final values)
Temperature drift (Zero point)	typ. ±0.008°/K
Sampling rate	100 Hz
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

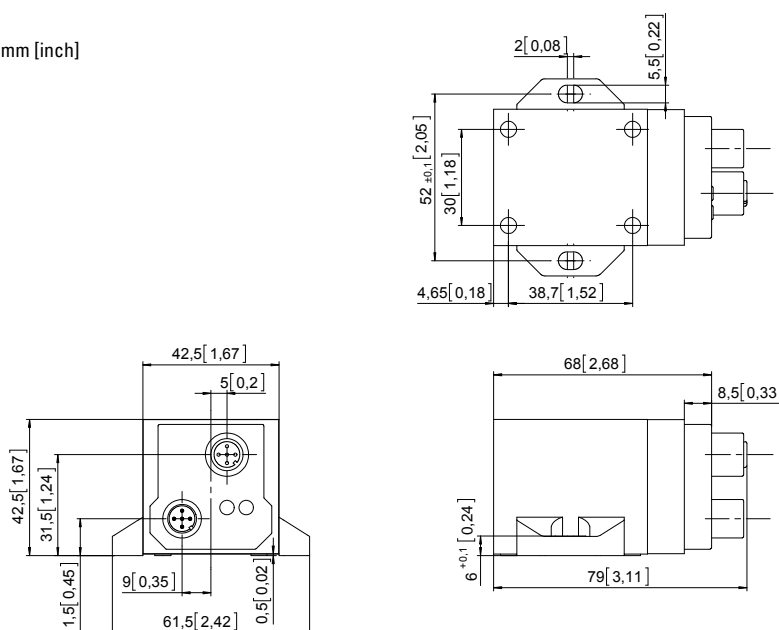
Terminal assignment

PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Power supply (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L Bus cable

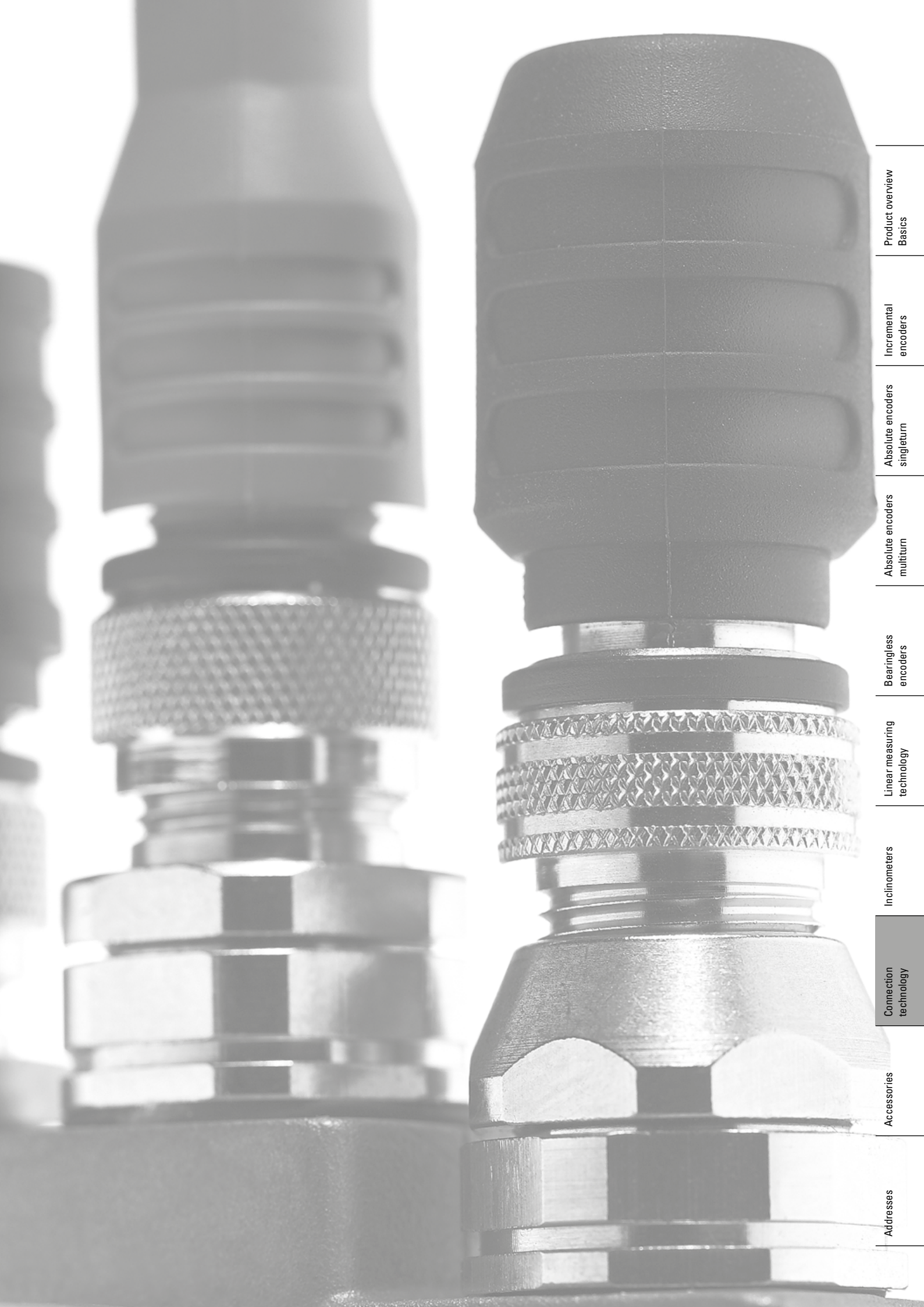


Dimensions

Dimensions in mm [inch]



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Absolute encoders multiturn
Bearingless encoders
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Product overview
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multiturn

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Connection technology

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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⁾ incremental encoders without inversions	
	Permanent working temperature range	flexible installation: -5°C ... +70°C [+23°F ... +158°F] secure installation: -30°C ... +70°C [-22°F ... +158°F]			
	Bending radius	flexible installation: min. 70 mm [2.76"] secure installation: min. 45 mm [1.77"]			
	Cable diameter	approx. 4.7 mm ±0.2 mm			
PE-X electronic trailing cable halogen-free, silicon-free					
  	Cross section	5 x 0.75 mm ² [AWG18]	suitable for:	8.0000.6600.XXXX ¹⁾ H100 with speed switch, robust incremental encoders without inversions	
	Permanent working temperature range	flexible installation: -35°C ... +100°C [-31°F ... +212°F] secure installation: -40°C ... +100°C [-40°F ... +212°F]			
	Bending radius	flexible installation: min. 40 mm [1.57"] secure installation: min. 25 mm [0.98"]			
	Cable diameter	approx. 7.5 mm ±0.3 mm			
8 core + shield					
PUR trailing cable halogen-free    	Cross section	8 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6P00.XXXX ¹⁾ Limes, 365X, 368X SSI and analog Safety-M	
	Permanent working temperature range	flexible installation: -20°C ... +90°C [-4°F ... +194°F] secure installation: -40°C ... +90°C [-40°F ... +194°F]			
	Bending radius	flexible installation: min. 65 mm [2.56"] secure installation: min. 45 mm [1.77"]			
	Cable diameter	approx. 5.5 mm ±0.2 mm			
PUR trailing cable halogen-free    	Cross section	3 x 2 x 0.14 mm ² [AWG25] + 2 x 0.5 mm ² [AWG20]	suitable for:	8.0000.6F00.XXXX ¹⁾ Limes, 365X, 368X SSI and analog Safety-M	
	Permanent working temperature range	flexible installation: -30°C ... +80°C [-22°F ... +178°F] secure installation: -40°C ... +90°C [-40°F ... +194°F]			
	Bending radius	flexible installation: min. 80 mm [3.15"] secure installation: min. 50 mm [1.97"]			
	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⁾ H100, H120 LA10, LA50 Safety-M	
	Permanent working temperature range	flexible installation: -40°C ... +90°C [-40°F ... +194°F] secure installation: -50°C ... +90°C [-58°F ... +194°F]			
	Bending radius	flexible installation: min. 95 mm [3.74"] secure installation: min. 40 mm [1.57"]			
	Cable diameter	approx. 7.9 mm ±0.8 mm			


















1) XXXX = cable length in meters (e.g. 10 m = 0010)

Connection technology

Cable		Unprepared, cut to length			Order no.
12 core + shield					
PUR electronic 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"]		8.0000.6200.XXXX ¹⁾
	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"]		8.0000.6E00.XXXX ¹⁾
	Cable diameter		approx. 6.7 mm ±0.3 mm		
PE-X 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"]		8.0000.6900.XXXX ¹⁾
	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 analog output, twisted pair conductors	
 	Bending radius	flexible installation secure installation	min. 110 mm [4.33"] min. 75 mm [2.95"]		8.0000.6Q00.XXXX ¹⁾
	Cable diameter		approx. 7.3 mm ±0.2 mm		
PUR electronic cable halogen-free 	Cross section		6 x 2 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6Q00.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-10°C ... +90°C [+14°F ... +194°F] -30°C ... +90°C [-22°F ... +194°F]	ATEX zone 2/22 encoders	
 	Bending radius	flexible installation secure installation	min. 120 mm [4.72"] min. 80 mm [3.15"]		8.0000.6D00.XXXX ¹⁾
	Cable diameter		approx. 7.8 mm ±0.2 mm		
PVC trailing cable halogen-free 	Cross section		4 x 0.10 mm ² [AWG27] + 4 x 2 x 0.10 mm ² [AWG27]	suitable for:	8.0000.6D00.XXXX ¹⁾
	Permanent working temperature range	flexible installation secure installation	-5°C ... +80°C [+23°F ... +176°F] -30°C ... +80°C [-22°F ... +176°F]	5873 Motor-Line	
 	Bending radius	flexible installation secure installation	min. 105 mm [4.13"] min. 70 mm [2.76"]		8.0000.6D00.XXXX ¹⁾
	Cable diameter		approx. 5.8 mm ±0.2 mm		

1) XXXX = cable length in meters (e.g. 10 m = 0010)

Connection technology

Cable		Unprepared, cut to length			Order no.
18 core + shield					
PVC electronic cable LiVCY  	Cross section	18 x 0.14 mm ² [AWG25]	suitable for:	8.0000.6700.XXXX ¹⁾ absolute encoders with parallel output, SK 1S-1P	
	Permanent working temperature range	flexible installation -5°C ... +70°C [+23°F ... +158°F] secure installation -30°C ... +80°C [-22°F ... +176°F]			
Bending radius	flexible installation min. 120 mm [4.72"] secure installation min. 78 mm [3.07"]				
Cable diameter	approx. 7.8 mm ±0.2 mm				
PROFIBUS DP - cable					
PUR outer jacket, PE wire insulation halogen-free  	Cross section	2 x 0.34 mm ² [AWG22]	suitable for:	05.KABEL451.XXX ¹⁾ all Profibus fieldbus encoders, Safety-M modular SMBU and SMBS 	
	Permanent working temperature range	flexible installation -25°C ... +60°C [-13°F ... +140°F] secure installation -50°C ... +90°C [-58°F ... +194°F]			
Bending radius	flexible installation min. 80 mm [3.15"] secure installation min. 40 mm [1.57"]				
Cable diameter	approx. 7.6 mm ±0.2 mm				
DeviceNet - cable					
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⁾ all DeviceNet fieldbus encoders 	
	Permanent working temperature range	flexible installation -30°C ... +70°C [-22°F ... +158°F] secure installation -40°C ... +80°C [-40°F ... +176°F]			
Bending radius	flexible installation min. 70 mm [2.76"] secure installation min. 50 mm [1.97"]				
Cable diameter	approx. 8.4 mm ±0.2 mm				
CANopen - cable					
PVC electronic cable   	Cross section	3 x 2 x 0.25 mm ² [AWG23]	suitable for:	8.0000.6V00.XXXX ¹⁾ all CANopen fieldbus encoders, Safety-M modular SMBU 	
	Permanent working temperature range	flexible installation -10°C ... +90°C [+14°F ... +194°F] secure installation -30°C ... +90°C [-22°F ... +194°F]			
Bending radius	flexible installation min. 130 mm [5.12"] secure installation min. 60 mm [2.36"]				
Cable diameter	approx. 6.2 mm ±0.2 mm				
Industrial Ethernet - cable					
PUR electronic cable  	Cross section	2 x 2 x 0.34 mm ² [AWG22]	suitable for:	05.00.6031.1111.XXXM ¹⁾ all EtherCAT / PROFINET IO / EtherNet/IP encoders, Safety-M modular SMBU and SMBS   EtherNet/IP	
	Permanent working temperature range	flexible installation -30°C ... +70°C [-22°F ... +158°F] secure installation -40°C ... +80°C [-40°F ... +176°F]			
Bending radius	flexible installation min. 50 mm [1.97"] secure installation min. 25 mm [0.98"]				
Cable diameter	approx. 4.8 mm ±0.2 mm				


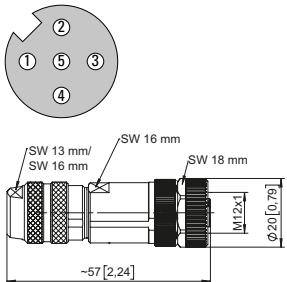

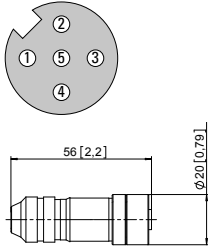

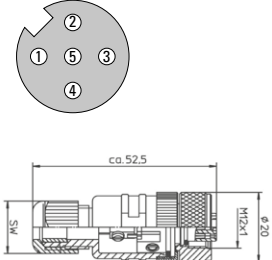

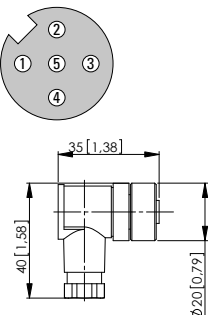
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Absolute encoders multiturn
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Accessories
Addresses

1) XXXX = cable length in meters (e.g. 10 m = 0010)

Connection technology

M12 connection technology		Connectors, self-assembly		Order no.	Product overview
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: 5858 / 5878 5868 / 5888 F5858 / F5878 F5868 / F5888 C60, D120 EMIO.SIO.10xP	05.B8141-0		Basics Incremental encoders Absolute encoders singleturn
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: 5858 / 5878 5868 / 5888 C60, D120 EMIO.SIO.10xP	05.B8241-0		Absolute encoders multiturn Bearingless encoders
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		Linear measuring technology Inclometers
Male connector with external thread D coded, straight Housing: metal, IP67 	displacement/terminal connection, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"] 	suitable for our series: 5858 / 5878 5868 / 5888 F5858 / F5878 F5868 / F5888 SR120, SR160, SR250H  Conformance tested  EtherNet/IP	05.WASCSY4S		Connection technology Accessories Addresses


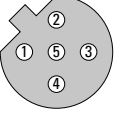
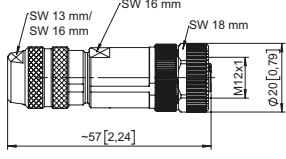


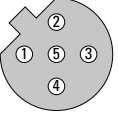
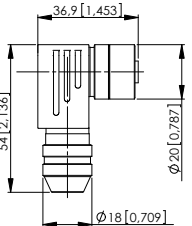



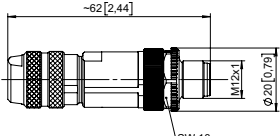


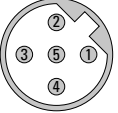
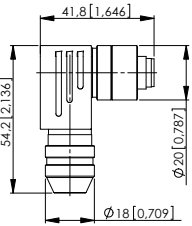

M12 connection technology Connectors, self-assembly

5 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>3651 / 3671</td> <td>M3658 / M3678</td> </tr> <tr> <td>F3658 / F3658</td> <td>5858 / 5878</td> </tr> <tr> <td>M3661 / M3681</td> <td>M3661R</td> </tr> <tr> <td>M3668 / M3688</td> <td>M3668R</td> </tr> <tr> <td>F3668 / F3688</td> <td>F5868 / F5888</td> </tr> <tr> <td>M5861</td> <td>M5868</td> </tr> <tr> <td>5868 / 5888</td> <td>F5888M</td> </tr> </table> <p>A50, B80, C60, C100, C120, D120, D125, D135</p> <p>IS40, IS60, IN88</p> <p>SR120, SR160, SR250H</p> <p>CANopen DeviceNet</p>	3651 / 3671	M3658 / M3678	F3658 / F3658	5858 / 5878	M3661 / M3681	M3661R	M3668 / M3688	M3668R	F3668 / F3688	F5868 / F5888	M5861	M5868	5868 / 5888	F5888M	<p>8.0000.5116.0000</p>
3651 / 3671	M3658 / M3678																
F3658 / F3658	5858 / 5878																
M3661 / M3681	M3661R																
M3668 / M3688	M3668R																
F3668 / F3688	F5868 / F5888																
M5861	M5868																
5868 / 5888	F5888M																
<p>Female connector with coupling nut A coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 9 mm [0.24 ... 0.35"]</p> 	<p>suitable for our series:</p> <p>ATEX zone 2/22 encoders</p> <p>Ex 2/22</p> <p>CANopen DeviceNet</p>	<p>8.0000.5116.0000.Ex</p>														
<p>Female connector with coupling nut A coded, straight</p> <p>Housing: plastic, IP67</p> 	<p>screw connections, for cable \varnothing 4 ... 8 mm [0.16 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>3651 / 3671</p> <p>A50, B80, C60, C100, C120, D120, D125, D135</p> <p>IS40, IS60, IN88</p> <p>CANopen DeviceNet</p>	<p>05.B-8151-0/9</p>														
<p>Female connector with coupling nut A coded, right-angle</p> <p>Housing: plastic, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>3651 / 3671</p> <p>A50, B80, C60, C100, C120, D120, D125, D135</p> <p>IS40, IS60, IN88</p> <p>CANopen DeviceNet</p>	<p>05.B-8251-0/9</p>														


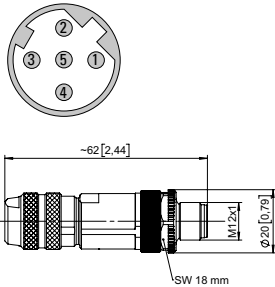

Product overview Basics
Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

Connection technology

M12 connection technology		Connectors, self-assembly		Order no.	Product overview
5 pin					
Male connector with external thread A coded, straight Housing: metal, IP67	screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]	suitable for our series: F3658 / F3658 F3668 / F3688 M3658 / M3678 M3668 / M3688 M3668R / M3688R 5858 / 5878 5868 / 5888 F5868 / F5888 F5888M IS60, IN88 SR120, SR160, SR250H		8.0000.5111.0000	Basics Incremental encoders Absolute encoders singleturn
Male connector with external thread A coded, straight Housing: metal / plastic, IP67	screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]	suitable for our series: F3658 / F3658 F3668 / F3688 M3658 / M3678 M3668 / M3688 5858 / 5878 5868 / 5888 F5868 / F5888 IS60, IN88 EMIO.SIO.10xP		05.BS-8151-0/9	Absolute encoders multiturn Bearingless encoders
Male connector with external thread A coded, right-angle Housing: metal / plastic, IP67	screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]	suitable for our series: F3658 / F3658 F3668 / F3688 M3658 / M3678 M3668 / M3688 5858 / 5878 5868 / 5888 F5868 / F5888 IS60, IN88		05.BS-8251-0/9	Linear measuring technology Inclinoimeters


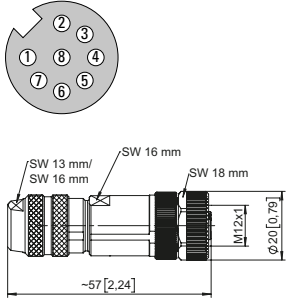

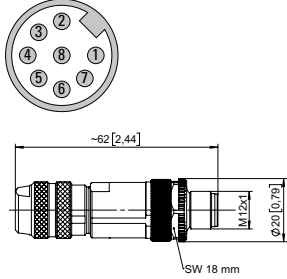

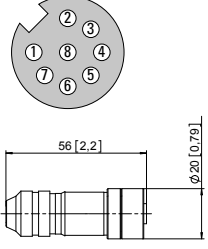


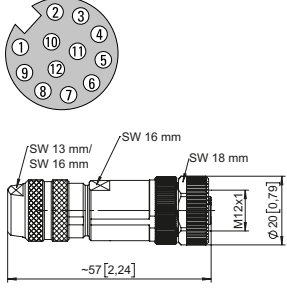
M12 connection technology		Connectors, self-assembly		Order no.	Product overview
5 pin					
Female connector with coupling nut B coded, straight Housing: metal, IP67 	screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]  	suitable for our series: 5858 / 5878 5868 / 5888 SR120, SR160, SR250H 	05.BMWS 8151-8.5		Basics
Female connector with coupling nut B coded, right-angle Housing: metal, IP67 	screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]  	suitable for our series: 5858 / 5878 5868 / 5888 SR120, SR160, SR250H 	05.BMWS 8251-8.5		Incremental encoders
Male connector with external thread B 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 SR120, SR160, SR250H 	05.BMSWS 8151-8.5		Absolute encoders singleturn
Male connector with external thread B coded, right-angle Housing: metal, IP67 	screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]  	suitable for our series: 5858 / 5878 5868 / 5888 SR120, SR160, SR250H 	05.BMSWS 8251-8.5		Absolute encoders multiturn
					Bearingless encoders
					Linear measuring technology
					Inclinometers
					Connection technology
					Accessories
					Addresses

M12 connection technology Connectors, self-assembly

5 pin		Order no.				
<p>Male connector with external thread D 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 style="width: 100%; border: none;"> <tr> <td style="width: 50%;">5858 / 5878</td> <td style="width: 50%;">5868 / 5888</td> </tr> <tr> <td>F5858 / F5878</td> <td>F5868 / F5888</td> </tr> </table> <p></p> <p>EtherCAT Conformance tested</p> <p>PROFINET</p> <p>EtherNet/IP</p>	5858 / 5878	5868 / 5888	F5858 / F5878	F5868 / F5888
5858 / 5878	5868 / 5888					
F5858 / F5878	F5868 / F5888					
		8.0000.5121.0000.Ex				

- Product overview Basics
- Incremental encoders
- Absolute encoders singleturn
- Absolute encoders multiturn
- Bearingless encoders
- Linear measuring technology
- Inclinometers
- Connection technology
- Accessories
- Addresses

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>KIS40 / KIH40</td> </tr> <tr> <td>F3653 / F3673</td> <td>F3663 / F3683</td> </tr> <tr> <td>M3663 / M3683</td> <td>M3663R</td> </tr> <tr> <td>5000 / 5020</td> <td>5006 / 5026</td> </tr> <tr> <td>KIS50 / KIH50</td> <td></td> </tr> <tr> <td>5814 / 5834</td> <td>58x4FSx</td> </tr> <tr> <td>5853 / 5873</td> <td>5863 / 5883</td> </tr> <tr> <td>M5863</td> <td>F5883M</td> </tr> <tr> <td>5821</td> <td>A020 / A02H</td> </tr> <tr> <td>H120</td> <td></td> </tr> <tr> <td>C60, D120, D125</td> <td></td> </tr> </table>	3610 / 3620	KIS40 / KIH40	F3653 / F3673	F3663 / F3683	M3663 / M3683	M3663R	5000 / 5020	5006 / 5026	KIS50 / KIH50		5814 / 5834	58x4FSx	5853 / 5873	5863 / 5883	M5863	F5883M	5821	A020 / A02H	H120		C60, D120, D125		<p>05.CMB 8181-0</p>
3610 / 3620	KIS40 / KIH40																								
F3653 / F3673	F3663 / F3683																								
M3663 / M3683	M3663R																								
5000 / 5020	5006 / 5026																								
KIS50 / KIH50																									
5814 / 5834	58x4FSx																								
5853 / 5873	5863 / 5883																								
M5863	F5883M																								
5821	A020 / A02H																								
H120																									
C60, D120, D125																									
<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>	<p>05.CMBS 8181-0</p>																						
<p>Female connector with coupling nut A coded, straight</p> <p>Housing: metal, IP67</p> 	<p>screw connections, for cable \varnothing 6 ... 9 mm [0.24 ... 0.35"]</p> 	<p>suitable for our series:</p> <p>ATEX zone 2/22 encoders</p> 	<p>8.0000.5136.0000.Ex</p>																						
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>	<p>8.0000.5162.0000</p>																						

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology



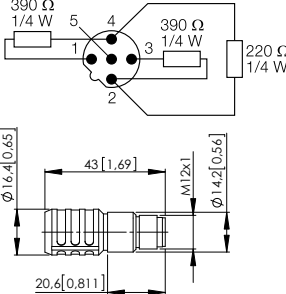

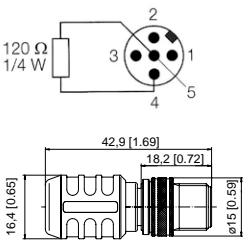
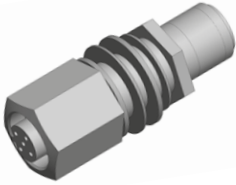
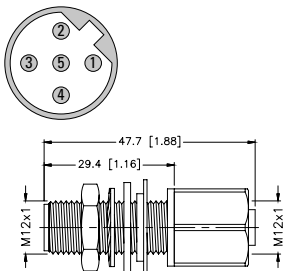
Inclinometers

Connection technology

Accessories

Addresses

Connection technology

M12 connection technology		Connectors, self-assembly		Order no.
Accessories				
Securing clip for M12 connectors Material: plastic 	against accidental disconnection under load working temperature range -25°C ... +90°C [-13°F ... +194°F]	suitable for: M12 connectors	8.0000.5000.0006	
Terminating resistor Male connector with external thread B coded, straight Housing: metal / plastic, IP67 		suitable for our series: 5858 / 5878 5868 / 5888	05.RSS4.5-PDP-TR	
Terminating resistor Male connector with external thread A coded, straight Housing: metal / plastic, IP67 		suitable for our series: 5858 / 5878 5868 / 5888 F5868 / F5888 F5888M IN88	05.RSE 57 TR2	
M12 lead-through B coded, straight Housing: metal, IP67 		suitable for our series: 5858 / 5878 5868 / 5888	05.FKW-FSW45/M12	

 Product overview
Basics

Incremental encoders

 Absolute encoders
singleturn

 Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology


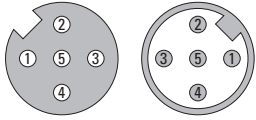
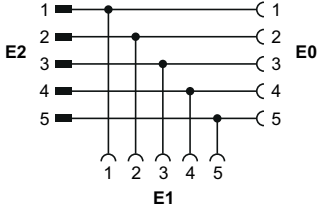

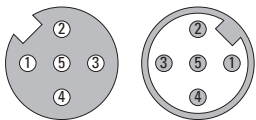
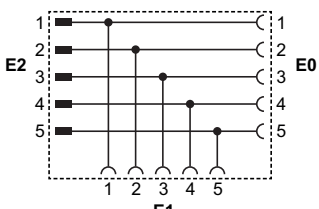
Inclometers

Connection technology

Accessories

Addresses

Connection technology

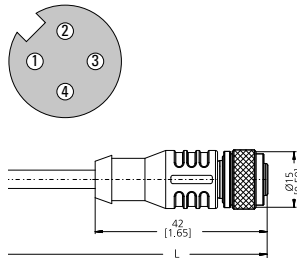
M12 connection technology		Connectors, self-assembly		Order no.
Accessories				
<p>T-junction A coded, 5 pin</p> <p>Housing: metal / plastic, IP67</p> 	<p>2 x female connector with coupling nut 1 x male connector with external thread</p>  	<p>suitable for: M12 connectors</p> <p>DeviceNet</p>	<p>05.FKM5-FKM5-FSM5</p>	Product overview Basics
<p>T-junction, shielded 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: M12 connectors</p> <p>CANopen</p>	<p>05.WAKS5-WAKS5-WASS5</p>	Incremental encoders Absolute encoders singleturn Absolute encoders multiturn Bearingsless encoders Linear measuring technology Inclinometers

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
Core color:	BN	WH	BU	BK

suitable for our series:

5858 / 5878 5868 / 5888
F5858 / F5878 F5868 / F5888
H120
EMIO.SIO.10xP

cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 5 m [16.40']
10 m [32.81']
15 m [49.21']

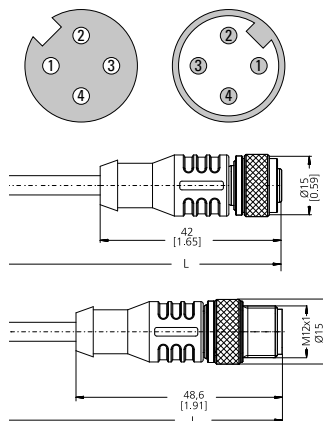
05.00.6061.6211.002M
05.00.6061.6211.005M
05.00.6061.6211.010M
05.00.6061.6211.015M

other cable lengths
(minimum order quantity 4 pieces)

05.00.6061.6211.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + male connector with external thread A coded, straight power supply

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



suitable for our series:

5858 / 5878 5868 / 5888
EMIO.SIO.10xP

cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 5 m [16.40']
10 m [32.81']
15 m [49.21']

05.00.6061.6462.002M
05.00.6061.6462.005M
05.00.6061.6462.010M
05.00.6061.6462.015M

other cable lengths
(minimum order quantity 4 pieces)

05.00.6061.6462.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.

M12 connection technology

Cordsets, pre-assembled

With connector, 4 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

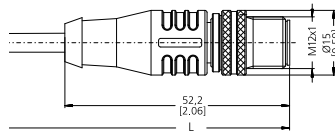
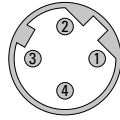
Order no.

Male connector with external thread
single-ended
D coded, straight

Cable: PUR, 2 x 2 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Port A (1) and B (2)



suitable for our series:

5858 / 5878 5868 / 5888
F5858 / F5878 F5868 / F5888
SR120, SR160, SR250H

EtherCAT
Conformance tested

PROFI
NET

EtherNet/IP

cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 5 m [16.40']
10 m [32.81']
15 m [49.21']

05.00.6031.4411.002M
05.00.6031.4411.005M
05.00.6031.4411.010M
05.00.6031.4411.015M

other cable lengths
(minimum order quantity 4 pieces)

05.00.6031.4411.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Terminal assignment

Pin male contacts:	1	2	3	4
Core color:	YE	OG	WH	BU

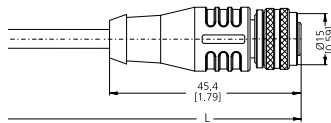
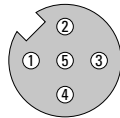
With connector, 5 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

Female connector with coupling nut +
single-ended
A coded, straight

Cable: PVC, 5 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



suitable for our series:

M3661 / M3681 M3661R
M5861
A50, B80, C120, D135
IS40
SR160, SR250H

cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 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

other cable lengths
(minimum order quantity 4 pieces)

05.00.6081.2211.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Terminal assignment

Pin female contacts:	1	2	3	4	5	PH ²⁾
Core color:	BN	WH	BU	BK	GY	PH ²⁾

1) Other cable lengths on request.

Connection technology

M12 connection technology Cordsets, pre-assembled

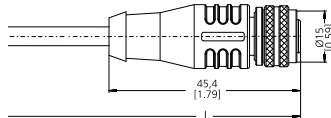
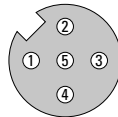
With connector, 5 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Female connector with coupling nut + single-ended A coded, straight

Cable: PUR, 4 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

IS60, IN88
SR160, SR250H

DeviceNet.

cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 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

other cable lengths
(minimum order quantity 4 pieces)

05.00.6021.2211.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Terminal assignment

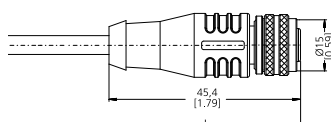
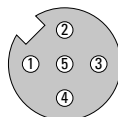
Pin female contacts:	1	2	3	4	5
Core color:	± 3)	RD	BK	WH	BU

Female connector with coupling nut + single-ended A coded, straight

Cable: PVC,
3 x 2 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

M3658 / M3678 M3668 / M3688
M3668R
5858 / 5878 5868 / 5888
M5868 F5868 / F5888
C60, C100, D120, D125
IN88
SR160, SR250H

CANopen

cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 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

other cable lengths
(minimum order quantity 4 pieces)


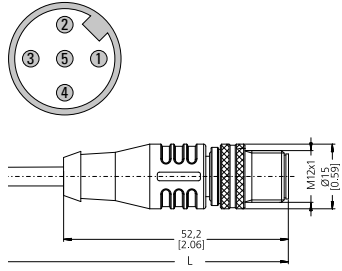

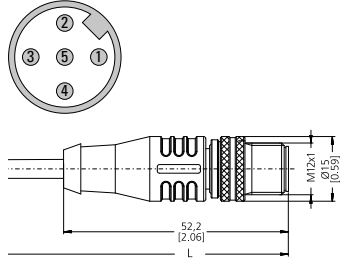
05.00.6091.A211.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Terminal assignment

Pin female contacts:	1	2	3	4	5	PH ²⁾
Core color:	GY	BN	WH	GN	YE	PH ²⁾


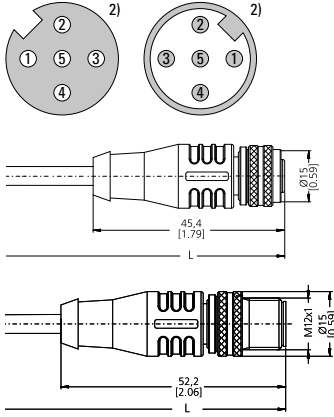


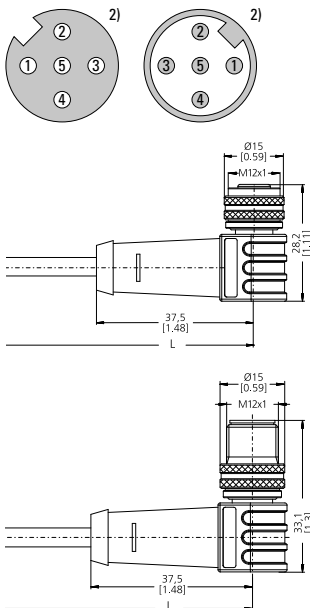

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

M12 connection technology Cordsets, pre-assembled

With connector, 5 pin		Working temp. -30°C ... +80°C [-22°F ... +176°F]	Order no.													
<p>Male connector with external thread + single-ended A coded, straight</p> <p>Cable: PUR, 4 x 0.34 mm² [AWG22] Housing: metal / plastic, IP67</p> 	<p>Bus out</p> 	<p>suitable for our series:</p> <p>IS60, IN88 SR160, SR250H</p> <p>DeviceNet</p>														
				<p><i>Terminal assignment</i></p> <table border="1"> <tr> <td>Pin male contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>Core color:</td> <td>± 3)</td> <td>RD</td> <td>BK</td> <td>WH</td> <td>BU</td> </tr> </table>	Pin male contacts:	1	2	3	4	5	Core color:	± 3)	RD	BK	WH	BU
Pin male contacts:	1	2	3	4	5											
Core color:	± 3)	RD	BK	WH	BU											
<p>Male connector with external thread + single-ended A coded, straight</p> <p>Cable: PVC, 3 x 2 x 0.25 mm² [AWG23] Housing: metal / plastic, IP67</p> 	<p>Bus out</p> 	<p>suitable for our series:</p> <p>M3658 / M3678 F5868 / F5888 5858 / 5878 5868 / 5888</p> <p>C60 IN88 SR160, SR250H EMIO.SIO.10xP</p> <p>CANopen</p>														
				<p><i>Terminal assignment</i></p> <table border="1"> <tr> <td>Pin male contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>PH²⁾</td> </tr> <tr> <td>Core color:</td> <td>GY</td> <td>BN</td> <td>WH</td> <td>GN</td> <td>YE</td> <td>PH²⁾</td> </tr> </table>	Pin male contacts:	1	2	3	4	5	PH ²⁾	Core color:	GY	BN	WH	GN
Pin male contacts:	1	2	3	4	5	PH ²⁾										
Core color:	GY	BN	WH	GN	YE	PH ²⁾										

1) Other cable lengths on request.
2) Shield on housing.
3) Shield with pin 1.

Connection technology

M12 connection technology		Cordsets, pre-assembled		Working temp. -30°C ... +80°C [-22°F ... +176°F]	Order no.	
With connector, 5 pin Female connector with coupling nut + male connector with external thread A coded, straight Cable: PUR, 2 x 0,25 mm ² [AWG23] + 2 x 0,34 mm ² [AWG22] Housing: metal / plastic, IP67 		Bus in / out 	suitable for our series: M3658 / M3678 F5868 / F5888 5858 / 5878 5868 / 5888 C60, C100, D120, D125 IS60, IN88 SR160, SR250H EMIO.SIO.10xP 	cable length ¹⁾ standard cable length 2 m [6.56'] (available from 1 piece) 5 m [16.40'] 10 m [32.81'] 15 m [49.21'] other cable lengths (minimum order quantity 4 pieces)	05.00.6021.2422.002M 05.00.6021.2422.005M 05.00.6021.2422.010M 05.00.6021.2422.015M 05.00.6021.2422.0xxM xx = length in meters: 1, 3, 8, 12, 20, 25, 30	Product overview Basics Incremental encoders Absolute encoders singleturn Absolute encoders multiturn
Female connector with coupling nut + male connector with external thread A coded, right-angle Cable: PUR, 2 x 0,25 mm ² [AWG23] + 2 x 0,34 mm ² [AWG22] Housing: metal / plastic, IP67 		Bus in / out 	suitable for our series: M3658 / M3678 F5868 / F5888 5858 / 5878 5868 / 5888 C60, C100, D120, D125 IS60, IN88 SR160, SR250H EMIO.SIO.10xP 	cable length ¹⁾ standard cable length 2 m [6.56'] (available from 1 piece) 5 m [16.40'] 10 m [32.81'] 15 m [49.21'] other cable lengths (minimum order quantity 4 pieces)	05.00.6021.2523.002M 05.00.6021.2523.005M 05.00.6021.2523.010M 05.00.6021.2523.015M 05.00.6021.2523.0xxM xx = length in meters: 1, 3, 8, 12, 20, 25, 30	Bearingless encoders Linear measuring technology Inclinometers Connection technology Accessories

1) Other cable lengths on request.
 2) Shield on housing.

Connection technology

M12 connection technology Cordsets, pre-assembled

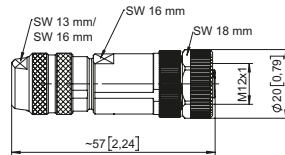
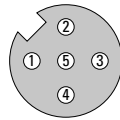
With connector, 5 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Female connector with coupling nut + single-ended
A coded, straight

Cable: PVC,
 3 x 2 x 0,25 mm² [AWG23]
 Housing: metal, IP67



Bus in



suitable for our series:

M3658 / M3678
 5858 / 5878 5868 / 5888
 C60, C100, D120, D125
 SR160, SR250H



Terminal assignment

Pin female contacts:	1	2	3	4	5	PH ²⁾
Wire color:	GY	BN	WH	GN	YE	⊥

standard cable length *cable length*¹⁾
 2 m [6.56']
 (available from 1 piece) 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

other cable lengths
 (minimum order quantity 4 pieces)

8.0000.6V81.0002
8.0000.6V81.0005
8.0000.6V81.0010
8.0000.6V81.0015

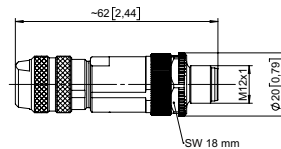
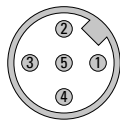
8.0000.6V81.00xx
 xx = length in meters:
 1, 3, 8, 12, 20, 25, 30

Male connector with external thread + single-ended
A coded, straight

Cable: PVC,
 3 x 2 x 0,25 mm² [AWG23]
 Housing: metal, IP67



Bus out



suitable for our series:

M3658 / M3678
 5858 / 5878 5868 / 5888
 SR160, SR250H



Terminal assignment

Pin male contacts:	1	2	3	4	5	PH ²⁾
Core color:	GY	BN	WH	GN	YE	⊥

standard cable length *cable length*¹⁾
 2 m [6.56']
 (available from 1 piece) 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

other cable lengths
 (minimum order quantity 4 pieces)

8.0000.6V88.0002
8.0000.6V88.0005
8.0000.6V88.0010
8.0000.6V88.0015

8.0000.6V88.00xx
 xx = length in meters:
 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
 2) Shield on housing.

Connection technology

M12 connection technology Cordsets, pre-assembled

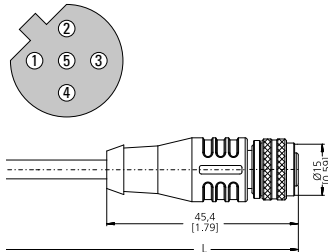
With connector, 5 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

Female connector with coupling nut + single-ended B coded, straight

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

5858 / 5878 5868 / 5888
SR120, SR160, SR250H



Terminal assignment

Pin female contacts:	1	2	3	4	5	PH ²⁾
Core color:	n.c.	GN	n.c.	RD	n.c.	PH ²⁾

cable length¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 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

other cable lengths
(minimum order quantity 4 pieces)

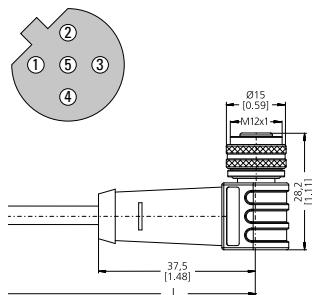
05.00.6011.3211.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended B coded, right-angle

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing: metal / plastic, IP67



Bus-in



suitable for our series:

5858 / 5878 5868 / 5888
SR120, SR160, SR250H



Terminal assignment

Pin female contacts:	1	2	3	4	5	PH ²⁾
Core color:	n.c.	GN	n.c.	RD	n.c.	PH ²⁾

cable length¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 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


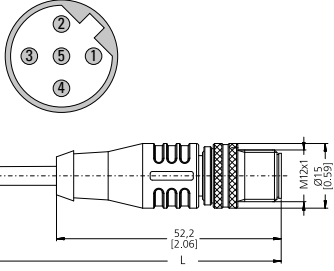


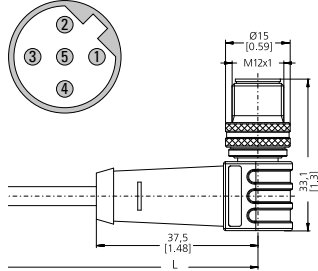

other cable lengths
(minimum order quantity 4 pieces)

05.00.6011.3311.0xxM
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

M12 connection technology

Cordsets, pre-assembled

With connector, 5 pin		Working temp. -30°C ... +80°C [-22°F ... +176°F]	Order no.														
<p>Male connector with external thread + single-ended B coded, straight</p> <p>Cable: PUR, 2 x 0.34 mm² [AWG22] Housing: metal / plastic, IP67</p>  <p><i>Terminal assignment</i></p> <table border="1"> <tr> <td>Pin male contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>PH ²⁾</td> </tr> <tr> <td>Core color:</td> <td>n.c.</td> <td>GN</td> <td>n.c.</td> <td>RD</td> <td>n.c.</td> <td>PH ²⁾</td> </tr> </table>	Pin male contacts:	1	2	3	4	5	PH ²⁾	Core color:	n.c.	GN	n.c.	RD	n.c.	PH ²⁾	<p>Bus-out</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 SR120, SR160, SR250H</p> 	<p><i>cable length ¹⁾</i></p> <p>standard cable length 2 m [6.56'] (available from 1 piece) 5 m [16.40'] 10 m [32.81'] 15 m [49.21']</p> <p>other cable lengths (minimum order quantity 4 pieces)</p> <p>05.00.6011.3411.002M 05.00.6011.3411.005M 05.00.6011.3411.010M 05.00.6011.3411.015M</p> <p>05.00.6011.3411.0xxM xx = length in meters: 1, 3, 8, 12, 20, 25, 30</p>
Pin male contacts:	1	2	3	4	5	PH ²⁾											
Core color:	n.c.	GN	n.c.	RD	n.c.	PH ²⁾											
<p>Male connector with external thread + single-ended B coded, right-angle</p> <p>Cable: PUR, 2 x 0.34 mm² [AWG22] Housing: metal / plastic, IP67</p>  <p><i>Terminal assignment</i></p> <table border="1"> <tr> <td>Pin male contacts:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>PH ²⁾</td> </tr> <tr> <td>Core color:</td> <td>n.c.</td> <td>GN</td> <td>n.c.</td> <td>RD</td> <td>n.c.</td> <td>PH ²⁾</td> </tr> </table>	Pin male contacts:	1	2	3	4	5	PH ²⁾	Core color:	n.c.	GN	n.c.	RD	n.c.	PH ²⁾	<p>Bus-out</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 SR120, SR160, SR250H</p> 	<p><i>cable length ¹⁾</i></p> <p>standard cable length 2 m [6.56'] (available from 1 piece) 5 m [16.40'] 10 m [32.81'] 15 m [49.21']</p> <p>other cable lengths (minimum order quantity 4 pieces)</p> <p>05.00.6011.3511.002M 05.00.6011.3511.005M 05.00.6011.3511.010M 05.00.6011.3511.015M</p> <p>05.00.6011.3511.0xxM xx = length in meters: 1, 3, 8, 12, 20, 25, 30</p>
Pin male contacts:	1	2	3	4	5	PH ²⁾											
Core color:	n.c.	GN	n.c.	RD	n.c.	PH ²⁾											

1) Other cable lengths on request.
2) Shield on housing.

M12 connection technology

Cordsets, pre-assembled

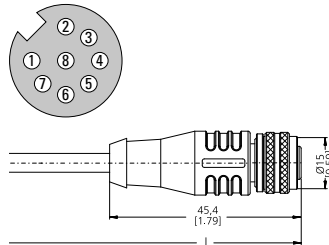
With connector, 8 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

Order no.

Female connector with coupling nut + single-ended
A coded, straight

Cable: PVC, 8 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



suitable for our series:

3610 / 3620	KIS50 / KIH50
5000 / 5020	5006 / 5026
5814 / 5834	5814FSx / 5834FSx
5821	A020 / A02H
F3653 / F3673	5853 / 5873
M3663 / M3683	M3663R / M3683R
F3663 / F3683	F5863 / F5883
5863 / 5883	
F5883M	F5888M
C60, D120	
SP 1SC-2SC2D	SP 2D-2D
SK 1A-1S1D2RS	SK 1S-1P
PW 1D-1D	

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH ²⁾
Core color:	WH	BN	GN	YE	GY	PK	BU	RD	PH ²⁾

cable length¹⁾

standard cable length	2 m [6.56']
(available from 1 piece)	5 m [16.40']
	10 m [32.81']
	15 m [49.21']

05.00.6041.8211.002M
05.00.6041.8211.005M
05.00.6041.8211.010M
05.00.6041.8211.015M

other cable lengths

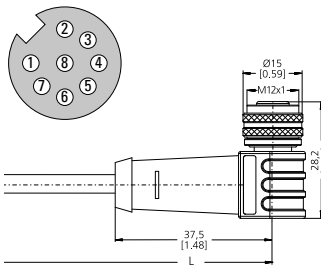
(minimum order quantity 4 pieces)

05.00.6041.8211.0xxM

xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended
A coded, right-angle

Cable: PVC, 8 x 0.25 mm² [AWG23]
Housing: metal / plastic, IP67



suitable for our series:

3610 / 3620	5000 / 5020
5814 / 5834	5814FSx / 5834FSx
5006 / 5026	5821
A020 / A02H	
F3653 / F3673	5853 / 5873
M3663 / M3683	M3663R / M3683R
F3663 / F3683	F5863 / F5883
5863 / 5883	F5888M
C60, D120	
SP 1SC-2SC2D	SP 2D-2D
SK 1A-1S1D2RS	SK 1S-1P
PW 1D-1D	

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH ²⁾
Core color:	WH	BN	GN	YE	GY	PK	BU	RD	PH ²⁾

cable length¹⁾

standard cable length	2 m [6.56']
(available from 1 piece)	5 m [16.40']
	10 m [32.81']
	15 m [49.21']

05.00.6041.8311.002M
05.00.6041.8311.005M
05.00.6041.8311.010M
05.00.6041.8311.015M

other cable lengths

(minimum order quantity 4 pieces)

05.00.6041.8311.0xxM

xx = length in meters:
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

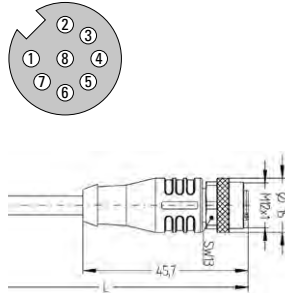
Connection technology

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: PUR, 8 x 0.25 mm² [AWG23]
 Housing: metal / plastic, IP67



suitable for our series:

- 3610 / 3620 5000 / 5020
- 5814 / 5834 5814FSx / 5834FSx
- 5006 / 5026 5821
- A020 / A02H
- F3653 / F3673 5853 / 5873
- M3663 / M3683 M3663R / M3683R
- F3663 / F3683 F5863 / F5883
- 5863 / 5883 M5863

C60, D120

- SP 1SC-2SC2D SP 2D-2D
- SK 1A-1S1D2RS SK 1S-1P
- PW 1D-1D

SR160

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH ²⁾
Core color:	WH	BN	GN	YE	GY	PK	BU	RD	PH ²⁾

cable length ¹⁾

- standard cable length 2 m [6.56']
- (available from 1 piece) 5 m [16.40']
- 10 m [32.81']
- 15 m [49.21']

- 05.00.6051.8211.002M**
- 05.00.6051.8211.005M**
- 05.00.6051.8211.010M**
- 05.00.6051.8211.015M**

other cable lengths

(minimum order quantity 4 pieces)

05.00.6051.8211.0xxM

xx = length in meters:

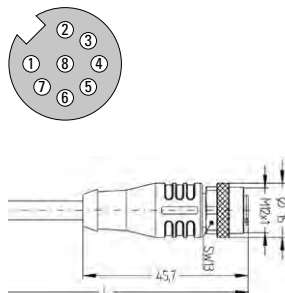
- 1, 3, 8, 12, 20, 25, 30

Female connector with coupling nut + single-ended
A coded, straight

Cable: PUR, 4 x 2 x 0,25 mm² [AWG23]
 Housing: metal / plastic, IP67



Twisted-pair cables - for particularly interference-free transmission



suitable for our series with RS422, RS485 or SinCos output:

- 3610 / 3620 5000 / 5020
- 5814 / 5834 5814FSx / 5834FSx
- 5006 / 5026 5821
- A020 / A02H
- F3653 / F3673 5853 / 5873
- M3663 / M3683 M3663R / M3683R
- F3663 / F3683 F5863 / F5883
- 5863 / 5883

C60, D120

- SP 1SC-2SC2D SP 2D-2D
- SK 1A-1S1D2RS SK 1S-1P
- PW 1D-1D

SR160

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH ²⁾
Core color:	WH	BN	GN	YE	GY	PK	BU	RD	PH ²⁾

cable length ¹⁾

- standard cable length 2 m [6.56']
- (available from 1 piece) 5 m [16.40']
- 10 m [32.81']
- 15 m [49.21']

- 05.00.60E1.8211.002M**
- 05.00.60E1.8211.005M**
- 05.00.60E1.8211.010M**
- 05.00.60E1.8211.015M**

other cable lengths

(minimum order quantity 4 pieces)

05.00.60E1.8211.0xxM

xx = length in meters:

- 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
 2) Shield on housing.

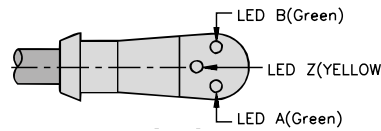
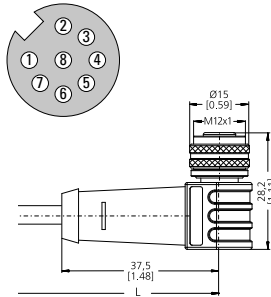
Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclination meters
 Connection technology
 Accessories
 Addresses

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 |
| C60, D120 | |
| SP 1SC-2SC2D | SP 2D-2D |
| SK 1A-1S1D2RS | SK 1S-1P |
| PW 1D-1D | |

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	PH ²⁾
Core color:	WH	BN	YE	GN	PK	GY	RD	BU	PH ²⁾

cable length¹⁾

2 m [6.56']	05.E-WKC 8T-PX3-930-0002
5 m [16.40']	05.E-WKC 8T-PX3-930-0005
10 m [32.81']	05.E-WKC 8T-PX3-930-0010
15 m [49.21']	05.E-WKC 8T-PX3-930-0015

1) Other cable lengths on request.
 2) Shield on housing.

Connection technology


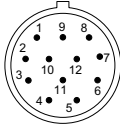
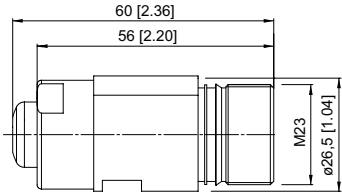

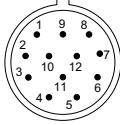
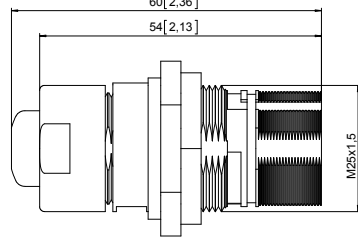


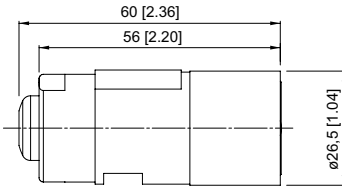
M12 connection technology Cordsets, pre-assembled

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 mm ² [AWG25] Housing: metal / plastic, IP67		suitable for our series: RLA50 LA10 C100, D125																													
Terminal assignment <table border="1"> <tr> <td>Pin female contacts:</td> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>PH 2)</td> </tr> <tr> <td>Core color:</td> <td>WH</td><td>BN</td><td>GN</td><td>YE</td><td>GY</td><td>PK</td><td>BU</td><td>RD</td><td>BK</td><td>VT</td><td>GY/PK</td><td>RD/BU</td><td>PH 2)</td> </tr> </table>		Pin female contacts:		1	2	3	4	5	6	7	8	9	10	11	12	PH 2)	Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	PH 2)	cable length ¹⁾ standard cable length 2 m [6.56'] (available from 1 piece) 5 m [16.40'] 10 m [32.81'] 15 m [49.21'] other cable lengths (minimum order quantity 4 pieces)
Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH 2)																		
Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	PH 2)																		

1) Other cable lengths on request.
 2) Shield on housing.


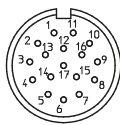
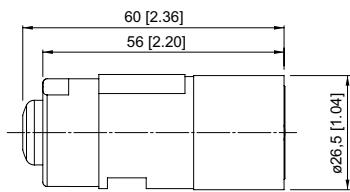
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 Accessories
 Addresses

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>Product overview Basics</p> <p>Incremental encoders</p> <p>Absolute encoders singleturn</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>Absolute encoders multiturn</p> <p>Bearingless encoders</p> <p>Linear measuring technology</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>KIS50 / KIH50 5000 / 5020 5814 / 5834 5814FSx / 5834FSx 580X / 582X</p> <p>F5863 / F5883 F5883M 585x / 587x 5853FSx / 5873FSx 586x / 588x 5863FSx / 5883FSx A02x</p>	<p>8.0000.5012.0000</p>	<p>Inclinometers</p> <p>Connection technology</p> <p>Accessories</p> <p>Addresses</p>



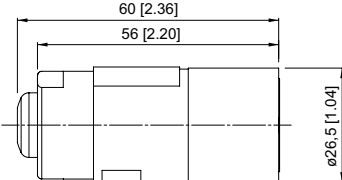


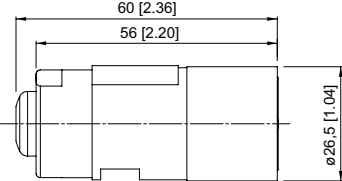
Connection technology

M23 connection technology Connectors, self-assembly

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: 5852 / 5872</p> <p>8.0000.5042.0000</p>

- Product overview Basics
- Incremental encoders
- Absolute encoders singleturn
- Absolute encoders multiturn
- Bearingless encoders
- Linear measuring technology
- Inclinometers
- Connection technology
- Accessories
- Addresses

M23 connection technology Cordsets, pre-assembled

With connector, 12 pin		Working temp. -30°C ... +80°C [-22°F ... +176°F]	Order no.																																		
<p>Female connector with coupling nut + single-ended</p> <p>Cable: PVC, 6 x 2 x 0.14 mm² [AWG25] Housing: metal, IP67</p> 	<p>pin socket assignment cw</p>  	<p>suitable for our series with RS422 or SinCos output:</p> <table border="0"> <tr> <td>KIS50 / KIH50</td> <td>5000 / 5020</td> </tr> <tr> <td>5805 / 5825 ³⁾</td> <td></td> </tr> <tr> <td>5814 / 5834</td> <td>5814FSx / 5834FSx ³⁾</td> </tr> <tr> <td>A020 / A02H</td> <td>H120</td> </tr> </table>	KIS50 / KIH50	5000 / 5020	5805 / 5825 ³⁾		5814 / 5834	5814FSx / 5834FSx ³⁾	A020 / A02H	H120																											
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A020 / A02H	H120																																				
<p><i>Terminal assignment</i></p> <table border="1"> <tr> <td>Pin female contacts:</td> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>PH ²⁾</td> </tr> <tr> <td>Core color:</td> <td>PK</td><td>RD-BU</td><td>BU</td><td>RD</td><td>GN</td><td>YE</td><td>-</td><td>GY</td><td>-</td><td>WH</td><td>GY-PK</td><td>BN</td><td>PH ²⁾</td> </tr> </table>	Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH ²⁾	Core color:	PK	RD-BU	BU	RD	GN	YE	-	GY	-	WH	GY-PK	BN	PH ²⁾	<p>standard cable length (available from 1 piece)</p> <table border="0"> <tr> <td>2 m [6.56']</td> <td>8.0000.6901.0002</td> </tr> <tr> <td>5 m [16.40']</td> <td>8.0000.6901.0005</td> </tr> <tr> <td>10 m [32.81']</td> <td>8.0000.6901.0010</td> </tr> <tr> <td>15 m [49.21']</td> <td>8.0000.6901.0015</td> </tr> </table> <p>other cable lengths (available from 1 piece)</p> <p>8.0000.6901.00xx xx = length in meters: 1, 3, 8, 12, 20, 25, 30</p>	2 m [6.56']	8.0000.6901.0002	5 m [16.40']	8.0000.6901.0005	10 m [32.81']	8.0000.6901.0010	15 m [49.21']	8.0000.6901.0015
Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH ²⁾																								
Core color:	PK	RD-BU	BU	RD	GN	YE	-	GY	-	WH	GY-PK	BN	PH ²⁾																								
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<p>Female connector with coupling nut + single-ended</p> <p>Cable: PUR, 10 x 0.14 mm² [AWG25] + 2 x 0.5 mm² [AWG20] Housing: metal, IP67</p> 	<p>pin socket assignment cw</p>  	<p>suitable for our series with RS422 or SinCos output:</p> <table border="0"> <tr> <td>KIS50 / KIH50 ³⁾</td> <td>5000 / 5020 ³⁾</td> </tr> <tr> <td>5803 / 5823</td> <td>5804 / 5824</td> </tr> <tr> <td>5805 / 5825</td> <td></td> </tr> <tr> <td>5814 / 5834 ³⁾</td> <td>5814FSx / 5834FSx</td> </tr> <tr> <td>A020 / A02H ³⁾</td> <td>H120 ³⁾</td> </tr> </table>	KIS50 / KIH50 ³⁾	5000 / 5020 ³⁾	5803 / 5823	5804 / 5824	5805 / 5825		5814 / 5834 ³⁾	5814FSx / 5834FSx	A020 / A02H ³⁾	H120 ³⁾																									
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Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH ²⁾																								
Core color:	PK	BN	BU	RD	GN	YE	-	GY	-	WH 0.5 mm ²	WH 0.5 mm ²	BN 0.5 mm ²	PH ²⁾																								
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1) Other cable lengths on request.
2) Shield on housing.
3) Connector color assignment is different from encoder color assignment.

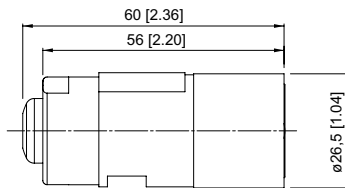
Connection technology

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 SSI or analog output:

5853 / 5873 5853FSx / 5873FSx
 5863 / 5883 5863FSx / 5883FSx
 F5863 / F5883 F5883M

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH 2)
Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	PH 2)

cable length ¹⁾

standard cable length 2 m [6.56']
 (available from 1 piece) 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

8.0000.6901.0002.0031
8.0000.6901.0005.0031
8.0000.6901.0010.0031
8.0000.6901.0015.0031

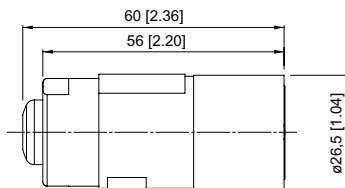
other cable lengths
 (available from 1 piece)

8.0000.6901.00xx.0031
 xx = length in meters:
 1, 3, 8, 12, 20, 25, 30

With connector, 12 pin Working temp. -40°C ... +135°C [-40°F ... +275°F] Order no.

Female connector with coupling nut + single-ended
 Cable: PE-X, 5 x 2 x 0.14 mm² [AWG25]
 + 2 x 0.5 mm² [AWG20]
 Housing: metal, IP67

pin socket assignment cw



suitable for our series with RS422 or SinCos output:

KIS50 / KIH50 ³⁾ 5000 / 5020 ³⁾
 5803 / 5823 5804 / 5824
 5805 / 5825
 5814 / 5834 ³⁾ 5814FSx / 5834FSx
 A020 / A02H ³⁾ H120 ³⁾

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	PH 2)
Core color:	PK	BN	BU	RD	GN	YE	-	GY	-	WH 0.5 mm ²	WH	BN 0.5 mm ²	PH 2)

cable length ¹⁾

standard cable length 2 m [6.56']
 (available from 1 piece) 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

8.0000.6E01.0002
8.0000.6E01.0005
8.0000.6E01.0010
8.0000.6E01.0015

other cable lengths
 (available from 1 piece)

8.0000.6E01.00xx
 xx = length in meters:
 1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
 2) Shield on housing.
 3) Connector color assignment is different from encoder color assignment.

M23 connection technology

Cordsets, pre-assembled

With connector, 12 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

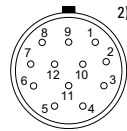
Order no.

Female connector with coupling nut + male connector with external thread

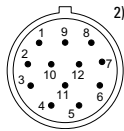
Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: metal, IP67



pin socket assignment cw

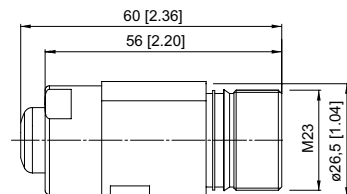
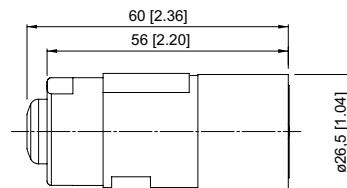


pin socket assignment ccw



suitable for our series:

5000 / 5020	5803 / 5823
5804 / 5824	5805 / 5825
5814 / 5834	5814FSx / 5834FSx
A020 / A02H	H120



standard cable length (available from 1 piece)

2 m [6.56']	8.0000.6905.0002
5 m [16.40']	8.0000.6905.0005
10 m [32.81']	8.0000.6905.0010
15 m [49.21']	8.0000.6905.0015

other cable lengths (available from 1 piece)

8.0000.6905.00xx

xx = length in meters:
1, 3, 8, 12, 20, 25, 30

1) Other cable lengths on request.
2) Shield on housing.

Connection technology

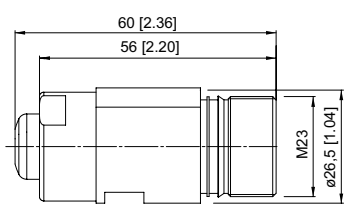
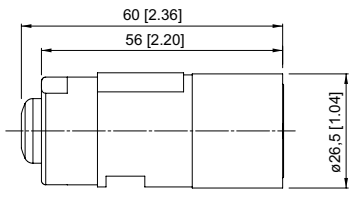
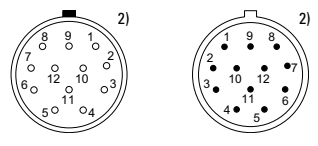
M23 connection technology Cordsets, pre-assembled

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 c cw



suitable for our series:
 5853 / 5873 5853FSx / 5873FSx
 5863 / 5883 5863FSx / 5883FSx
 F5863 / F5883

cable length ¹⁾
 standard cable length 2 m [6.56']
 (available from 1 piece) 5 m [16.40']
 10 m [32.81']
 15 m [49.21']
 other cable lengths
 (available from 1 piece)

8.0000.6905.0002.0.032
8.0000.6905.0005.0.032
8.0000.6905.0010.0.032
8.0000.6905.0015.0.032
8.0000.6905.00xx.0032
 xx = length in meters:
 1, 3, 8, 12, 20, 25, 30

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1) Other cable lengths on request.
 2) Shield on housing.

M23 connection technology

Cordsets, pre-assembled

With connector, 17 pin

Working temp. -30°C ... +80°C [-22°F ... +176°F]

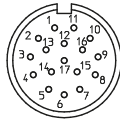
Order no.

Female connector with coupling nut + single-ended

Cable: PVC, 18 x 0.14 mm² [AWG25]
Housing: metal, IP67



pin socket assignment ccw



suitable for our series:

5852 / 5872

cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

other cable lengths
(available from 1 piece)

8.0000.6741.0002
8.0000.6741.0005
8.0000.6741.0010
8.0000.6741.0015

8.0000.6741.00xx
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Terminal assignment

Pin female contacts:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	WH-GN	BN-GN	WH-YE	YE-BN	WH-GY

Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology

Inclinometers



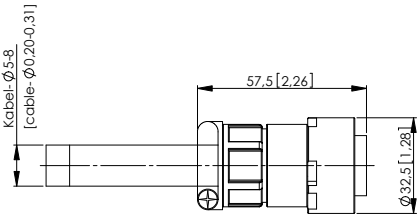


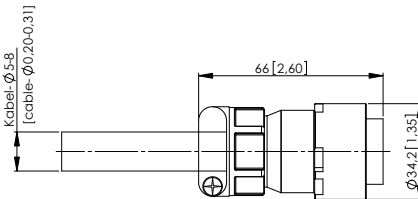
Connection
technology

Accessories

Addresses

1) Other cable lengths on request.

Connection technology

MIL connection technology		Connectors, self-assembly		Order no.	Product overview
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	Product overview Basics	
	 			Incremental encoders Absolute encoders singleturn	
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	Absolute encoders multiturn	
	 			Bearingless encoders Linear measuring technology	
				Inclinoimeters Connection technology	
				Accessories	
				Addresses	

PCB connection technology Cordsets, pre-assembled

With PCB connector, 12 pin Working temp. -30°C ... +80°C [-22°F ... +176°F] Order no.

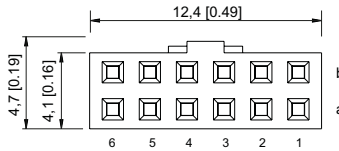
Female connector + single-ended

Cable: PVC, 12 x 0,14 mm² [AWG25]
Housing: plastic

FCI Minitex connector (female contact) double-row

suitable for our series:

5873 Motor-Line



cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 8 m [26.25']

other cable lengths
(available from 1 piece)

8.0000.6D91.0002
8.0000.6D91.0008

8.0000.6D91.00xx
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Terminal assignment

Pin female contacts:	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Core color:	PK	BN	BU	GN	GY-PK	VT	BK	WH	YE	RD	RD-BU	GY

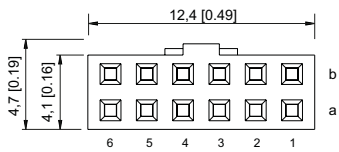
Female connector + single-ended

Cable: PVC, 12 x 0,14 mm² [AWG25]
Housing: plastic

FCI Minitex connector (female contact) double-row

suitable for our series:

5834 Motor-Line



cable length ¹⁾

standard cable length 2 m [6.56']
(available from 1 piece) 8 m [26.25']

other cable lengths
(available from 1 piece)

8.0000.6D91.0002 .0097
8.0000.6D91.0008 .0097

8.0000.6D91.00xx.0097
xx = length in meters:
1, 3, 8, 12, 20, 25, 30

Terminal assignment

Pin female contacts:	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b
Core color:	n.c.	BN	GN	n.c.	n.c.	PK	GY	WH	n.c.	YE	n.c.	n.c.

1) Other cable lengths on request.

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.

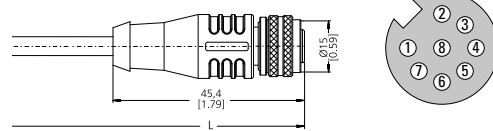
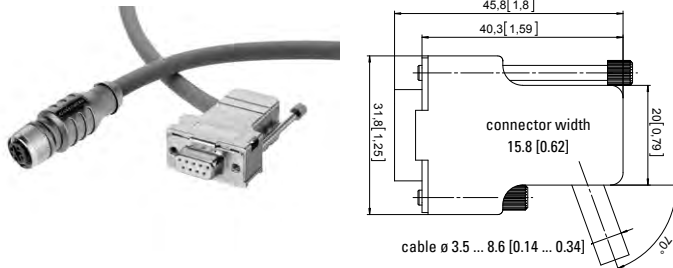
**Sub-D female connector, 9 pin, cable outlet 70°
+ M12 female connector with coupling nut,
8 pin, A coded**

Cable: PVC, 3 x 2 x 0.25 mm² [AWG 23]
Housing Sub-D: ABS, metalized, IP20
Housing M12: metal / plastic, IP67

suitable for our series:

5000 / 5020 5006 / 5026
5814 / 5834 5814FSx / 5834FSx
5821

SMC1, SMC2 SMC1D, SMC2D



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, SMC2

cable length ¹⁾

2 m [6.56']	8.0000.6V00.0002.0084
5 m [16.40']	8.0000.6V00.0005.0084
10 m [32.81']	8.0000.6V00.0010.0084
15 m [49.21']	8.0000.6V00.0015.0084

1) Other cable lengths on request.
2) Shield on housing.

Product overview Basics
Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearings encoders
Linear measuring technology
Inclinometers
Connection technology
Accessories
Addresses

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.

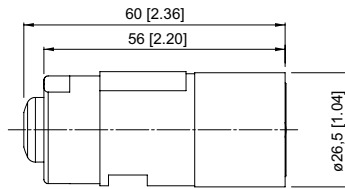
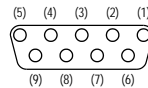
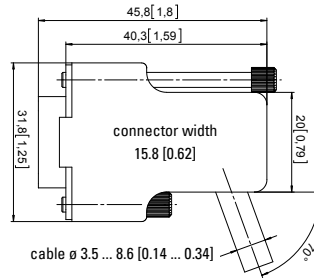
**Sub-D female connector, 9-pin, cable outlet 70°
+ M23 female connector with coupling nut,
12 pin**

Cable: PVC, 3 x 2 x 0.25 mm² [AWG 23]
Housing Sub-D: ABS, metalized, IP20
Housing M23: metal, IP67

suitable for our series:

5000 / 5020 5006 / 5026
5814 / 5834 5814FSx / 5834FSx
5821

SMC1, SMC2 SMC1D, SMC2D



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, SMC2

cable length¹⁾

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.

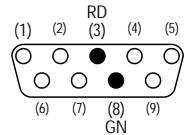
Connection technology

Sub-D connection technology Cordsets, pre-assembled

With Sub-D connector 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
- SMBU.031
- SMBS.S31



Terminal assignment

Pin Sub-D:	1	2	3	4	5	6	7	8	9	PH ²⁾
Core color:	-	-	RD	-	-	-	-	GN	-	

cable length ¹⁾

- 2 m [6.56']
- 5 m [16.40']
- 10 m [32.81']
- 15 m [49.21']

- 05.00.6011.5511.002M**
- 05.00.6011.5511.005M**
- 05.00.6011.5511.010M**
- 05.00.6011.5511.015M**

1) Other cable lengths on request.
 2) Shield on housing.

- Product overview Basics
- Incremental encoders
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- Bearingless encoders
- Linear measuring technology
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- Connection technology
- Accessories
- Addresses

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 female connector with coupling nut, 5 pin, B coded Bus in suitable for our series:

Cable: PUR, 2 x 0.34 mm² [AWG22] 5858 / 5878
 Housing Sub-D: ABS, metalized 5868 / 5888

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° Profibus master with terminating resistor + M12 male connector with external thread, 5 pin, B coded Bus out suitable for our series:

Cable: PUR, 2 x 0.34 mm² [AWG22] 5858 / 5878
 Housing Sub-D: ABS, metalized 5868 / 5888

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.

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 Linear measuring technology
 Inclinoimeters
 Connection technology
 Accessories
 Addresses

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.

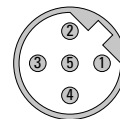
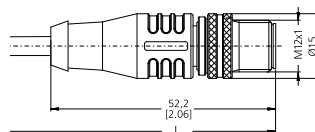
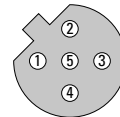
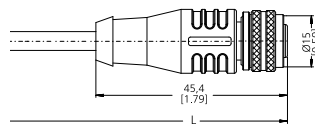
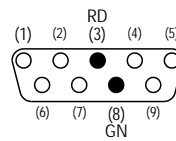
**Sub-D male connector, 9 pin, cable outlet 90°
Profibus master with terminating resistor +
M12 male connector with external thread and
M12 female connector with coupling nut,
5 pin, B coded**

Bus in, Bus out

suitable for our series:

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing Sub-D: ABS, metalized
Housing M12: metal / plastic

5858 / 5878
5868 / 5888



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']	05.00.6012.5536.002M
2 x 5 m [16.40']	05.00.6012.5536.005M
2 x 10 m [32.81']	05.00.6012.5536.010M
2 x 15 m [49.21']	05.00.6012.5536.015M

1) Other cable lengths on request.
2) Shield on housing.

Product overview Basics
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Optical fiber transmission modules

Optical fiber signal transmission

Transmitter and receiver

RS422/HTL

eco plus

Cost advantage compared to conventional wiring over 150 m length*



The solution where signal transmission is difficult.

The system is made up of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals of a normal incremental encoder into a light signal for transmission by means of a glass fiber.

The receiving module converts the optical signal back into electrical signals. Up to 4 channels with inverted signals may be transmitted safely.

Innovative

- Signal transmission via just a single glass fiber.
- Safe signal transmission up to 2000 m.
- Input frequency up to 400 kHz.
- Input level 10 ... 30 V or RS422.
- Inverted input signals.
- Resists extremely strong electro-magnetical fields.

Compact

- Can be installed even where space is tight.
- Minimal installation depth.
- Connections plug-in HD-Sub D15 or terminal clamp.

Application areas

- 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 fiber transmitter / receiver

6.LWL X . XX
a b c

a
 S = Optical fiber transmitter
 E = Optical fiber receiver

b *Input or output circuit / Power supply*
 1 = RS422 / 10 ... 30 V DC
 2 = HTL, without inverted signals / 10 ... 30 V DC (only for optical fiber transmitter)
 4 = RS422 / 5 V DC
 5 = HTL / 10 ... 30 V DC, input

c *Type of connection*
 0 = Terminal clamp
 1 = Plug-in connector HD-Sub D15

Scope of delivery:
 - Optical fiber module
 - Multilingual operating manual

Optical fiber transmitter versions can be combined with any version of the optical fiber receivers.

Accessories

**Simplex Patch cable
 ST-ST - Multimode**



Connector: 2 x ST/PC
 Glass fiber: 1 x 50/125
 bending radius min.:
 static 30 mm [1.18"]
 dynamic 60 mm [2.36"]

Order no. **05.B09-B09.821-XXXX**
 XXXX = Length in m
 Standard lengths: 2 m, 5 m,
 8 m, 10 m, 15 m, 20 m, ...
 (in 5 m steps)

ST Multimode coupling



Barrel: ceramic, slotted

Order no. **05.LWLK.001**

* Comparison of costs:
 Costs per meter standard copper cable compared to costs per meter optical fiber signal cable + costs of transmitter + costs of receiver.

Optical fiber transmission modules

Optical fiber signal transmission Transmitter and receiver RS422/HTL

Technical data

General technical data	
Power supply	10 ... 30 DC V eg. 5 V DC ±5%
Power consumption per module	< 2 W
Operating voltage reverse connection protection	available
Encoder inputs optical fiber transmitter channels	A, \bar{A} , B, \bar{B} , 0, $\bar{0}$
Max. input frequency optical fiber transmitter and output frequency optical fiber receiver	400 kHz
Input level optical fiber transmitter	10 ... 30 V or RS 422
Optical wavelength	850 nm
Optical transmission rate	120 Mbit/s
Optical fiber synchronisation display	LED on the receiver
Optical fiber connection	ST connector, \varnothing 9 mm [0.35] on the bottom side of the housing
Glass fiber	multimode fiber, 50/125 μ m, 62.5/125 μ m

Input signals sampling rate	10 MSamples/s	
Optical fiber transmission distance	max. 2000 m [6561']	
Dimensions (W x L x H)	Terminal clamp	22.5 x 110.8 x 88.4 mm [0.89 x 4.36 x 3.48"]
	Plug-in connector	19.0 x 110.8 x 88.4 mm [0.75 x 4.36 x 3.48"]
Protection acc. to EN 60529	IP40, terminals IP20	
Terminals		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

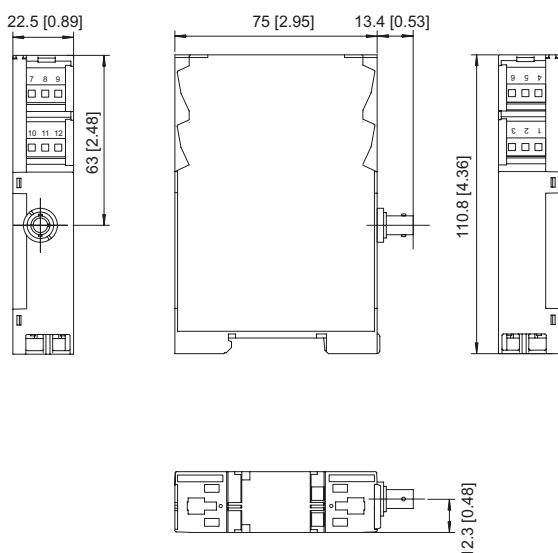
Terminal assignment

Type of connection	Terminal clamp, optical fiber transmitter and 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 fiber 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
	Pin female contact:	8	6	3	9	7	4	1	2	15	11, 12	13	1	2
Type of connection	HD-Sub D15, optical fiber receiver											Terminal		
1	Signal:	\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
	Pin female contact:	8	6	3	9	7	4	1	2	15	11, 12	13	1	2

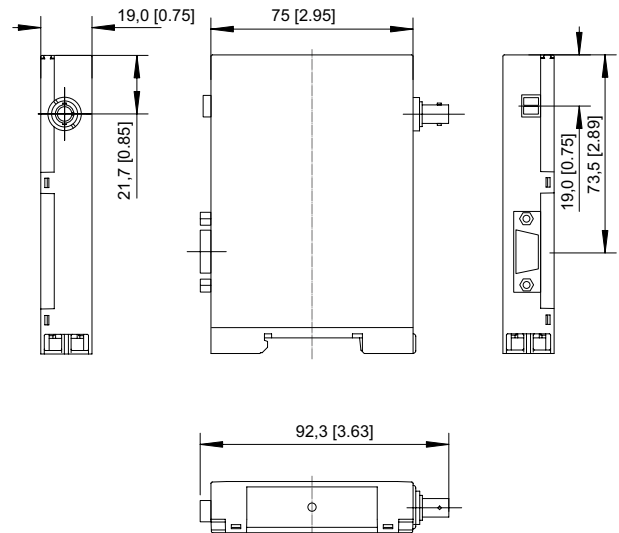
Dimensions

Dimensions in mm [inch]

Terminal clamp



Plug-in connector, HD-Sub D15



Optical fiber transmission modules

Optical fiber signal transmission **Transmitter and receiver** **SSI**

eco plus
 Cost advantage compared to conventional wiring over 150 m length*



Optical fiber transmission system for SSI absolute encoders
 The system is made up of an optical fiber transmitter and an optical fiber receiver. The optical fiber transmitter converts the electrical signals of a normal absolute encoder with Synchronous Serial Interface (SSI) into a light signal for transmission by means of an optical fiber. The receiving module converts the optical signal back into electrical signals.
 Absolute signals can be transmitted safely through one glass fiber over distances of up to 2000 m. A rotary switch on the front side of the module allows adjusting the SSI clock between 1 and 99 bits.

Reliable transmission

- Safe signal transmission up to 2000 m.
- Resists extremely strong electro-magnetic fields.

Easy installation

- Signal transmission via a single glass fiber.
- Clock of 1 ... 99 bit can be set via rotary switch.
- LED for monitoring of power supply and clock.
- DIN-rail mounting – requires min. installation space – only 19 mm wide.

Application areas

- Process control technology and automation technology.
- Crane systems.
- High voltage plants.
- Heavy industry.
- Wind power plants.
- Drive technology.
- Rolling mills.

Order code

Optical fiber transmitter / receiver

6.LWLA . XXX
 a b c

- a** S = Optical fiber transmitter
E = Optical fiber receiver
- b** Power supply
1 = 10 ... 30 V DC
4 = 5 V DC
- c** Type of connection
0 = Terminal clamp
1 = Plug-in connector Sub-D9

Scope of delivery:
 - Optical fiber transmission module
 - Operating manual, dual language, German and English

Accessories

**Simplex Patch cable
 ST-ST - Multimode**



Connector: 2 x ST/PC
 Glass fiber: 1 x 50/125
 bending radius min.:
 static 30 mm [1.18"]
 dynamic 60 mm [2.36"]

Order no. **05.B09-B09.821-XXXX**
 XXXX = Length in m
 Standard lengths: 2 m, 5 m,
 8 m, 10 m, 15 m, 20 m, ...
 (in 5 m steps)

ST Multimode coupling



Barrel: ceramic, slotted

Order no. **05.LWLK.001**

* Comparison of costs:
 Costs per meter standard copper cable compared to costs per meter optical fiber signal cable + costs of transmitter + costs of receiver

Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclometers
 Connection technology
 Accessories
 Addresses

Optical fiber transmission modules

Optical fiber signal transmission Transmitter and receiver SSI

Technical data

General technical data	
Power supply	10 ... 30 DC V eg. 5 V DC $\pm 5\%$
Power consumption per module	< 1 W
Operating voltage reverse connection protection	available
Electrical inputs / outputs (Optical fiber transmitter / receiver)	Clock C+ and C-, RS422 Data D+ and D-, RS422 NPN error input on transmitter Open-Drain outut on receiver
SSI clock rate	max. 1 MHz
Optical wavelength	850 nm (infrared)
Optical fiber connection	ST connector, on the bottom side of the housing
Glass fiber	multimode fiber, 50/125 μm , 62.5/125 μm
Optical fiber transmission distance	max. 2000 m [6561']

Dimensions (W x L x H)	19.0 x 110.8 x 92.3 mm [0.75 x 4.36 x 3.63"]
Protection acc. to EN 60529	IP40, terminals IP20
Connection	terminal clamps 11-pin plug-in screw terminal, RM 3.5 Sub-D9 9-pin Sub-D female contacts (for signals) power supply 2-pin plug-in screw terminal
Temperature range	-10°C ... +70°C [+14°F ... +158°F]
Weight	appr. 70 g [2.47 oz]

EMC		
Standards	Emitted interference	EN 55011 class B1
	Immunity to interference	EN 61000-6-2

Terminal assignment

Optical fiber transmitter

Type of connection	Terminal clamp											
0	Signal:	0 V	+V	C+	C-	D+	D-	input/error	-	-	-	⊥
	Pin female contact:	1	2	3	4	5	6	7	8	9	10	11

Type of connection	Plug-in connector, Sub-D9									
1	Signal:	0 V	+V	input/error	D-	D+	C-	C+	-	⊥
	Pin female contact:	1	2	3	4	5	6	7	8	9

Optical fiber receiver

Type of connection	Terminal clamp											
0	Signal:	0 V	+V	C+	C-	D+	D-	output/error	-	-	-	⊥
	Pin female contact:	1	2	3	4	5	6	7	8	9	10	11

Type of connection	Plug-in connector, Sub-D9									
1	Signal:	0 V	+V	output/error	D-	D+	C-	C+	-	⊥
	Pin female contact:	1	2	3	4	5	6	7	8	9

Power supply

	Screw terminal, 2 pin		
	Signal:	0 V	+V
	Pin female contact:	1	2

Contacts 1/2 of the 2-pin plug-in screw terminal are connected to contacts 1/2 of the 11-pin plug-in screw terminal or with contacts 1/2 of the Sub-D connector.

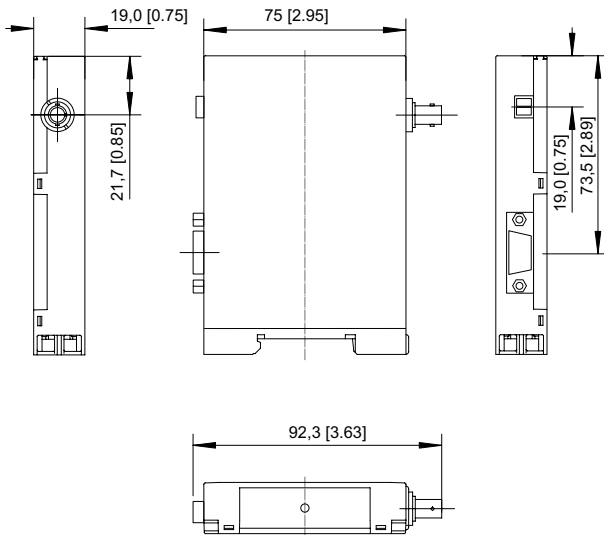
- +V: Power supply +V DC
- 0 V: Power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- ⊥: Shield

Connection technology

Optical fiber transmission modules Transmitter and receiver SSI

Dimensions

Dimensions in mm [inch]



Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

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Addresses

Accessories

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technology

Inclinometers

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technology

Bearingless
encoders

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multiturn

Absolute encoders
singleturn

Incremental
encoders

Product overview
Basics

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			Page	
Fixing components for hollow shaft encoders	For encoders up to ø 58 mm	Overview	662	Product overview Basics
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	For encoders up to ø 58 mm	Details	665	
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		Details	675	
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	Couplings	Bellows coupling (FS)	684	
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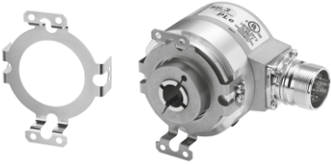
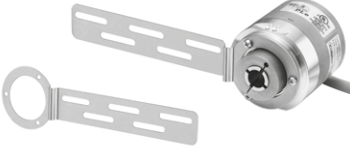
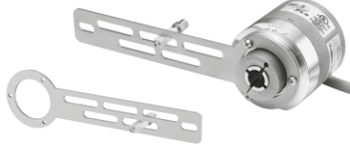
Addresses

Fixing components for hollow shaft encoders For encoders up to ø 58 mm Overview

Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	Incremental encoders			Absolute singleturn encoders		Absolute multiturn encoders			
					3620, 3720	KIH50, 5020, 5026	5834 Motor-Line	5823, 5824, 5825, 5834	3671, M3678, F3673, F3678	5873, 5878, 5870, 5872	5873 Motor-Line	F3683, F3688	M3681, M3683, M3688
	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 <i>Connection to the application:</i> cylindrical pin	665	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]	8.0010.4100.0000 <i>Connection to the application:</i> cylindrical pin	665	X	X		X	X		X	X	X
	Torque stop, short (flexible) For applications with axial and radial play, low dynamics	64.5 [2.54]	8.0010.40M0.0000 <i>Connection to the application:</i> 1 screw	665		X		X				X	X
	Torque stop, medium (flexible) For applications with axial and radial play for constant rotary movements	65 ... 91.5 [2.56 ... 3.60]	8.0010.40E0.0000 <i>Connection to the application:</i> 1 screw	665		X		X				X	X
	Torque stop, long (flexible) For applications with axial and radial play and low dynamics	80 ... 170 [3.15 ... 6.69]	8.0010.4R00.0000 <i>Connection to the application:</i> 1 screw	666		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 <i>Connection to the application:</i> 2 screws	666	X			X					X
	Stator coupling, double-winged For applications with high demands for accuracy	63 [2.48]	8.0010.4D00.0000 <i>Connection to the application:</i> 2 screws	666		flange C + D	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 <i>Connection to the application:</i> 3 screws	667		flange C + D		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 <i>Connection to the application:</i> 3 screws	667		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 <i>Connection to the application:</i> 1 screw	667		X		X		X			X

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Fixing components for hollow shaft encoders		For encoders up to ø 58 mm					Overview							
Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	Incremental encoders				Absolute singleturn encoders		Absolute multiturn encoders			
					5834FSx	5020	5823, 5824, 5825	5823, 5824, 5825	5873FSx	5873, 5878	5873 Motor-Line	5883FSx	5883, 5888, 5882, F5883, F5888	F5883M, F5888M
	<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>	668	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>	668	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>	669	X	X	X		X	X			X	X

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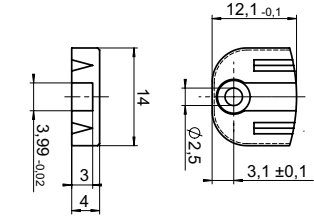

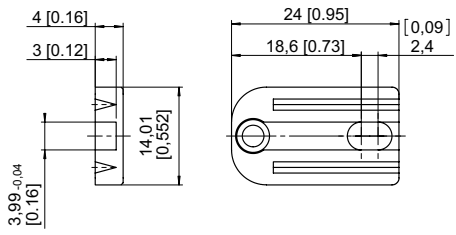

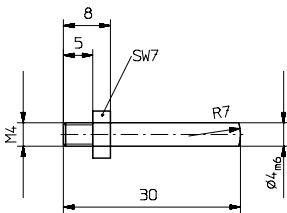
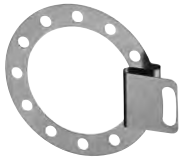
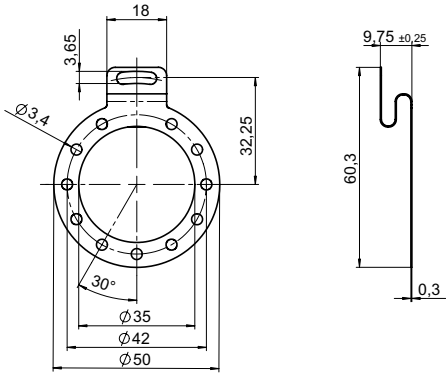
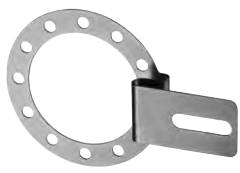
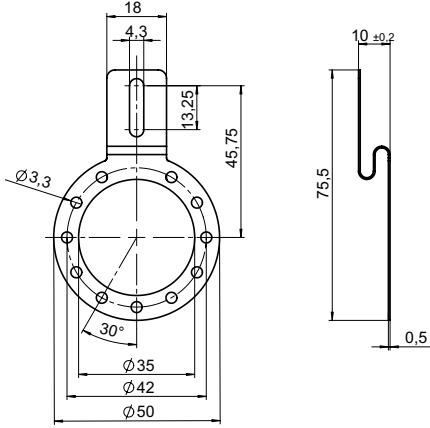
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Fixing components for hollow shaft encoders For encoders > ø 58 mm Overview


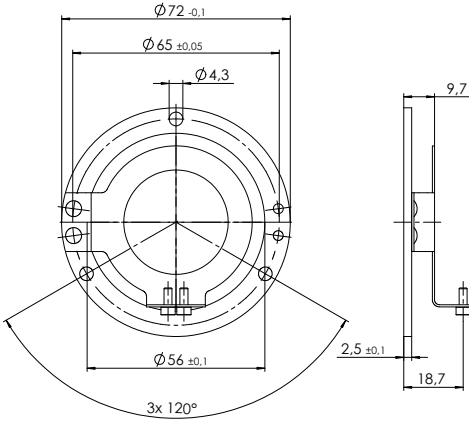

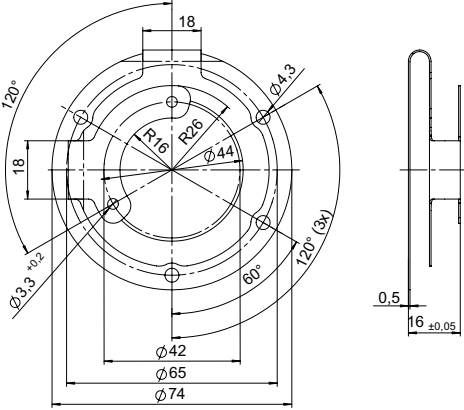


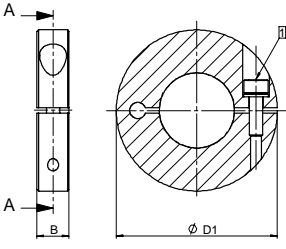
Figure	Description	Pitch circle diameter in mm [inch]	Order no.	Details s. page	A020, A02H	H120	
	Spring element, short For applications with reduced mounting space	76 [2.99]	8.0010.4J00.0000 <i>Connection to the application:</i> cylindrical pin	670	X		Product overview Basics Incremental encoders
	Spring element, long For applications with high axial play	110 [4.33]	8.0010.4K00.0000 <i>Connection to the application:</i> cylindrical pin	670	X		Absolute encoders singleturn Absolute encoders multiturn
	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:</i> 1 screw	670			Bearingless encoders
	Torque stop, short For applications with axial play	149 [5.87]	8.0010.4T00.0000 <i>Connection to the application:</i> s. details	670	X		Linear measuring technology
	Torque stop, 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:</i> 1 screw	671	X		Inclinometers
	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:</i> 1 screw	671	X	X	Connection technology
	Tether arm, long For applications with low axial and radial play, flexible in use	Length = 70 [2.75]; Length = 100 [3.94]; Length = 150 [5.91]; 262 ... 422 [10.32 ... 16.61]	8.0010.40S1.0000 8.0010.40T1.0000 8.0010.40U1.0000 <i>Connection to the application:</i> 1 screw	672		X	Accessories
	Stator coupling For applications with axial and radial play and high dynamics	119 [4.69]	8.0010.40V0.0000 <i>Connection to the application:</i> 2 screws	672	X	X	Addresses

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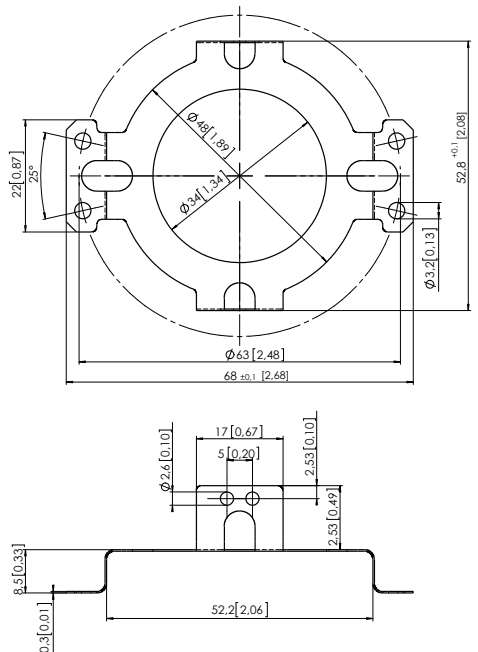
Fixing components for hollow shaft encoders		For encoders up to \varnothing 58 mm	Details	
Dimensions / Details	Dimensions in mm [inch]		Order no.	
Spring element, short 		<i>Scope of delivery:</i> - spring element (plastic) - 1 screw for fixing to the encoder <i>Connection to application:</i> - cylindrical pin (8.0010.4700.0000) (not supplied)	8.0010.4H00.0000	Product overview Basics Incremental encoders
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	Absolute encoders singleturn Absolute encoders multiturn
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	Bearingless encoders
Torque stop, 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	Linear measuring technology Inclometers
Torque stop, 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	Connection technology Accessories


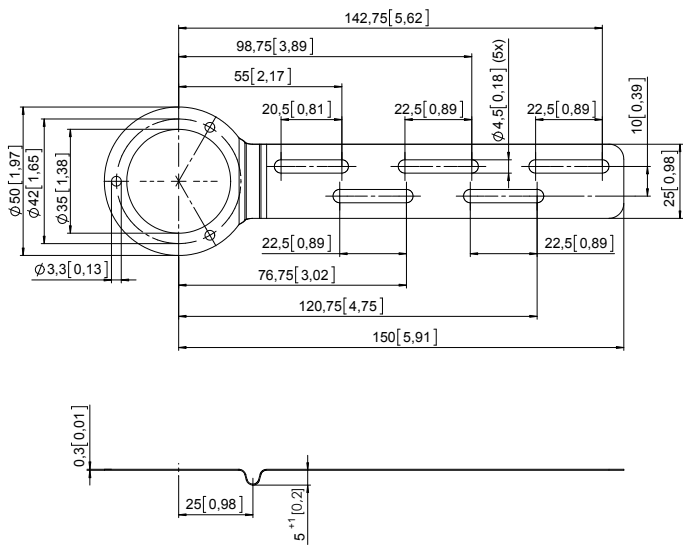
Fixing components for hollow shaft encoders		For encoders up to \varnothing 58 mm	Details		
Dimensions / Details			Order no.		
Torque stop, long			<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Fastening arm (stainless steel) - 3 screws for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 1 screw (not supplied) 	8.0010.4R00.0000	Product overview Basics
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	Incremental encoders
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) - 4 screws M2.5 x 6 [0.24] for fixing to the encoders <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	Absolute encoders singleturn
Absolute encoders multiturn	Bearingless encoders	Linear measuring technology	Inclination meters	Connection technology	Accessories

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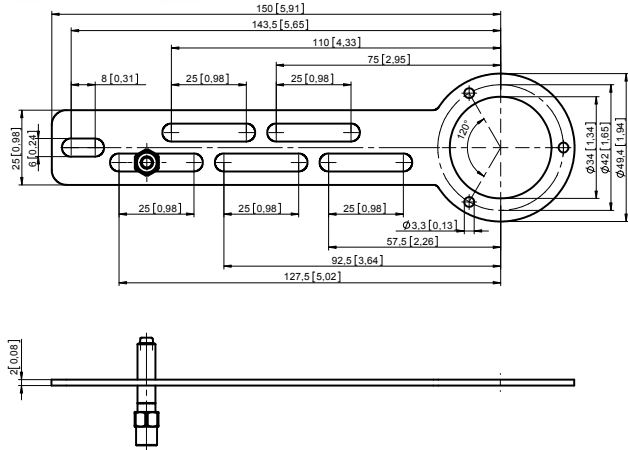

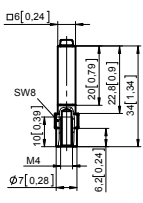
Fixing components for hollow shaft encoders		For encoders up to \varnothing 58 mm		Details																				
Dimensions / Details		Dimensions in mm [inch]		Order no.																				
Stator coupling for side fixing onto the encoder flange 		Scope of delivery: - Stator coupling (stainless steel) - 2 screws for fixing to the encoder Connection to application: - 3 screws (not supplied)	8.0010.1602.0000																					
			Product overview Basics																					
Stator coupling for front fixing onto the encoder flange 		Scope of delivery: - Stator coupling (stainless steel) - 2 screws for fixing to the encoder Connection to application: - 3 screws (not supplied)	8.0010.40L0.0000																					
			Incremental encoders																					
Spring tether element 		Scope of delivery: - spring tether element - 1 screw for fixing to the encoder Connection to application: - 1 screw (not supplied)	8.0010.40W0.0000																					
			Absolute encoders singleturn																					
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>6 [0.236]</td> <td>29 [1.14]</td> <td>10 [0.39]</td> <td>8.0000.4V00.0000</td> </tr> <tr> <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>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	8.0000.4V00.0000 8.0000.4W00.0000 8.0010.4W01.0000	
				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																				
Incremental encoders	Absolute encoders multiturn	Bearingless encoders	Linear measuring technology	Inclinometers	Connection technology																			
		1 screw DIN 912 A2 M2.5, max. tightening torque 0.45 Nm		Accessories	Addresses																			

Fixing components for hollow shaft encoders For encoders up to \varnothing 58 mm Details


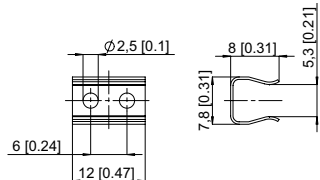

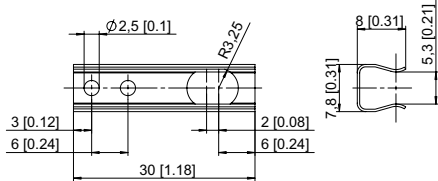

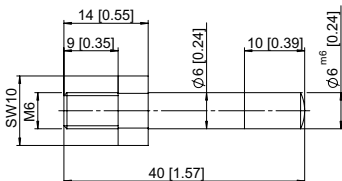

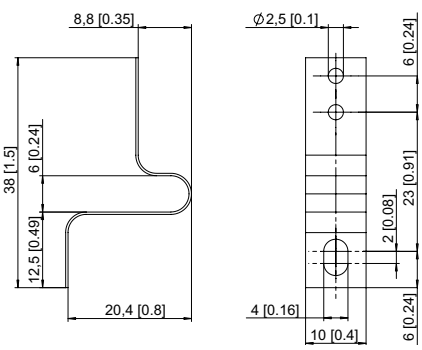

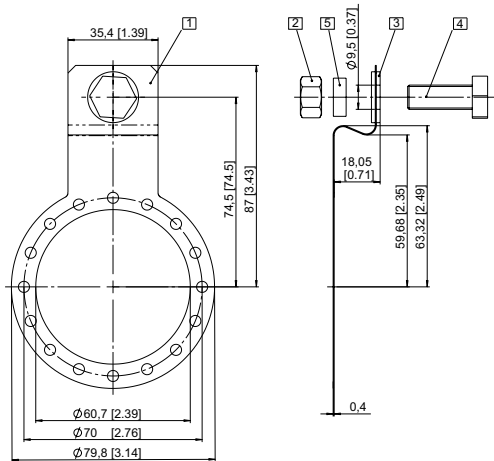
Dimensions / Details	Dimensions in mm [inch]	Order no.
<p>Stator coupling</p> 	 <p>Technical drawing showing dimensions for the stator coupling:</p> <ul style="list-style-type: none"> Top view: $\varnothing 63$ [2.48], $\varnothing 49$ [1.93], $\varnothing 24$ [0.94], 68 ± 0.1 [2.68], $52.8^{+0.1}$ [2.08], 22 [0.87], 25°, $\varnothing 3.2$ [0.13] Side view: 8.5 [0.33], 0.3 [0.01], 52.2 [2.06], 17 [0.67], 5 [0.20], $\varnothing 2.6$ [0.10], 2.53 [0.10], 2.53 [0.49] 	<p>8.0010.4048.00FS</p> <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Stator coupling (stainless steel) - 4 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 4 screws (not supplied) <p><i>Max. permissible shaft connection tolerances:</i></p> <ul style="list-style-type: none"> - Axial offset $< \pm 0.25$ mm - Radial offset $< \pm 0.20$ mm - Angular offset $< 1^\circ$

<p>Torque stop, flexible</p> 	 <p>Technical drawing showing dimensions for the torque stop, flexible:</p> <ul style="list-style-type: none"> Top view: 142.75 [5.62], 98.75 [3.89], 55 [2.17], 20.5 [0.81], 22.5 [0.89], 22.5 [0.89], 22.5 [0.89], 22.5 [0.89], 10 [0.39], 25 [0.98], $\varnothing 50$ [1.97], $\varnothing 42$ [1.65], $\varnothing 35$ [1.38], $\varnothing 3.3$ [0.13], $\varnothing 4.5$ [0.18] (5x) Side view: 0.3 [0.01], 25 [0.98], 5° [0.2] 	<p>8.0010.4047.00FS</p> <p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Fastening arm (stainless steel) - 3 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 1 screw (not supplied) <p><i>Max. permissible shaft connection tolerances:</i></p> <ul style="list-style-type: none"> - Axial offset $< \pm 0.25$ mm - Radial offset $< \pm 0.20$ mm - Angular offset $< 1^\circ$
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Fixing components for hollow shaft encoders		For encoders up to \varnothing 58 mm	Details
Dimensions / Details	Dimensions in mm [inch]		Order no.
Torque stop set, rigid  		<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Fastening arm (stainless steel) - 3 screws M3x6 mm [M3 x 0.24"] for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 1 screw (not supplied) <p><i>Max. permissible shaft connection tolerances:</i></p> <ul style="list-style-type: none"> - Axial offset < \pm 0.25 mm - Radial offset < \pm 0.20 mm - Angular offset < 1° 	8.0010.4051.00FS
Cylindrical pin (replacement)  		<p>suitable for: Fastening arm 8.0010.4051.00FS</p>	8.0010.4049.0075

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Fixing components for hollow shaft encoders		For encoders > ø 58 mm	Details
Dimensions / Details	Dimensions in mm [inch]		Order no.
Spring element, short 		<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)	8.0010.4J00.0000
Spring element, long 		<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)	8.0010.4K00.0000
Cylindrical pin, long with fastening thread 		suitable for spring element short (8.0010.4J00.0000) and long (8.0010.4K00.0000)	8.0010.4700.0003
Tether square 		<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)	8.0010.4G00.0000
Torque stop, short 		<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" 5 Washer D10.4 x 15 x 15 (supplied)	8.0010.4T00.0000

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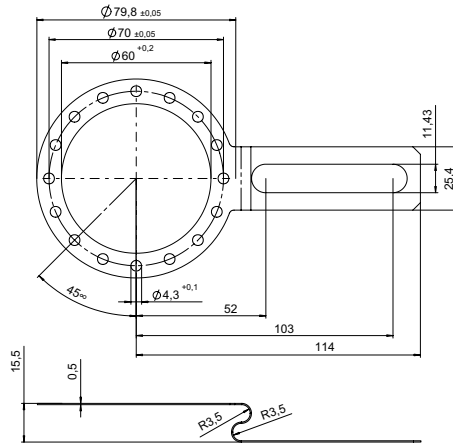
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Fixing components for hollow shaft encoders For encoders > ø 58 mm Details

Dimensions / Details Dimensions in mm [inch] Order no.

Torque stop, short



Scope of delivery:

- Fastening arm (stainless-steel)
- 3 screws for fixing to the encoder

Connection to application:

- 1 screw (not supplied)

8.0010.4E00.0000

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Tether arm, long



Tether arm	L1	L2	
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]	8.0010.40S0.0000
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]	8.0010.40T0.0000
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]	8.0010.40U0.0000

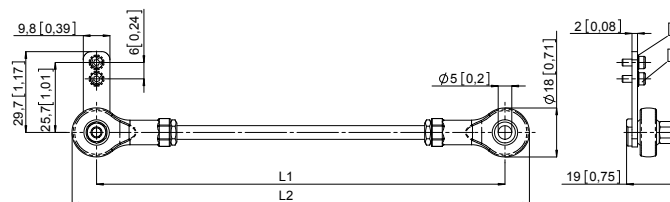
Scope of delivery:

- Tether arm
- For fixing to the encoder:

- 1 2 cap screws
M2.5 x 6 [0.24]
- 2 2 lock washers

Connection to application:

- 1 screw (not supplied)



Bearingless encoders

Linear measuring technology

Inclinometers


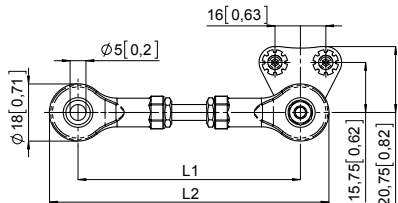
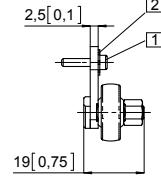
Connection technology


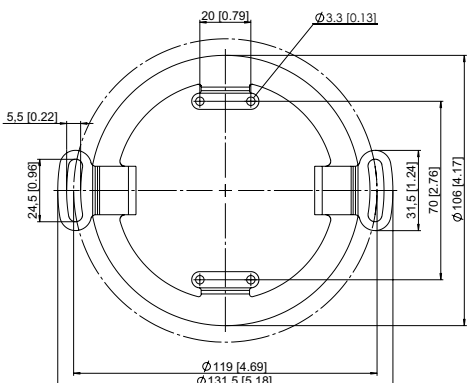
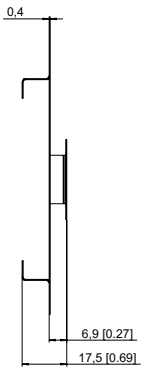
Accessories

Addresses

Accessories

Fixing components for hollow shaft encoders For encoders > ø 58 mm Overview

Dimensions / Details	Dimensions in mm [inch]			Order no.
Tether arm, long	<i>Tether arm</i>	<i>L1</i>	<i>L2</i>	
	70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]	8.0010.40S1.0000
	100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]	8.0010.40T1.0000
	150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]	8.0010.40U1.0000
<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Tether arm - For fixing to the encoder: <ul style="list-style-type: none"> 1 2 cap screws M2,5 x 12 [0.47] 2 2 lock washers <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 1 screw (not supplied) 				
<div style="display: flex; justify-content: space-around;">   </div>				

Stator coupling		8.0010.40V0.0000
	<p><i>Scope of delivery:</i></p> <ul style="list-style-type: none"> - Stator coupling (stainless steel) - 4 screws for fixing to the encoder <p><i>Connection to application:</i></p> <ul style="list-style-type: none"> - 2 screws (not supplied) 	
	<div style="display: flex; justify-content: space-around;">   </div>	

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology




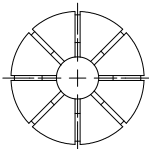
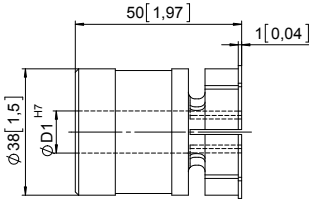
Inclinometers

Connection technology

Accessories

Addresses

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

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 Absolute encoders
singleturn

 Absolute encoders
multiturn

Bearingless encoders

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Fixing components for shaft encoders Overview

Figure	Description	Order no.	Details s.page	Incremental encoders		Abs. singleturn encoders		Abs. multiturn encoders	
				5000, KIS50, 5814, 5006, 5803, 5804, 5805	7000, 7100	5853, 5858, 5852	7053, 7058, 7153, 7158	5863, 5868, F5863, F5868	M5861, M5863, M5868
	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	675 675 675 675	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	676	X	X	X	X		
	Flange, ø 115 mm [4.53"] Euroflange	8.0010.2160.0000 8.0010.2170.0000	676	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	676	X	X	X	X		
	Flange, ø 90 mm [3.54"] Mechanically compatible with former encoder Type 9000	8.0010.2270.0000	677	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	677	X	X	X	X		
	Assembly bell Electrical and thermal isolation by means of glass fiber reinforced plastic and isolating spring washer coupling – supplied as complete set	8.0010.4D00.0000	678	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	679	see table page 679					
	Robust bearing unit Matching shaft encoders with clamping flange and shaft 10 mm [0.39"]	8.0010.8200.000C	680	X	X	X	X		
	Bearing box	8.0010.8200.0004	681	X	X	X	X		

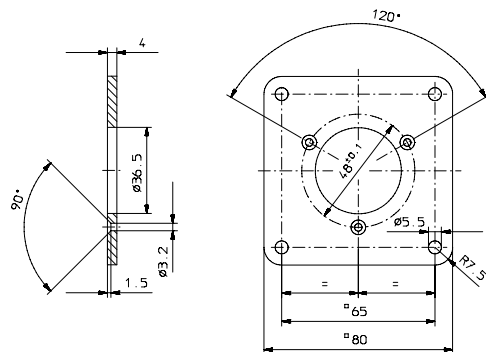
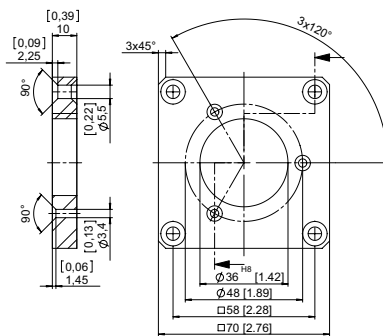
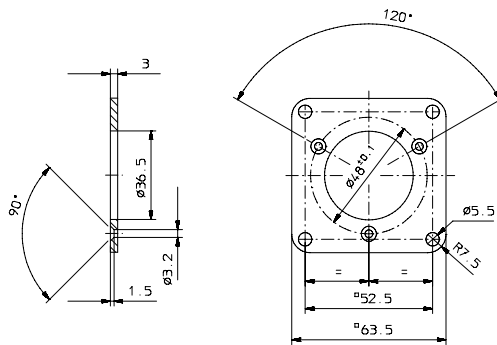
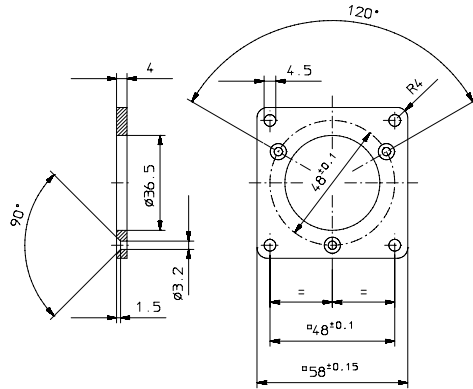
Product overview Basics
 Incremental encoders
 Absolute encoders singleturn
 Absolute encoders multiturn
 Bearingless encoders
 Linear measuring technology
 Inclinoimeters
 Connection technology
 Accessories
 Addresses

Accessories

Fixing components for shaft encoders

Dimensions / Details

Flange, square



- Scope of delivery:**
- flange (aluminum)
 - 3 screws for fixing to the encoder
- Connection to application:**
- 4 screws (not supplied)

8.0010.2100.0000

8.0010.2120.0000

8.0010.2600.0000

8.0010.2800.0000

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders


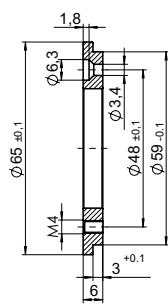
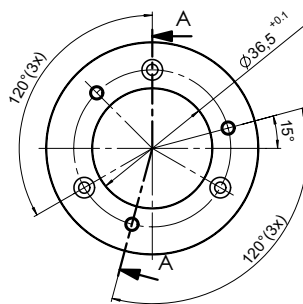

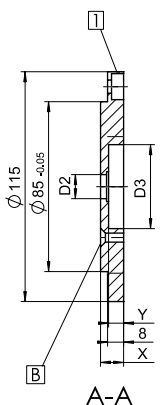
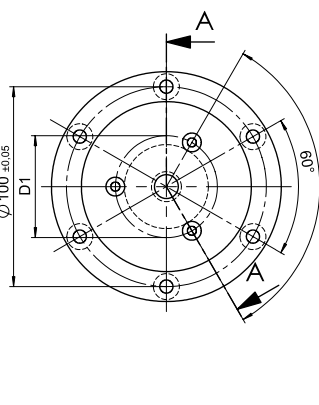

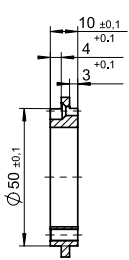
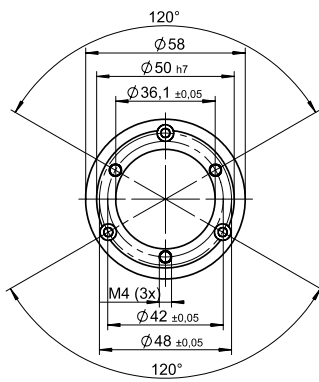
Linear measuring technology

Inclinometers

Connection technology

Accessories


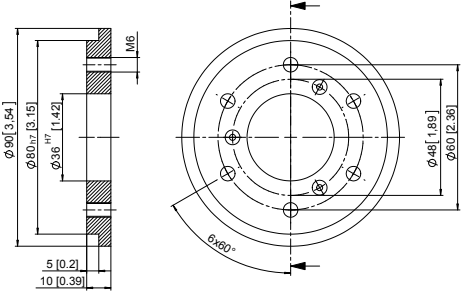

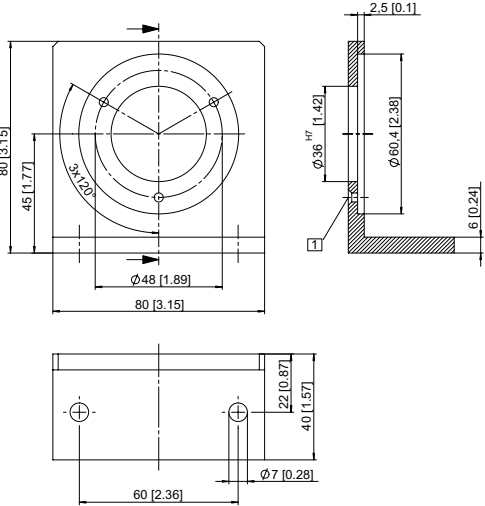
Addresses

Fixing components for shaft encoders		Details																							
Dimensions / Details	Dimensions in mm [inch]	Order no.																							
<p>Flange, ø 65 [2.56]</p> <p>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].</p> 	 	<p>Scope of delivery:</p> <ul style="list-style-type: none"> - flange (aluminum) - 3 screws for fixing to the encoder <p>Connection to application:</p> <ul style="list-style-type: none"> - 3 screws (not supplied) 	<p>8.0010.2230.0000</p>	<p>Product overview Basics</p>																					
<p>Flange, ø 115 [4.53], Euroflange (Euro REO 444)</p> 	<table border="1"> <thead> <tr> <th>encoder type</th> <th>D1</th> <th>D2</th> <th>D3</th> <th>X</th> <th>Y</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>580X/5000</td> <td>48 [1.89]</td> <td>36 [1.42]</td> <td>58 [2.28]</td> <td>11 [0.43]</td> <td>1 [0.039]</td> <td>DIN 74-BM3</td> </tr> <tr> <td>70XX</td> <td>51 [2.01]</td> <td>12 [0.47]</td> <td>42 [1.65]</td> <td>11.5 [0.45]</td> <td>7.5 [0.30]</td> <td>DIN 74-BM4</td> </tr> </tbody> </table>   <p>1 Countersunk DIN 74-Hm6 B See table</p>	encoder type	D1	D2	D3	X	Y	B	580X/5000	48 [1.89]	36 [1.42]	58 [2.28]	11 [0.43]	1 [0.039]	DIN 74-BM3	70XX	51 [2.01]	12 [0.47]	42 [1.65]	11.5 [0.45]	7.5 [0.30]	DIN 74-BM4	<p>Scope of delivery:</p> <ul style="list-style-type: none"> - flange (aluminum) - 3 screws for encoder mounting <p>Connection to application:</p> <ul style="list-style-type: none"> - 6 screws (not supplied) 	<p>8.0010.2160.0000</p> <p>8.0010.2170.0000</p>	<p>Absolute encoders singleturn</p> <p>Absolute encoders multiturn</p> <p>Bearingless encoders</p> <p>Linear measuring technology</p>
encoder type	D1	D2	D3	X	Y	B																			
580X/5000	48 [1.89]	36 [1.42]	58 [2.28]	11 [0.43]	1 [0.039]	DIN 74-BM3																			
70XX	51 [2.01]	12 [0.47]	42 [1.65]	11.5 [0.45]	7.5 [0.30]	DIN 74-BM4																			
<p>Flange, ø 58 [2.28]</p> <p>Converts encoders with a clamping flange into synchro flange.</p> 	 	<p>Scope of delivery:</p> <ul style="list-style-type: none"> - flange (aluminum) - 3 screws for encoder mounting <p>Connection to application:</p> <ul style="list-style-type: none"> - 3 screws (not supplied) 	<p>8.0010.2180.0000</p>	<p>Inclinometers</p> <p>Connection technology</p>																					

Accessories

Fixing components for shaft encoders

Details

Dimensions / Details	Dimensions in mm [inch]	Order no.	Product overview Basics
<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) 	Incremental encoders
<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 (aluminum) - 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>	Absolute encoders singleturn
			Absolute encoders multiturn
			Bearingless encoders
			Linear measuring technology
			Inclinometers
			Connection technology
			Accessories
			Addresses

Fixing components for shaft encoders

Details

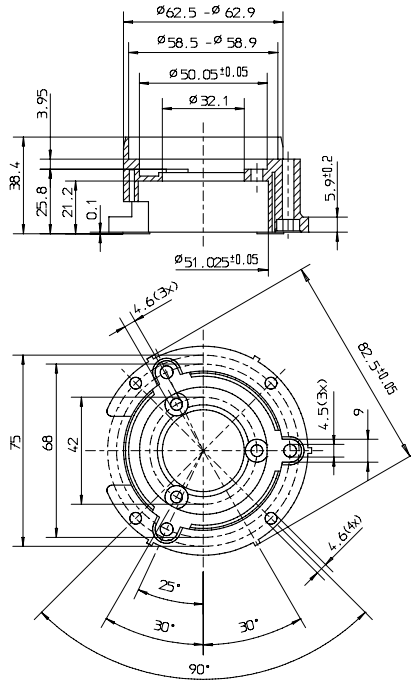
Dimensions / Details

Dimensions in mm [inch]

Order no.

Assembly bell

- Easy and quick encoder mounting
- Electrical and thermal isolation by means of glass fiber reinforced plastic and isolating spring washer coupling
- Supplied as complete set

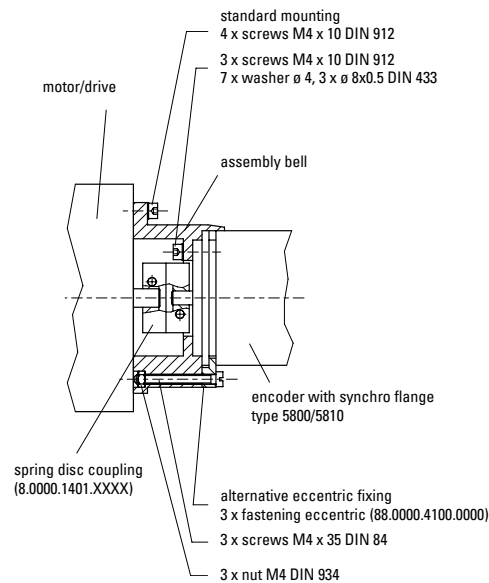


Scope of delivery:

- Assembly bell
- Spring washer type coupling (8.0000.1401.XXXX)
- 4 hexagon socket head cap screws DIN 912 M4 x 12 [0.47]
- 3 hexagon socket head cap screws DIN 912 M4 x 10 [0.39]
- 7 washers DIN 433 ø 4 [0.16]
- 3 fastening eccentrics (8.0000.4B00.0000)
- 3 hexagon head screws DIN 84 M 4 x 35 [0.16 x 1.38]
- 3 hexagon nuts DIN 934 - M4

8.0000.4500.XXYY

XX = Coupling diameter
d1 in mm
YY = Coupling diameter
d2 in mm



Product overview
Basics

Incremental
encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless
encoders

Linear measuring
technology



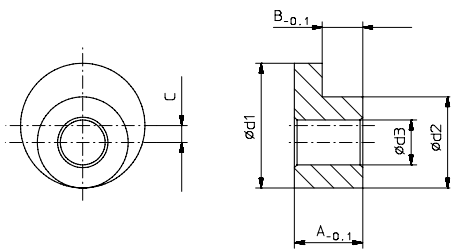
Inclinometers

Connection
technology

Accessories

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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: galvanized Ni		<i>encoder type</i>	<i>D1</i>	<i>D2</i>	<i>D3</i>	<i>A</i>	<i>B</i>	<i>C</i>		Product overview Basics
		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	Incremental encoders
		5000 5803 / 5804 / 5805 5853 / 5858 5863 / 5868 F5863 / F5868 5852 7053 / 7058 7063 / 7068	9.6 [0.38]	6.5 [0.26]	3.2 [0.13]	5.6 [0.22]	2.9 [0.11]	1.55 [0.06]	8.0010.4100.0000	Absolute encoders singleturn
  		<i>Scope of delivery:</i> - 3 eccentrics - 3 screws (Use at least three fastening eccentrics to mount the encoder)							Absolute encoders multiturn	

Product overview Basics
Incremental encoders
Absolute encoders singleturn
Absolute encoders multiturn
Bearingless encoders
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Robust bearing unit

Suitable for Sendix 50xx and 58xx



Quick and simple – more protection

Separating the bearing load and the sensor technology affords the encoder greater protection in harsh environments.

Retrofitting to all encoders with a 58 mm clamping flange is very easy and quick.



Shock / vibration resistant



Temperature



High IP value



High shaft load capacity

Order no.

8.0010.8200.000C

Robust bearing unit

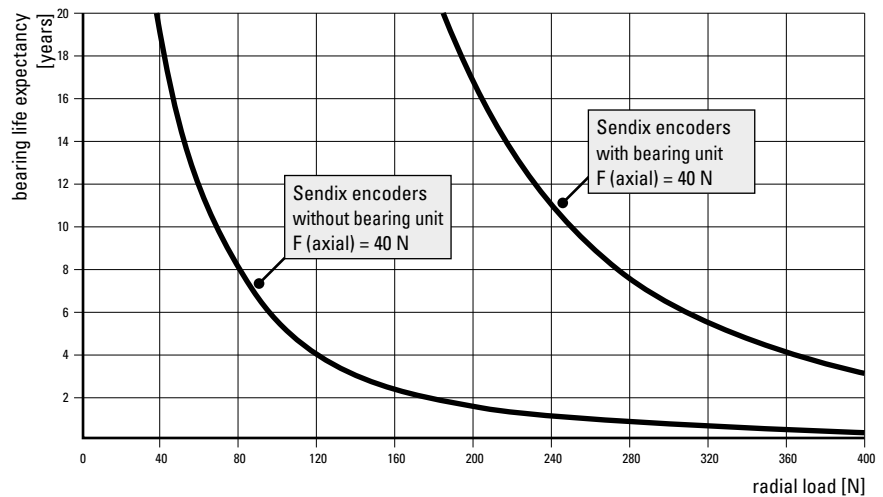
matching shaft encoders with clamping flange and shaft 10 mm [0.39"]

Technical data

Maximum speed	6000 min ⁻¹
Weight	approx. 560 g [19.75 oz]
Protection	IP67
Material	housing aluminum optional: seawater resistant shaft stainless steel

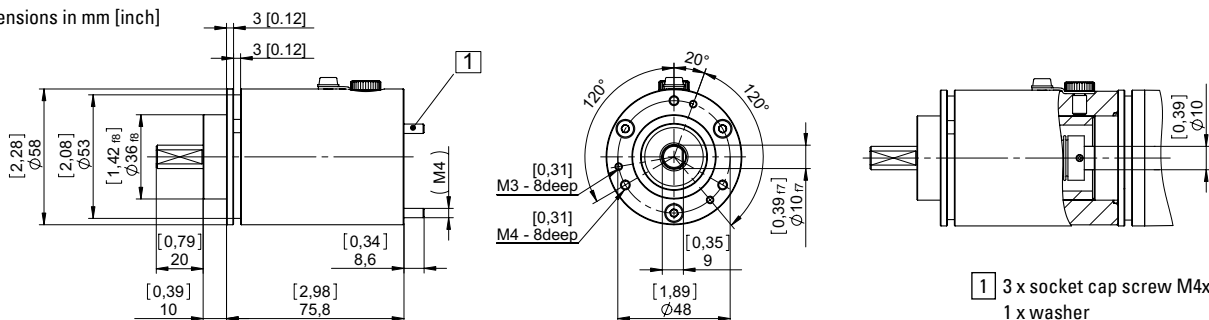
Bearing life expectancy L10

at 3000 revolutions/min with continuous operation



Dimensions

Dimensions in mm [inch]



1 3 x socket cap screw M4x25 (SW3)
1 x washer
included as mounting set

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.

Product overview
Basics

Incremental encoders

Absolute encoders
singleturn

Absolute encoders
multiturn

Bearingless encoders

Linear measuring technology

Inclinometers

Connection technology

Accessories

Addresses

Order no. **8.0010.8200.0004**

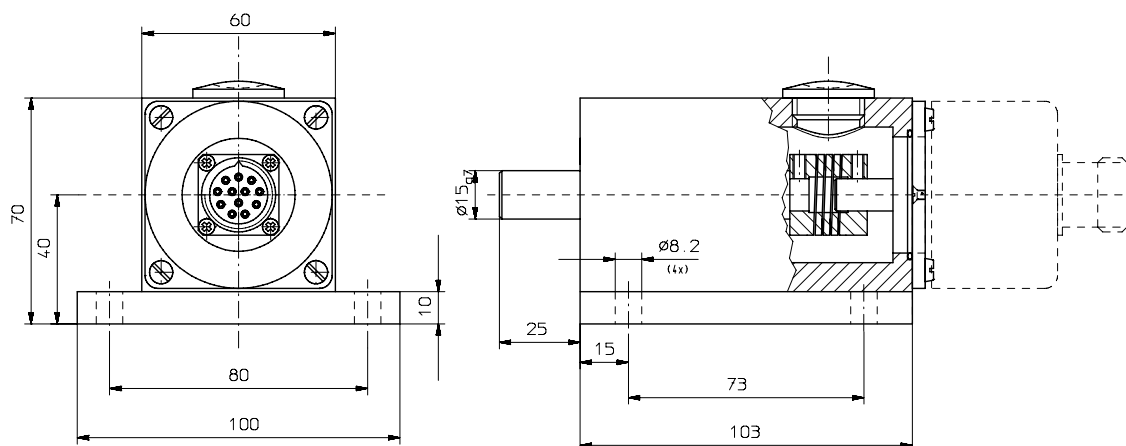
Scope of delivery

- 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



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

- 102 = Bellows-type ø 19 mm [0.75"]
- 202 = Bellows-type ø 15 mm [0.59"]
- 301 = Spring washer type, ø 30 mm [1.18"], one-part
- 401 = Spring washer type, ø 30 mm [1.18"], three part, plug-in
- 502 = Bellows-type ø 25 mm [0.98"]

b Bore diameter d1 (see technical data)

Note:
for the bore diameter d1 = 1/4" please enter Code A2

c Bore diameter d2 (see technical data)

Example: d1 = 10 mm [0.39"] and d2 = 12 mm [0.47"]
Order no. = 8.0000.1X0X.1012

Technical data

Type		8.0000.1102.XXXX	8.0000.1202.XXXX	8.0000.1301.XXXX	8.0000.1401.XXXX	8.0000.1502.XXXX
Maximum speed	min ⁻¹	10000	10000	12000	12000	10000
Maximum torque	Ncm	120	40	80	60	200
Maximum displacement	radial	mm ± 0.3	± 0.25	± 0.4	± 0.3	± 0.35
	axial	mm ± 0.5	± 0.45	± 0.4	± 0.4	± 0.54
	angular	- ± 4°	± 4°	± 3°	± 2.5°	± 4°
Torsion spring stiffness	Nm/rad	150	85	150	30	183
Radial spring stiffness	N/mm	10	20	6	40	17.8
Moment of inertia	gcm ²	9.5	2.1	19	35	20
Max. tightening torque	Ncm	150	70	80	80	120
Working temperature		-30°C ... +120°C [-22°F ... +248°F]	-30°C ... +120°C [-22°F ... +248°F]	-30°C ... +120°C [-22°F ... +248°F]	-10°C ... +80°C [+14°F ... +176°F]	-30°C ... +120°C [-22°F ... +248°F]
Weight approx.		16 g [0.56 oz]	6.5 g [0.23 oz]	16 g [0.56 oz]	30 g [1.06 oz]	24 g [0.85 oz]
Material	flange bellow or spring washer/casing	Al, anodized stainless steel	Al, anodized stainless steel	Al, anodized stainless steel	Al, anodized PA 6.6 gf.	Al, anodized 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.

Connection of motor and encoder **Couplings** **Bellows and spring washer couplings**

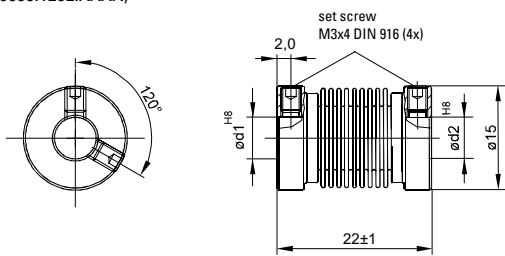
Metal bellows-type couplings (.1102, .1202 und .1502)

Metal bellows-type couplings are recommended as an inexpensive type of coupling. They are also suitable for compensating larger angle displacements.

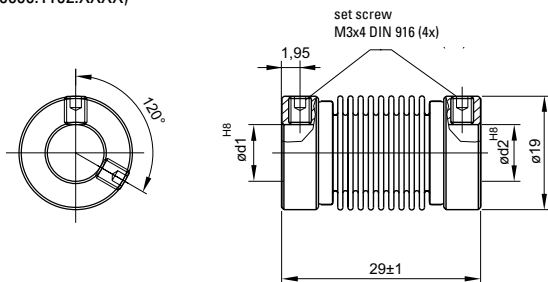
Dimensions

Dimensions in mm

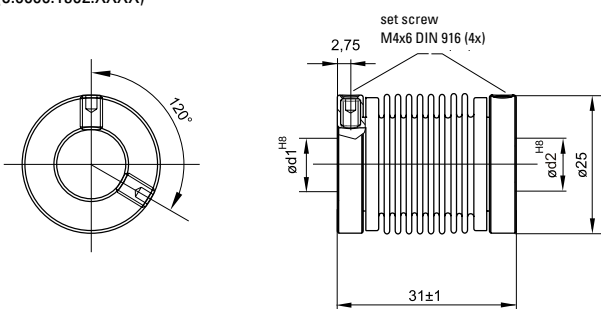
Bellows-type coupling $\varnothing 15$ [0.59]
(8.0000.1202.XXXX)



Bellows-type coupling $\varnothing 19$ [0.75]
(8.0000.1102.XXXX)



Bellows-type coupling $\varnothing 25$ [0.98]
(8.0000.1502.XXXX)



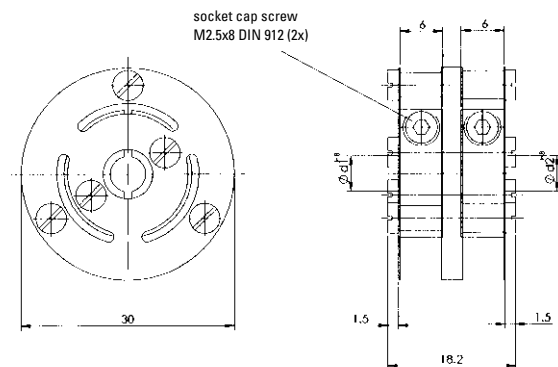
Installation instructions

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.

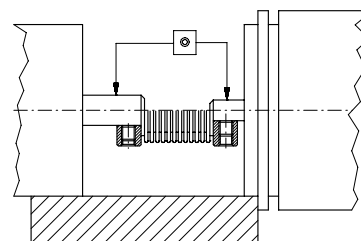
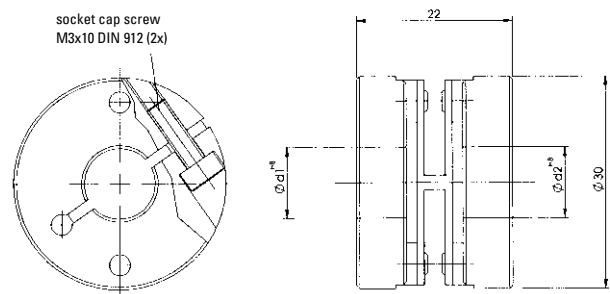
Spring washer-type couplings (.1301 und .1401)

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)



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Connection of motor and encoder

Couplings

Bellows couplings (FS)



Bellows couplings provide cost-effective connection of the motor and encoder. They are also able to correct any angular errors between the drive and encoder.

These bellows couplings (FS) are used for safe connection of applications and Sendix SIL encoders.

The safety-oriented bellows coupling has, in addition to the metallic bellows, internal claws that ensure the driving of the encoder in case of breakage of the bellows connection.

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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

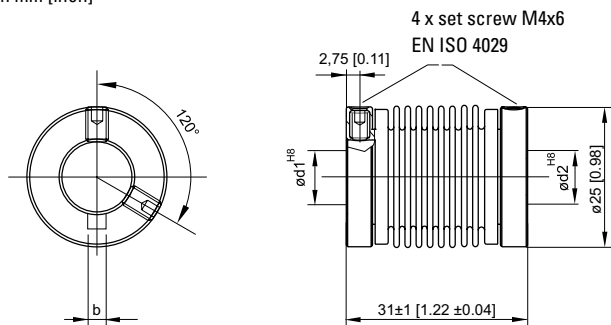
Technical data

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**

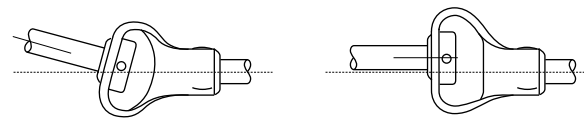
Order no. size 2

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**

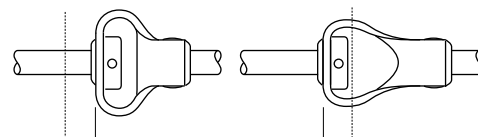
Technical data		
	Size 1	Size 2
Max. speed	3000 min ⁻¹	3000 min ⁻¹
Max. torque	0.5 Nm	2.0 Nm
Max. offset of shafts	radial ± 2 mm axial ± 2 mm angular ± 10°	± 3 mm ± 4 mm ± 12°
Torsion spring stiffness	13 Nm/rad	28 Nm/rad
Radial spring stiffness	13 N/mm	7 N/mm
Moment of inertia	41 gcm ²	106 gcm ²
Max. 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

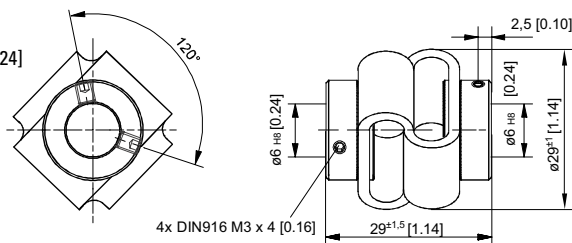


Dimensions

Dimensions in mm

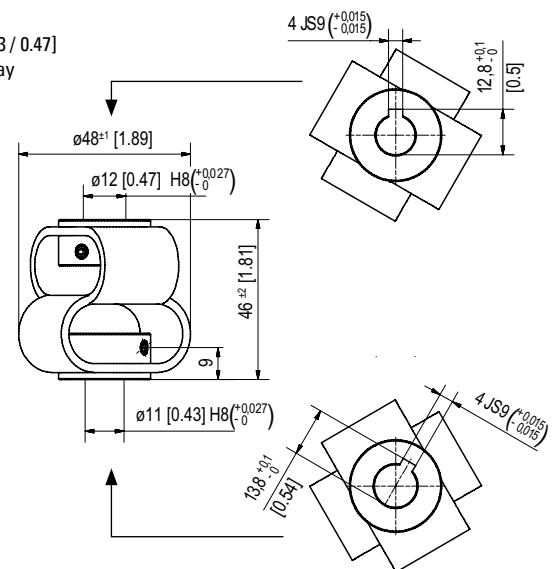
Size 1

6 / 6
[0.24 / 0.24]



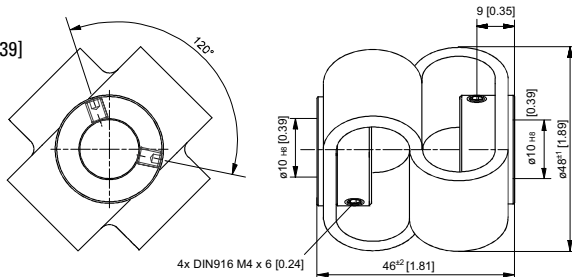
Size 2

11 / 12 [0.43 / 0.47]
with keyway



Size 2



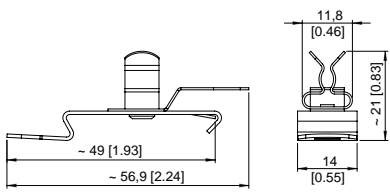

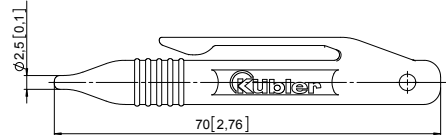
10 / 10
[0.39 / 0.39]



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Dimensions / Details	Dimensions in mm [inch]	Order no.	Product overview
<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>Basics Incremental encoders Absolute encoders singleturn</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, galvanized) Foot (spring steel)</p>	<p>8.0000.4G06.0000</p>	<p>Absolute encoders multiturn</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>	<p>Bearingless encoders Linear measuring technology</p>

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Addresses

Kübler worldwide

Kübler Group

- 
Fritz Kübler GmbH
Germany
 Phone +49 7720 3903-0
info@kuebler.com
www.kuebler.com
- 
Fritz Kübler SARL
France
 Phone +33 3 89 53 45 45
info@kuebler-sarl.com
www.kuebler.fr
- 
Kübler Italia S.r.l.
Italy
 Phone +39 026 423 345
info@kuebler.it
www.kuebler.it
- 
Kübler Österreich
Austria
 Phone +43 720 510459
at@kuebler.com
www.kuebler.com
- 
Kubler SP. Z O.O.
Poland
 Phone +48 61 84 99 902
info@kubler.pl
www.kubler.pl
- 
Kübler Group
Spain
 Phone +34 91 1516773
alejandrperez-manrique@kuebler.com
www.kuebler.com
- 
Kübler Turkey Otomasyon Ticaret Ltd. Sti.
Turkey
 Phone +90 216 999 9791
cengizhan.temurcin@kuebler.com
www.kuebler.com.tr
- 
Kuebler (Beijing) Automation Trading Co. Ltd.
China
 Phone +86 10 8471 0818
beijing@kuebler.com
www.kuebler.com
- 
Kuebler Automation India Pvt. Ltd.
India
 Phone +91 2135 618200
 Fax +91 2135 618232
info@kuebler.in
www.kuebler.in
- 
Kuebler Korea (by F&B)
South Korea
 Phone +82 51 319 12 30
fnb@kuebler.co.kr
www.kuebler.kr
- 
Kuebler Inc.
USA
 Phone +1-704-705-4710
 Toll Free +1-855-KUEBLER (583-2537)
usa@kuebler.com
www.kuebler.com/usa

Europe

- Austria**
 FEK Österreich
 Deutsch Bieling 35
 A-7522 Heiligenbrunn
 Phone +43 720 510459
 Fax +43 720 510456
at@kuebler.com
www.kuebler.com
- 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.fek.by
- Belgium**
 Turck 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.
 Ulica Pri rampi 2
 HR-49210 Zabok
 Phone +385 49 221 182
 Fax +385 49 223 658
bering@bering.hr
www.bering.hr
- Czech Republic**
 TURCK s.r.o.
 Na Brně 2065
 CZ-500 06 Hradec Králové
 Phone +420 - 4 95 51 87 66
 Fax +420 - 4 95 51 87 67
turck-cz@turck.com
www.turck.cz
- Denmark**
 Hans Følsgaard A/S
 Theilgaards Torv 1
 DK-4600 Køge
 Phone +45 43 20 86 00
 Fax +45 43 96 88 55
hf@hf.net
www.hf.net
- Estonia**
 Standel AS
 Kiisa 8
 EE-11313 Tallinn
 Phone +372 6 558 180
 Fax +372 6 558 179
standel@standel.ee
www.standel.ee
- Finland**
 Sähkölehto Oy
 Holkkitie 14
 FIN-00880 Helsinki
 Phone +358 9 774 6420
 Fax +358 9 759 1071
office@sahkolehto.fi
www.sahkolehto.fi
- France**
 Fritz Kübler S.à.r.l.
 Compteurs et codeurs industriels
 2 rue de Grande Bretagne
 F-68310 Wittelsheim
 Phone +33 3 89 53 45 45
 Fax +33 3 89 53 66 77
info@kuebler-sarl.com
www.kuebler.fr
- Germany**
 Fritz Kübler GmbH
 Schubertstrasse 47
 D-78054
 Villingen-Schwenningen
 Phone +49 7720 3903-0
 Fax +49 7720 21564
info@kuebler.com
www.kuebler.com
- 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. Skourgalos
 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@elteco.no
www.elteco.no
- Poland**
 Kubler Sp. z o.o.
 ul. Dabrowskiego 441
 PL-60-451 Poznan
 Phone +48 61 849 99 02
 Fax +48 61 849 99 03
info@kubler.pl
www.kubler.pl
 ASTAT sp. z o.o.
 ul. Dabrowskiego 441
 PL-60-451 Poznan
 Phone +48 61 848 8871
 Fax +48 61 848 8276
info@astat.com.pl
www.astat.com.pl
 • Electronic counters and process displays:
 IMPOL-1 Sp.J.
 ul. Krakowiaków 103
 PL-02-255 Warszawa
 Phone +48 22 886 56 02
 Fax +48 22 886 56 04
biuro@impol-1.pl
www.impol-1.pl
 • Encoders:
 OEM AUTOMATIC Sp. z o.o.
 ul. Działkowa 121 A
 PL-02-234 Warszawa
 Phone +48 22 863 27 22
 Fax +48 22 863 27 24
info@pl.oem.se
www.oemautomatic.pl
- Portugal**
 Kübler Group
 C/ Aviación Española 5, 4 D
 28003 Madrid, Spain
 Phone +34 91 1516773
 Mobil +34 630 976 107
alejandrperez-manrique@kuebler.com
www.kuebler.com
 vLA2P – Tecnologias de Auto-
 mação, LDA
 Rua Teófilo Braga, 156 A
 Escrit. F - Edifício S. Domingos
 Cabeço do Moura
 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
- Russia**
 LLC Servotechnica
 Klara Tsetkin str., 33/35
 RUS-125130 Moscow
 Phone +7 495 797 8866
 Fax +7 495 450 0043
info@servotechnica.ru
www.servotechnica.ru
- 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**
 Kübler Group
 C/ Aviación Española 5, 4 D
 28003 Madrid
 Phone +34 91 1516773
 Mobil +34 630 976 107
alejandrperez-manrique@kuebler.com
www.kuebler.com
 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
- 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
- Switzerland**
 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
 ① 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
 ② Fritz Kübler GmbH
 Schubertstraße 47
 D-78054 Villingen-Schwenningen
 Phone +49 7720 3903-0
 Fax +49 7720 21564
info@kuebler.com
www.kuebler.com
- Turkey**
 Kübler Turkey Otomasyon
 Ticaret Ltd. Sti.
 Bahçelievler Mah.
 Serpinti Sok.No:6 Kat:4
 TR - 34893 Pendik/Istanbul
 Phone +90 216 999 9791
 Fax +90 216 999 9784
cengizhan.temurcin@kuebler.com
www.kuebler.com
 • System Integrator
 ROBOSAN Otomasyon San.Tic. Ltd.
 Robosan Plaza Bahçelievler Mah.
 Serpinti Sok. No:6 Pendik
 TR-34893 Pendik/Istanbul
 Phone +90 216 340 39 70
 Fax +90 216 340 39 64
info@robosan.com.tr
www.robosan.com.tr
 • 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

America, Asia, Australia, Africa

Catalog 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

Argentina
AUMECON S.A.
Acassuso 4768
1605 Munro
Prov. de Buenos Aires
Phone +54 11 47 56 1251
Fax +54 11 47 62 63 31
ventas@aumecon.com.ar
www.aumecon.com.ar

Australia
Balluff PTY LTD
18 Malvern Street
Bayswater, VIC 3153
Phone +61 1300 225833
Fax +61 1300 653894
sales@balluff.com.au
www.balluff.com.au

Brazil
Brastronic Comércio e
Serviço Importação e
Exportação Ltda.
Representante Exclusivo
no Brasil
Rua Antônio Pagano,
43 - Jardim Prudência
Cep 04368-040 São Paulo
Phone +55 (11) 5670-8970
vendas@kebbrazil.com.br
www.kebbrazil.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.
14 Gamal EL Din Aly Khairy St.,
AL Nozha AL Gadida
Heliopolis, Cairo
Tel. +202 26229472
Fax +202 26229473
sales.dep@aeecontrols.com
www.aeecontrols.com

Hong Kong
Po Kwong Electric (HK) Ltd.
Rm. 177-180, 1/F, Blk C,
Hang Wai Ind. Ctr.,
6 Kin Tai St., Tuen Mun, N.T
Phone +852 24 23 66 22
Fax +852 24 61 10 02
sales@pokwong.com
www.pokwong.com

India
Kuebler Automation India Pvt Ltd
Plot No 677, S. No. 269/3,
Paud Road, Bhugaon,
Pune 412 115,
Maharashtra
Phone +91 99 7065 5599
Phone +91 20 6790 1-200 / 230 /
214 / 202
Fax +91 20 6790 1232
info@kuebler.in
www.kuebler.in

Indonesia
PT. Supra Engineering
Jl. Pecenongan 17 D
RI-10120 Jakarta
Phone +62 21 345 73 55
Fax +62 21 345 73 18
atsupra@supra.co.id
www.supra-engineering.com

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
Phone +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
christiau@dpstar.com.my
www.dpstar.com.my

Mexico
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Blvd. Campestre No. 100
Parque Industrial SERVER
C.P. 25350 Arteaga, Coahuila
Phone +52 844 411 6650
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(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
0 Malabon, Metro Manila
Phone +632 985 07 05
Fax +632 716 59 86
technorand@gmail.com

Singapore
Raymond International Pte. Ltd.
Blk 219 Henderson Road #07-04
Henderson Industrial Park
Singapore 159556
Phone +65 62 76 37 38
Fax +65 62 76 37 39
sales@raymondcom.com
www.raymondcom.com

South Africa
Kübler Group
DC Auto-Motion (Pty) Ltd.
11 Sunrock Close,
131 Sunnyrock, Ext. 2
Germiston, Gauteng.
Phone +27 11 453 1740
Fax +27 86 508 5929
dave@dcauto-motion.co.za
www.kuebler.co.za

South Korea
Kuebler Korea (by F&B)
578, Kwaebop-dong, Sasang-ku
Pusan Industrial Supplies
Market 9-116
PUSAN
Phone +82 51 319 12 30
Fax +82 51 319 12 50
fnb@kuebler.co.kr
www.kuebler.kr

Taiwan, R.O.C.
• Encoders, transmission
technology:
E-E-Sensors & Automation Int'l Corp.
No.17-2, Beichang 2nd St.
Fengshan Dist.,
Kaohsiung City 83053
Taiwan, R.O.C.
Phone +886-7-7323606
Fax +886-7-7333023
ez-corp@umail.hinet.net
www.e-sensors.com.tw

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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.
10430-J Harris Oak Boulevard
Charlotte, NC 28269
Phone +1-704-705-4710
Toll Free +1-855-KUEBLER (583-2537)
Fax +1-704-733-9170
usa@kuebler.com
www.kuebler.com/usa

• Counting and process
technology:
Howland Technology
8129 North Austin AVE
Morton Grove, IL 60053
Toll-free number:
1-800-951-8774
Phone 847 965 9808
Fax 847 901 9846
sales@howlandtechnology.com
www.kueblerusa.com

United Arab Emirates
Baer Measurements LLC
P.O. Box 111393
Al Gaith Tower 1902,
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

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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
 Mohndblumenweg 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
 Mohndblumenweg 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
 Michael Schwarz
 Im Lug 36
 74360 Ilsfeld
 Phone +49 7133 2294895
 Fax +49 7133 2294896
 michael.schwarz@kuebler.com

PLZ 80000 ... 83999
PLZ 87000 ... 87999
PLZ 89200 ... 89499
 Kübler Vertriebsbüro Süd
 Schubertstraße 47
 78054 VS-Schwenningen
 Phone +49 7720 3903-0
 Fax +49 7720 21564
 info@kuebler.com

PLZ 84000 ... 86999
 Kübler Vertriebsbüro Süd-Ost
 Lars Meyer
 Durchfahrt 9
 09569 Oederan
 Phone +49 37292 283500
 Fax +49 37292 283501
 lars.meyer@kuebler.com

PLZ 88000 ... 89199
PLZ 89500 ... 89999
 Kübler Vertriebsbüro Süd-West
 Michael Schwarz
 Im Lug 36
 74360 Ilsfeld
 Phone +49 7133 2294895
 Fax +49 7133 2294896
 michael.schwarz@kuebler.com

PLZ 90000 ... 95999
 Kübler Vertriebsbüro Süd-Ost
 Lars Meyer
 Durchfahrt 9
 09569 Oederan
 Phone +49 37292 283500
 Fax +49 37292 283501
 lars.meyer@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 Götterborn
 Herbert Neundoerfer
 GmbH & Co. KG
 Werksvertretungen
 Am Campus 5
 Phone +49 6825 9545-0
 Fax +49 6825 9545-99
 info@herbert-neundoerfer.de
 www.herbert-neundoerfer.de

82069 Hohenschäftlarn
 Bachmann
 Electronic GmbH
 Am Wagnerfeld 4
 Phone +49 8178-8676-0
 Fax +49 8178-8676-50
 info@bachmann-electronic.de
 www.bachmann-electronic.de

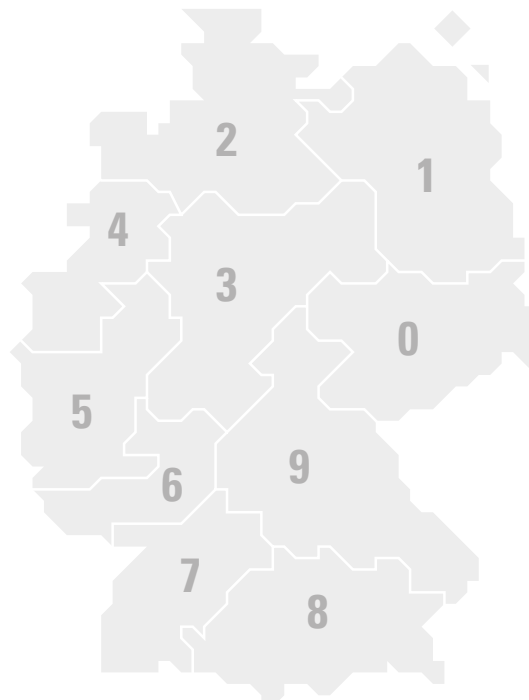
Catalogue distributors (Germany):

28359 Bremen
 Distrelec Schuricht GmbH
 Lise Meitner-Str. 4
 Phone +49 1805 2234-35
 Fax +49 1805 2234-36
 scc@distrelec.de
 www.distrelec.de

64546 Mörfelden-Walldorf
 RS Components GmbH
 Hessenring 13 b
 Phone +49 6105 401234
 Fax +49 6105 401100
 www.rs-components.de

82041 Oberhaching
 Farnell GmbH
 Keltenring 14
 Phone +49 89 61393939
 www.farnell.de

92240 Hirschau
 Conrad Electronic SE
 Klaus-Conrad-Straße 1
 92240 Hirschau
 Phone +49 9604 408 787
 www.conrad.com



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