

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

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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.

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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.

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10 by 10

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- Calculable delivery
- Flexible use of small batch sizes



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



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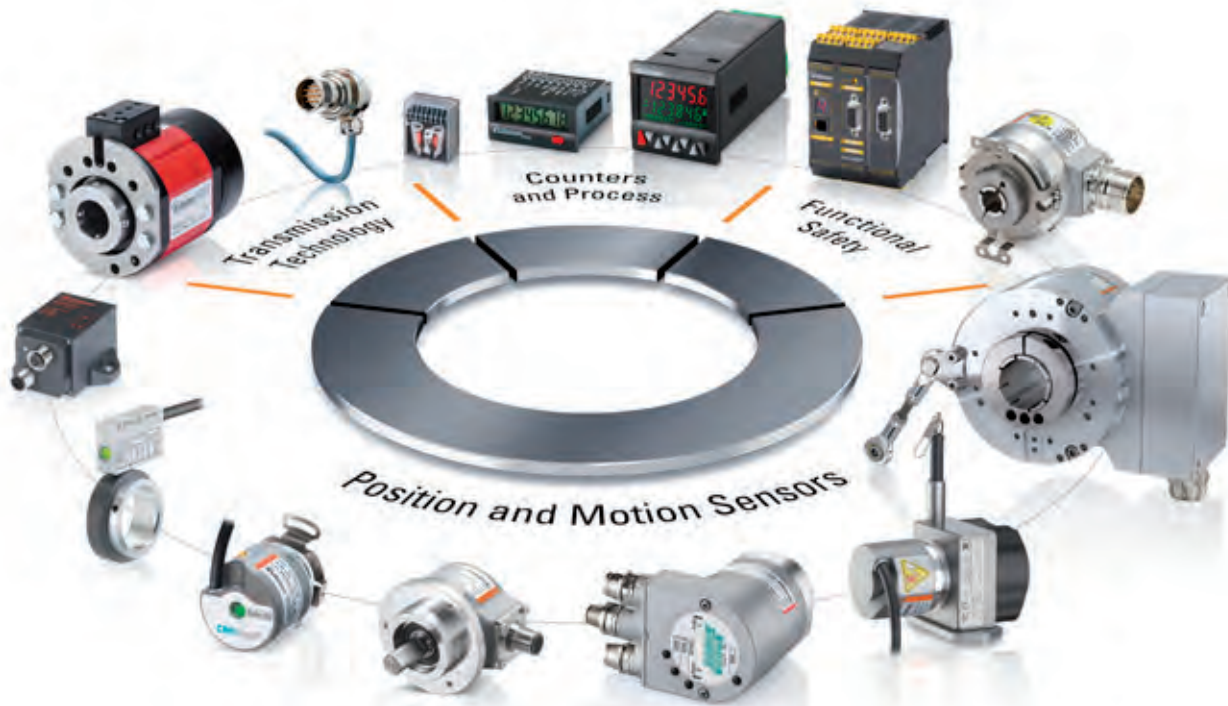
Basic Technical Knowledge

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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Our product portfolio



Position and Motion Sensors

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

Connector and Signal Transmission Technology

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

Functional Safety

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

Counters and Process Devices

- Pulse Counters and Preset Counters
- Hour Meters and Timers
- Frequency Meters and Tachometers
- Combination Time and Energy Meters
- Position Displays
- Process Displays and Controllers for Temperature, Analogue Signals and Strain-Gauge
- Setpoint Adjuster

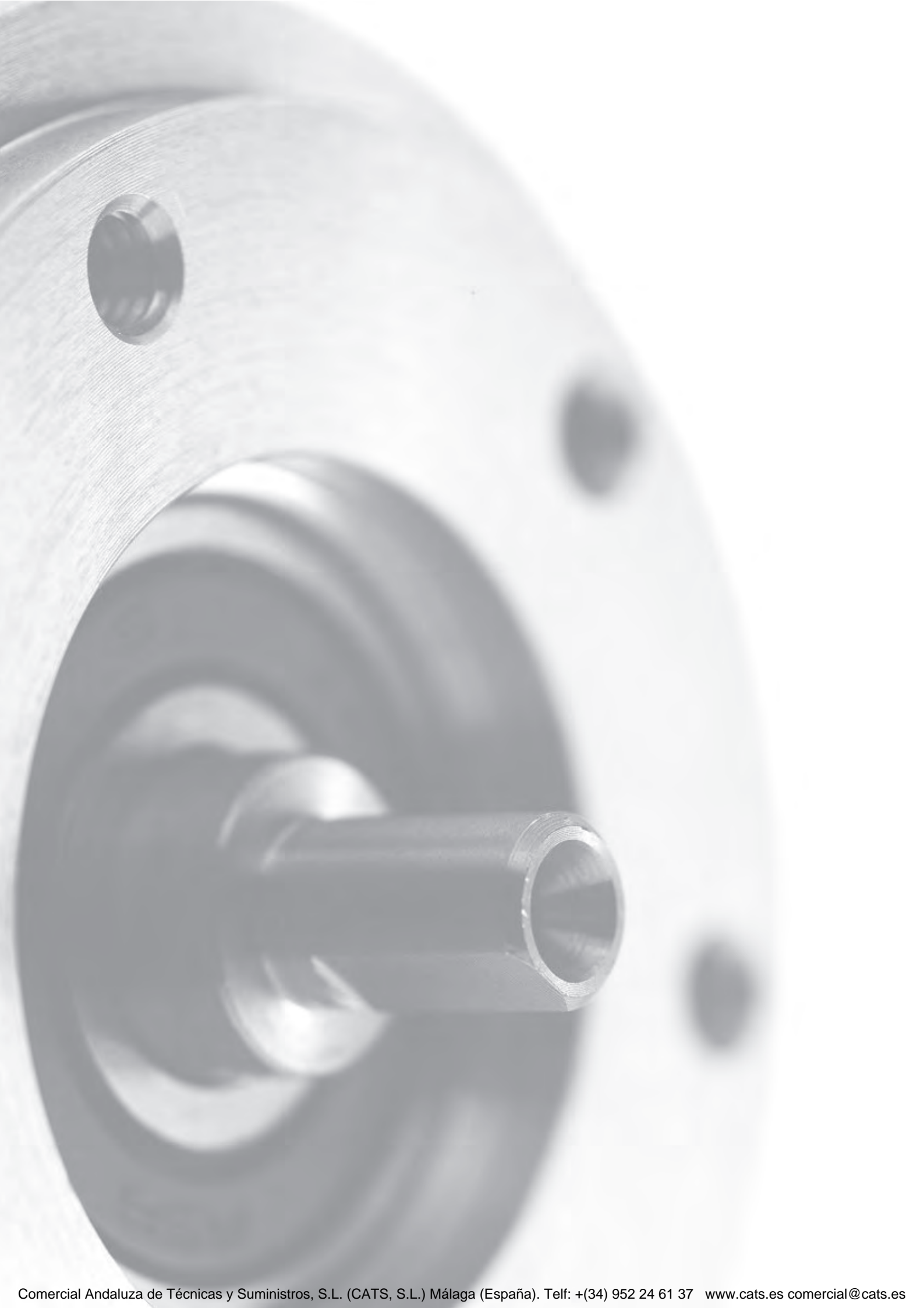
We offer solutions for the following industries:



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

www.kuebler.com/industries

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Product overview / Technical basics

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Technical basics

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



Product overview

Incremental Encoders

		Ø Size in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ±0.015°)	Resolution max. in PPR	Push-pull interface	RS422 interface	Sin Cos interface	Ø Hollow shaft max. mm [inch]	Speed max. in RPM	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	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	12.000	-20...+85 [-4...+185]	IP64	•	-	5...24 8...30	160	•	C UL US	20
	Miniature, magnetic 2430 (Shaft) 2440 (Hollow shaft)	24 [0.94]	•	-	256	-	•	-	6	12.000	-20...+85 [-4...+185]	IP67	•	-	5	300	•	-	23
	Compact, optical 3610 (Shaft) 3620 (Hollow shaft)	36 [1.43]	-	•	2.500	•	•	-	8	12.000	-20...+85 [-4...+185]	IP64	•	M12	5 5...18 8...30	300	•	C UL US	26
	Compact, plastic housing 3700 (Shaft) 3720 (Hollow shaft)	37 [1.46]	-	•	1.024	•	•	-	8	6.000	-20...+70 [-4...+158]	IP65	•	-	5 5...30 10...30	250	•	C RU US	30
	Standard, optical Sendix 5000 (Shaft) Sendix 5020 (Hollow shaft)	58 [2.28]	-	•	5.000	•	•	-	15 15.87	12.000	-40...+85 [-40...+185]	IP67	•	M12 M23 MIL	5 5...30 10...30	300	•	C UL US Ex 2/22	34
	Standard, optical high temperature 5803 (Shaft) 5823 (Hollow shaft)	58 [2.28]	-	•	5.000	•	•	-	12	12.000	-20...+105 [-4...+221]	IP65	•	M23 MIL	5 10...30	300	•	C UL US	44
	Standard, optical sine wave output + zero pulse 5804 (Shaft) 5824 (Hollow shaft)	58 [2.28]	-	•	5.000	-	-	•	12	12.000	-20...+85 [-4...+185]	IP65	•	M23	5 10...30	180	•	C UL US	49
	new Standard, optical sine wave output, highly interpolable Sendix 5814 (Shaft) Sendix 5834 (Hollow shaft)	58 [2.28]	-	•	1.024 and 2.048	-	-	•	15	12.000	-40...+90 [-40...+194]	IP67	•	M12	5 10...30	400	•	C UL US Ex 2/22	53
	new Standard, optical sine wave output, SIL2 / PLd Sendix SIL 5814FS2 (S.) Sendix SIL 5834FS2 (Hs.)	58 [2.28]	-	•	1.024 and 2.048	-	-	•	14	12.000	-40...+90 [-40...+194]	IP67	•	M12 M23	5 10...30	400	•	C UL US Ex 2/22 SIL2 PLd	56
	new Standard, optical sine wave output, SIL3 / PLe Sendix SIL 5814FS3 (S.) Sendix SIL 5834FS3 (Hs.)	58 [2.28]	-	•	1.024 and 2.048	-	-	•	14	12.000	-40...+90 [-40...+194]	IP67	•	M12 M23	5 10...30	400	•	C UL US Ex 2/22 SIL3 PLe	61
	Standard, optical high resolution 5805 (Shaft) 5825 (Hollow shaft)	58 [2.28]	-	•	36.000	•	•	-	12	12.000	-20...+105 [-4...+221]	IP65	•	M23	5 10...30	800	•	C UL US	66

Product overview

Incremental Encoders

		Ø Size in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution max. in PPR	Push-pull interface	RS422 interface	Sin Cos interface	Ø Hollow shaft max. mm [inch]	Speed max. in RPM	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	Power supply in V DC	Pulse frequency max. in kHz	RoHS compliant	Approvals	Page
	Standard, optical	58 [2.28]	-	•	5.000	•	•	-	12	6.000	-40...+85 [-40...+185]	IP67	•	M12	5 5...30 10...30	300	•	cUL ^{us} Ex ^{2/22}	70
	Stainless steel Sendix 5006 (Shaft) 5826 (Hollow shaft)																		73
	Standard, optical Large hollow shaft 5821 (Hollow shaft)	58 [2.28]	-	•	5.000	•	•	-	28	2.500	-20...+70 [-4...+158]	IP64	•	M12	5 8...30	300	•	-	75
	Standard, optical ATEX 7000 (Shaft)	70 [2.76]	-	•	5.000	•	•	-	-	6.000	-40...+60 [-40...+140]	IP67	•	-	5 5...30 10...30	300	•	Ex IECEx	78
	Standard, optical ATEX, SIL2/PLd Sendix SIL 7014FS2 (S.)	70 [2.76]	-	•	1.024 and 2.048	-	-	•	-	6.000	-40...+60 [-40...+140]	IP67	•	-	5 10...30	400	•	Ex IECEx SIL2 PLd	81
	Standard, optical ATEX, SIL3/PLe Sendix SIL 7014FS3 (S.)	70 [2.76]	-	•	1.024 and 2.048	-	-	•	-	6.000	-40...+60 [-40...+140]	IP67	•	-	5 10...30	400	•	Ex IECEx SIL3 PLe	84
	Large hollow shaft, optical A020 (Hollow shaft)	100 [3.94]	-	•	5.000	•	•	•	42	3.000	-40...+70 [-40...+140]	IP65	•	M12 M23	5 5...30 10...30	300	•	cUL ^{us}	87
	Large hollow shaft, optical, robust A02H (Hollow shaft)	100 [3.94]	-	•	5.000	•	•	•	42	6.000	-40...+80 [-40...+176]	IP65	•	M12 M23 MIL	5 5...30 10...30	300	•	cUL ^{us} Ex ^{2/22}	91
	Heavy Duty, optical H100 (Shaft)	115 [4.53]	-	•	3.600	•	•	-	-	6.000	-40...+100 [-40...+212]	IP66	•	-	5...30 10...30	300	•	Ex ^{2/22}	98
	Heavy Duty, optical H120 (Hollow shaft)	100 [3.94]	-	•	5.000	•	•	-	28	6.000	-40...+100 [-40...+212]	IP67	•	M12 M23 LWL	5 10...30	300	•	Ex ^{2/22}	102
	Bearingless, magnetic RI20/Limes LI20 (Hollow shaft)	16x10 [0.63x 0.39]	•	-	3.600	•	•	-	30	12.000	-20...+80 [-4...+176]	IP67	•	-	4.8...26 4.8...30	250	•	-	107
	Bearingless, magnetic with zero pulse RI50/LI50 Limes (Hollow shaft)	16x10 [0.63x 0.39]	•	-	3.600	•	•	-	30	9.000	-20...+80 [-4...+176]	IP67	•	-	4.8...26 4.8...30	250	•	-	110







Product overview

Absolute Encoders Singleturn






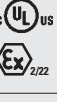


		Ø Size in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution in bit max.	SSI interface	BiSS-C interface	Analogue interface	Parallel interface	Additional incremental track	Speed max. in RPM	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	Power supply in V DC	RoHS compliant	Approvals	Page
	Miniature, magnetic SSI 2450 (Shaft) 2470 (Hollow shaft)	24 [0.94]	•	-	12	•	-	-	-	-	12.000	-20...+85 [-4...+185]	IP67	•	-	5	•	-	116
	Compact, magnetic SSI Sendix 3650 (Shaft) Sendix 3670 (Hollow shaft)	36 [1.43]	•	-	9	•	-	-	-	-	6.000	-40...+85 [-40...+185]	IP69k	•	-	5...30	•	Ex _{2/22}	119
	Compact, magnetic analogue Sendix 3651 (Shaft) Sendix 3671 (Hollow shaft)	36 [1.43]	•	-	12	-	-	4...20 mA 0...10 V	-	-	6.000	-40...+85 [-40...+185]	IP69k	•	M12	10...30 15...30	•	Ex _{2/22} e1	122
	Compact, optical SSI / BiSS-C Sendix F3653 (Shaft) Sendix F3673 (Hollow shaft)	36 [1.43]	-	•	17	•	•	-	-	Sin Cos RS422	12.000	-40...+90 [-40...+194]	IP67	•	M12	5 10...30	•	cUL _{US} Ex _{2/22}	135
	Standard, optical parallel / analogue 5850 (Shaft) 5870 (Hollow shaft)	58 [2.28]	-	•	13	-	-	4...20 mA	•	-	12.000	-20...+85 [-4...+185]	IP66	•	M23	5 10...30	•	cUL _{US}	145
	Standard, optical parallel, highspeed 5852 (Shaft) 5872 (Hollow shaft)	58 [2.28]	-	•	14	-	-	-	•	-	12.000	-20...+85 [-4...+185]	IP66	•	M23	5 10...30	•	cUL _{US}	150
	Standard, optical SSI / BiSS-C Sendix 5853 (Shaft) Sendix 5873 (Hollow shaft)	58 [2.28]	-	•	17	•	•	-	-	Sin Cos RS422	12.000	-40...+90 [-40...+194]	IP67	•	M12 M23	5 10...30	•	cUL _{US} Ex _{2/22}	153
	Standard, optical SSI / BiSS-C + SinCos SIL2 / PLd Sendix SIL 5853FS2 (S.) Sendix SIL 5873FS2 (Hs.)	58 [2.28]	-	•	17	•	•	-	-	Sin Cos	9.000/ 12.000	-40...+90 [-40...+194]	IP67	•	M23	5 10...30	•	cUL _{US} Ex _{2/22} SIL2 PLd	160
	Standard, optical SSI / BiSS-C + SinCos SIL3 / PLe Sendix SIL 5853FS3 (S.) Sendix SIL 5873FS3 (Hs.)	58 [2.28]	-	•	17	•	•	-	-	Sin Cos	9.000/ 12.000	-40...+90 [-40...+194]	IP67	•	M23	5 10...30	•	cUL _{US} Ex _{2/22} SIL3 PLe	165
	Standard, optical Stainless steel SSI / parallel 5876 (Hollow shaft)	58 [2.28]	-	•	14	•	-	-	•	-	6.000	-20...+80 [-4...+176]	IP67	•	M12	5 10...30	•	cUL _{US} Ex _{2/22}	193

Product overview

Absolute Encoders Singleturn

	ø Size in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	Resolution in bit max.	SSI interface	BiSS-C interface	Analogue interface	Parallel interface	Additional incremental track	Speed max. in RPM	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	Power supply in V DC	RoHS compliant	Approvals	Page
	70 [2.76]	-	•	17	•	•	-	-	-	6.000	-40...+60 [-40...+185]	IP67	•	-	10...30	•		197
new 	70 [2.76]	-	•	17	•	•	-	-	SinCos	6.000	-40...+60 [-40...+185]	IP67	•	-	10...30	•		200
new 	70 [2.76]	-	•	17	•	•	-	-	SinCos	6.000	-40...+60 [-40...+185]	IP67	•	-	10...30	•		203

Absolute Encoders Singleturn Fieldbus

	ø Size in mm [inch]	Magnetic (Accuracy ±1°)	Optical (Accuracy ≤ ±0.015°)	CANopen	SAE J1939	PROFIBUS DP	EtherCAT	PROFINET IO	Type of connection cable	Type of connection connector	Resolution max. in Bit	Speed max. in RPM	Temperature range in °C [°F]	Protection max.	Power supply in V DC	RoHS compliant	Approvals	Page
	36 [1.43]	•	-	•	•	-	-	-	•	M12	14	6.000	-40...+85 [-40...+185]	IP69k	8...30	•		127 131
	36 [1.43]	-	•	•	-	-	-	-	•	-	16	12.000	-40...+85 [-40...+185]	IP67	10...30	•		141
	58 [2.28]	-	•	•	-	•	•	•	•	M12 M23	16	9.000	-40...+80 [-40...+176]	IP67	10...30	•		170 175 183 188
	70 [2.76]	-	•	•	-	•	-	-	•	-	16	6.000	-40...+60 [-40...+140]	IP67	10...30	•		206 209

Product overview

Absolute Encoders Multiturn

		ø Size in mm [inch]	Optical (Accuracy $\leq \pm 0.015^\circ$)	Resolution max. in Bit ST+MT	SSI interface	BiSS-C interface	RS485 interface	Additional incremental track	Speed max. in RPM	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	Power supply in V DC	RoHS compliant	Approvals	Page
	Compact, optical electronic Multiturn Sendix F3663 (Shaft) Sendix F3683 (Hollow s.)	36 [1.42]	•	17 + 24	•	•	-	SinCos RS422	12.000	-40...+90 [-40...+194]	IP67	•	M12	5 10...30	•	 	214
	Standard, optical mechanical Multiturn Sendix 5863 (Shaft) Sendix 5883 (Hollow s.)	58 [2.28]	•	17 + 12	•	•	-	SinCos RS422	12.000	-40...+90 [-40...+194]	IP67	•	M12 M23	5 10...30	•	 	225
	Standard, optical mechanical Multiturn SSI / BiSS-C + SinCos SIL2 / PLd Sendix SIL 5863FS2 (S.) Sendix SIL 5883FS2 (Hs.)	58 [2.28]	•	17 + 12	•	•	-	SinCos	12.000	-40...+90 [-40...+194]	IP67	•	M23	5 10...30	•	 	232
	Standard, optical mechanical Multiturn SSI / BiSS-C + SinCos SIL3 / PLe Sendix SIL 5863FS3 (S.) Sendix SIL 5883FS3 (Hs.)	58 [2.28]	•	17 + 12	•	•	-	SinCos	12.000	-40...+90 [-40...+194]	IP67	•	M23	5 10...30	•	 	237
	Standard, optical electronic Multiturn Sendix F5863 (Shaft) Sendix F5883 (Hollow s.)	58 [2.28]	•	17 + 24	•	•	-	SinCos RS422	12.000	-40...+85 [-40...+185]	IP67	•	M12 M23	5 10...30	•	 pending 	242
	Standard, programmable optical / magnetic 5862 (Shaft) 5882 (Hollow shaft)	58 [2.28]	•	13 + 12	•	-	-	-	6.000	-20...+85 [-4...+185]	IP65	•	M23	5...30	•		248
	Standard, optical mechanical Multiturn ATEX Sendix 7063 (Shaft)	70 [2.76]	•	17 + 12	•	•	-	-	6.000	-40...+60 [-40...+140]	IP67	•	-	10...30	•	 	284
	Standard, optical mechanical Multiturn ATEX, SIL2 / PLd Sendix SIL 7063FS2 (S.)	70 [2.76]	•	17 + 12	•	•	-	SinCos	6.000	-40...+60 [-40...+140]	IP67	•	-	10...30	•	 	287
	Standard, optical mechanical Multiturn ATEX, SIL3 / PLe Sendix SIL 7063FS3 (S.)	70 [2.76]	•	17 + 12	•	•	-	SinCos	6.000	-40...+60 [-40...+140]	IP67	•	-	10...30	•	 	290
	Large hollow shaft, optical / magnetic, programmable 9081 (Hollow shaft)	90 [3.54]	•	13 + 12	•	-	•	-	6.000	-20...+70 [-4...+158]	IP65	•	M23	4.75...30 5...30	•		306

Product overview

Absolute Encoders Multiturn Fieldbus

		Ø Size in mm [inch]	Optical (Accuracy ≤ ±0.015°)	Resolution max. in Bit ST+MT	CANopen	CANopenlift	PROFIBUS DP	DeviceNet	EtherCAT	PROFINET IO	Speed max. in RPM	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	Power supply in V DC	RoHS compliant	Approvals	Page
	Compact, optical electronic Multiturn Sendix F3668 (Shaft) Sendix F3688 (Hollow s.)	36 [1.42]	•	16 + 16	•	-	-	-	-	-	12.000	-40...+85 [-40...+185]	IP67	•	-	10...30	•		220
	Standard, optical electronic Multiturn Sendix F5868 (Shaft) Sendix F5888 (Hollow s.)	58 [2.28]	•	16 + 16	•	-	-	-	-	-	12.000	-40...+80 [-40...+176]	IP67	•	M12	10...30	•	<p>pending</p>	253
	Standard, optical mechanical Multiturn Sendix 5868 (Shaft) Sendix 5888 (Hollow s.)	58 [2.28]	•	16 + 12	•	•	•	-	•	•	9.000	-40...+85 [-40...+185]	IP67	•	M12 D-Sub	10...30	•		258 263 274 279
	Standard, optical mechanical Multiturn ATEX Sendix 7068 (Shaft)	70 [2.76]	•	16 + 12	•	-	•	-	-	-	6.000	-40...+60 [-40...+140]	IP67	•	-	10...30	•		293 296
	Large hollow shaft, optical / magnetic 9080 (Hollow shaft)	90 [3.54]	•	13 + 12	•	-	•	•	-	-	6.000	-10...+70 [-14...+158]	IP65	•	M12	10...30	•		299 302





Product overview

Linear Measuring Technology

	Measuring max. in m	Accuracy max.	Resolution max.	Ø Size in mm [inch]	Incremental RS422/Push-Pull	Incremental SinCos	Absolute analogue	Absolute SSI/BiSS-C	Absolute Fieldbus	Traverse speed max. in m/s	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	RoHS compliant	Page
	50	dep. on meas. length 0.08 mm for 1 m	10 µm	10x25x40 [0.39 x 0.98 x 1.57]	•	-	-	-	-	25	-20...+80 [-4...+176]	IP69k	•	-	•	312
	50	dep. on meas. length 0.1 mm for 1 m	5 µm	10x25x40 [0.39 x 0.98 x 1.57]	•	-	-	-	-	16.25	-20...+80 [-4...+176]	IP69k	•	-	•	315
	1.25	±0.05% of measuring range	0.05 mm	50x50x max. 99 [1.97 x 1.97 x 3.90]	•	-	4...20 mA 0...10 V 1 kΩ	•	•	10	-20...+85 [-4...+185]	IP67	•	-	•	318
	3	±0.05% of measuring range	0.05 mm	80x80 x max. 144 [3.15 x 3.15 x 5.67]	•	•	4...20 mA 0...10 V 1 kΩ	•	•	10	-20...+85 [-4...+185]	IP67	•	M12 M23	•	321
	6	±0.05% of measuring range	0.08 mm	120x120x max. 136 [4.72 x 4.72 x 5.35]	•	•	4...20 mA 0...10 V 1 kΩ	•	•	10	-20...+85 [-4...+185]	IP67	•	M12 M23	•	324
	42.5	±0.05% of measuring range	0.08 mm	135x136 x max. 318 [5.32 x 5.35 x 12.52]	•	•	4...20 mA 0...10 V 1 kΩ	•	•	5	-20...+85 [-4...+185]	IP67	•	M12 M23	•	327
	2	±0.1% of measuring range	0.1 mm	40x40x max. 72 [1.57 x 1.57 x 2.83]	•	-	4...20 mA 0...10 V 10 kΩ	-	-	1	-10...+80 [-4...+176]	-	•	-	•	332
	2	±0.1% of measuring range	0.1 mm	105x85 x max. 163 [4.13 x 3.35 x 6.42]	•	•	-	•	•	0.8	-20...+85 [-4...+185]	-	•	-	•	334
	6	±0.1% of measuring range	0.1 mm	105x85 x max. 163 [4.13 x 3.35 x 6.42]	•	•	-	•	•	3	-20...+80 [-4...+176]	-	•	-	•	336



Product overview

Linear Measuring Technology





	Measuring length max. in m	Accuracy max.	Resolution max.	ø Size in mm [inch]	Incremental RS422/Push-Pull	Incremental SinCos	Absolute analogue	Absolute SSI/BiSS-C	Absolute Fieldbus	Traverse speed max. in m/s	Temperature range in °C [°F]	Protection max.	Type of connection cable	Type of connection connector	RoHS compliant	Page	
	Elevator measuring system for shaft-copying LM3	53	±0.5mm	0.1 mm	dep. on type	•	•	—	•	•	6	-20...+85 [-4...+185]	IP67	•	M12 M23 MIL	•	338
	Length measuring kit, mini measuring wheel system incl. encoder	∞	±0.015°	0.1 mm	74x50x52 [2.91 x 1.97 x 2.05]	•	•	—	—	—	2.000 rpm	-20...+80 [-4...+176]	IP64	•	—	•	340
	Length measuring kit with rack and pinion incl. encoder / preset counter	∞	0.5 mm	0.1 mm	dep. on rack	•	•	—	—	—	0.5	-20...+80 [-4...+176]	IP67	•	M12 M23 MIL	•	341
	Length measuring kit with measuring wheels incl. encoder / preset counter	∞	±0.015°	0.1 mm	dep. on the measuring wheel	•	•	—	—	—	2.000 rpm	-20...+80 [-4...+176]	IP67	•	M12 M23 MIL	•	342

Product overview

Inclinometers

		Measuring angle max.	Accuracy max.	Resolution max.	ø Size in mm [inch]	Absolute analogue	Absolute Fieldbus	Speed max. in m/s	Temperature range in °C [°F]	Protection max.	Type of connection connector	RoHS compliant	Page
	Inclinometer MEMS, capacitive analogue IS40, 2-dimensional	±60°	±0.5°	0.15°	60x30x20 [2.36 x 1.18 x 0.79]	4...20mA 0.1...4.9V 2%...98%	–	Reaction time 0.1 s	-30...+70 [-22...+158]	IP68	M12	•	348
	Inclinometer MEMS, capacitive CANopen IS60, 2-dimensional	±60°	±0.05°	0.01°	68x42.5x42.5 [2.67 x 1.67 x 1.67]	–	•	Reaction time 0.1 s	-40...+80 [-40...+176]	IP68	M12	•	350







Functional Safety Basic modules

	Monitoring - number of axis	Digital safe inputs ¹⁾	Analogue inputs ¹⁾	Relays outputs ¹⁾	Digital outputs	Messaging outputs	Encoder interface front (D-SUB)	Encoder interface terminal	Max. number of expansions/ field bus modules	Power supply in V DC	Module width in mm [inch]	Approvals	Page
	Speed monitoring for 1 axis Safety-M MS1	1	14	–	2	2	TTL/SinCos/SSI	HTL/ proximity switches	2/1	24	45 [1.77]	SiL3 PIe	354
	Speed and position monitoring for 1 axis Safety-M MSP1	1	14	–	2	2	TTL/SinCos/SSI/ Resolver	HTL/ proximity switches	2/1	24	67.5 [2.66]	SiL3 PIe	357
	Speed monitoring for 2 axes Safety-M MS2	2	14	4 optional	2	2	TTL/SinCos/SSI	HTL/ proximity switches	2/1	24	67.5 [2.66]	SiL3 PIe	361
	Speed and position monitoring for 2 axes Safety-M MSP2	2	14	4 optional	2	2	TTL/SinCos/SSI/ Resolver	HTL/ proximity switches	2/1	24	112.5 [4.43]	SiL3 PIe	364








1) Safe due to redundant operation

Product overview

Functional Safety Expansion modules




		Safe digital inputs	Safe digital outputs	Relays outputs ¹⁾	Messaging outputs	Power supply	Module width in mm [inch]	Approvals	Page
 	I/O expansion digital Safety-M EM3	12	10	–	2	24 V DC	45		368
 	I/O expansion relays Safety-M EM4	12	2	8	2	24 V DC	90		370




Functional Safety Communication modules

	Type	Fieldbus	Baud rate	Power supply	Module width in mm [inch]	Interface	Page
 	BM11	DeviceNet	125 ... 500 kbit/s	from the basic modules	22.5 [0.89]		372
	BM21	CANopen	500 kbit/s				374
	BM31	PROFIBUS DP	9.6 kBaud ... 12 Mbaud				376
	BMB1	EtherCAT	100 Mbit/s, full-duplex				378
	BMC1	PROFINET IO	100 Mbit/s, full-duplex				380





1) Safe due to redundant operation



Product overview

Connecting Technology Connectors		N° of pins	Housing	Connection technology	Cable diameter Ø in mm	Straight connector	Right angle connector	Wall/panel lead-through	Page
	M12	4/5/8	metal	Screw terminals	6 – 8	•	•	•	from 386
	M23	9/12/17	metal	Solder pins	5.5 – 10.5	•	–	•	404
	MIL	7/10	metal	Solder pins	5 – 8	•	–	–	409

Connecting Technology Cordsets		PVC cable	PUR cable	TPE cable	Optical fibre	Straight connector	Right angle connector	for incremental encoders	for SSI / BiSS-C encoders	for Fieldbus	for analogue interfaces	Page
	M12	•	•	–	–	•	•	•	•	•	•	from 387
	M23	•	•	•	–	•	–	•	•	–	•	from 406
	Optical fibre	–	–	–	•	•	–	•	•	–	–	414









Product overview

Connecting Technology		N° of pins	Housing	Connecting technology	Cable	Page
Safety technology						
		9 8	ABS, metallized plastic	D-Sub RJ45	-	410
		9 12	ABS, metallized metal	D-Sub M23	PVC	411

Connecting Technology		Interface	Transmission distance in m	Input frequency in kHz	Transmission rate in Mbit/s	Temperature in °C [°F]	Power supply in VDC	Power consumption in W	Page
Optical fibre modules									
	Optical fibre module	RS422 HTL	1.000	400	120	-10 ... +60 [-14...+140]	5 10...30	2	414
	Optical fibre module	SSI	1.500	500	120	-10 ... +60 [-14...+140]	5 10...30	1.6	416



Incremental Encoders

Series	Type	Output circuit	Page
Miniature, optical	2400 / 2420 (Shaft / Hollow shaft)	Push-Pull	20
Miniature, magnetic	2430 / 2440 (Shaft / Hollow shaft)	RS422	23
Compact, optical	3610 / 3620 (Shaft / Hollow shaft)	Push-Pull / RS422	26
	Plastic housing 3700 / 3720 (Shaft / Hollow shaft)	Push-Pull / RS422	30
Standard, optical	Sendix 5000 / 5020 (Shaft / Hollow shaft)	Push-Pull / RS422	34
	High temperature 5803 / 5823 (Shaft / Hollow shaft)	Push-Pull / RS422	44
	Sine wave output, with zero pulse 5804 / 5824 (Shaft / Hollow shaft)	SinCos	49
	 Sine wave output, highly interpolable Sendix 5814 / 5834 (Shaft / Hollow shaft)	SinCos	53
	 Sine wave output, SIL2 / PLd Sendix SIL 5814FS2 / 5834FS2 (Shaft/Hollow shaft)	SinCos	56
	 Sine wave output, SIL3 / PLe Sendix SIL 5814FS3 / 5834FS3 (Shaft/Hollow shaft)	SinCos	61
	High resolution 5805 / 5825 (Shaft / Hollow shaft)	Push-Pull / RS422	66
	Stainless steel, shaft Sendix 5006 (Shaft)	Push-Pull / RS422	70
	Stainless steel, hollow shaft Sendix 5826 (Hollow shaft)	Push-Pull / RS422	73
	Large hollow shaft 5821 (Hollow shaft)	Push-Pull / RS422	75
	 ATEX Sendix 7000 (Shaft)	Push-Pull / RS422	78
	 ATEX, SIL2 / PLd Sendix SIL 7014FS2 (Shaft)	SinCos	81
	 ATEX, SIL3 / PLe Sendix SIL 7014FS3 (Shaft)	SinCos	84
Large hollow shaft, optical	A020 (Hollow shaft)	Push-Pull / RS422 / SinCos	87
	Robust A02H (Hollow shaft)	Push-Pull / RS422 / SinCos	91
Heavy Duty, optical	 Shaft Sendix Heavy Duty H100 (Shaft)	Push-Pull / RS422 / Speed switch	98
	 Hollow shaft Sendix Heavy Duty H120 (Hollow shaft)	Push-Pull / RS422 / Optical fibre	102
Bearingless, magnetic	RI20 / Limes LI20 (Hollow shaft)	Push-Pull / RS422	107
	Zero pulse RI50 / Limes LI50 (Hollow shaft)	Push-Pull / RS422	110

Incremental Encoders

**Miniature
Optical**

2400 / 2420 (Shaft / Hollow shaft)

Push-Pull

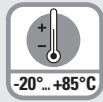


The incremental miniature encoders type 2400 / 2420 with their optical sensor technology offer a resolution of up to 1024 PPR.

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



High rotational speed



Temperature range
-20°...+85°C



Shock / vibration resistant



Short-circuit proof



Magnetic field proof



Optical sensor

Reliable

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

Versatile

- Ideally suited for use in small devices
- Meets the certification requirements of Railways Standard EN 50121

Order code Shaft version

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

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



a Flange

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

b Shaft (ø x L)

1 = ø 4 x 10 mm [0.16 x 0.39"]
3 = ø 5 x 10 mm [0.20 x 0.39"], with flat
2 = ø 6 x 10 mm [0.24 x 0.39"]

4 = ø 1/4" x 10 mm [1/4" x 0.39"], with flat ¹⁾
6 = ø 6 x 10 mm [0.24 x 0.39"], with flat ¹⁾

c Output circuit / Power supply

1 = Push-Pull (without inverted signal) / 5 ... 24 V DC
2 = Push-Pull (with inverted signal) / 5 ... 24 V DC
3 = Push-Pull (without inverted signal) / 8 ... 30 V DC
4 = Push-Pull (with inverted signal) / 8 ... 30 V DC

d Type of connection

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

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)
Other pulse rates on request

Stock types

05.2400.1122.0050
05.2400.1122.0360
05.2400.1122.0500
05.2400.1122.1000
05.2400.1122.1024

Order code Hollow shaft

05.2420 . **1XXXX** . **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"]

b Blind hollow shaft

insertion depth max. 14 mm [0.55"]
1 = ø 4 mm [0.16"]
2 = ø 6 mm [0.24"]

4 = ø 1/4" ¹⁾

c Output circuit / Power supply

1 = Push-Pull (without inverted signal) / 5 ... 24 V DC
2 = Push-Pull (with inverted signal) / 5 ... 24 V DC
3 = Push-Pull (without inverted signal) / 8 ... 30 V DC
4 = Push-Pull (with inverted signal) / 8 ... 30 V DC

d Type of connection

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

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)
Other pulse rates on request

Stock types

05.2420.1212.0500
05.2420.1212.1000
05.2420.1222.0500
05.2420.1222.1000
05.2420.1222.1024

1) US version

Incremental Encoders

Miniature Optical	2400 / 2420 (Shaft / Hollow shaft)	Push-Pull
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Mounting accessory for shaft encoders		Order-No.
Coupling	Bellocs coupling \varnothing 15 mm [0.59"] for shaft 4 mm [0.16"]	8.0000.1201.0404

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		
Speed		max. 12 000 min ⁻¹
Moment of inertia		approx. 0.1 x 10 ⁻⁶ kgm ²
Starting torque - at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial	10 N
	axial	20 N
Weight		approx. 0.06 kg [2.12 oz]
Protection acc. to EN 60529	housing side	IP65
	flange side	IP50 (IP64 on request)
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]
Materials	shaft	stainless steel
	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 ¹⁾ (7272 compatible)	Push-Pull ¹⁾ (7272 compatible)
Power supply	5 ... 24 V DC ²⁾	8 ... 30 V DC
Power consumption (no load)	max. 50 mA	max. 50 mA
Permissible load / channel	max. 50 mA	max. 50 mA
Pulse frequency	max. 160 kHz	max. 160 kHz
Signal level	HIGH min. +V - 2.5 V	min. +V - 3 V
	LOW max. 0.5 V	max. 0.5 V
Rising edge time t_r	max. 1 μ s	max. 1 μ s
Falling edge time t_f	max. 1 μ s	max. 1 μ s
Short circuit proof outputs	yes	yes
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Incremental Encoders

An independent test laboratory (TTI-PG115/96-01) approved by the German Accreditation Council (DAR) certified the compliance with the Railways Standard, according to EN 50121. This means our encoder is compatible with higher electromagnetic noise standards than standard industrial encoders.



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

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
1, 3 without inv. signal	1, 2	Signal:	0 V	+V	A	B	0				
		Cable colour:	WH	BN	GN	YE	GY				
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)									
2, 4 with inv. signal	1, 2	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	

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

1) Max. recommended cable length 30 m [6.56']
 2) With 24 V DC there is no tolerance above 24 V DC. Please use output circuit 8 ... 30 V DC.

Incremental Encoders

**Miniature
Optical**

2400 / 2420 (Shaft / Hollow shaft)

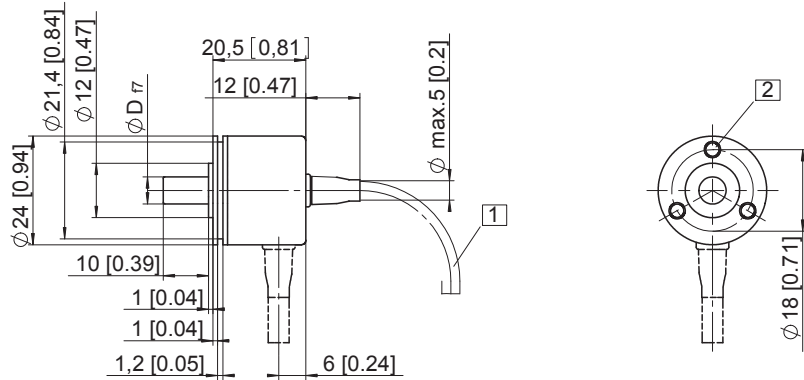
Push-Pull

Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

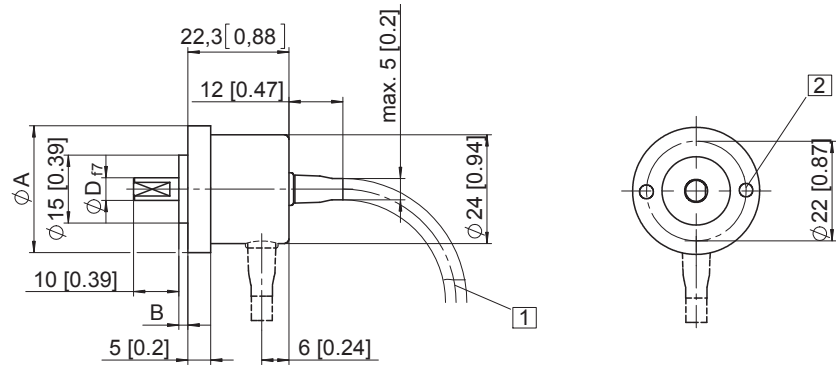
- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep



Flange type 2, ø 30 [1.18]

Flange type 3, ø 28 [1.10]

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



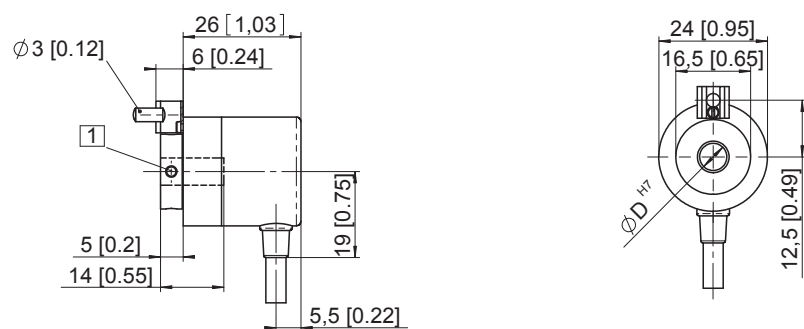
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5



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.



Incremental Encoders

High rotational speed	Temperature range	Shock / vibration resistant	Short-circuit proof	Reverse polarity protection	Magnetic sensor technology

Magnetically robust

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

Compact power

- Resolution up to 256 ppr
- Shaft and hollow shaft version

Order code	8.2430	. X X 6 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.				
Shaft version	Type	<table border="0" style="font-size: x-small;"> <tr> <td style="border: 1px solid black; padding: 2px;">a</td> <td style="border: 1px solid black; padding: 2px;">b</td> <td style="border: 1px solid black; padding: 2px;">c</td> <td style="border: 1px solid black; padding: 2px;">d</td> <td style="border: 1px solid black; padding: 2px;">e</td> </tr> </table>			a	b	c
a	b	c	d	e			
a Flange <u>1 = ø 24 mm [0.94"]</u> 3 = ø 28 mm [1.10"] 2 = ø 30 mm [1.18"]		c Output circuit / Power supply <u>6 = RS422 (with inverted signal) / 5 V DC</u>		e Pulse rate 1 ... 128 (factory programmable) <u>256</u> (e.g. 128 pulses => 0128) Other pulse rates on request			
b Shaft (ø x L) 1 = ø 4 x 10 mm [0.16 x 0.39"] 3 = ø 5 x 10 mm [0.20 x 0.39"], with flat <u>2 = ø 6 x 10 mm [0.24 x 0.39"]</u>		d Type of connection 1 = axial cable, 2 m [6.56'] PVC <u>2 = radial cable, 2 m [6.56'] PVC</u>					

Order code	8.2440	. 1 X 6 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.				
Hollow shaft	Type	<table border="0" style="font-size: x-small;"> <tr> <td style="border: 1px solid black; padding: 2px;">a</td> <td style="border: 1px solid black; padding: 2px;">b</td> <td style="border: 1px solid black; padding: 2px;">c</td> <td style="border: 1px solid black; padding: 2px;">d</td> <td style="border: 1px solid black; padding: 2px;">e</td> </tr> </table>			a	b	c
a	b	c	d	e			
a Flange <u>1 = ø 24 mm [0.94"]</u>		c Output circuit / Power supply <u>6 = RS422 (with inverted signal) / 5 V DC</u>		e Pulse rate 1 ... 128 (factory programmable) <u>256</u> (e.g. 128 pulses => 0128) Other pulse rates on request			
b Blind hollow shaft insertion depth max. 14 mm [0.55"] 1 = ø 4 mm [0.16"] <u>2 = ø 6 mm [0.24"]</u>		d Type of connection 1 = axial cable, 2 m [6.56'] PVC <u>2 = radial cable, 2 m [6.56'] PVC</u>					

Incremental Encoders

Miniature Magnetic	2430 / 2440 (Shaft / Hollow shaft)	RS422
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Mounting accessory for shaft encoders		Order-No.
Coupling	Bellocs coupling \varnothing 15 mm [0.59"] for shaft 4 mm [0.16"]	8.0000.1201.0404

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		
Speed		max. 12.000 min ⁻¹
Moment of inertia		approx. 0.1 x 10 ⁻⁶ kgm ²
Starting torque - at 20°C [68°F]		< 0.01 Nm
Shaft load capacity	radial axial	10 N 20 N
Weight		approx. 0.06 kg [2.11 oz]
Protection acc. to EN 60529	housing side flange side	IP65 (IP67 on request) IP50 (IP67 on request)
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]
Materials	shaft / hollow shaft clamping flange	stainless steel MS58
Shock resistance acc. to EN 60068-2-27		1000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics		
Output circuit		RS422 (TTL-compatible)
Power supply		5 V DC \pm 5%
Power consumption with inverted signal (no load)		typ. 40 mA / max. 90 mA
Permissible load/channel		max. \pm 20 mA
Pulse frequency		max. 300 kHz
Signal level	HIGH LOW	min. 2.5 V max. 0.5 V
Rising edge time t_r		max. 200 ns
Falling edge time t_f		max. 200 ns
Min. flange distance		0.5 μ s ¹⁾
Short circuit proof outputs²⁾		yes ³⁾
Reverse polarity protection of the power supply		no
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC

Terminal assignment

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

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

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

Incremental Encoders

**Miniature
Magnetic**

2430 / 2440 (Shaft / Hollow shaft)

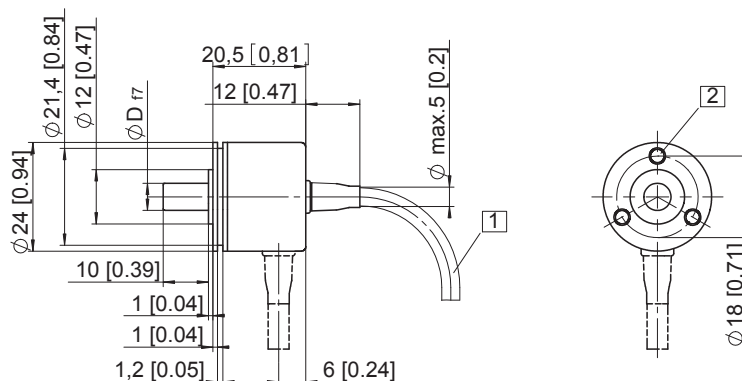
RS422

Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

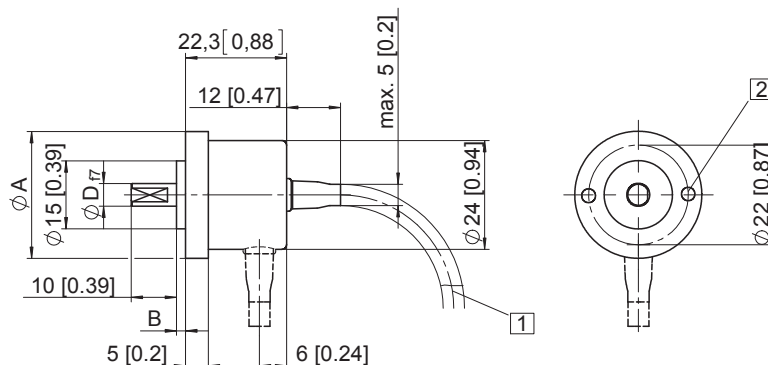
- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep



Flange type 2, \varnothing 30 [1.18]

Flange type 3, \varnothing 28 [1.10]

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



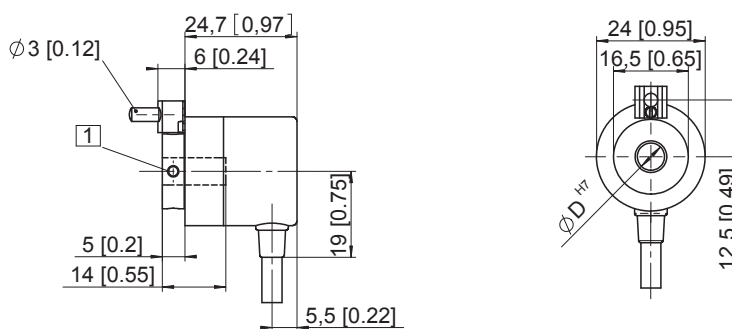
Flange type	A	B
2	\varnothing 30 [1.18]	3 [0.12]
3	\varnothing 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, \varnothing 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5



Incremental Encoders

Incremental Encoders

**Compact
Optical**

3610 / 3620 (Shaft / Hollow shaft)

Push-Pull / RS422



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

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



High rotational speed



Temperature range
-20°...+85°C



Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic field proof



Optical sensor

Compact

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

Versatile

- Available with cable outlet or M12 connector
- Maximum resolution of 2500 pulses per revolution
- Supply voltage 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 [6.56'] PVC cable
2 = radial cable, 2 m [6.56'] PVC cable
3 = M12 connector, 8-pin, axial
4 = M12 connector, 8-pin, radial

e Pulse rate

- 25, 100, 200, 360, 500, 512, 600, 1000, 1024,
1500, 2000, 2048, 2500
(e.g. 500 pulses => 0500)
Other pulse rates on request

Order code Hollow shaft

8.3620 . **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 = with spring element short
2 = with spring element long
5 = with stator coupling, \varnothing 46 mm [1.81"]

b Hollow shaft

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

c Output circuit / Power supply

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

d Type of connection

- E = radial cable, 2 m [6.56'] PVC cable
4 = M12 connector, 8-pin, radial

e Pulse rate

- 25, 100, 200, 360, 500, 512, 600, 1000, 1024,
1500, 2000, 2048, 2500
(e.g. 500 pulses => 0500)
Other pulse rates on request

Incremental Encoders

Compact Optical	3610 / 3620 (Shaft / Hollow shaft)	Push-Pull / RS422
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 15 mm [0.59"] for shaft 6 mm [0.24"]	8.0000.1201.0606
Connection technology		
Connector, self-assembly (straight)	M12 female connector with coupling nut	05.CMB 8181-0
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6041.8211.002M

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

Mechanical characteristics			Electrical characteristics			
Speed	shaft version hollow shaft version	max. 12000 min ⁻¹ max. 6000 min ⁻¹	Output circuit	RS422	Push-Pull ¹⁾ (7272 comp.)	Push-Pull ¹⁾ (7272 comp.)
Moment of inertia		approx. 0.2 x 10 ⁻⁶ kgm ²	Power supply	5 V DC ±5% / 8 ... 30 V DC	5 ... 18 V DC	8 ... 30 V DC
Starting torque - at 20°C [68°F]		< 0.05 Nm	Power consumption with inverted signal (no load)	typ. 40 mA/ max. 90 mA	max. 40 mA	max. 40 mA
Shaft load capacity	radial axial	40 N 20 N	Permissible load / channel	max. ±20 mA	max. ±20 mA	max. ±20 mA
Weight		approx. 0.08 kg [2.82 oz]	Pulse frequency	max. 300 kHz	max. 200 kHz	max. 200 kHz
Protection acc. to EN 60529	housing side flange side	IP65 IP50 (IP64 on request)	Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.5 V max. 0.5 V	min. +V - 3 V max. 0.5 V
Working temperature range		-20°C ... +85°C [-4°F ... +185°F]	Rising edge time t_r	max. 200 ns	max. 1 µs	max. 1 µs
Materials	shaft hollow shaft housing cable	stainless steel brass aluminium PVC	Falling edge time t_f	max. 200 ns	max. 1 µs	max. 1 µs
Shock resistance acc. to EN 60068-2-27		1000 m/s ² , 6 ms	Short circuit proof outputs ²⁾	yes	yes	yes
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz	Reverse polarity protection of the power supply	yes	yes	yes
			UL approval	File 224618		
			CE compliant acc. to	EMC guideline 2004/108/EC		
			RoHS compliant acc. to	guideline 2002/95/EC		

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)
2, 4, 5, 6 with inv. signal	1, 2, E	Signal: 0 V +V A \bar{A} B \bar{B} 0 $\bar{0}$
		Cable colour: WH BN GN YE GY PK BU RD
3 without inv. signal	1, 2, E	Signal: 0 V +V A \bar{A} B \bar{B} 0 $\bar{0}$
		Cable colour: WH BN GN - YE - GY -
Output circuit	Type of connection	M12 connector
2, 4, 5, 6 with inv. signal	3, 4	Signal: 0 V +V A \bar{A} B \bar{B} 0 $\bar{0}$
		Pin: 1 2 3 4 5 6 7 8
Output circuit	Type of connection	M12 connector
3 without inv. signal	3, 4	Signal: 0 V +V A \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

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

Top view of mating side, male contact base



M12 connector, 8-pin

Incremental Encoders

**Compact
Optical**

3610 / 3620 (Shaft / Hollow shaft)

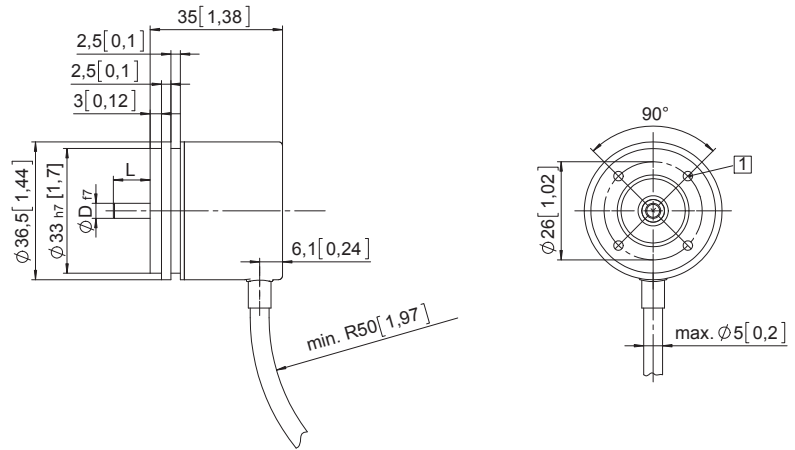
Push-Pull / RS422

Dimensions shaft version

Dimensions in mm [inch]

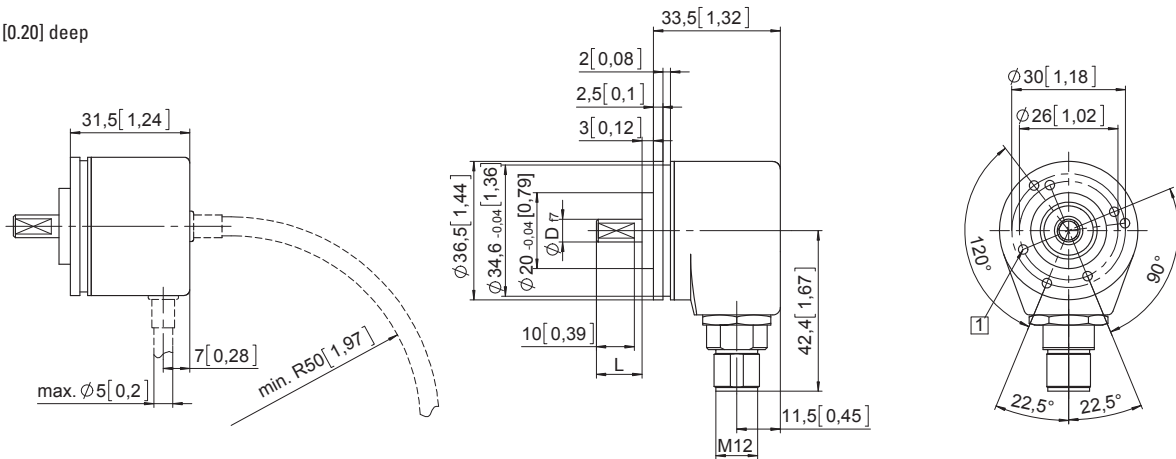
**Synchro flange, ø 36.5 [1.44]
Flange type 2**

1 M3, 5 [0.20] deep



**Clamping flange, ø 36.5 [1.44]
Flange type 3**

1 M3, 5 [0.20] deep



Incremental Encoders

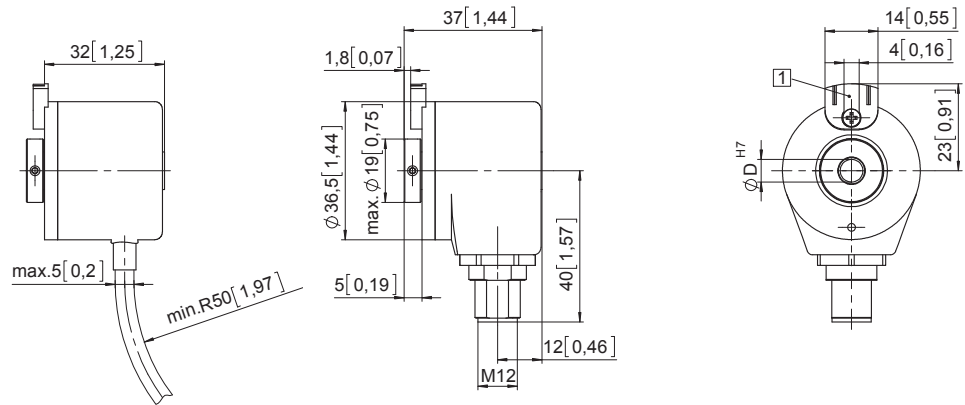
Compact Optical	3610 / 3620 (Shaft / Hollow shaft)	Push-Pull / RS422
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Dimensions hollow shaft version

Dimensions in mm [inch]

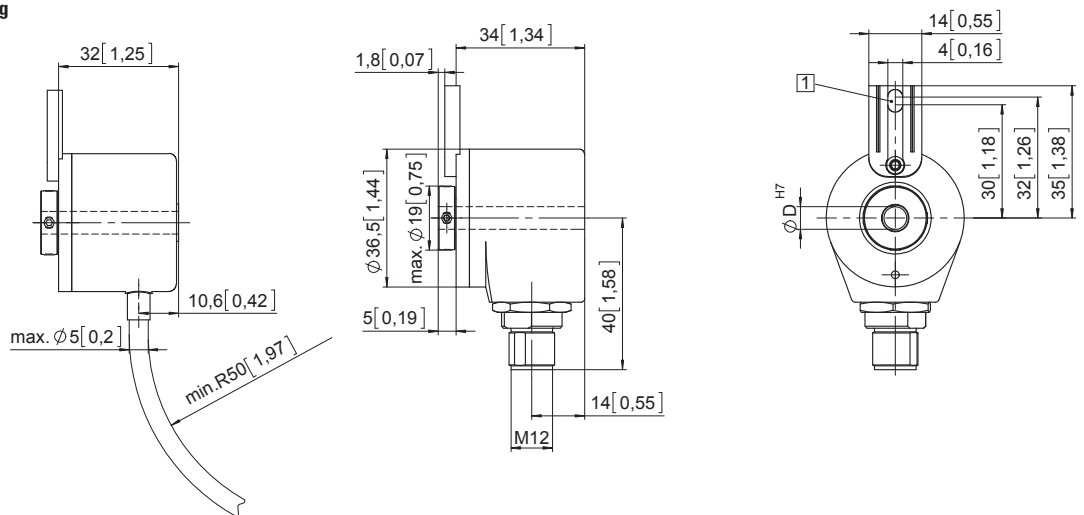
Flange with spring element short Flange type 1

- 1 Torque stop slot
Recommendation:
Cylindrical pin DIN 7,
ø 4 [0.16]



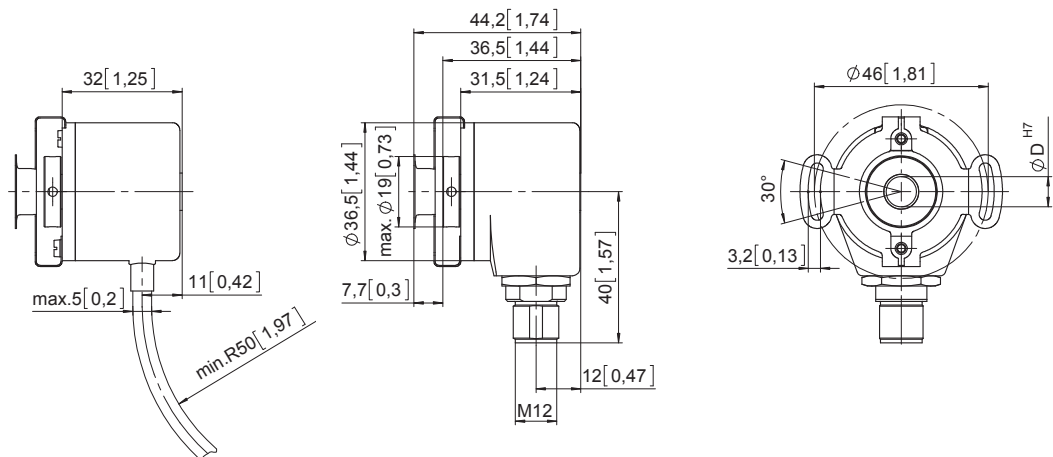
Flange with spring element long Flange type 2

- 1 Torque stop slot
Recommendation:
Cylindrical pin DIN 7,
ø 4 [0.16]



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

Shaft: Minimum insertion
depth 1.5 x D



Incremental Encoders

Compact
Plastic housing, optical

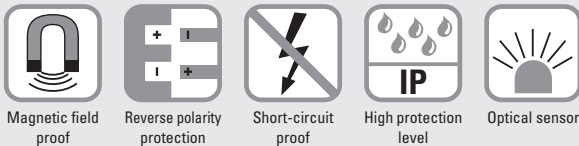
3700 / 3720 (Shaft / Hollow shaft)

Push-Pull / RS422



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

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



Reliable

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

Versatile

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

Order code
Shaft version

8.3700 . **X** **X** **X** **X** . **X** **X** **X** **X**

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 / synchro flange, ø 36.8 mm [1.45"]**
A = flange adapter, mounted, ø 36.8 mm [1.45"]

b Shaft (ø x L), with flat

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

c Output circuit / Power supply

- 1 = RS422 / 5 V DC ±5 %
3 = Push-Pull (with inverted signal) / 5 ... 30 V DC
4 = Push-Pull (with inverted signal) / 10 ... 30 V DC

d Type of connection ¹⁾

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

e Pulse rate

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

Stock types

- 8.3700.1332.0050
8.3700.1332.0360
8.3700.1332.0500
8.3700.1332.1000
8.3700.1332.1024

Order code
Hollow shaft

8.3720 . **X** **X** **X** **X** . **X** **X** **X** **X**

Type a b c d e

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



a Flange

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

b Hollow shaft

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

c Output circuit / Power supply

- 1 = RS422 / 5 V DC ±5 %
3 = Push-Pull (with inverted signal) / 5 ... 30 V DC
4 = Push-Pull (with inverted signal) / 10 ... 30 V DC

d Type of connection ¹⁾

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

e Pulse rate

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

Stock types

- 8.3720.5631.0360
8.3720.5611.1024

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

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"]	8.0000.1201.0606

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		
Speed		max. 6 000 min ⁻¹
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
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-20°C ... +70°C ¹⁾ [-4°F ... 158°F] ¹⁾
Materials	shaft / hollow shaft	stainless steel
	housing, flange	PPA, 40% CF (carbon fibre)
	cable	PVC
Shock resistance acc. to EN 60068-2-27		1000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz

Electrical characteristics			
Output circuit	RS422 (TTL compatible)	Push-Pull (7272 comp.) ⁴⁾	Push-Pull (7272 comp.) ⁴⁾
Power supply	5 V DC ($\pm 5\%$)	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	min. +V - 2.0 V
	LOW	max. 0.5 V	max. 0.5 V
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 224618		
CE compliant acc. to	EMC guideline 2004/108/EC		
RoHS compliant acc. to	guideline 2002/95/EC		

Terminal assignment

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

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

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

Incremental Encoders

Compact
Plastic housing, optical

3700 / 3720 (Shaft / Hollow shaft)

Push-Pull / RS422

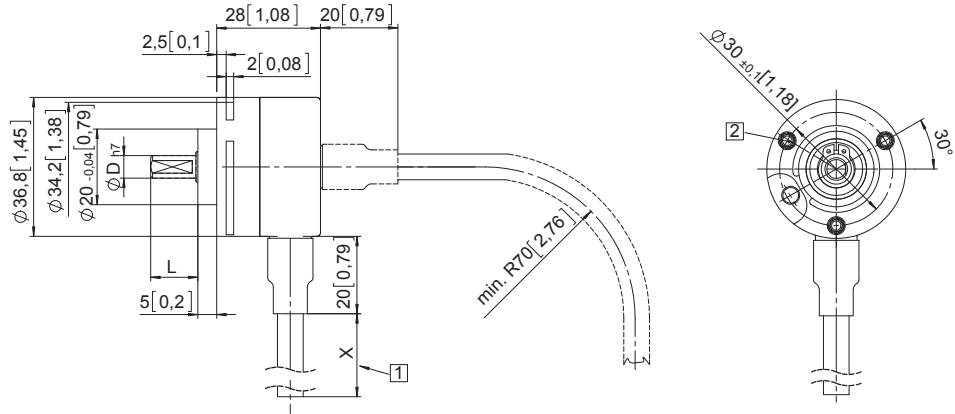
Dimensions shaft version

Dimensions in mm [inch]

Clamping / Synchro flange, $\varnothing 36.8$ [1.45]

Flange type 1

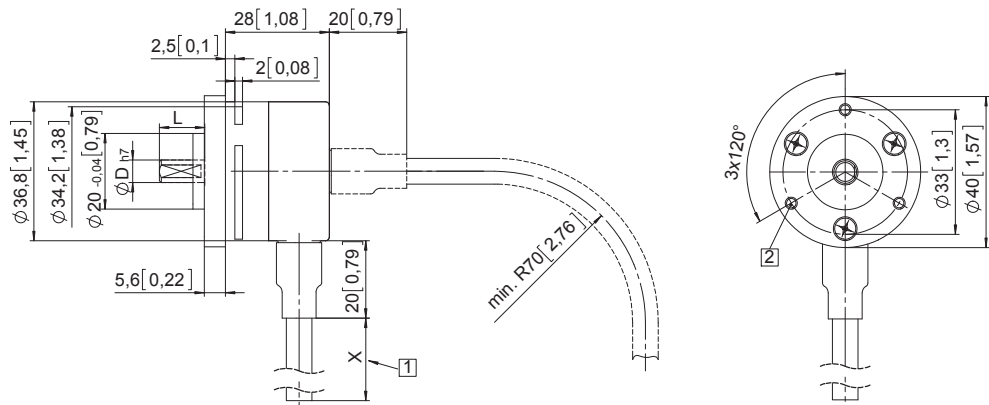
- 1 Cable length
1, 2, 3 or 5 m
[3.28', 6.56', 9.84' or 16.40']
- 2 M3, 6 [0.24] deep



Flange adapter, $\varnothing 36.8$ [1.45]

Flange type A

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



Incremental Encoders

Compact Plastic housing, optical	3700 / 3720 (Shaft / Hollow shaft)	Push-Pull / RS422
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Dimensions hollow shaft version

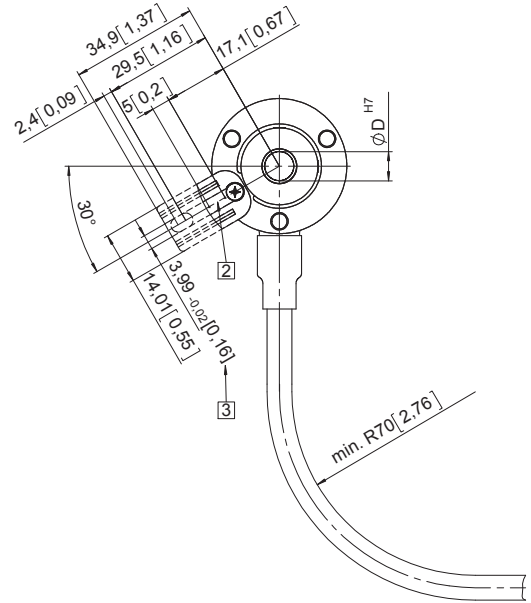
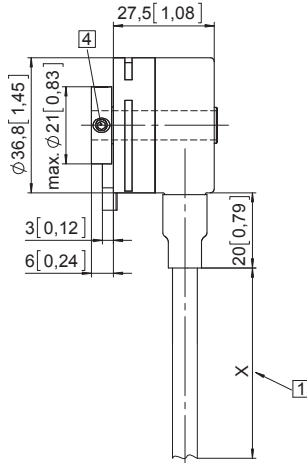
Dimensions in mm [inch]

Flange with spring element short

(Long spring element version is shown dashed)

Flange type 1 (2)

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

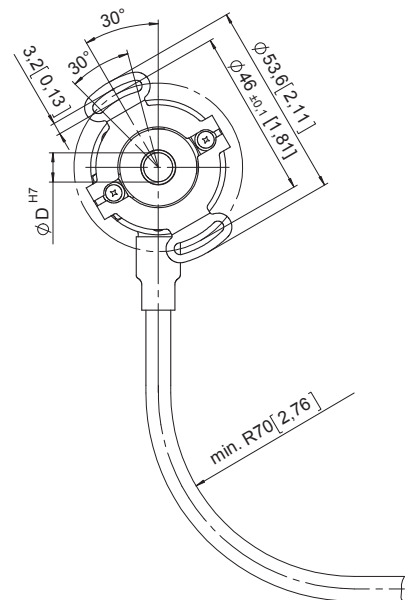
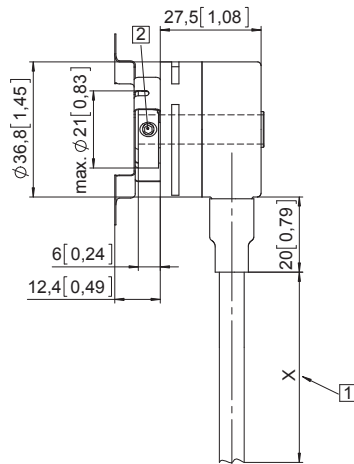


Incremental Encoders

Flange with stator coupling, \varnothing 46 [1.81]

Flange type 5

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



Incremental Encoders

Standard
Optical

Sendix 5000 / 5020 (Shaft / Hollow shaft)

Push-Pull / RS422



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

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



Safety-Lock™



High rotational speed



Temperature range
-40...+85°C



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater-resistant version on request

Robust performance

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

Many variants

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

Order code Shaft version

8.5000 . 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

5 = synchro flange, IP67	∅ 50.8 mm [2"]
6 = synchro flange, IP65	∅ 50.8 mm [2"]
7 = clamping flange, IP67	∅ 58 mm [2.28"]
8 = clamping flange, IP65	∅ 58 mm [2.28"]
A = synchro flange, IP67	∅ 58 mm [2.28"]
B = synchro flange, IP65	∅ 58 mm [2.28"]
C = square flange, IP67	□ 63.5 mm [2.5"]
D = square flange, IP65	□ 63.5 mm [2.5"]
G = euro flange, IP67	∅ 115 mm [4.53"] ²⁾

1 = servo flange, IP67	∅ 50.8 mm [2"] ¹⁾
2 = servo flange, IP65	∅ 50.8 mm [2"] ¹⁾
3 = square flange, IP67	□ 50.8 mm [2"] ¹⁾
4 = square flange, IP65	□ 50.8 mm [2"] ¹⁾
E = servo flange, IP67	∅ 63.5 mm [2.5"] ¹⁾
F = servo flange, IP65	∅ 63.5 mm [2.5"] ¹⁾

b Shaft (∅ x L), with flat

1 = ∅ 6 x 10 mm [0.24 x 0.39"]	2 = ∅ 1/4 x 5/8"
6 = ∅ 8 x 15 mm [0.32 x 0.59"]	4 = ∅ 3/8 x 5/8"
3 = ∅ 10 x 20 mm [0.39 x 0.79"]	
B = ∅ 11 x 33 mm [0.43 x 1.30"]	
	with feather key shaft slot ³⁾
5 = ∅ 12 x 20 mm [0.47 x 0.79"]	

7 = ∅ 1/4 x 7/8" ¹⁾	
8 = ∅ 3/8 x 7/8" ¹⁾	

c Output circuit / Power supply

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

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

Stock types

8.5000.8358.0200	8.5000.8358.1000	8.5000.B157.5000
8.5000.8358.0360	8.5000.8358.5000	8.5000.8354.1024
8.5000.8358.0500	8.5000.B157.1024	8.5000.8354.5000

d Type of connection

1 = axial cable, 1 m [3.28'] PVC cable	
2 = radial cable, 1 m [3.28'] PVC cable	
3 = M12 connector, 8-pin, axial	
4 = M12 connector, 8-pin, radial	
7 = M23 connector, 12-pin, axial	
8 = M23 connector, 12-pin, radial	
Y = MIL connector, 10-pin, radial	
W = MIL connector, 7-pin, radial	

9 = MIL connector, 6-pin, radial ¹⁾	

e Pulse rate

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

optional on request

- Ex 2/22
- seawater-resistant
- special cable length

1) US version

2) Only in conjunction with shaft type B

3) Only in conjunction with flange type G

Incremental Encoders

Standard Optical	Sendix 5000 / 5020 (Shaft / Hollow shaft)	Push-Pull / RS422
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Order code Hollow shaft	8.5020 Type	. X 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.	10 by 10
a Flange	1 = with spring element long, IP67 2 = with spring element long, IP65 3 = with fastening arm long, IP67 4 = with fastening arm long, IP65 7 = with stator coupling, IP67 \varnothing 65 mm [2.56"] 8 = with stator coupling, IP65 \varnothing 65 mm [2.56"] C = with stator coupling, IP67 \varnothing 63 mm [2.48"] D = with stator coupling, IP65 \varnothing 63 mm [2.48"]	c Output circuit / Power supply 4 = RS422 (with inverted signal) / 5 V DC 1 = RS422 (with inverted signal) / 5 ... 30 V DC 2 = Push-Pull (7272 compatible with inverted signal) / 5 ... 30 V DC 5 = Push-Pull (with inverted signal) / 10 ... 30 V DC 3 = Open collector (with inverted signal) / 5 ... 30 V DC ¹⁾ 8 = Push-Pull (7272 with inverted signal), without capacitor / 5 ... 30 V DC ¹⁾	e Pulse rate 1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 100 pulses => 0100) Other pulse rates on request <i>optional on request</i> - Ex 2/22 - seawater-resistant - special cable length	
5 = with stator coupling, IP67 \varnothing 57.2 mm [2.25"] ¹⁾ 6 = with stator coupling, IP65 \varnothing 57.2 mm [2.25"] ¹⁾	d Type of connection 1 = radial cable, 1 m [3.28'] PVC cable 2 = M12 connector, 8-pin, radial 4 = M23 connector, 12-pin, radial 7 = MIL connector, 10-pin, radial E = tangential cable, 1 m [3.28'] PVC cable H = tangential cable, 0.3 m [0.98'] PVC cable, including M12 connector for central fastening	b Hollow shaft 1 = \varnothing 6 mm [0.24"] 2 = \varnothing 1/4" 9 = \varnothing 8 mm [0.32"] 4 = \varnothing 3/8" 3 = \varnothing 10 mm [0.39"] 6 = \varnothing 1/2" 5 = \varnothing 12 mm [0.47"] 7 = \varnothing 5/8" A = \varnothing 14 mm [0.55"] 8 = \varnothing 15 mm [0.59"]	<i>Stock types</i> 8.5020.2351.1000 8.5020.8552.1024 8.5020.2351.2500 8.5020.8552.5000 8.5020.2551.0500	

Incremental Encoders

Mounting accessory for shaft encoders	Order No.
Coupling	
Bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010

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

Isolation / adapter inserts for hollow shaft encoders	D1	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.		
Tip: By using these adapter inserts you can achieve six different hollow shaft diameters, all on the basis of the encoder 8.5020.X8XX.XXXX.	6 mm [0.24"] 8 mm [0.32"] 10 mm [0.39"] 12 mm [0.47"] 1/4" 3/8" 1/2"	8.0010.4021.0000 8.0010.4020.0000 8.0010.4023.0000 8.0010.4025.0000 8.0010.4022.0000 8.0010.4024.0000 8.0010.4026.0000

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

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

1) US version

Incremental Encoders

Standard Optical	Sendix 5000 / 5020 (Shaft / Hollow shaft)	Push-Pull / RS422
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Technical data

Mechanical characteristics	
Max. Speed	IP65 12 000 min ⁻¹ 6 000 min ⁻¹ (continuous)
	IP67 6 000 min ⁻¹ 3 000 min ⁻¹ (continuous)
	shaft version approx. 1.8 x 10 ⁻⁶ kgm ² hollow shaft version approx. 6 x 10 ⁻⁶ kgm ²
Moment of inertia	
Starting torque at 20°C [68°F]	IP65 < 0.01 Nm IP67 < 0.05 Nm
Shaft load capacity	radial 80 N axial 40 N
Weight	approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	without shaft seal IP65 with shaft seal IP67
EX approval for hazardous areas	optional Zone 2 and 22
Working temperature range	-40°C ¹⁾ ... +85°C [-40°F ¹⁾ ... +185°F]
Material	shaft stainless steel
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10 ... 2000 Hz

Electrical characteristics						
Output circuit	RS422 (TTL compatible)	RS422 (TTL compatible)	Push-Pull	Push-Pull (7272 compatible)	Push-Pull (7272, without capacitor)	Open collector (7273)
Ordercode	1	4	5	2	8	3
Power supply	5 ... 30 V DC	5 V DC ±5%	10 ... 30 V DC	5 ... 30 V DC	5 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA	100 mA
Permissible load / channel	max. ±20 mA	max. ±20 mA	max. ±20 mA	max. ±20 mA	max. ±20 mA	20 mA sink at 30 V DC
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz ²⁾	max. 300 kHz	max. 300 kHz
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. 2.5 V max. 0.5 V	min +V - 1 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V	
Rising edge time t_r	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	max. 1 µs	
Falling edge time t_f	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	max. 1 µs	
Short circuit proof outputs³⁾	yes ⁴⁾	yes ⁴⁾	yes	yes	yes ⁴⁾	yes
Reverse polarity protection of the power supply	yes	no	yes	no	no	no
UL approval	File 224618					
CE compliant acc. to	EMC guideline 2004/108/EC					
RoHS compliant acc. to	guideline 2002/95/EC					

1) With connector: -40°C [-40°F], cable fixed: -30°C [-22°F], cable moved: -20°C [-4°F]

2) Max. recommended cable length 30 m [98.43']

3) If supply voltage correctly applied

4) 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.

Incremental Encoders

Standard Optical	Sendix 5000 / 5020 (Shaft / Hollow shaft)	Push-Pull / RS422
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Terminal assignment

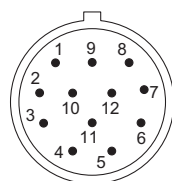
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)												
1, 2, 3, 4, 5, 8	5000: 1, 2	Signal:	0 V	+V	0 Vsens	+Vsens	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp	
	5020: 1, E	Cable colour:	WH	BN	GY PK	RD BU	GN	YE	GY	PK	BU	RD	shield	
1, 2, 3, 4, 5, 8	5000: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

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

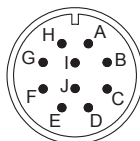
Top view of mating side, male contact base



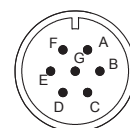
M12 connector, 8-pin



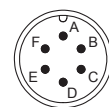
M23 connector, 12-pin



MIL connector, 10-pin



MIL connector, 7-pin



MIL connector, 6-pin

1) PH = Shield is attached to connector housing

Incremental Encoders

**Standard
Optical**

Sendix 5000 / 5020 (Shaft / Hollow shaft)

Push-Pull / RS422

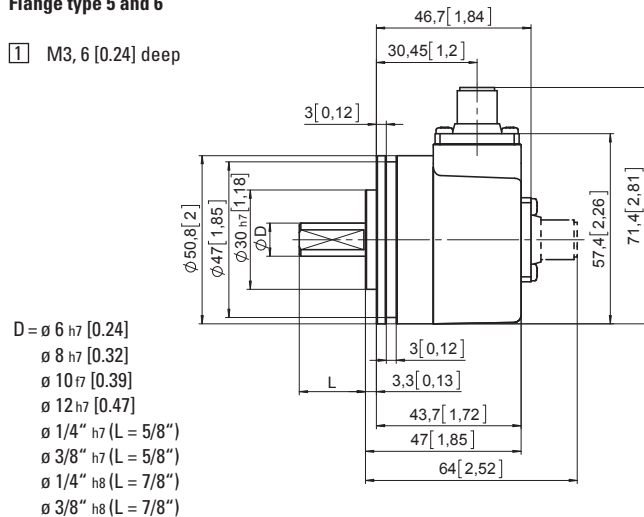
Dimensions shaft version

Dimensions in mm [inch]

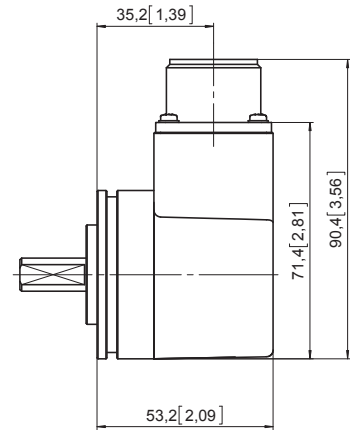
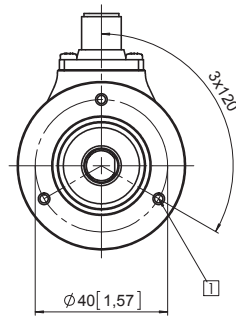
Synchro flange, $\varnothing 50.8$ [2]

Flange type 5 and 6

1 M3, 6 [0.24] deep



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

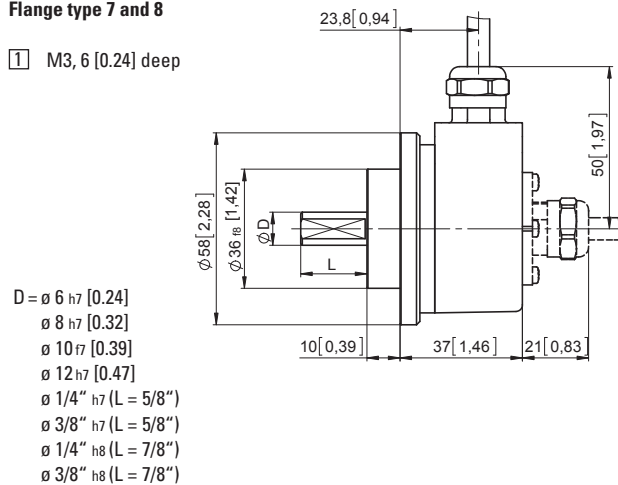


MIL-connector version

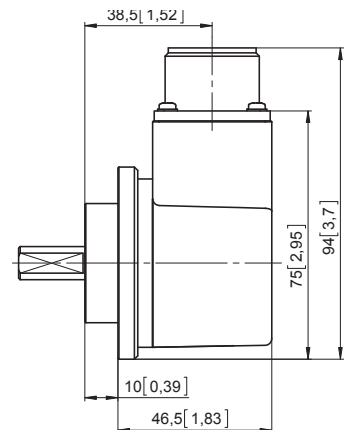
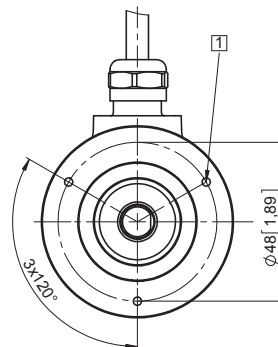
Clamping flange, $\varnothing 58$ [2.28]

Flange type 7 and 8

1 M3, 6 [0.24] deep



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

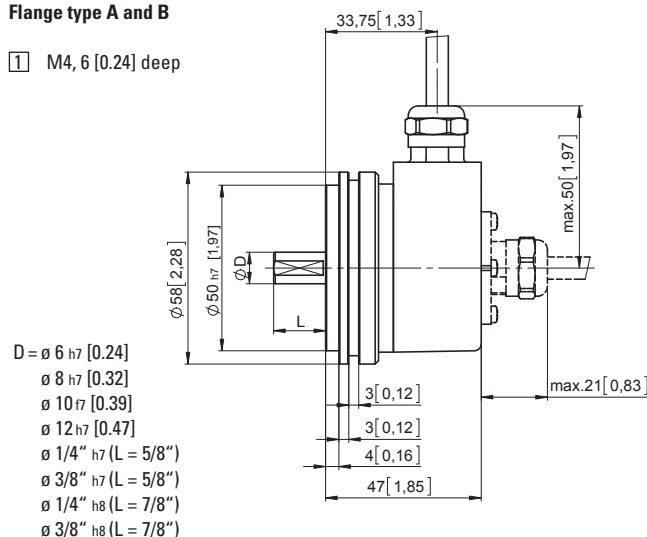


MIL-connector version

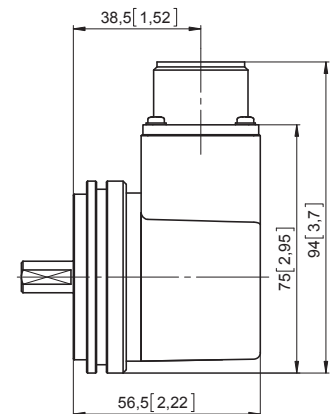
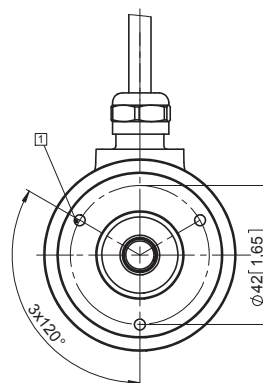
Synchro flange, $\varnothing 58$ [2.28]

Flange type A and B

1 M4, 6 [0.24] deep



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



MIL-connector version

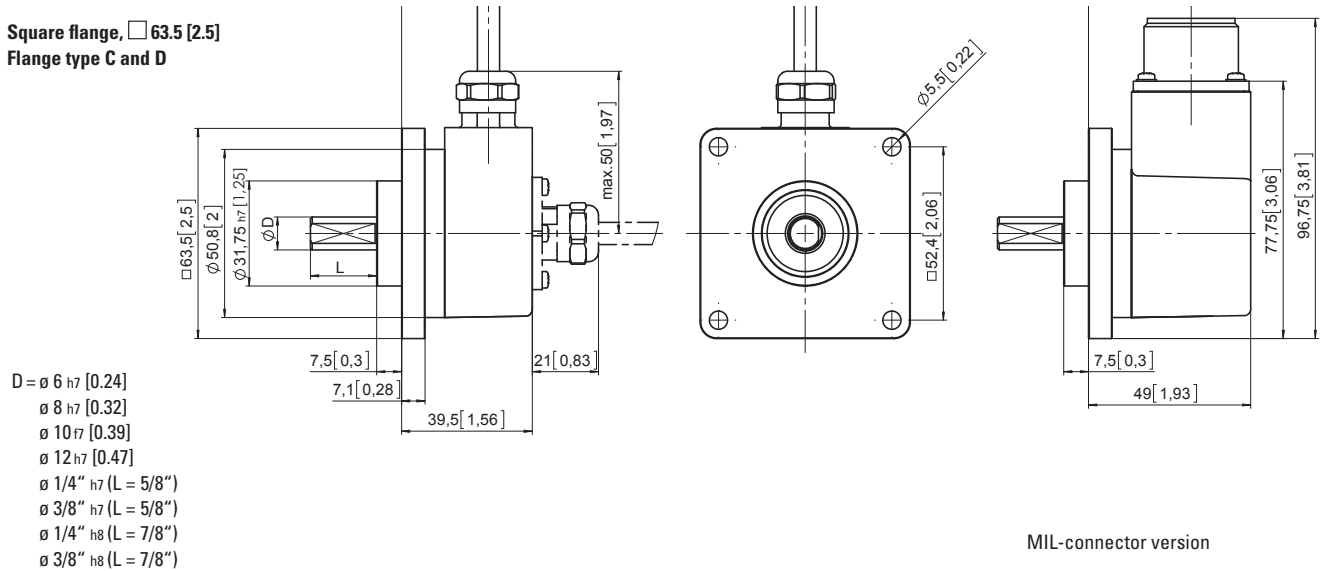
Incremental Encoders

Standard Optical	Sendix 5000 / 5020 (Shaft / Hollow shaft)	Push-Pull / RS422
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Dimensions shaft version

Dimensions in mm [inch]

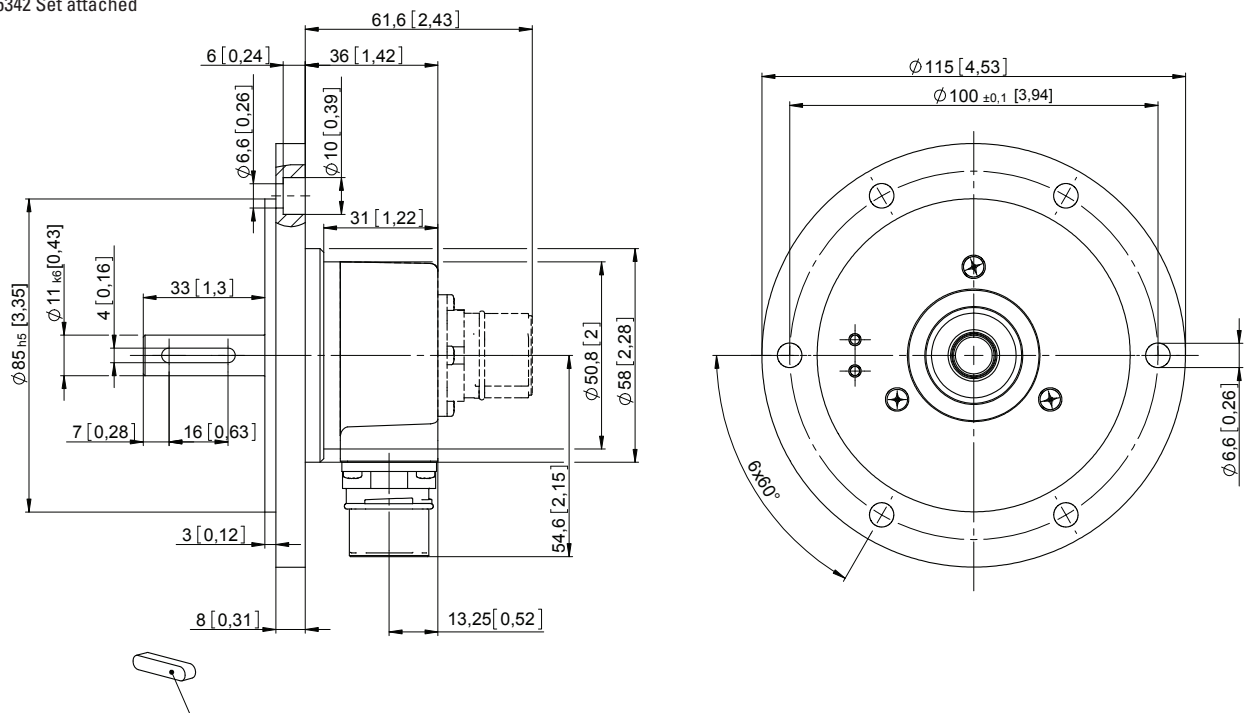
Square flange, □ 63.5 [2.5]
Flange type C and D



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

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

1 215342 Set attached



Incremental Encoders

**Standard
Optical**

Sendix 5000 / 5020 (Shaft / Hollow shaft)

Push-Pull / RS422

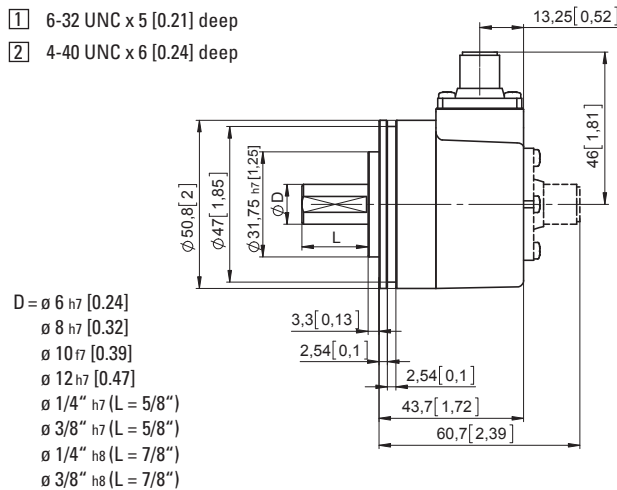
Dimensions shaft version

Dimensions in mm [inch]

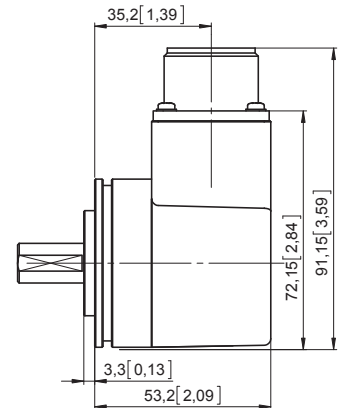
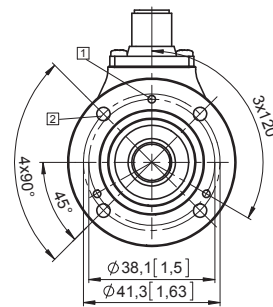
Servo flange, \varnothing 50.8 [2]

Flange type 1 and 2

- 1 6-32 UNC x 5 [0.21] deep
- 2 4-40 UNC x 6 [0.24] deep



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

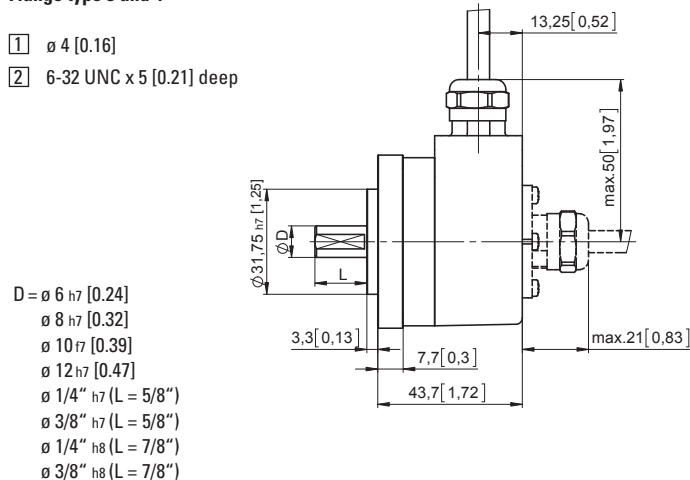


MIL-connector version

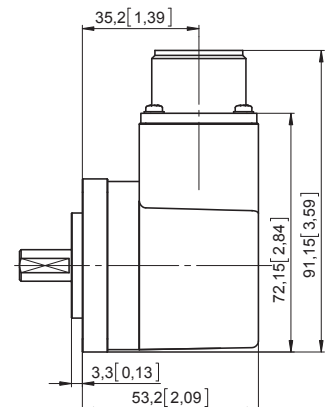
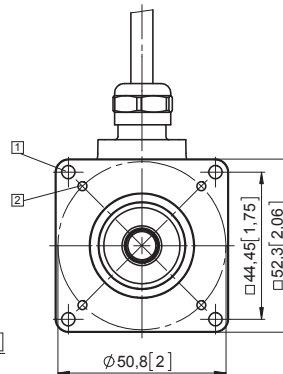
Square flange, \square 50.8 [2]

Flange type 3 and 4

- 1 \varnothing 4 [0.16]
- 2 6-32 UNC x 5 [0.21] deep



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

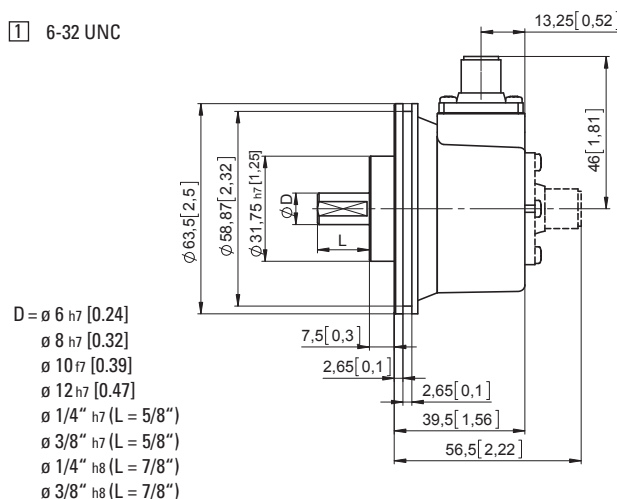


MIL-connector version

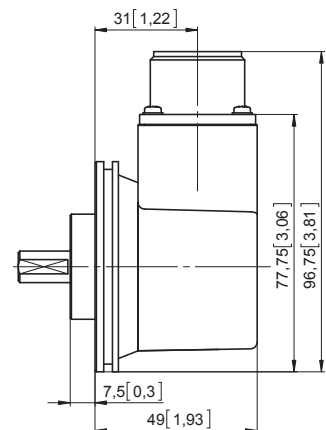
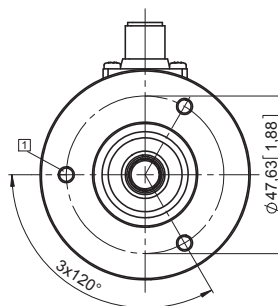
Servo flange, \varnothing 63.5 [2.5]

Flange type E and F

- 1 6-32 UNC



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



MIL-connector version

Incremental Encoders

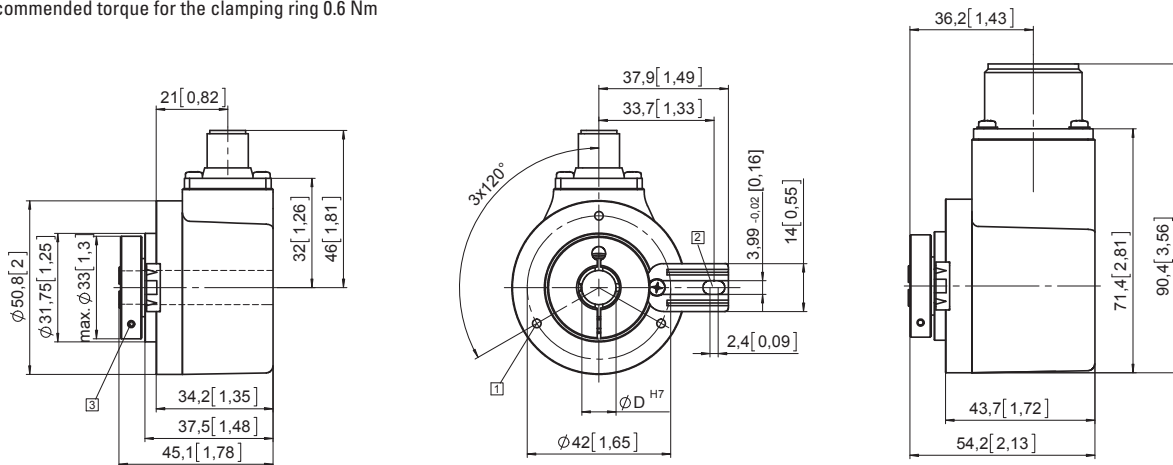
Standard Optical	Sendix 5000 / 5020 (Shaft / Hollow shaft)	Push-Pull / RS422
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element long Flange type 1 and 2

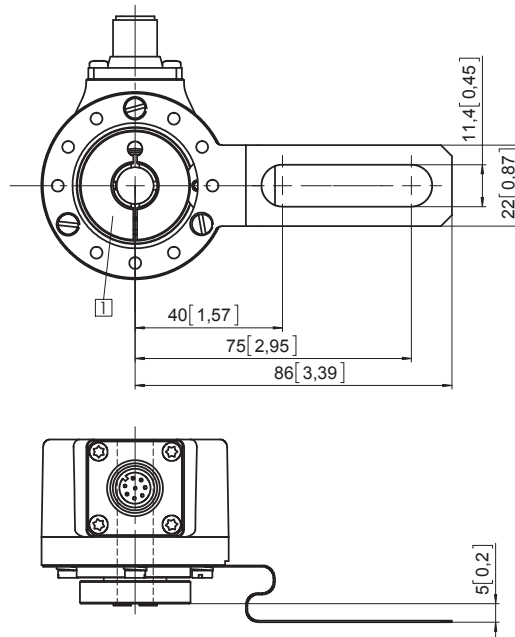
- 1 M3, 6 [0.24] deep
- 2 Torque stop slot,
Recommendation: Cylindrical pin DIN7, 4 [0.16]
- 3 Recommended torque for the clamping ring 0.6 Nm



MIL-connector version

Flange with fastening arm long Flange type 3 and 4

- 1 Recommended torque for the clamping ring 0.6 Nm



Incremental Encoders

**Standard
Optical**

Sendix 5000 / 5020 (Shaft / Hollow shaft)

Push-Pull / RS422

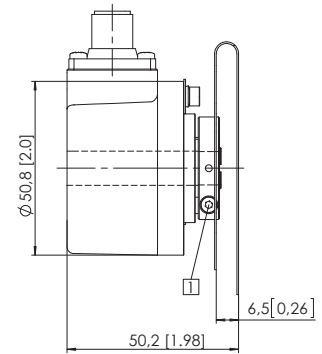
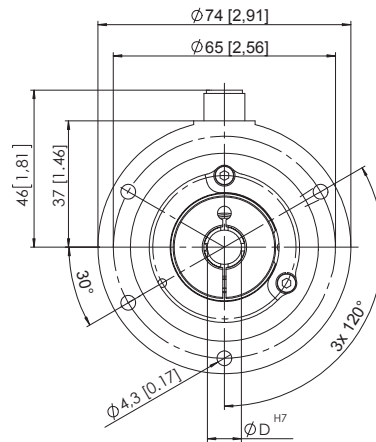
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling, \varnothing 65 [2.56]

Flange type 7 and 8

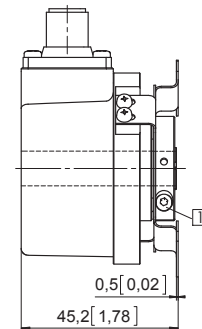
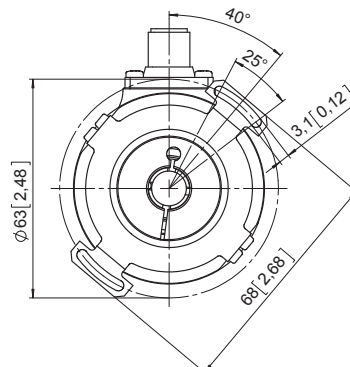
1 Recommended torque for the clamping ring 0.6 Nm



Flange with stator coupling, \varnothing 63 [2.48]

Flange type C and D

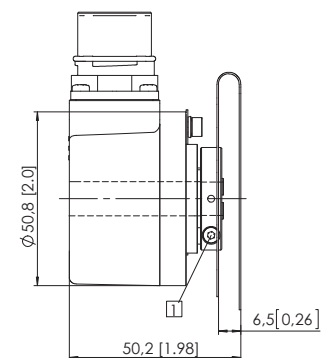
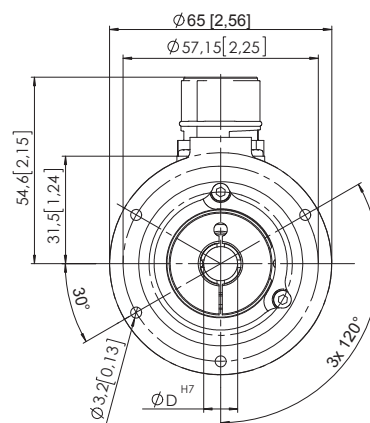
1 Recommended torque for the clamping ring 0.6 Nm



Flange with stator coupling, \varnothing 57.2 [2.25]

Flange type 5 and 6

1 Recommended torque for the clamping ring 0.6 Nm



Incremental Encoders

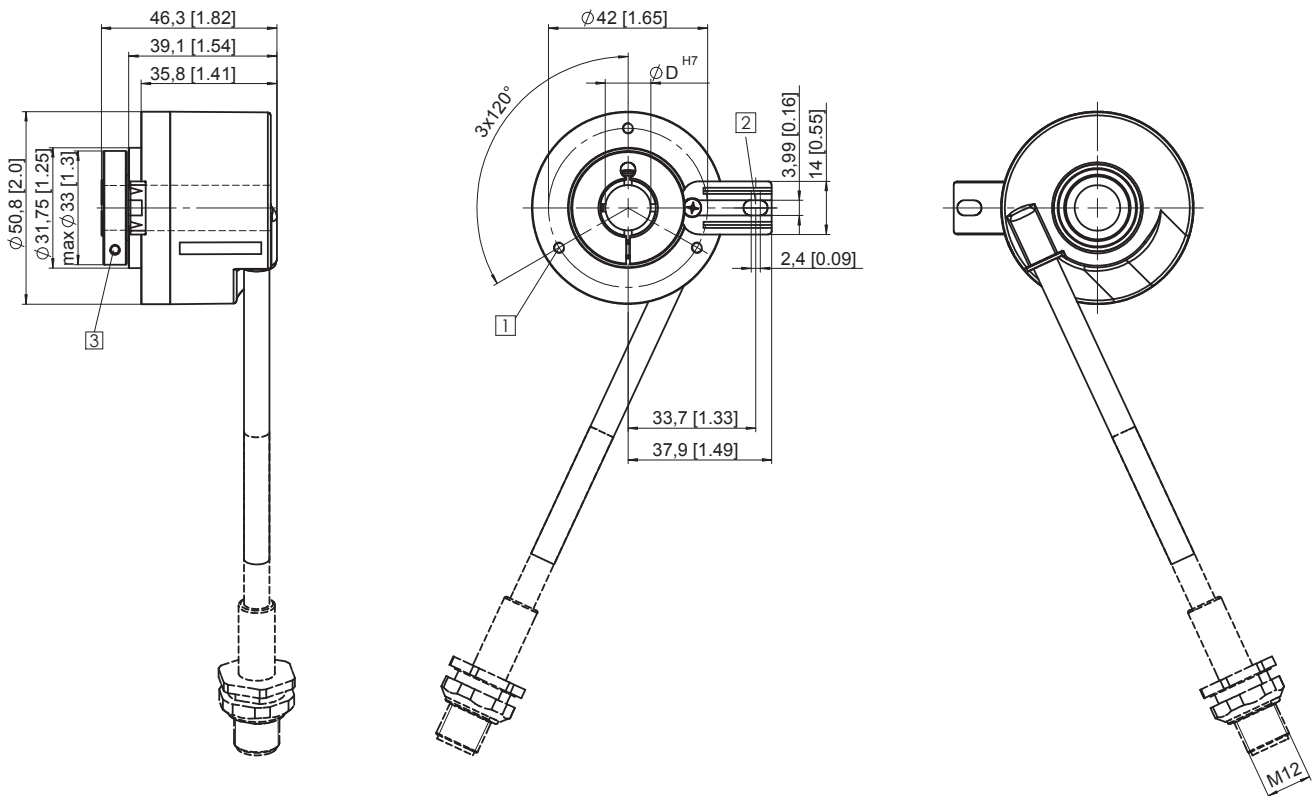
Standard Optical	Sendix 5000 / 5020 (Shaft / Hollow shaft)	Push-Pull / RS422
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Dimensions hollow shaft version

Dimensions in mm [inch]

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

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



Incremental Encoders

Standard
High temperature, optical

5803 / 5823 (Shaft / Hollow shaft)

Push-Pull / RS422



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

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



Powerful

- Can be used at temperatures of up to max. 110°C
- High resolution up to 5000 PPR
- Maximum speed of 12000 RPM

Flexible

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

Order code

Shaft version

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

a Flange

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

b Shaft (ø x L), with flat

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

c Output circuit / Power supply

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

d Type of connection

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

Order code

Hollow shaft

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

a Flange

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

b Hollow shaft

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

c Output circuit / Power supply

- 1 = RS422 (with inverted signal) / 5 V DC
- 4 = RS422 (with inverted signal) / 10 ... 30 V DC
- 3 = Push-Pull (with inverted signal) / 10 ... 30 V DC
- 2 = Push-Pull (without inverted signal) / 10 ... 30 V DC

d Type of connection

- 1 = radial cable, 1 m [3.28'] TPE cable
- 2 = M23 connector, 12-pin, radial, 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)
- Other pulse rates on request

1) Only in conjunction with flange M or P

2) Only with output circuit 7

3) Insertion depth ≤ 30 mm [1.18"]

Incremental Encoders

Standard High temperature, optical	5803 / 5823 (Shaft / Hollow shaft)	Push-Pull / RS422
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	with fixing thread	8.0010.4700.0000
		8.0010.4D00.0000
Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling nut	8.0000.5012.0000
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	8.0000.6901.0002

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

Technical data		
Mechanical characteristics		
Speed	shaft IP65 hollow shaft IP40 hollow shaft IP66 ¹⁾	max. 12000 min ⁻¹ max. 12000 min ⁻¹ max. 6000 min ⁻¹
Moment of inertia	shaft hollow shaft	approx. 1.8 x 10 ⁻⁶ kgm ² approx. 6.0 x 10 ⁻⁶ kgm ²
Starting torque at 20°C [68°F]	shaft IP65 / hollow shaft IP40 hollow shaft IP66	< 0.01 Nm < 0.05 Nm
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	shaft hollow shaft without seal hollow shaft with seal	IP65 IP40 IP66
Working temperature range	shaft IP65 / hollow shaft IP40 hollow shaft IP66	-20°C ... +105°C [-4°F ... +221°F] -20°C ... +90°C [-4°F ... +194°F]
Material	shaft	stainless steel H7
Shock resistance acc. EN 60068-2-27		1000 m/s ² , 6 ms
Vibration resistance acc. 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 with inverted signal	typ. 55 mA / max. 125 mA typ. 80 mA / max. 150 mA
Permissible load / channel	max. ±20 mA	max. ±30 mA
Pulse frequency	max. 300 kHz	max. 300 kHz
Signal level	HIGH LOW	min. 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	no; 10 ... 30 V DC: yes	yes
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

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

Incremental Encoders

Standard
High temperature, optical

5803 / 5823 (Shaft / Hollow shaft)

Push-Pull / RS422

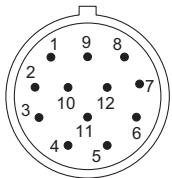
Terminal assignment

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

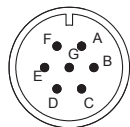
Using RS422 outputs and long cable distances, a wave impedance has to be applied at each cable end.

- +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)

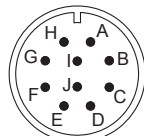
Top view of mating side, male contact base



M23 connector, 12-pin



MIL connector, 7-pin



MIL connector, 10-pin

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

Incremental Encoders

Standard High temperature, optical	5803 / 5823 (Shaft / Hollow shaft)	Push-Pull / RS422
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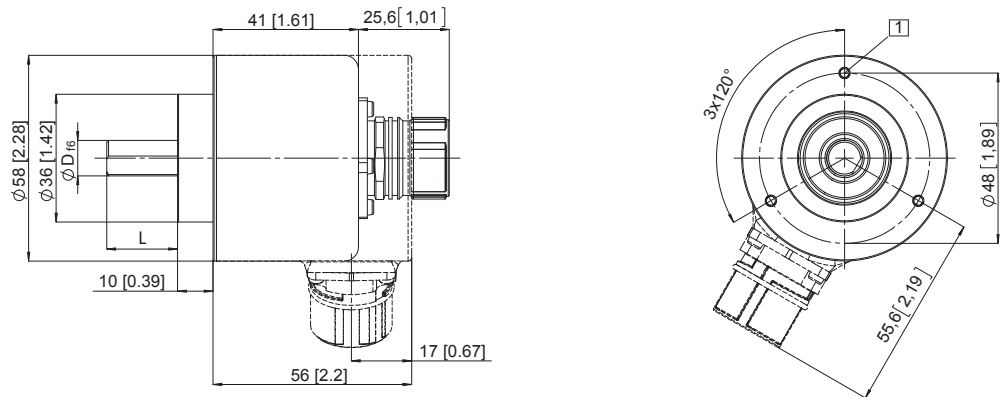
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]

Flange type 1

1 3 x M3, 5 [0.2] deep



Incremental Encoders

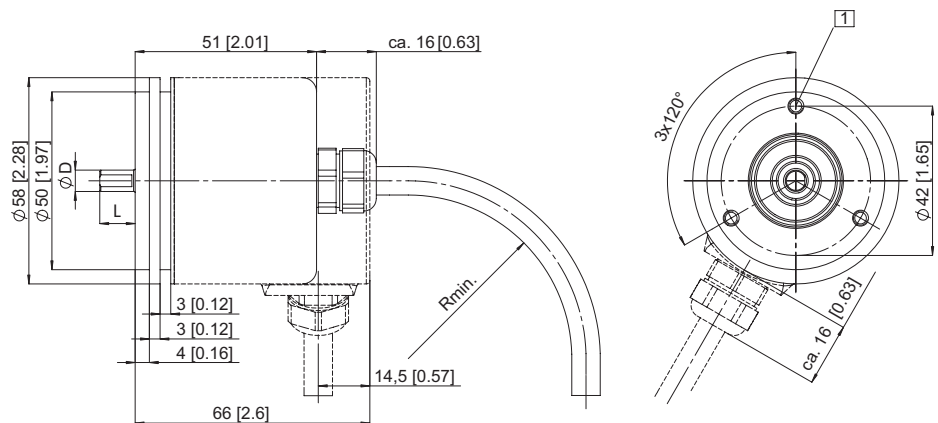
Synchro flange, ø 58 [2.28]

Flange type 2

1 3 x M4, 5 [0.2] deep

R_{min}:-

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



Incremental Encoders

Standard
High temperature, optical

5803 / 5823 (Shaft / Hollow shaft)

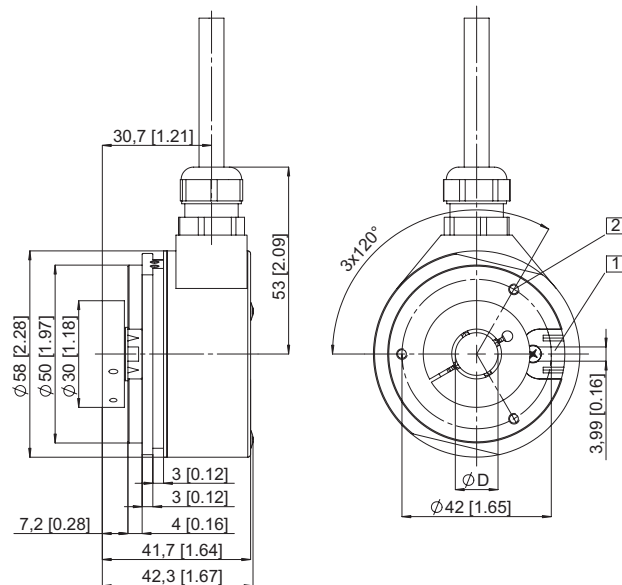
Push-Pull / RS422

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element short Flange type 1 and 2

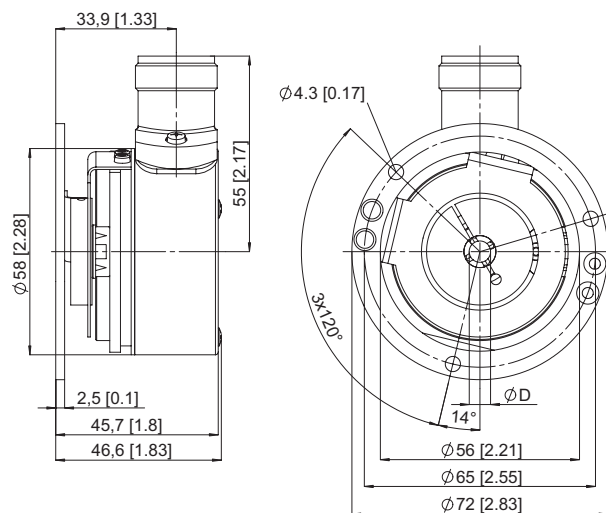
- 1 Torque stop slot,
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 M3, 5 [0.2] deep
Recommended torque for the clamping ring 0.6 Nm



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

Recommended torque for the clamping ring 0.6 Nm

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



Incremental Encoders

Standard Sine wave output, with zero pulse, optical	5804 / 5824 (Shaft / Hollow shaft)	SinCos
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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.



Incremental Encoders

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

High performance

- High resolution up to 5000 PPR
- Maximum speed up to 12000 RPM
- High IP protection up to max. IP66

Adaptable

- Shaft or hollow shaft version
- With cable or connector

Order code Shaft version	8.5804 Type	. XXXX . XXXX
		a b c d e

- | | | |
|---|--|---|
| <p>a Flange</p> <p>1 = clamping flange ø 58 mm [2.28"]
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"]
2 = ø 10 x 20 mm [0.39 x 0.79"]</p> | <p>c Output circuit / Power supply</p> <p>1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC</p> <p>d Type of connection</p> <p>1 = axial cable, 1 m [3.28'] TPE cable
2 = radial cable, 1 m [3.28'] TPE cable
3 = M23 connector, 12-pin, axial, without mating connector
5 = M23 connector, 12-pin, radial, without mating connector</p> | <p>e Pulse rate</p> <p>512, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 512 pulses => 0512)
Other pulse rates on request</p> |
|---|--|---|

Order code Hollow shaft	8.5824 Type	. XXXX . XXXX
		a b c d e

- | | | |
|---|--|---|
| <p>a Flange</p> <p>1 = with hollow shaft and spring element short
2 = with blind hollow shaft ¹⁾ and spring element short
3 = with hollow shaft and stator coupling, ø 65 mm [2.56"]
4 = with blind hollow shaft ¹⁾ and stator coupling, ø 65 mm [2.56"]</p> <p>b Hollow shaft</p> <p>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</p> | <p>c Output circuit / Power supply</p> <p>1 = SinCos, 1 Vpp (with inverted signal) / 5 V DC
2 = SinCos, 1 Vpp (with inverted signal) / 10 ... 30 V DC</p> <p>d Type of connection</p> <p>1 = radial cable, 1 m [3.28'] TPE cable
2 = M23 connector, 12-pin, radial, without mating connector</p> | <p>e Pulse rate</p> <p>512, 1000, 1024, 1200, 1250, 1500, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 512 pulses => 0512)
Other pulse rates on request</p> |
|---|--|---|

1) Insertion depth ≤ 30 mm [1.18"]

Incremental Encoders

Standard		5804 / 5824 (Shaft / Hollow shaft)	SinCos
Sine wave output, with zero pulse, optical			
Mounting accessory for shaft encoders			Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]		8.0000.1101.1010
Mounting accessory for hollow shaft encoders			
Cylindrical pin, long for torque stops		with fixing thread	8.0010.4700.0000
Stator coupling ø 63 mm [2.48"]			8.0010.4D00.0000
Connection technology			
Connector, self-assembly (straight)	M23 female connector with coupling nut		8.0000.5012.0000
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable		8.0000.6901.0002

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

Technical data		
Mechanical characteristics		
Speed	shaft IP65 hollow shaft IP40 hollow shaft IP66 ¹⁾	max. 12000 min ⁻¹ max. 12000 min ⁻¹ max. 6000 min ⁻¹
Moment of inertia	shaft hollow shaft	approx. 1.8 x 10 ⁻⁶ kgm ² approx. 6.0 x 10 ⁻⁶ kgm ²
Starting torque at 20°C [68°F]	shaft IP65 / hollow shaft IP40 hollow shaft IP66	< 0.01 Nm < 0.05 Nm
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529	shaft hollow shaft without seal hollow shaft with seal	IP65 IP40 IP66
Working temperature range	shaft IP65 / hollow shaft IP40 hollow shaft IP66	-20°C ... +85°C ²⁾ [-4°F ... +185°F] -20°C ... +80°C ²⁾ [-4°F ... +176°F]
Material	shaft	stainless steel H7
Shock resistance acc. EN 60068-2-27		1000 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz
Electrical characteristics		
Output circuit	SinCos, U = 1 V_{pp}	SinCos, U = 1 V_{pp}
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 V _{pp} (±20%) 0.1 ... 1.2 V
Short circuit proof outputs³⁾	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

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

Incremental Encoders

Standard	5804 / 5824 (Shaft / Hollow shaft)	SinCos
Sine wave output, with zero pulse, optical		

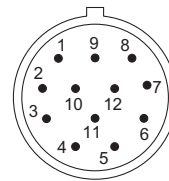
Terminal assignment

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

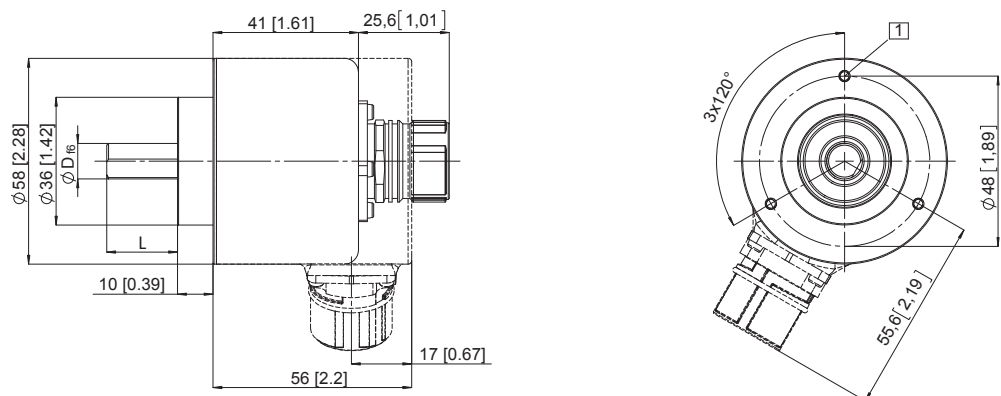
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1

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

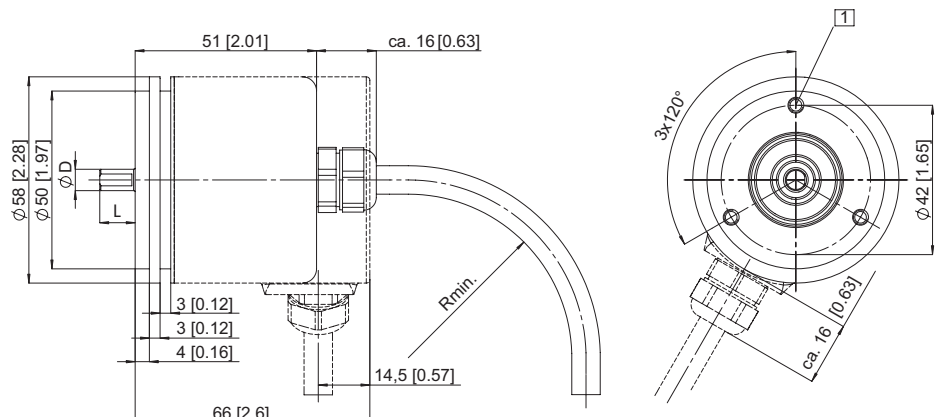


Synchro flange, \varnothing 58 [2.28]

Flange type 2

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

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



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

Incremental Encoders

Standard
Sine wave output, with zero pulse, optical

5804 / 5824 (Shaft / Hollow shaft)

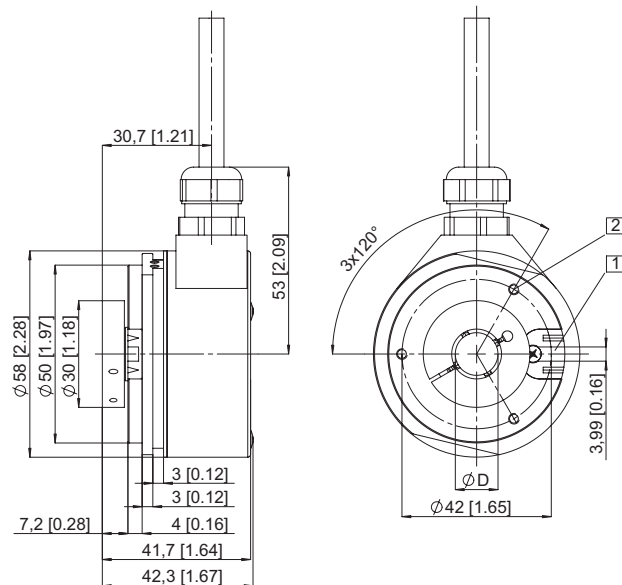
SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element short Flange type 1 and 2

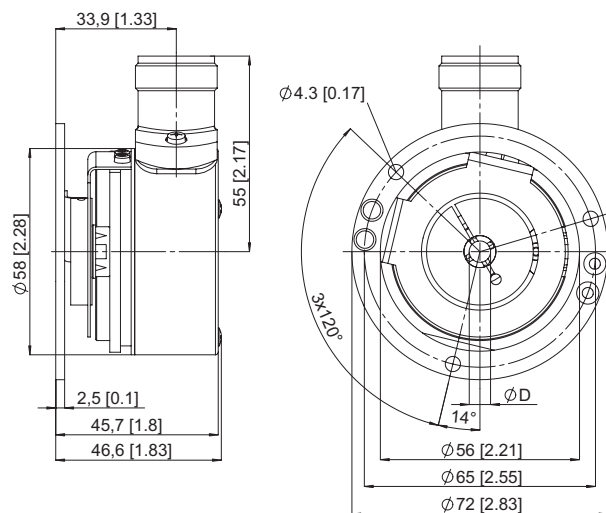
- 1 Torque stop slot,
 Recommendation:
 Cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 2 M3, 5 [0.2] deep
 Recommended torque for the clamping ring 0.6 Nm



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

Recommended torque for the clamping ring 0.6 Nm

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



Incremental Encoders

Standard Sine wave output, highly interpolable, optical	Sendix 5814 / 5834 (Shaft / Hollow shaft)	SinCos
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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.



Incremental Encoders

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

Powerful

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

Flexible

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

Order code Shaft version	8.5814 Type	. 1 2 XX . 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.	
a Flange	c Output circuit / Power supply	d Type of connection	e Pulse rate	
<u>1 = clamping flange, IP65, ø 58 mm [2.28"]</u>	1 = SinCos / 5 V DC	1 = axial cable, 1 m [3.28'] PVC	1024, <u>2048</u>	
b Shaft (ø x L)	<u>2 = SinCos / 10 ... 30 V DC</u>	<u>2 = radial cable, 1 m [3.28'] PVC</u>	<i>optional on request</i>	
<u>2 = 10 x 20 mm [0.39 x 0.79"], with flat</u>		5 = M12 connector, 8 pin, axial	- seawater-resistant	
		6 = M12 connector, 8 pin, radial	- special cable length	
			- Ex 2/22	

Order code Hollow shaft	8.5834 Type	. 5 XXX . 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.	
a Flange	c Output circuit / Power supply	d Type of connection	e Pulse rate	
1 = with spring element long, IP65	1 = SinCos / 5 V DC	2 = radial cable, 1 m [3.28'] PVC	1024, <u>2048</u>	
<u>5 = with stator coupling, IP65, ø 63 mm [2.48"]</u>	<u>2 = SinCos / 10 ... 30 V DC</u>	<u>E = tangential cable, 1 m [3.28'] PVC</u>	<i>optional on request</i>	
b Hollow shaft		6 = M12 connector, 8 pin, radial	- seawater-resistant	
3 = ø 10 mm [0.39"]			- special cable length	
K = ø 10 mm [0.39"], tapered shaft			- Ex 2/22	
<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"				

Incremental Encoders

Standard Sine wave output, highly interpolable, optical	Sendix 5814 / 5834 (Shaft / Hollow shaft)	SinCos
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Connection technology		Order-No.
Connector, self-assembly (straight)	M12 female connector with coupling nut	05.CMB 8181-0
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6041.8211.002M

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

Technical data

Mechanical characteristics		
Max. speed	IP65	12 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
	IP67	8 000 min ⁻¹ , 2 000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
Moment of inertia	shaft	4.0 x 10 ⁻⁶ kgm ²
	hollow shaft	7.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial	80 N
	axial	40 N
Weight	approx. 0.45 kg [15.85 oz]	
Protection acc. to EN 60529		
	housing side	IP67
	shaft side	IP65, opt. IP67
Hazardous area approval	optional zone 2 and 22	
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ¹⁾	
Materials	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	cable	PVC
Shock resistance acc. EN 60068-2-27	2500 m/s ² , 6 ms	
Vibration resistance acc. EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz	

Electrical characteristics	
Power supply	5 V DC ± 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 70 mA
	10 ... 30 V DC max. 45 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

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

Terminal assignment

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

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- PH \perp : Plug connector housing (Shield)

Top view of mating side, male contact base



M12 connector, 8-pin

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

Incremental Encoders

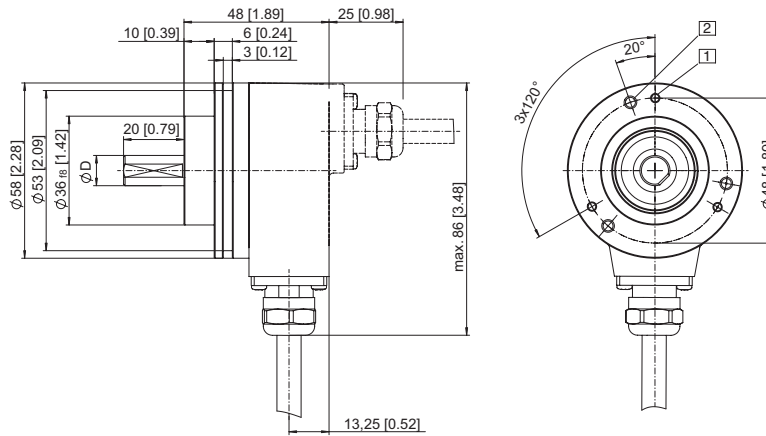
Standard Sine wave output, highly interpolable, optical	Sendix 5814 / 5834 (Shaft / Hollow shaft)	SinCos
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Dimensions shaft version

Dimensions in mm [inch]

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

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

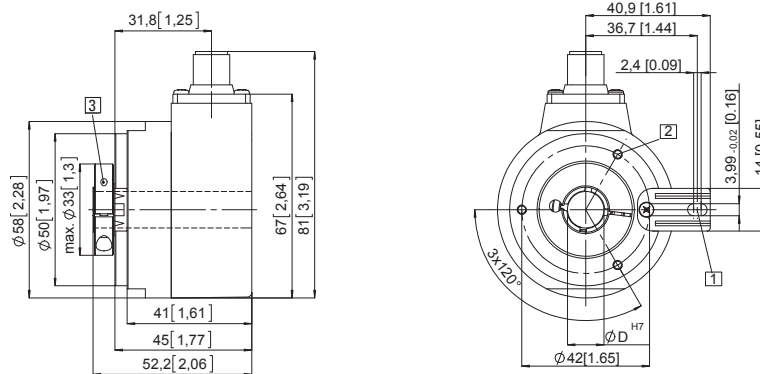


Dimensions hollow shaft version

Dimensions in mm [inch]

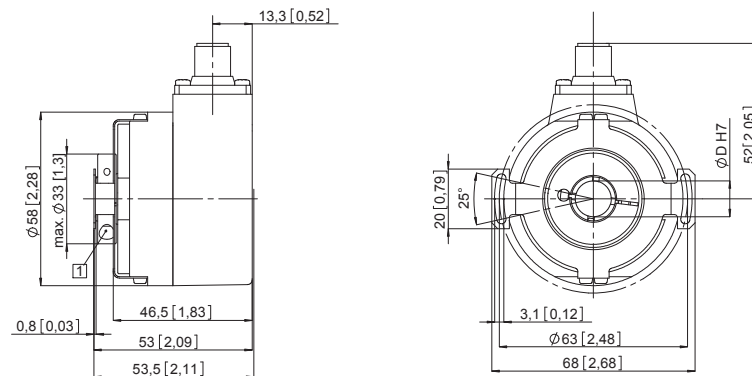
Flange with spring element long Flange type 1 (drawing with M12 connector)

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



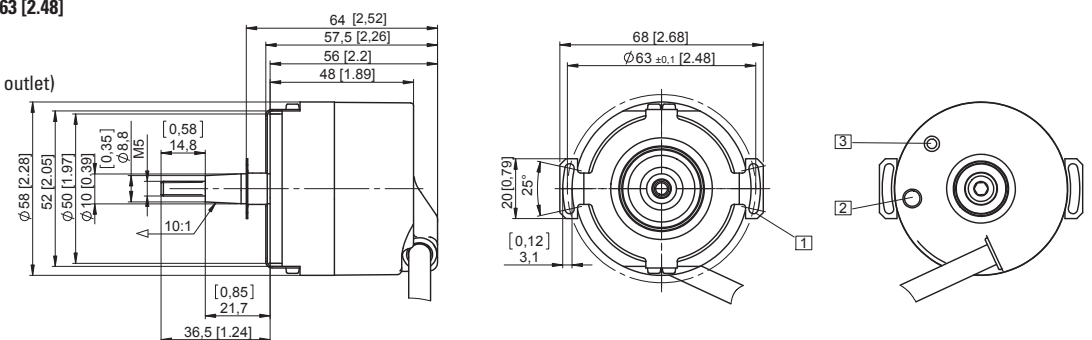
Flange with stator coupling, \varnothing 63 [2.48] and hollow shaft Flange type 5 (Drawing with M12 connector)

- 1 Recommended torque for the clamping ring 0.6 Nm



Flange with stator coupling, \varnothing 63 [2.48] and tapered shaft Flange type 5 (Drawing with tangential cable outlet)

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



Incremental Encoders

Standard

Sine wave output, SIL2 / PLd, optical

Sendix SIL 5814FS2 / 5834FS2 (Shaft / Hollow shaft)

SinCos



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

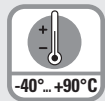
These encoders are particularly suited for applications in the field of safe drive technology.



Safety-Lock™



High rotational speed



Temperature range



High protection level



High shaft load capacity



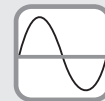
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Optical sensor

Functional Safety

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

Flexible

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

Order code Shaft version

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

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



a Flange

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

b Shaft (ø x L)

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

e Pulse rate

1024, 2048

d Type of connection

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

optional on request
- special cable length
- Ex 2/22

Order code Hollow shaft

8.5834FS2 . X X X X . X X X X
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

A = with torque stop set, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]

b Hollow shaft

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

c Output circuit / Power supply

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

e Pulse rate

1024, 2048

d Type of connection

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

optional on request
- special cable length
- Ex 2/22

Incremental Encoders

Standard Sine wave output, SIL2 / PLd, optical	Sendix SIL 5814FS2 / 5834FS2 (Shaft / Hollow shaft)	SinCos
Accessories – Safety control		Order-No.
Safety-M, basic modules	Speed monitoring for 1 axis	8.MS1.000
	Speed monitoring for 2 axes (analogue inputs optional)	8.MS2.XXX
Connection technology		
Connector, self-assembly (straight)	M12 female connector with coupling nut	05.CMB 8181-0
	M23 female connector with coupling nut	8.0000.5012.0000
	M23 female connector with coupling nut, Ex zone 2/22	8.0000.5012.0000.Ex
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6041.8211.002M
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	8.0000.6901.0002

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value ¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed, shaft version	up to 70°C 12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous) up to T _{max} 8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
Max. speed, hollow shaft version	up to 70°C 9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous) up to T _{max} 6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	shaft version < 0.01 Nm hollow shaft version < 0.03 Nm
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
EX approval for hazardous areas	optional zone 2 and 22
Working temperature range	-40°C ... +90°C [-40°F ... +194°F] ²⁾
Materials	shaft / hollow shaft stainless steel flange aluminium housing zinc die-cast housing cable PVC
Shock resistance acc. EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. 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 (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (± 10%)
Short circuit proof	yes ³⁾
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) Cable version: -30°C ... +90°C [-22°F ... +194°F] fixed installation
 3) Short circuit to 0 V or to output, one channel at a time, supply voltage correctly applied

Incremental Encoders

Standard Sine wave output, SIL2 / PLd, optical	Sendix SIL 5814FS2 / 5834FS2 (Shaft / Hollow shaft)	SinCos
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Terminal assignment

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

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

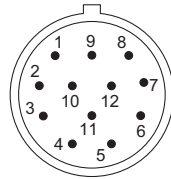
Output circuit	Type of connection	M12 connector, 8-pin							
1, 2	5, 6	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Pin:	1	2	3	4	5	6	PH ¹⁾

- +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) PH = shield is attached to connector housing

Incremental Encoders

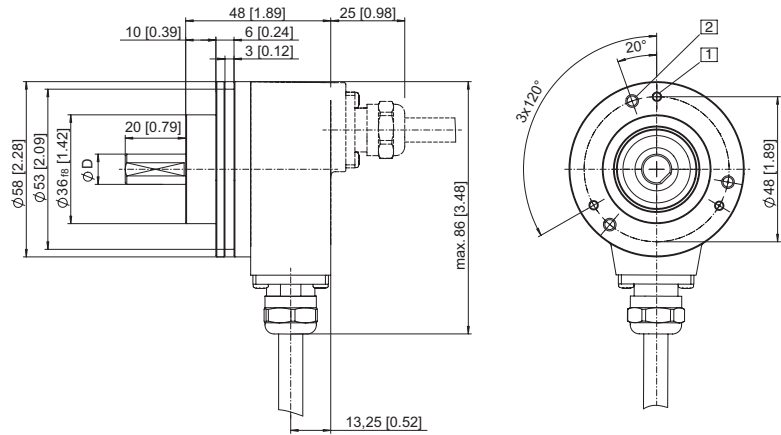
Standard Sine wave output, SIL2 / PLd, optical	Sendix SIL 5814FS2 / 5834FS2 (Shaft / Hollow shaft)	SinCos
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Dimensions shaft version

Dimensions in mm [inch]

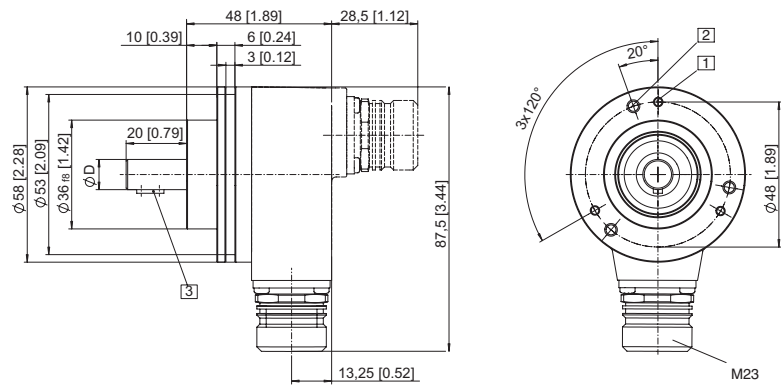
Clamping flange, $\varnothing 58$ [2.28] Flange type 1 with shaft type 2 (Drawing with cable)

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



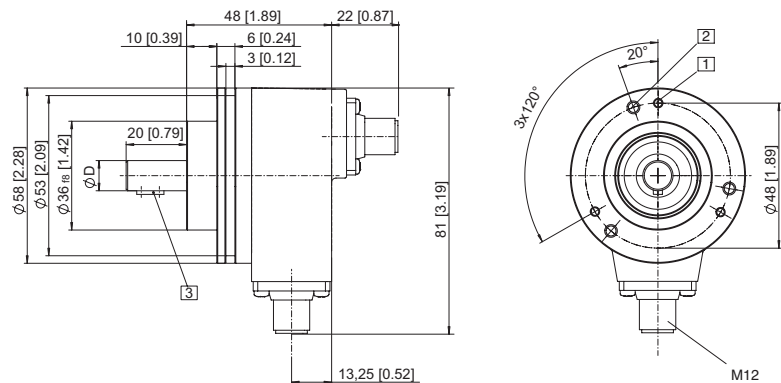
Clamping flange, $\varnothing 58$ [2.28] Flange type 1 with shaft type A (Drawing with M23 connector)

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



(Drawing with M12 connector)

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



Incremental Encoders

Standard

Sine wave output, SIL2 / PLd, optical

Sendix SIL 5814FS2 / 5834FS2 (Shaft / Hollow shaft)

SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

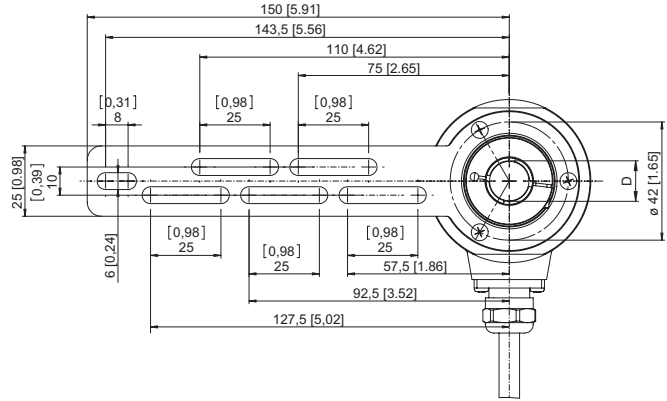
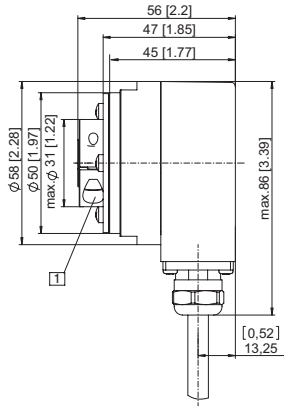
Flange with torque stop set

Flange type A

(Drawing with cable)

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

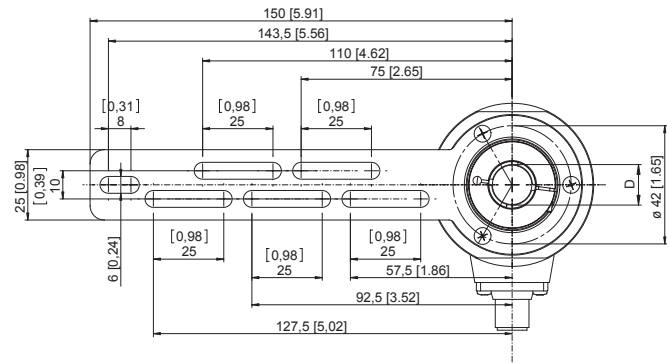
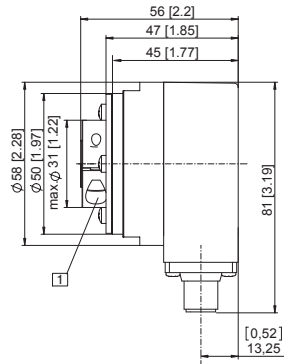
D = \varnothing 10^{H7} [0.39]
 \varnothing 12^{H7} [0.47]
 \varnothing 14^{H7} [0.55]



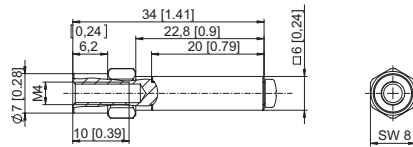
(Drawing with M12 connector)

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

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



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



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

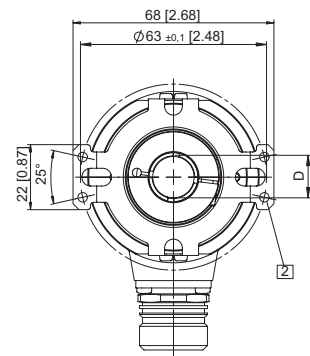
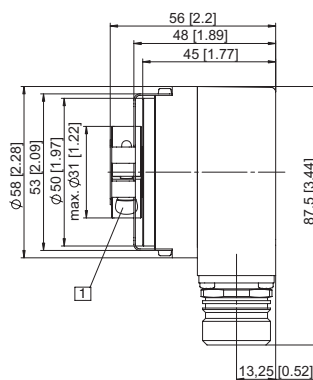
Flange type B

(Drawing with M23 connector)

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

- 2 for (4x) M3 screw

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



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

Flange type B

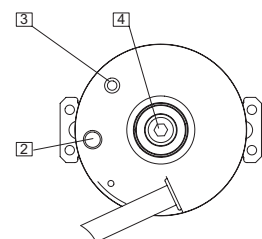
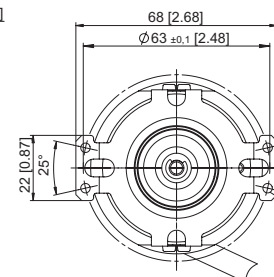
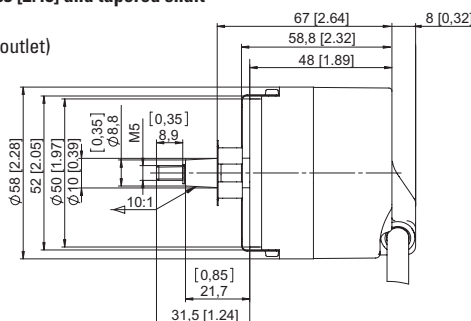
(Drawing with tangential cable outlet)

- 1 for (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



Incremental Encoders

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

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



Safety-Lock™	High rotational speed	Temperature range -40°..+90°C	High protection level	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 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

Incremental Encoders

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

- | | | |
|--|---|---|
| a Flange
<u>1 = clamping flange, IP65, ø 58 mm [2.28"]</u>

b Shaft (ø x L)
<u>2 = 10 x 20 mm [0.39 x 0.79"], with flat</u>
A = 10 x 20 mm [0.39 x 0.79"], with feather key | c Output circuit / Power supply
1 = SinCos / 5 V DC
<u>2 = SinCos / 10 ... 30 V DC</u> | e Pulse rate
1024, <u>2048</u> |
| | d Type of connection
1 = axial cable, 1 m [3.28'] PVC
2 = radial cable, 1 m [3.28'] PVC
3 = M23 connector, 12 pin, axial
<u>4 = M23 connector, 12 pin, radial</u>
5 = M12 connector, 8 pin, axial
6 = M12 connector, 8 pin, radial | <i>optional on request</i>
- special cable length
- Ex 2/22 |

Order code	8.5834FS3	. 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.	
Hollow shaft	Type	a b c d e		

- | | | |
|---|---|---|
| a Flange
A = with torque stop set, IP65
<u>B = with stator coupling, IP65, ø 63 mm [2.48"]</u> | c Output circuit / Power supply
1 = SinCos / 5 V DC
<u>2 = SinCos / 10 ... 30 V DC</u> | e Pulse rate
1024, <u>2048</u> |
| b Hollow shaft
3 = ø 10 mm [0.39"]
<u>4 = ø 12 mm [0.47"]</u>
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft | d Type of connection
2 = radial cable, 1 m [3.28'] PVC
E = tangential cable, 1 m [3.28'] PVC
<u>4 = M23 connector, 12 pin, radial</u>
6 = M12 connector, 8 pin, radial | <i>optional on request</i>
- special cable length
- Ex 2/22 |

Incremental Encoders

Standard Sine wave output, SIL3 / PLe, optical		Sendix SIL 5814FS3 / 5834FS3 (Shaft / Hollow shaft)	SinCos
Accessories – Safety control			Order-No.
Safety-M, basic modules	Speed monitoring for 1 axis		8.MS1.000
	Speed monitoring for 2 axes (analogue inputs optional)		8.MS2.XXX
Connection technology			
Connector, self-assembly (straight)	M12 female connector with coupling nut		05.CMB 8181-0
	M23 female connector with coupling nut		8.0000.5012.0000
	M23 female connector with coupling nut, Ex zone 2/22		8.0000.5012.0000.Ex
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable		05.00.6041.8211.002M
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable		8.0000.6901.0002

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics		
Max. speed, shaft version	up to 70°C	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)
	up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
Max. speed, hollow shaft version	up to 70°C	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque – at 20°C [68°F]	shaft version	< 0.01 Nm
	hollow shaft version	< 0.03 Nm
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
EX approval for hazardous areas		optional zone 2 and 22
Working temperature range		-40°C ... +90°C [-40°F ... +194°F] ²⁾
Materials	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	cable	PVC
Shock resistance acc. EN 60068-2-27		500 m/s ² , 11 ms
Vibration resistance acc. 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 (+V)	yes	
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC Machinery directive 2006/42/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

SinCos interface	
Max. frequency -3dB	400 kHz
Signal level	1 V _{pp} (± 10%)
Short circuit proof	yes ³⁾
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) Cable version: -30°C ... +90°C [-22°F ... +194°F] fixed installation
- 3) Short circuit to 0V or to output, one channel at a time, supply voltage correctly applied

Incremental Encoders

Standard	Sendix SIL 5814FS3 / 5834FS3 (Shaft / Hollow shaft)	SinCos
Sine wave output, SIL3 / PLe, optical		

Terminal assignment

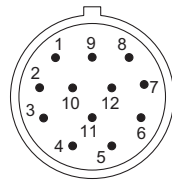
Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 2	1, 2, E	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Cable colour:	WH	BN	GN	YE	GY	PK	shield
Output circuit	Type of connection	M23 connector, 12-pin							
1, 2	3, 4	Signal:	0 V	+V	A	\bar{A}	B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

- +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

Incremental Encoders

1) PH = shield is attached to connector housing

Incremental Encoders

Standard
Sine wave output, SIL3 / PLe, optical

Sendix SIL 5814FS3 / 5834FS3 (Shaft / Hollow shaft)

SinCos

Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, $\varnothing 58$ [2.28]

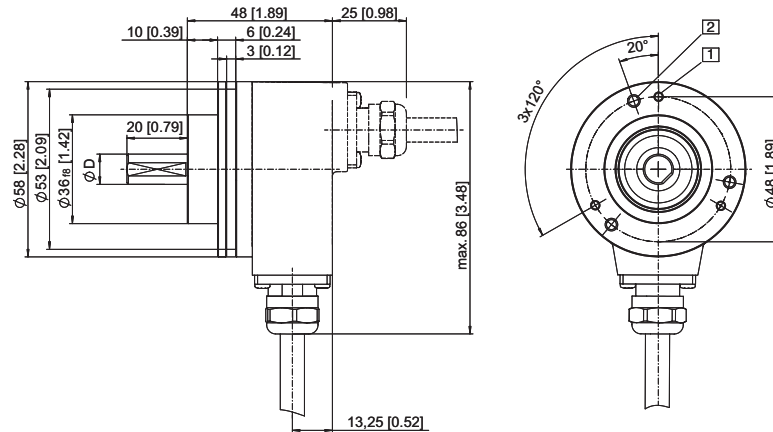
Flange type 1 with shaft type 2

(Drawing with cable)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

$D = 10$ ^{h7} [0.39]



Clamping flange, $\varnothing 58$ [2.28]

Flange type 1 with shaft type A

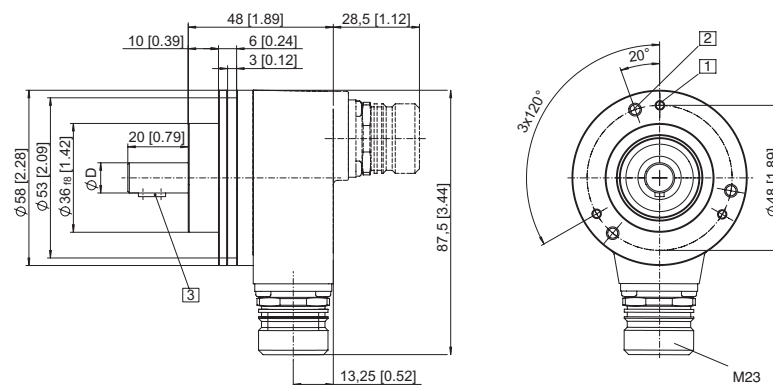
(Drawing with M23 connector)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

3 Feather key DIN 6885 - A - 3x3x6

$D = 10$ ^{h7} [0.39]



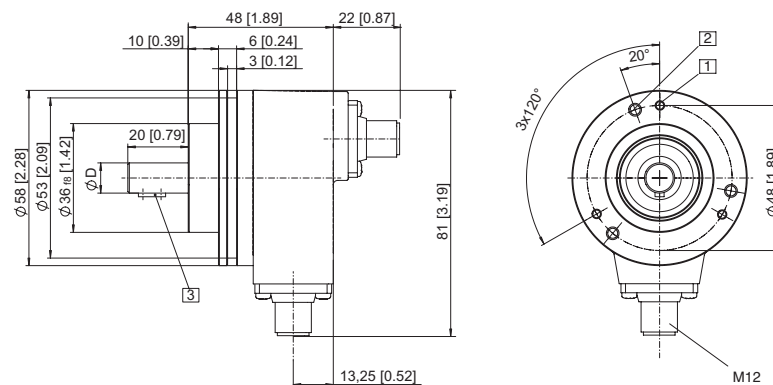
(Drawing with M12 connector)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

3 Feather key DIN 6885 - A - 3x3x6

$D = 10$ mm ^{h7} [0.39]



Incremental Encoders

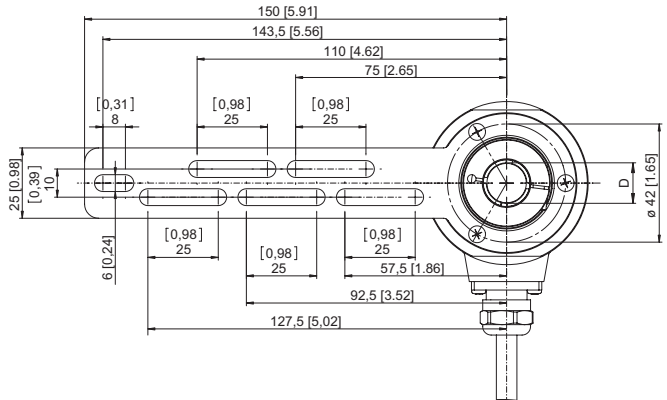
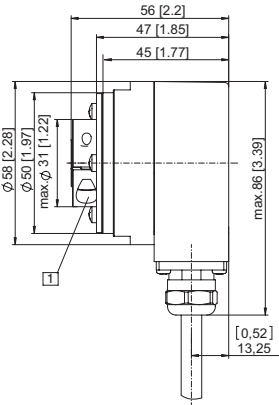
Standard	Sine wave output, SIL3 / PLe, optical	Sendix SIL 5814FS3 / 5834FS3 (Shaft / Hollow shaft)	SinCos
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Dimensions hollow shaft version

Dimensions in mm [inch]

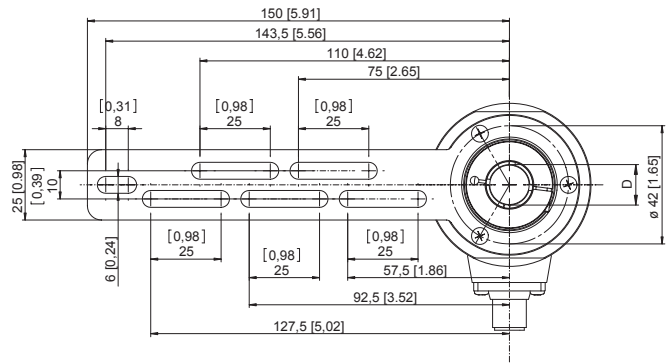
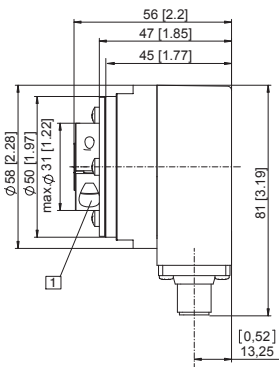
Flange with torque stop set Flange type A (Drawing with cable)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- D = \varnothing 10^{H7} [0.39]
- \varnothing 12^{H7} [0.47]
- \varnothing 14^{H7} [0.55]

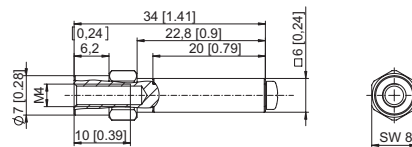


(Drawing with M12 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- D = \varnothing 10^{H7} [0.39]
- \varnothing 12^{H7} [0.47]
- \varnothing 14^{H7} [0.55]



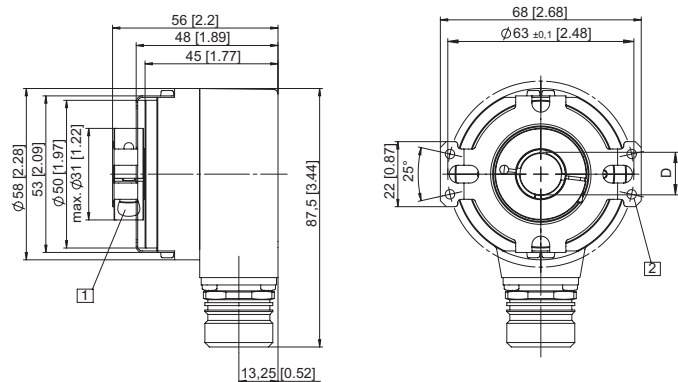
Torque pin with rectangular sleeve
with M4 thread, 10 [0.39] deep



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

Flange type B (Drawing with M23 connector)

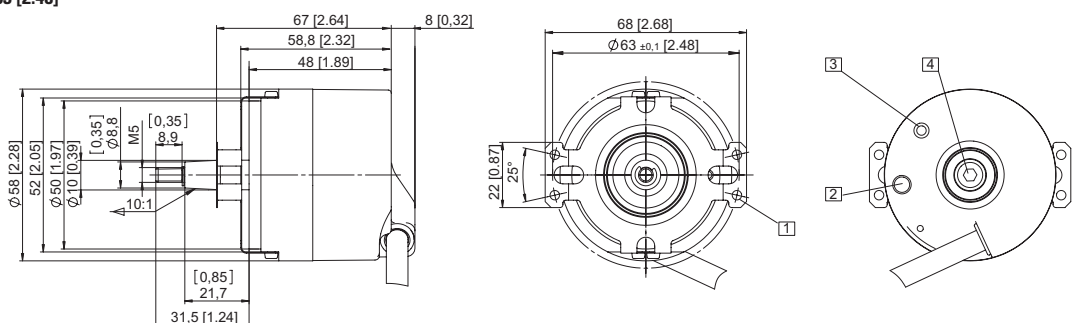
- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- 2 for (4x) M3 screw
- D = \varnothing 10^{H7} [0.39]
- \varnothing 12^{H7} [0.47]
- \varnothing 14^{H7} [0.55]



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

Flange type B (Drawing with tangential cable outlet)

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



Incremental Encoders

Incremental Encoders

Standard
High resolution, optical

5805 / 5825 (Shaft / Hollow shaft)

Push-Pull / RS422



The incremental encoders type 5805 / 5825 offer resolutions up to max. 36000 PPR.

They are thus perfect for use in applications where a very high level of accuracy is required.



High rotational speed



Temperature range
-20°...+85°C



High protection level
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Optical sensor

High performance

- High shaft loading capability
- Maximum speed up to 12000 RPM
- High IP protection up to max. IP66

Many variants

- With RS422 or push-pull interface
- With cable or connector

Order code
Shaft version

8.5805 . **XXXXX** . **XXXXX**
Type a b c d e

a Flange

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

b Shaft (ø x L), with flat

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

c Output circuit / Power supply

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

e Pulse rate

- 6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 (e.g. 18000 pulses => 18000) Other pulse rates on request

d Type of connection

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

Order code
Hollow shaft

8.5825 . **XXXXX** . **XXXXX**
Type a b c d e

a Flange

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

b Hollow shaft

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

c Output circuit / Power supply

- 1 = RS422 (with inverted signal) / 5 V DC
- 4 = RS422 (with inverted signal) / 10 ... 30 V DC
- 2 = Push-Pull (without inverted signal) / 10 ... 30 V DC
- 3 = Push-Pull (with inverted signal) / 10 ... 30 V DC

e Pulse rate

- 6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 (e.g. 18000 pulses => 18000) Other pulse rates on request

d Type of connection

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

1) Insertion depth ≤ 30 mm [1.18"]

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"]	8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	with fixing thread 	8.0010.4700.0000
		8.0010.4D00.0000
Stator coupling ø 63 mm [2.48"]		
Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling nut	8.0000.5012.0000
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	8.0000.6901.0002

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

Technical data	
Mechanical characteristics	
Speed	shaft IP65 max. 12000 min ⁻¹ hollow shaft IP40 max. 12000 min ⁻¹ hollow shaft IP66 ¹⁾ max. 6000 min ⁻¹
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. EN 60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. 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 LOW max. 0.5 V min. +V - 2.5 V max. 2.0 V
Rising edge time t_r	max. 200 ns max. 1 µs
Falling edge time t_f	max. 200 ns max. 1 µs
Short circuit proof outputs ²⁾	yes ³⁾ yes
Reverse polarity protection of the power supply	no; 10 ... 30 V DC: yes yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

1) For continuous operation max. 3000 min⁻¹, ventilated
2) If supply voltage 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

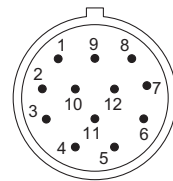
Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)											
1, 2, 3, 4, 5, 6, 7	5805: 1, 2	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5825: 1	Cable colour:	WH 0.5 mm ²	BN 0.5 mm ²	WH	BN	GN	YE	GY	PK	BU	RD	shield
Output circuit	Type of connection	M23 connector, 12-pin											
1, 2, 3, 4, 5, 6, 7	5805: 3, 5	Signal:	0 V	+V	0Vsens ²⁾	+Vsens ²⁾	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
	5825: 2	Pin:	10	12	11	2	5	6	8	1	3	4	PH ¹⁾

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

- +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

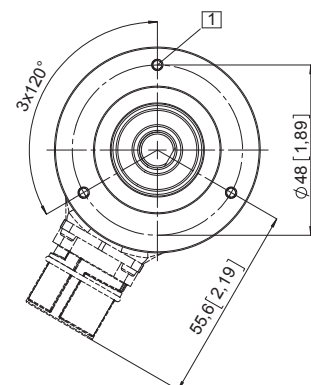
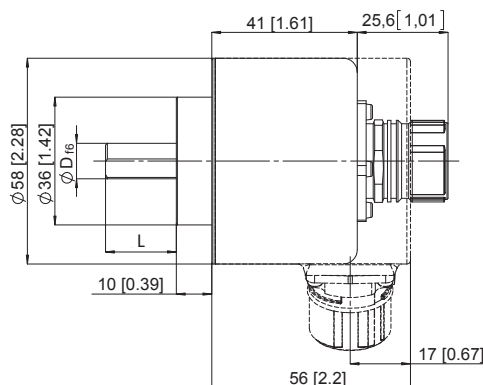
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]

Flange type 1

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

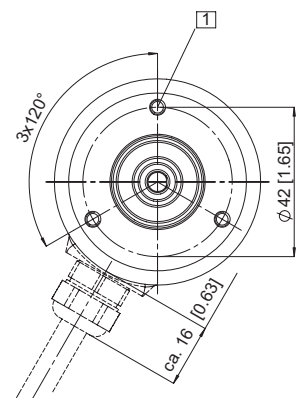
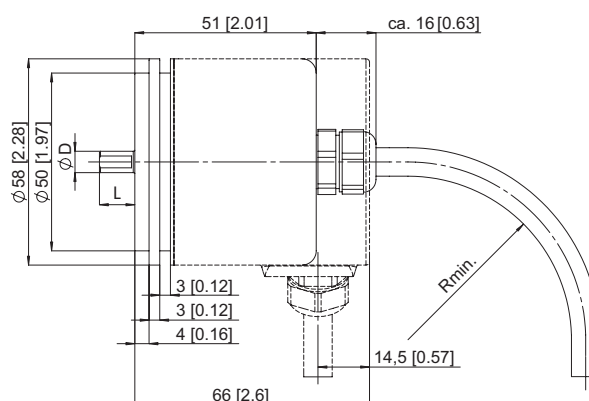


Synchro flange, ø 58 [2.28]

Flange type 2

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

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



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

Incremental Encoders

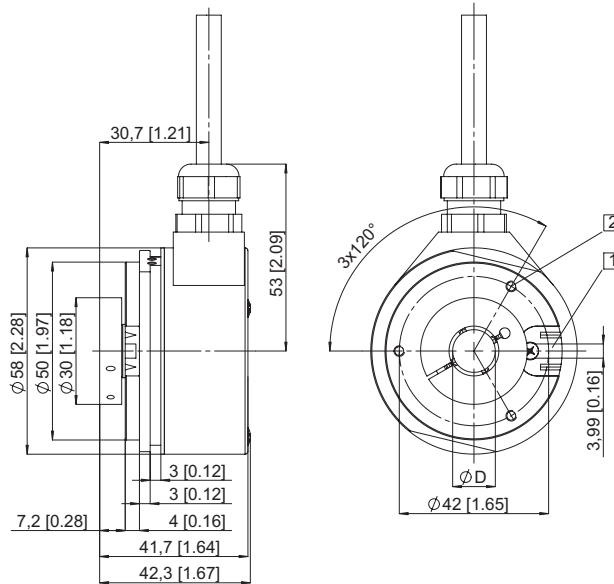
Standard High resolution, optical	5805 / 5825 (Shaft / Hollow shaft)	Push-Pull / RS422
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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element short Flange type 1 and 2

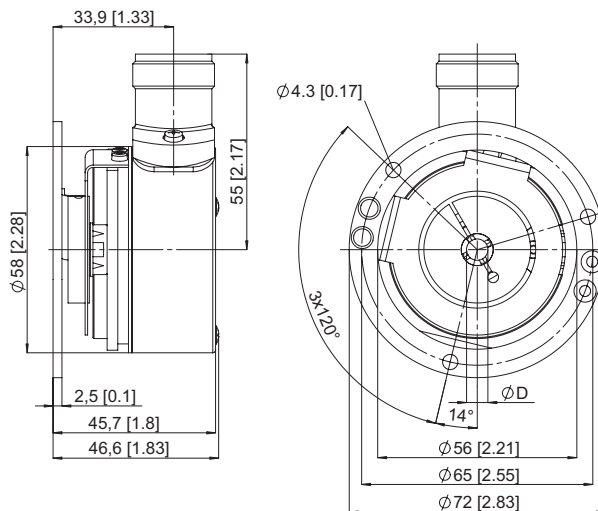
- 1 Torque stop slot,
Recommendation:
Cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 2 M3, 5 [0.2] deep
Recommended torque for the clamping ring 0.6 Nm



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

Recommended torque for the clamping ring 0.6 Nm

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



Incremental Encoders

Incremental Encoders

Standard
Stainless steel, shaft, optical

Sendix 5006 (Shaft)

Push-Pull / RS422



The Sendix incremental 5006 in stainless-steel offers optimum material resistance and thus virtually unlimited durability.

The high-grade Viton seals, the 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



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor

Durable and sealed

- Protection rating IP67
- Rugged stainless-steel housing
- Viton seals
- 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
- Supply voltage 5 ... 30 V DC, various interface options, max. 5000 PPR
- Compact dimensions:
Outer diameter 50 mm, installation depth max. 47 mm

Order code
Shaft version

8.5006 . XXXX 4 . XXXX
Type a b c d e

a Flange

- 7 = clamping flange \varnothing 58 mm [2.28"]
- A = synchro flange \varnothing 58 mm [2.28"]
- C = square flange \square 63.5 mm [2.5"]

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

- 1 = \varnothing 6 x 10 mm [0.24 x 0.39"]
- 3 = \varnothing 10 x 20 mm [0.39 x 0.79"]
- 8 = \varnothing 3/8" x 7/8"

c Output circuit / Power supply

- 2 = Push-Pull (7272 compatible with inverted signal) / 5 ... 30 V DC
- 5 = Push-Pull (with inverted signal) / 10 ... 30 V DC
- 4 = RS422 (with inverted signal) / 5 V DC

d Type of connection

- 4 = M12 connector, 8-pin, radial

e Pulse rate

- 360, 512, 1000, 1024, 2000, 2048, 2500, 3600, 4096, 5000
- (e.g. 100 pulses => 0100)
- Other pulse rates on request

Incremental Encoders

Standard Stainless steel, shaft, optical	Sendix 5006 (Shaft)	Push-Pull / RS422
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Technical data

Electrical characteristics				
Output circuit	RS422 (TTL compatible)	Push-Pull	Push-Pull (7272 compatible)	
Power supply	5 V DC $\pm 5\%$	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 V max. 0.5 V	min. +V - 2.0 V max. 0.5 V	
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 ¹⁾	yes ²⁾	yes	yes	
Reverse polarity protection of the power supply	no	yes	no	
UL approval	File 224618			
CE compliant acc. to	EMC guideline 2004/108/EC			
RoHS compliant acc. to	guideline 2002/95/EC			

Mechanical characteristics				
Speed ³⁾	max. 6000 min ⁻¹		EX approval for hazardous areas	optional Zone 2 and 22
Moment of inertia	approx. 1.8×10^{-6} kgm ²		Working temperature	-40°C ... +85°C [-40°F ... +185°F]
Starting torque – at 20°C [68°F]	< 0.05 Nm		Material	housing, flange, shaft connector seals stainless steel, 1.4305 stainless steel Viton
Weight	approx. 0.4 kg [14.11 oz]		Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Load capacity of shaft	radial 80 N axial 40 N		Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10...2000 Hz
Protection acc. to EN 60529	IP67			

Terminal assignment

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

- +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 supply voltage 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
 4) PH = Shield is attached to connector housing

Incremental Encoders

Standard
Stainless steel, shaft, optical

Sendix 5006 (Shaft)

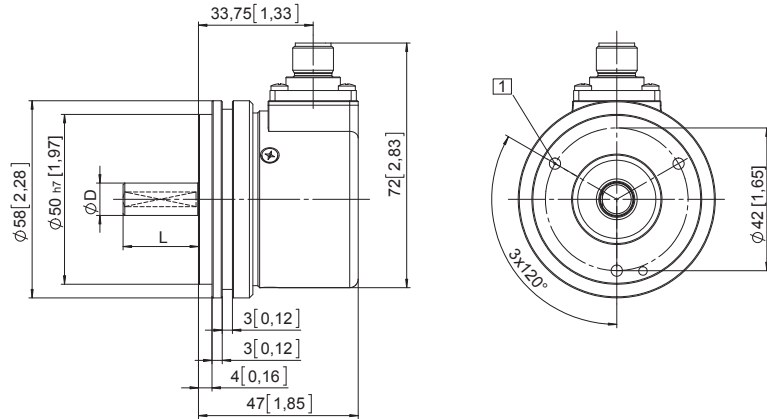
Push-Pull / RS422

Dimensions

Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]
Flange type A

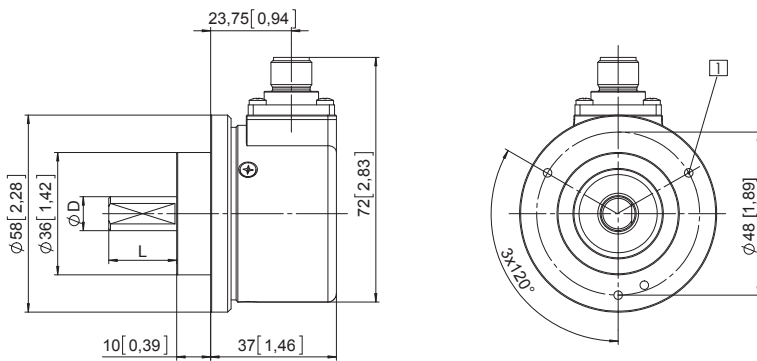
1 3 x M4, 6 [0.24] deep



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

Clamping flange, ø 58 [2.28]
Flange type 7

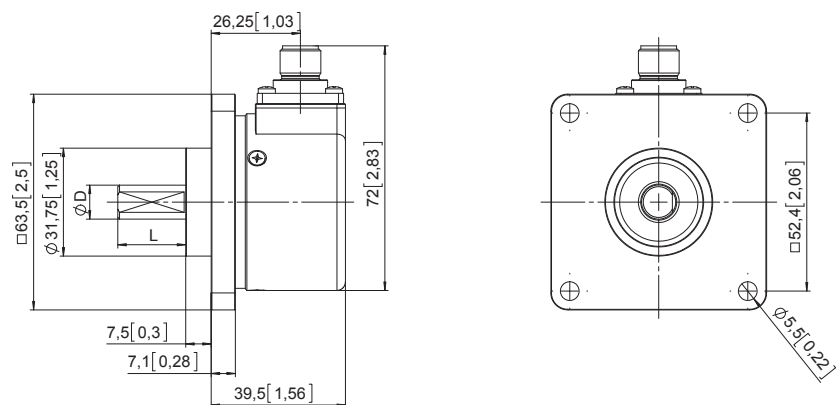
1 3 x M3, 5.5 [0.21] deep



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

Square flange, □ 63.5 [2.5]
Flange type C

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



Incremental Encoders

Standard Stainless steel, hollow shaft, optical	5826 (Hollow shaft)	Push-Pull / RS422
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Thanks to their stainless-steel housing, the incremental hollow shaft encoders type 5826 are particularly suitable for those applications that make high demands on the composition and properties of the materials used.

Stainless steel encoders are therefore often used in areas subjected to aggressive cleaning materials, as a result of high hygiene requirements.



Incremental Encoders

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

Custom-fit

- With cable connection
- Through hollow shaft with 10 mm or 12 mm diameter
- Protection up to IP66

Adaptable

- High resolution up to 5000 ppr
- Numerous connection possibilities, thanks to wide range of interfaces and supply voltages

Order code Hollow shaft	8.5826 Type	.	1 a	X b	X c	1 d	.	XXXX e
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a Flange
1 = with spring element short

b Hollow shaft
6 = ø 10 mm [0.39"]
8 = ø 12 mm [0.47"]

c Output circuit / Power supply
1 = RS422 (with inverted signal) / 5 V DC
7 = RS422 (with inverted signal) / 5 ... 30 V DC
4 = RS422 (with inverted signal) / 10 ... 30 V DC
5 = Push-Pull (without inverted signal) / 5 ... 30V DC
2 = Push-Pull (without inverted signal) / 10 ... 30 V DC
6 = Push-Pull (with inverted signal) / 5 ... 30 V DC
3 = Push-Pull (with inverted signal) / 10 ... 30 V DC

d Type of connection
1 = radial cable, 1 m [3.28'] PVC cable

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)
Other pulse rates on request

Incremental Encoders

**Standard
Stainless steel, hollow shaft, optical**

5826 (Hollow shaft)

Push-Pull / RS422

Technical data

Mechanical characteristics

Speed		max. 6000 min ⁻¹ 1)
Moment of inertia		approx. 6.0 x 10 ⁻⁶ kgm ²
Starting torque – at 20°C [68°F]		< 0.05 Nm
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529		IP66
Working temperature range	without seal	-20°C ... +80°C [-4°F ... +176°F]
Material	shaft	stainless steel
Shock resistance acc. EN 60068-2-27		2000 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 10 ... 2000 Hz

Electrical characteristics

Output circuit	RS422 (TTL-compatible)	Push-Pull
Power supply	5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC
Power consumption (no load)		
without inverted signal	–	typ. 55 mA / max. 125 mA
with inverted signal	typ. 40 mA / max. 90 mA	typ. 80 mA / max. 150 mA
Permissible load / channel	max. ±20 mA	max. ±30 mA
Pulse frequency	max. 300 kHz	max. 300 kHz
Signal level	HIGH min. 2.5 V LOW min. 0.5 V	min. +V - 2.5 V max. 2.0 V
Rising edge time t_r	max. 200 ns	max. 1 µs
Falling edge time t_f	max. 200 ns	max. 1 µs
Short circuit proof outputs ²⁾	yes ³⁾	yes
Reverse polarity protection of the power supply	no; 10 ... 30 V DC: yes	yes
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Terminal assignment

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

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

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

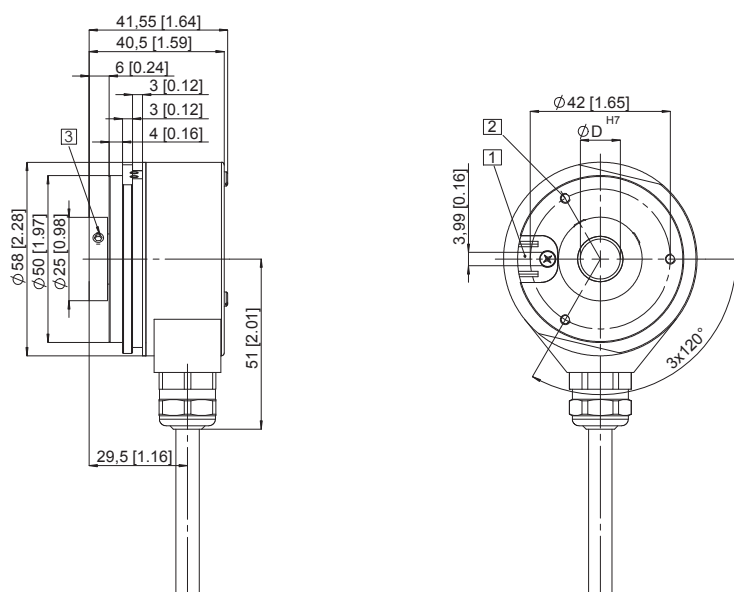
Dimensions

Dimensions in mm [inch]

Flange with spring element short

Flange type 1

- 1) Torque stop slot, Recommendation: Cylindrical pin DIN 7, ϕ 4 [0.16]
- 2) 3 x M3, 5 [0.2] deep
- 3) Recommended torque for the clamping ring 1.0 Nm



- 1) For continuous operation 3000 min⁻¹, ventilated
- 2) If supply voltage 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.
- 4) The sensor cables are connected to the supply voltage internally.
If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.

Incremental Encoders

Standard Large hollow shaft, optical	5821 (Hollow shaft)	Push-Pull / RS422
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Optimised proportions, optimised costs:

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

Incremental Encoders

Temperature range -20...+85°C	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 PPR

Order code
Hollow shaft

8.5821 Type	.	1 a	X b	X c	X d	.	XXXX e
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- | | | |
|---|---|---|
| <p>a Flange
1 = with spring element, \varnothing 58 mm [2.28"]</p> <p>b Hollow shaft
K = \varnothing 16 mm [0.63"]
C = \varnothing 20 mm [0.79"]
6 = \varnothing 24 mm [0.94"]
5 = \varnothing 25 mm [0.98"]
3 = \varnothing 28 mm [1.10"]
(other on request)</p> | <p>c Output circuit / Power supply
1 = RS422 (with inverted signal) / 5 V DC
4 = RS422 (with inverted signal) / 8 ... 30 V DC
3 = Push-pull (with inverted signal) / 8 ... 30 V DC</p> <p>d Type of connection
1 = radial cable, 2 m [6.56'] PVC cable
E = M12 connector, 8-pin, radial</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>Other pulse rates
on request</p> |
|---|---|---|

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

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

Incremental Encoders

Standard Large hollow shaft, optical	5821 (Hollow shaft)	Push-Pull / RS422
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Technical data

Mechanical characteristics	
Speed	max. 2500 min ⁻¹
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% / 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 V max. 2.5 V
Rising edge time t_r	max. 200 ns	max. 1 μs
Falling edge time t_f	max. 200 ns	max. 1 μs
Short circuit proof outputs ¹⁾	yes	yes
Reverse polarity protection of the power supply	yes	yes
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Terminal assignment

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

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

Top view of mating side, male contact base



M12 connector, 8-pin

1) If supply voltage correctly applied.
2) PH = Shield is attached to connector housing

Incremental Encoders

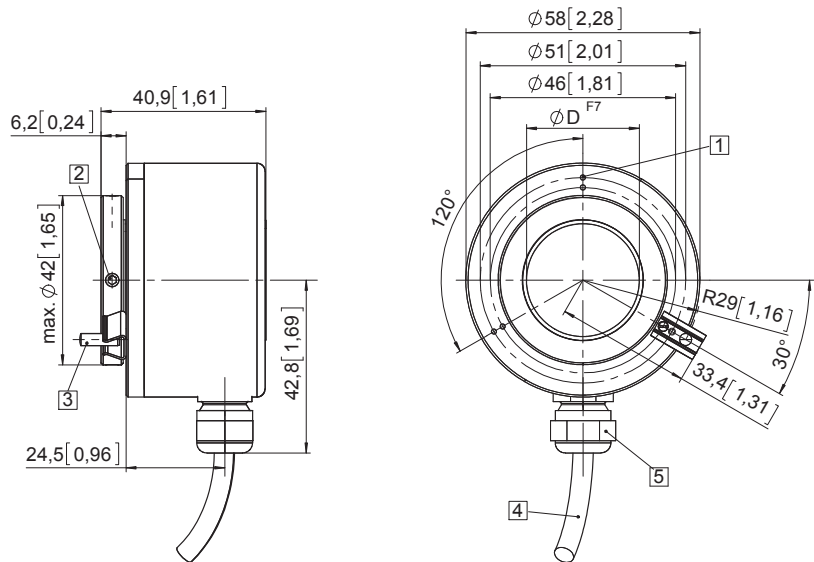
Standard Large hollow shaft, optical	5821 (Hollow shaft)	Push-Pull / RS422
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Dimensions

Dimensions in mm [inch]

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

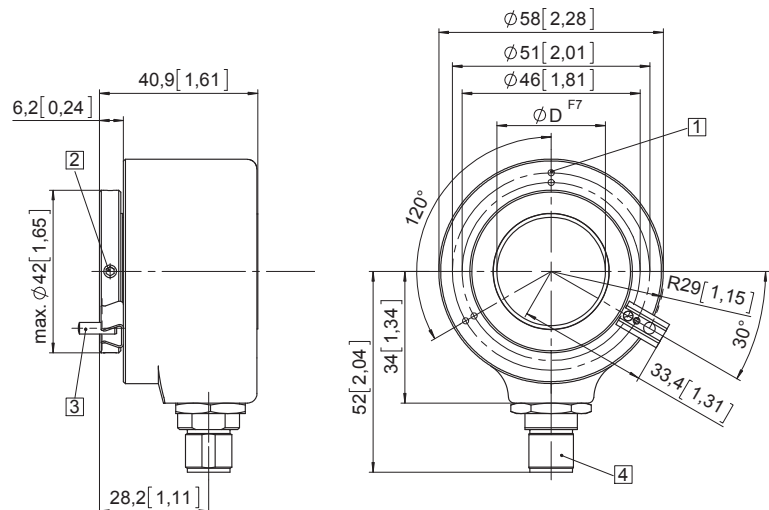
- 1 M1.6 / 5 [0.2] deep
- 2 4 x socket set screw M4x6 DIN 913
- 3 Cylindrical pin 3m6x12 DIN 6325 included
- 4 Cable length 2 m [6.56']
- 5 Cable gland PG7



Incremental Encoders

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

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



Incremental Encoders

**Standard
ATEX, optical**

Sendix 7000 (Shaft)

Push-Pull / RS422



The Sendix 7000 incremental encoders offer Ex protection in a compact 70 mm seawater resistant housing.

These shock and vibration resistant encoders operate flexibly with a resolution of up to 5000 ppr; 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-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection)

Explosion protection

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

**Order code
Shaft version**

8.7000 . **1** **X** **X** **X** . **XXXX** . **XXXX**
Type **a** **b** **c** **d** **e** **f**

a Flange

1 = clamping-synchronous flange, IP67
ø 70 mm [2.76"]

b Shaft (ø x L)

2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"],
with keyway for 4 x 4 mm [0.16 x 0.16"] key

c Output circuit / Power supply

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

d Type of connection

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

e Pulse rate

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. 250 pulses => 0250)
Other pulse rates on request

f Cable length in dm ¹⁾

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

*optional on request
- special cable length*

Mounting accessory for shaft encoders

Order No.

Coupling

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

8.0000.1101.1010

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

1) Not applicable with connection types 1 and 2

Incremental Encoders

Standard ATEX, optical	Sendix 7000 (Shaft)	Push-Pull / RS422
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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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Materials	shaft stainless steel flange / housing seawater-resistant Al, type AISiMgMn (EN AW-6082) (stainless steel on request) cable PUR
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

Output circuit	RS422 (TTL compatible)	RS422 (TTL compatible)	Push-Pull	Push-Pull (7272 compatible)
Ordercode	1	4	5	2
Power supply	5 ... 30 V DC	5 V DC ±5%	10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load / channel	max. ±20 mA	max. ±20 mA	max. ±20 mA	max. ±20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz ²⁾
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. 2.5 V max. 0.5 V	min +V - 1 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 outputs³⁾	yes ⁴⁾	yes ⁴⁾	yes	yes
Reverse polarity protection of the power supply	yes	no	yes	no
UL approval	File 224618			
CE compliant acc. to	EMC guideline 2004/108/EC, ATEX guideline 94/9/EC			
RoHS compliant acc. to	guideline 2002/95/EC			

Terminal assignment

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

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

1) Short-circuit with 0 V or output, only one channel at a time, supply voltage correctly applied
 2) Max. recommended cable length 30 m [98.43']
 3) If supply voltage correctly applied

4) 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.

Incremental Encoders

**Standard
ATEX, optical**

Sendix 7000 (Shaft)

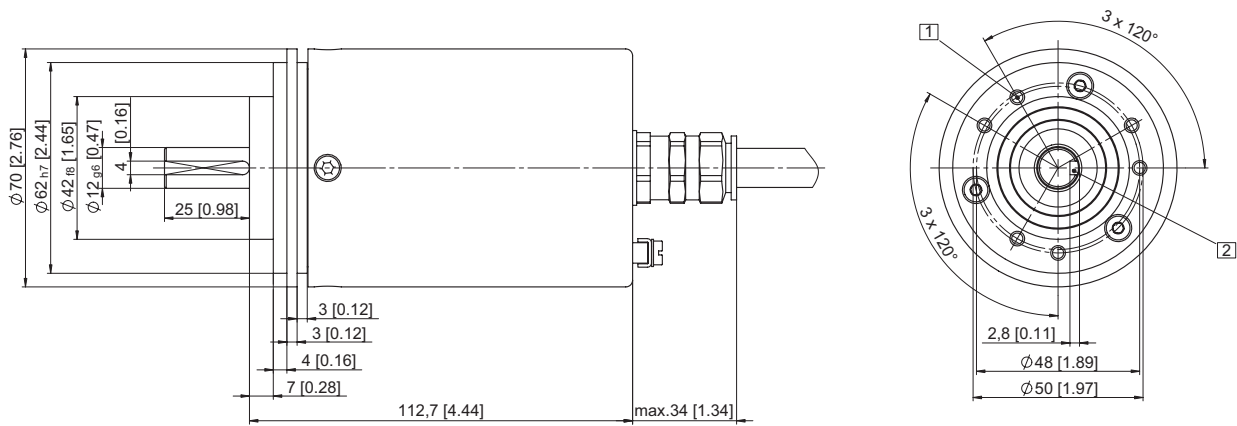
Push-Pull / RS422

Dimensions

Dimensions in mm [inch]

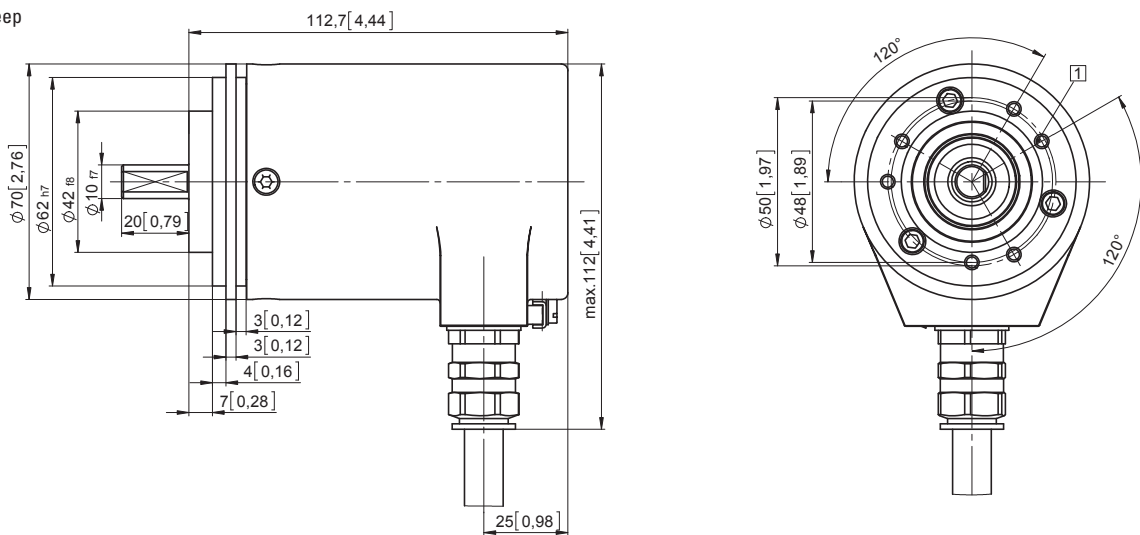
Clamping-synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Incremental Encoders

Standard ATEX, SIL2 / PLd, optical	Sendix SIL 7014FS2 (Shaft)	SinCos
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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-resistant aluminium.



Incremental Encoders

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

Functional Safety

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

Explosion protection

- "Flameproof-enclosure" version
- ATEX with EC type examination certificate
- IECEx with Certificate of Conformity (CoC)

Order code 8.7014 FS2 . 1 XXX . XXXX . XXXX
Shaft version Type

<p>a Flange</p> <p>1 = clamping-synchronous flange, IP67 ø 70 mm [2.76"]</p> <p>b Shaft (ø x L)</p> <p>2 = 10 x 20 mm [0.39 x 0.79"], with flat 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</p> <p>1 = SinCos / 5 V DC 2 = SinCos / 10 ... 30 V DC</p> <p>d Type of connection</p> <p>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</p> <p>1024, 2048</p> <p>f Cable length in dm ¹⁾</p> <p>0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']</p>	<p><i>optional on request</i> <i>- special cable length</i></p>
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Accessories – Safety control

Safety-M, basic modules	Order-No.
Speed monitoring for 1 axis	8.MS1.000
Speed monitoring for 2 axes (analogue inputs optional)	8.MS2.XXX

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

1) Not applicable with connection types 1 and 2

Incremental Encoders

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

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value ¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Materials	shaft stainless steel flange / housing seawater-resistant Al, type AISiMgMn (EN AW-6082) (stainless steel on request) cable PUR
Shock resistance acc. EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

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

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
1, 2	1, 2, A, B	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
		Cable marking:	6	1	7	8	9	10	shield

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Plug connector housing (Shield)

1) The specified value is based on a diagnostic coverage of 90%, that must be achieved with an encoder evaluation unit.

The encoder evaluation unit must meet at least the requirements for SIL2.

2) Short-circuit with 0 V or output, only one channel at a time, supply voltage correctly applied

Incremental Encoders

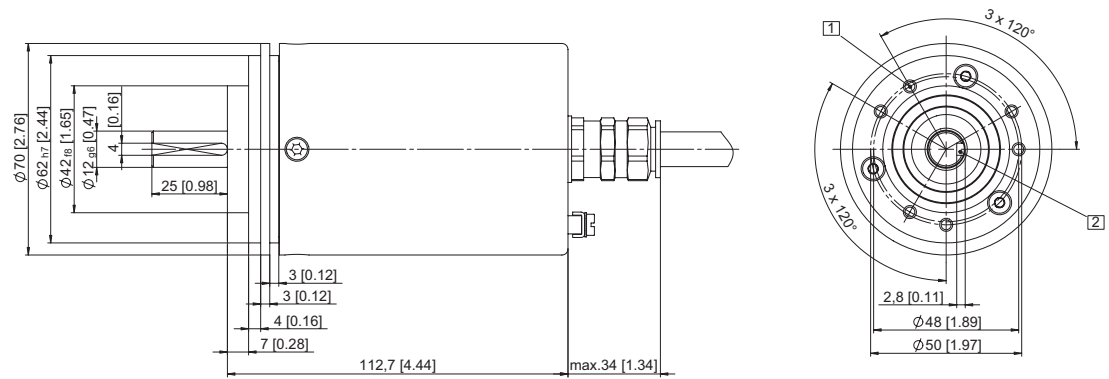
Standard ATEX, SIL2 / PLd, optical	Sendix SIL 7014FS2 (Shaft)	SinCos
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Dimensions

Dimensions in mm [inch]

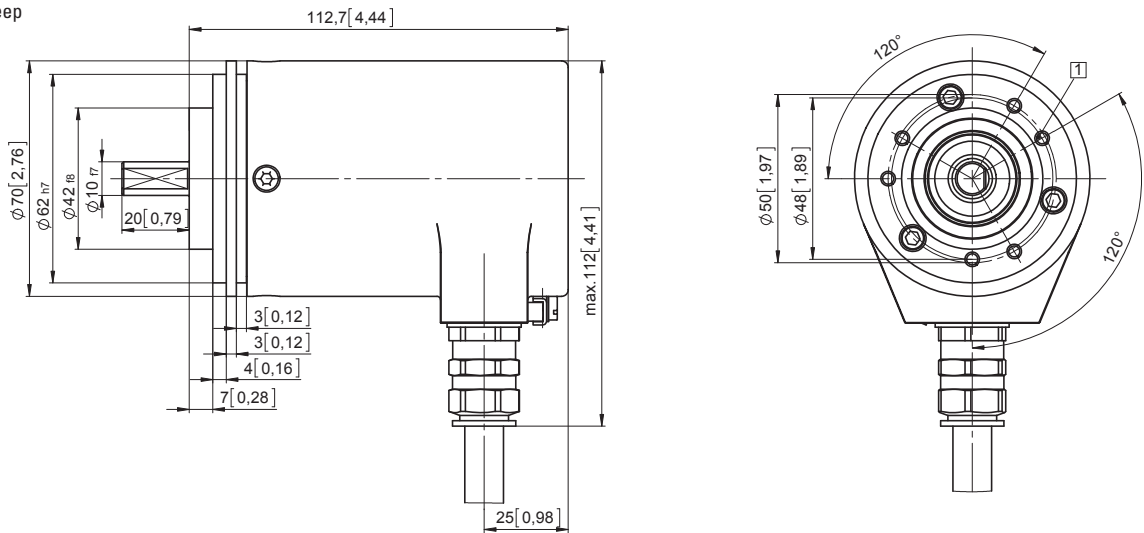
Clamping-synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Incremental Encoders

Standard ATEX, 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-resistant aluminium.



Ex approval



Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



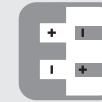
Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater-resistant

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"]	c Output circuit / Power supply 1 = SinCos / 5 V DC 2 = SinCos / 10 ... 30 V DC	e Pulse rate 1024, 2048 <i>optional on request</i> <i>- special cable length</i>
b Shaft (ø x L) 2 = 10 x 20 mm [0.39 x 0.79"], with flat 1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key	d Type of connection 1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length > 2 m [6.56'] B = radial cable, length > 2 m [6.56']	f Cable length in dm ¹⁾ 0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']

Accessories – Safety control		Order-No.
Safety-M, basic modules	Speed monitoring for 1 axis	8.MS1.000
	Speed monitoring for 2 axes (analogue inputs optional)	8.MS2.XXX

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

1) Not applicable with connection types 1 and 2

Incremental Encoders

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

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value ¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics		
Max. speed		continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]		< 0.05 Nm
Moment of inertia		4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529		IP67
Working temperature range		-40°C ... +60°C [-40 ... +140°F]
Materials	shaft flange / housing cable	stainless steel seawater-resistant Al, type AlSiMgMn (EN AW-6082) (stainless steel on request) PUR
Shock resistance acc. EN 60068-2-27		500 m/s ² , 11 ms
Vibration resistance acc. EN 60068-2-6		200 m/s ² , 10 ... 150 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

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

Terminal assignment

Output circuit	Type of connection	Cable (isolate unused wires individually before initial start-up)							
		Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	\perp
1, 2	1, 2, A, B	Cable marking:	6	1	7	8	9	10	shield

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- \perp : Plug connector housing (Shield)

1) The specified value is based on a diagnostic coverage of 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, supply voltage correctly applied

Incremental Encoders

Standard
ATEX, SIL3 / PLe, optical

Sendix SIL 7014FS3 (Shaft)

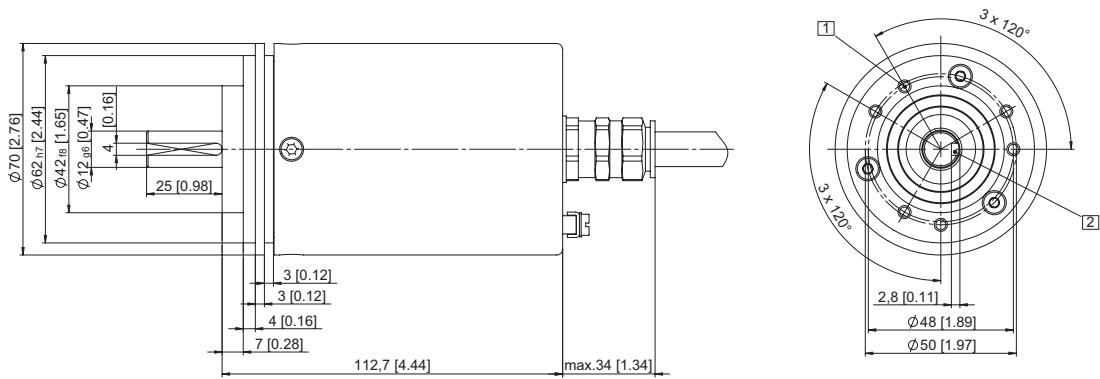
SinCos

Dimensions

Dimensions in mm [inch]

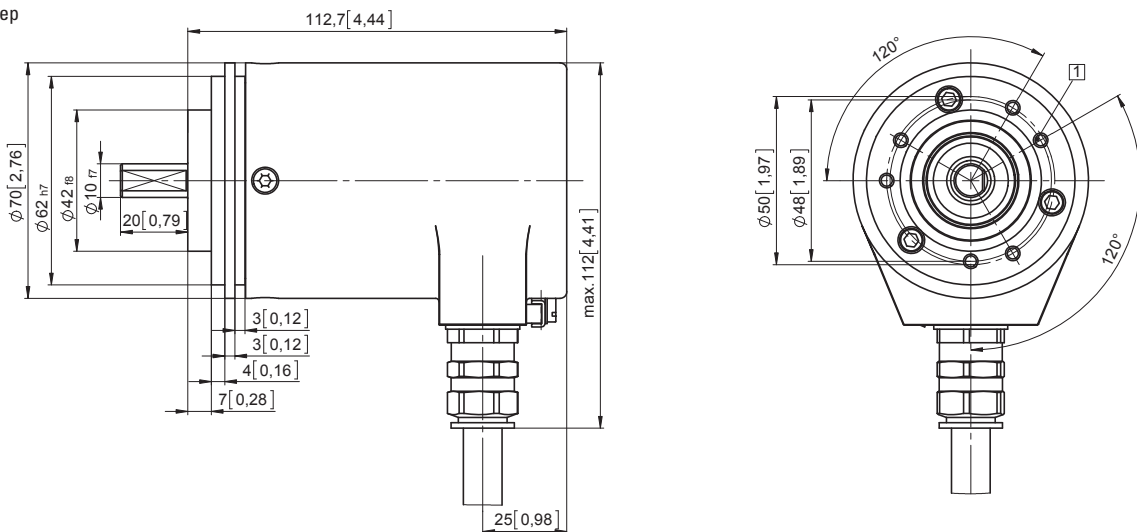
Clamping-synchronous flange, \varnothing 70 [2.76]
Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Incremental Encoders

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.



Incremental Encoders

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, M23 or M12 connectors

Order code Hollow shaft

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

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



- | | | |
|---|---|---|
| <p>a Flange
2 = with spring element short
3 = with spring element long
5 = with fastening arm long</p> <p>b 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"</p> | <p>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</p> <p>d Type of connection
1 = radial cable, 1 m [3.28'] PVC cable
2 = M23 connector, 12-pin, radial, without mating connector
E = M12 connector, 8-pin, radial</p> | <p>e Pulse rate
50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000
(e.g. 360 pulses => 0360)
Other pulse rates on request</p> <p>SinCos version only available with pulses \geq 1024</p> |
|---|---|---|

Mounting accessory for hollow shaft encoders	Order No.
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Cylindrical pin, long		with fixing thread
for torque stops		8.0010.4700.0003

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

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

Incremental Encoders

Large hollow shaft Optical	A020 (Hollow shaft)	Push-Pull / RS422 / SinCos
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Technical data

Mechanical characteristics		Electrical characteristics SinCos output		
Speed	max. 3000 min ⁻¹ 1)	Output circuit	SinCos U = 1 Vpp	SinCos U = 1 Vpp
Moment of inertia 2)	< 150 x 10 ⁻⁶ kgm ²	Power supply	5 V DC ±5%	10 ... 30 V DC
Starting torque with sealing at 20°C [68°F]	< 0.2 Nm	Power consumption with inverted signal (no load)	typ. 65 mA/max. 110 mA	typ. 65 mA/max. 110 mA
Weight	approx. 0.7 kg [24.69 oz]	-3 dB frequency	≤180 kHz	≤180 kHz
Protection acc. to EN 60529	IP65	Signal level	channels A/B 1 Vpp (±20%)	1 Vpp (±20%)
Working temperature range	-40°C 3) ... +70°C [-40°F 3) ... +158°F]	channel 0	0.1 ... 1.2 V	0.1 ... 1.2 V
Material	shaft stainless steel H7	Short circuit proof outputs 4)	yes	yes
Shock resistance acc. to EN 60068-2-27	1000 m/s ² , 6 ms	Reverse polarity protection of the power supply	no	yes
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10...2000 Hz	UL approval	File 224618	
		CE compliant acc. to	EMC guideline 2004/108/EC	
		RoHS compliant acc. to	guideline 2002/95/EC	

Electrical characteristics				
Output circuit	RS422 (TTL compatible)	Push-Pull	Push-Pull (7272 compatible)	
Power supply	5 V DC (±5 %) o. 10 ... 30 V DC	10 ... 30 V DC	5 ... 30 V DC	
Power consumption (no load)	without inverted signal – with inverted signal typ. 40 mA/max. 90 mA	typ. 55 mA/max. 125 mA typ. 80 mA/max. 150 mA	– typ. 50 mA/max. 100 mA	
Permissible load / channel	max. ±20 mA	max. ±30 mA	max. ±20 mA	
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz	
Signal level	HIGH 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 5)	yes	yes	
Reverse polarity protection of the power supply	no, 10 ... 30 V DC: yes	yes	no	
UL approval	File 224618			
CE compliant acc. to	EMC guideline 2004/108/EC			
RoHS compliant acc. to	guideline 2002/95/EC			

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 supply voltage correctly applied.

5) Only one channel allowed to be shorted-out:

At +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.

At +V = 10 ... 30 V DC short circuit to channel or 0 V is permitted.

Incremental Encoders

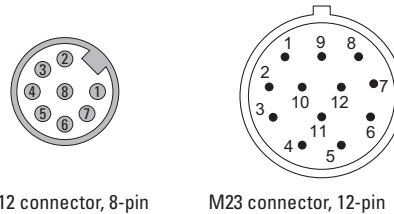
Large hollow shaft Optical	A020 (Hollow shaft)	Push-Pull / RS422 / SinCos
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Terminal assignment

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

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

Top view of mating side, male contact base



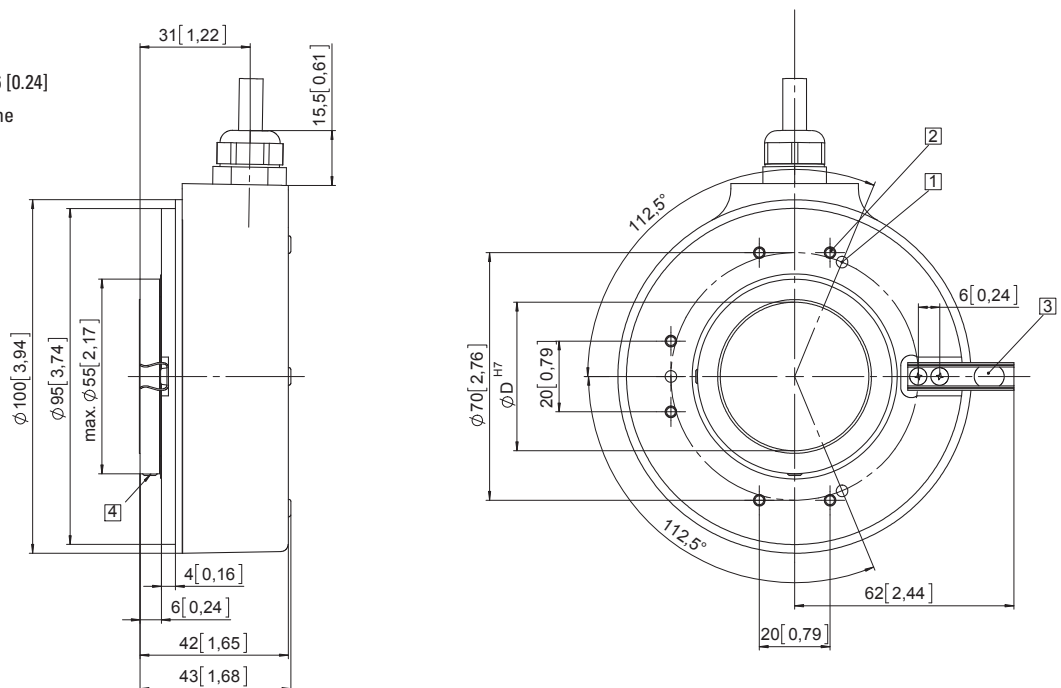
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element long Flange type 3

- 1) 3 x M4, 7 [0.28] deep
- 2) 6 x M3, 8 [0.31] deep
- 3) Cylindrical pin DIN 6325, ϕ 6 [0.24]
- 4) Recommended torque for the clamping ring 1.0 Nm

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



1) PH = Shield is attached to connector housing

Incremental Encoders

**Large hollow shaft
Optical**

A020 (Hollow shaft)

Push-Pull / RS422 / SinCos

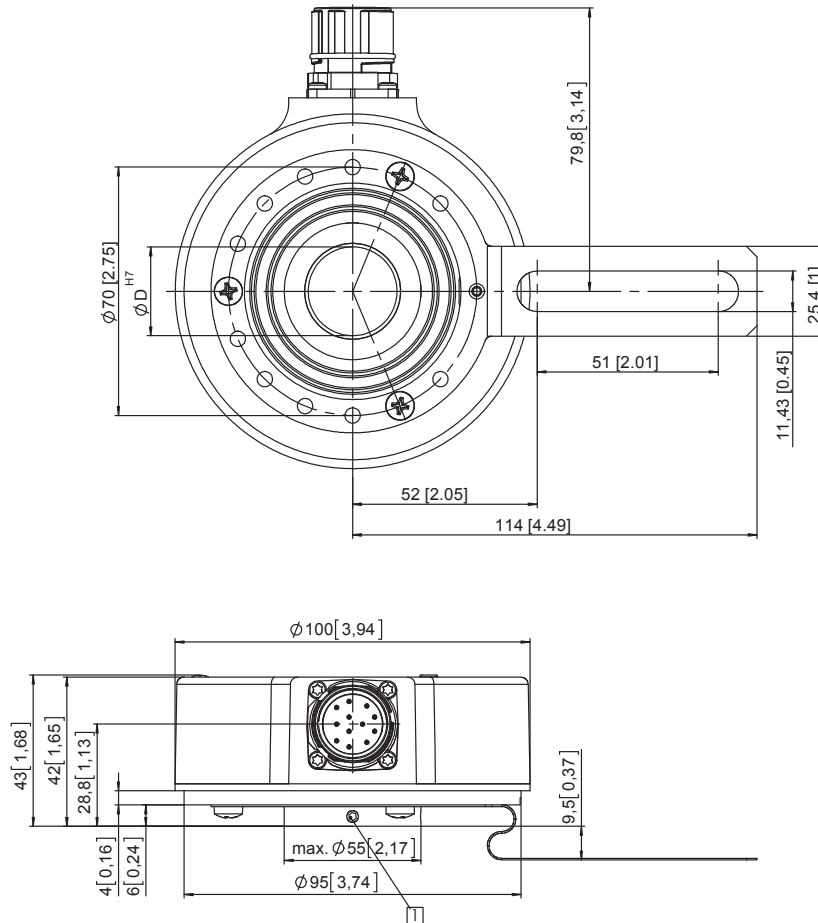
Dimensions hollow shaft version

Dimensions in mm [inch]

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

1 Recommended torque for the clamping ring 1.0 Nm

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



Incremental Encoders

Large hollow shaft Robust, optical	A02H (Hollow shaft)	Push-Pull / RS422 / SinCos
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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.



Incremental Encoders



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, M23, M12 or MIL connectors
- With Push-Pull, RS422 or SinCos interface

Order code Hollow shaft

8.A02H	.	X	X	X	X	.	X	X	X	
Type		a	b	c	d		e			

a Flange

- 1 = without mounting aid
- 2 = with spring element short
- 3 = with spring element long
- 5 = with fastening arm long
- 6 = with fastening arm short, 4.5" ¹⁾

b Hollow shaft

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

- E = ø 5/8" ¹⁾
- N = ø 1 1/4" ¹⁾

c Output circuit / Power supply

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

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

d Type of connection

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

D = MIL connector, 10-pin ¹⁾

e Pulse rate

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

SinCos version only available with pulses ≥ 1024

optional on request
- Ex 2/22
- special cable length

1) US version

Incremental Encoders

Large hollow shaft Robust, optical	A02H (Hollow shaft)	Push-Pull / RS422 / SinCos
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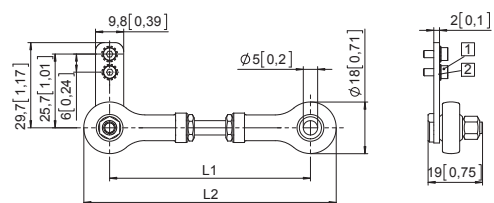
Mounting accessory for hollow shaft encoders	Order No.
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Cylindrical pin, long
for torque stops

With fixing thread

8.0010.4700.0003

Tether arm large, flexible



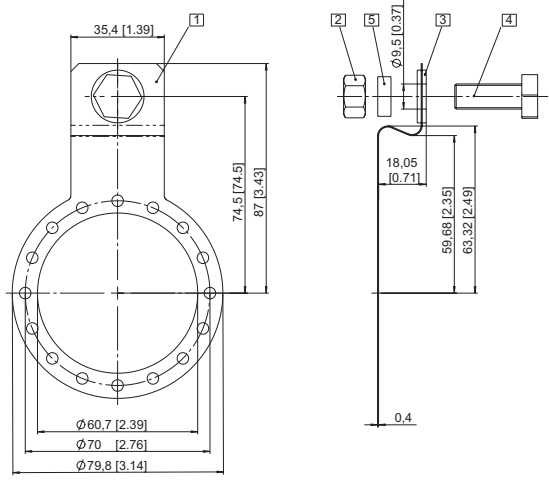
Tether arm
70 mm [2,76"]
100 mm [3,94"]
150 mm [5,91"]

8.0010.40S0.0000
8.0010.40T0.0000
8.0010.40U0.0000

- 1 Socket screw M2.5 x 6 [0.24]
- 2 Lock washer

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]

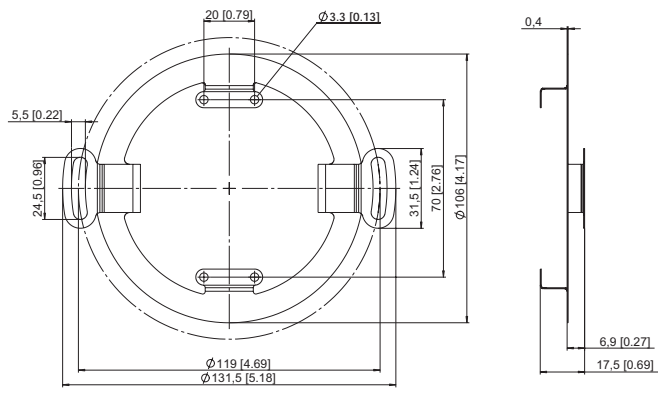
Fastening arm, short



- 1 Curved spring element
- 2 Hexagonal nut 3/8 - 16 UNC
- 3 Washer (isolating)
- 4 Hexagonal screw 3/8 16 UNC x 1"
- 5 Washer D10.4 x 15 x 15



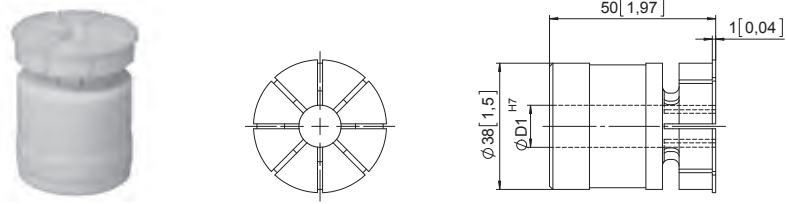
8.0010.4T00.0000

Stator coupling



8.0010.40V0.0000

Incremental Encoders

Large hollow shaft Robust, optical		A02H (Hollow shaft)	Push-Pull / RS422 / SinCos
Mounting accessory for hollow shaft encoders			Order No.
Protective cover 	For applications with a very high degree of pollution, Kübler now offers a protective cover for <ul style="list-style-type: none"> Improved reliability Extension of the service life of the encoder Scope of delivery: <ul style="list-style-type: none"> Protective cover Fastening arm (8.0010.4T00.0000) 3 screws for fixing to the encoder 		8.0010.40Y0.0001
Tapered shaft mounting kit for A02H with hollow shaft, \varnothing 38 mm [1.50"] 	For use in upgrading for tapered shaft mounting. Tapered shafts are used for high-precision direct coupling. An isolation insert is also included in the mounting kit; this reliably protects the encoder from shaft currents. Included in the set: <ul style="list-style-type: none"> Insert for cone blind hole, cone 1:10, 17 mm [0.67"] length Isolation insert Allen screw for central fixing 		8.0010.4028.0000
Isolation insert for hollow shaft, \varnothing 38 mm [1.50"] Temperature range -40°C ... +115°C [-40°F ... +239°F] 	Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC motor motors and considerably shorten the service life of the encoder bearings. For more details please call our Technical Hotline (+49 7720 3903 92) or send us an email (info@kuebler.com)	\varnothing D1: 12 mm [0.47"] 14 mm [0.55"] 15 mm [0.59"] 16 mm [0.63"] 18 mm [0.71"] 20 mm [0.79"] 25 mm [0.98"] 30 mm [1.18"] 32 mm [1.26"] 1/2" 5/8" 3/4" 1" 1 1/4"	8.0010.4091.0000 8.0010.4027.0000 8.0010.4038.0000 8.0010.4019.0000 8.0010.4080.0000 8.0010.4011.0000 8.0010.4012.0000 8.0010.4016.0000 8.0010.4015.0000 8.0010.4013.0000 8.0010.4070.0000 8.0010.4090.0000 8.0010.4050.0000 8.0010.4060.0000
Isolation insert for hollow shaft, \varnothing 42 mm [1.65"]	External diameter 42 mm [1.65"] / internal diameter 38 mm [1.50"] External diameter 42 mm [1.65"] / internal diameter 12 mm [0.47"]		8.0010.4017.0000 8.0010.4029.0000
Connection technology			
Connector, self-assembly (straight)	M12 female connector with coupling nut M23 female connector with coupling nut		05.CMB 8181-0 8.0000.5012.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable M23 female connector with coupling nut, 2 m [6.56'] PVC cable		05.00.6041.8211.002M 8.0000.6201.0002

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

Incremental Encoders

Large hollow shaft Robust, optical	A02H (Hollow shaft)	Push-Pull / RS422 / SinCos
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Technical data

Mechanical characteristics	
Speed	max. 6000 min ⁻¹ 1) at 60°C [140°F] max. 2500 min ⁻¹ 1)
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
EX approval for hazardous areas	optional zone 2 and 22
Working temperature range	-40°C 3) ... +80°C [-40°F 3) ... +176°F]
Materials	shaft stainless steel, bore tolerance H7
Shock resistance acc. to EN 60068-2-27	2000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 10...2000 Hz

Electrical characteristics SinCos output		
Output circuit	SinCos U = 1 Vpp	SinCos U = 1 Vpp
Power supply	5 V DC ±5%	10 ... 30 V DC
Power consumption with inverted signal (no load)	typ. 65 mA/max. 110 mA	typ. 65 mA/max. 110 mA
-3 dB frequency	< 180 kHz	< 180 kHz
Signal level	channels A/B 1 Vpp (±20%) 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 224618	
GL approval	Letter of Conformity No. 74130	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Electrical characteristics RS422 / Push-Pull

	RS422 (TTL compatible)	Push-Pull	Push-Pull (7272 compatible)
Output circuit			
Power supply	5 V DC (±5 %) 5 ... 30 V DC 10 ... 30 V DC	10 ... 30 V DC	5 ... 30 V DC
Power consumption (no load)			
without inverted signal	–	typ. 55 mA/max. 125 mA	–
with inverted signal	typ. 40 mA/max. 90 mA	typ. 80 mA/max. 150 mA	typ. 50 mA/max. 100 mA
Permissible load / channel	max. ±20 mA	max. ±30 mA	max. ±20 mA
Pulse frequency	max. 300 kHz	max. 300 kHz	max. 300 kHz 5)
Signal level	HIGH min. 2.5 V 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 224618		
GL approval	Letter of Conformity No. 74130		
CE compliant acc. to	EMC guideline 2004/108/EC		
RoHS compliant acc. to	guideline 2002/95/EC		

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 supply voltage correctly applied

5) Max. recommended cable length 30 m [98.43']

Incremental Encoders

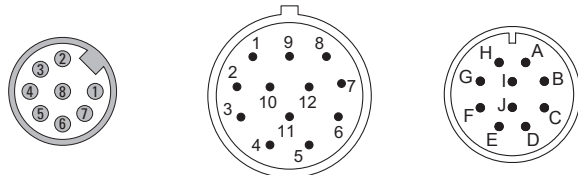
Large hollow shaft Robust, optical	A02H (Hollow shaft)	Push-Pull / RS422 / SinCos
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Terminal assignment

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

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

Top view of mating side, male contact base



M12 connector, 8-pin

M23 connector, 12-pin

MIL connector, 10-pin

1) PH = Shield is attached to connector housing.

Incremental Encoders

Large hollow shaft
Robust, optical

A02H (Hollow shaft)

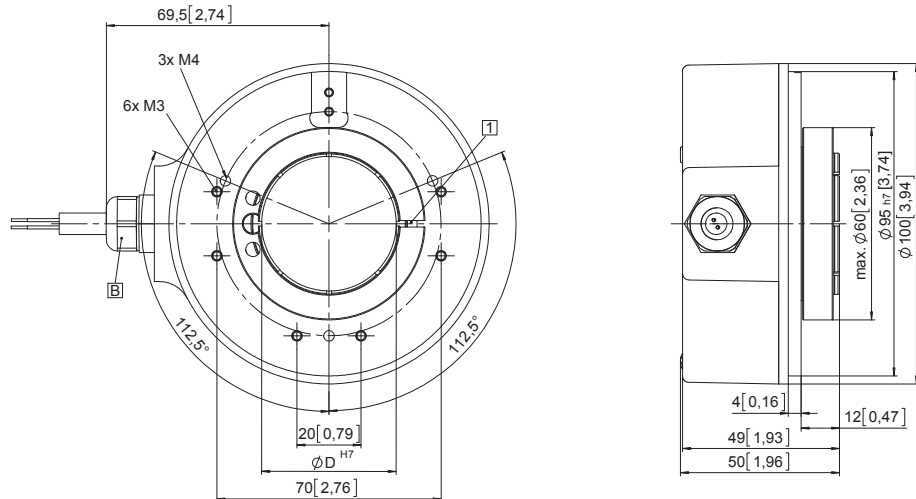
Push-Pull / RS422 / SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

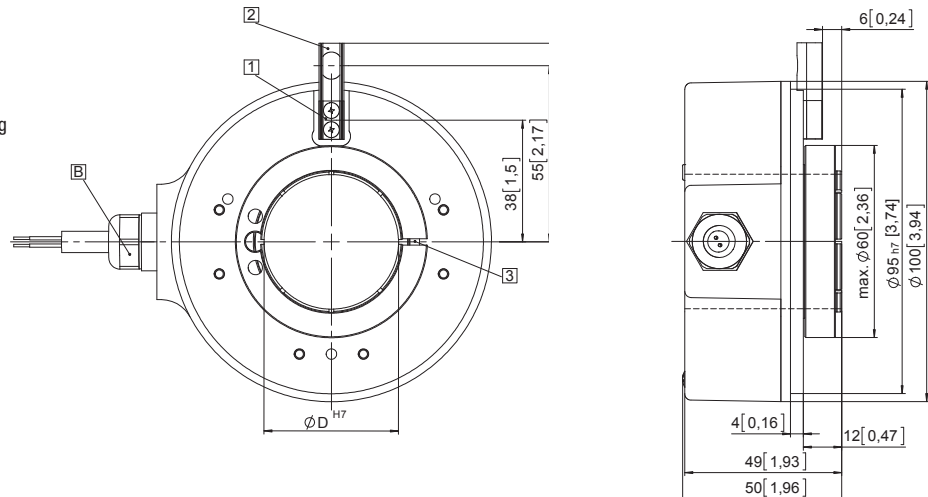
Flange without mounting aid Flange type 1

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



Flange with spring element Flange type 2 and 3

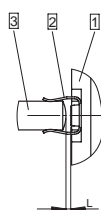
- 1 Spring element short (flange type 2)
- 2 Spring element long (flange type 3)
- 3 Recommended torque for the clamping ring
flange type 2: 1.0 Nm
flange type 3: 2.0 Nm
- B Cable version



Mounting using the spring element - short

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

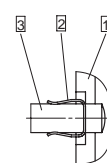
- 1 Flange
- 2 Spring element - short
- 3 Cylindrical pin



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
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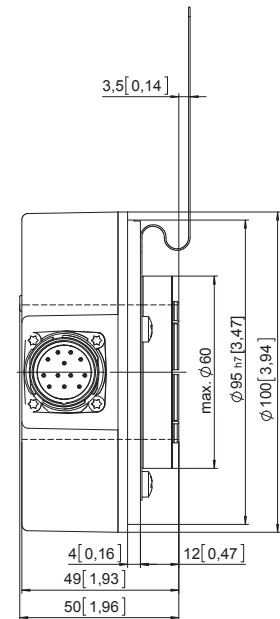
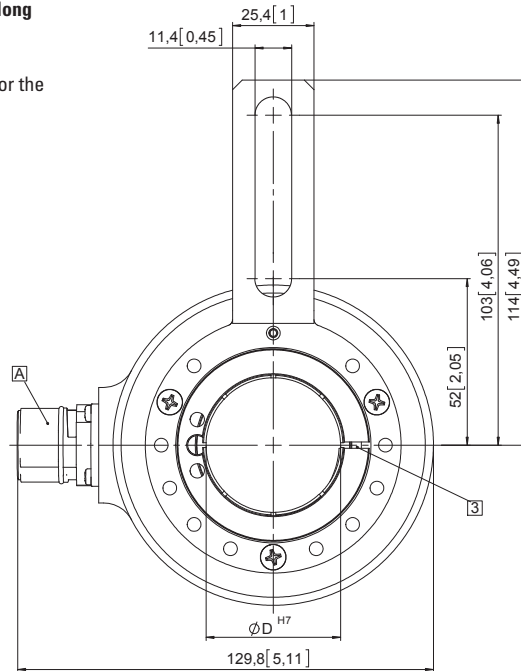
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with fastening arm long Flange type 5

③ Recommended torque for the clamping ring 2.0 Nm

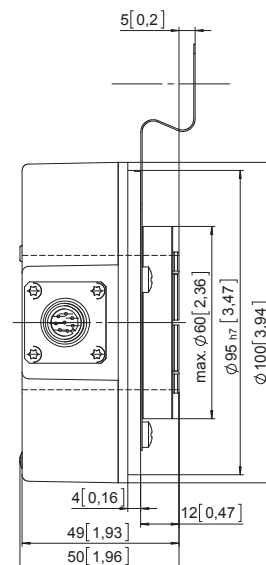
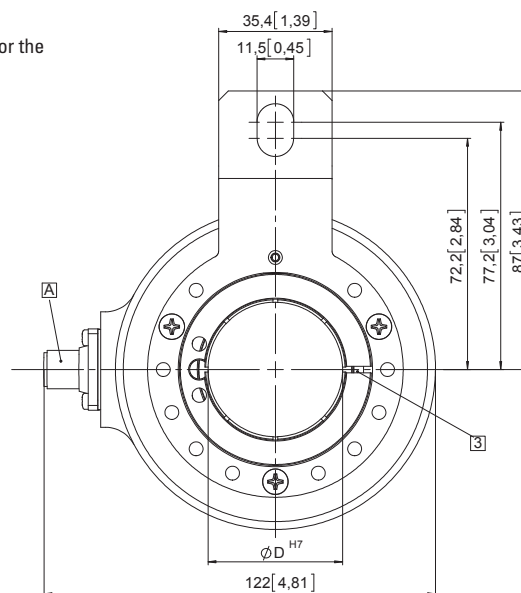
Ⓐ Plug version



Flange with fastening arm short 4.5" Flange type 6

③ Recommended torque for the clamping ring 2.0 Nm

Ⓐ Plug version

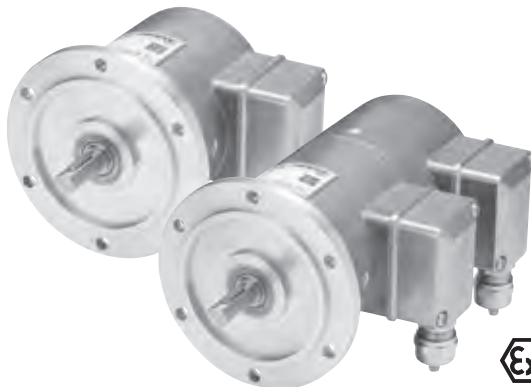


Incremental Encoders

**Heavy Duty
Shaft, optical**

Sendix Heavy Duty H100 (Shaft)

Push-Pull / RS422 / Speed switch



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

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



HD-Safety-Lock™



High rotational speed



Temperature range
-40...+100°C



High protection level
IP66



High shaft load capacity



Magnetic field proof



Plug-in cage-clamp connectors



Spring terminal connectors



Reverse polarity protection



Optical sensor



Seawater-resistant

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 [-40°F ... +212°F], IP66 protection and seawater-resistant 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 | c Version
1 = incremental encoder | e Pulse rate
360, 512, 1000, 1024, 2048, 2500, 3600
(e.g. 360 pulses => 0360)
Other pulse rates on request | <i>optional
on request
- Ex 2/22</i> |
| b Shaft (ø x L),
with feather key shaft slot
1 = ø 11 x 30 mm [0.43 x 1.18"] | d Output circuit / Power supply
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC | | |

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 | d Output circuit / Power supply
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC | f Switching speed
750, 1000, 2000, 3000, 4000
Other switching speeds on request | <i>optional
on request
- Ex 2/22</i> |
| b Shaft (ø x L), with feather key shaft slot
1 = ø 11 x 30 mm [0.43 x 1.18"] | e Pulse rate
360, 512, 1000, 1024, 2048, 2500, 3600
(e.g. 360 pulses => 0360)
Other pulse rates on request | g Switching accuracy
1 = Standard (± 4% at 100 rad/s ²)
Other switching accuracies on request | |
| c Version
2 = incremental encoder
with mech. speed switch | | | |

Order code double encoder

8.H100 . 1 1 3 X . XXXX . XXXX
Type a b c d e f

- | | | | |
|---|---|---|--|
| a Flange
1 = Euro RE0444 | c Version
3 = 2 x incremental encoder | e Pulse rate encoder 1
360, 512, 1000, 1024, 2048, 2500, 3600 | <i>optional
on request
- Ex 2/22</i> |
| b Shaft (ø x L),
with feather key shaft slot
1 = ø 11 x 30 mm [0.43 x 1.18"] | d Output circuit / Power supply
1 = RS422 (with inverted signal) / 5 ... 30 V DC
2 = Push-pull (with inverted signal) / 10 ... 30 V DC | f Pulse rate encoder 2
360, 512, 1000, 1024, 2048, 2500, 3600
Other pulse rates on request | |

Incremental Encoders

Heavy Duty Shaft, optical		Sendix Heavy Duty H100 (Shaft)	Push-Pull / RS422 / Speed switch
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.XXXX¹⁾
Speed switch cable	TPE-trailing cable, shielded, halogen free, black – 5 x 0.75 mm ² [AWG 18]		8.0000.6600.XXXX¹⁾

Technical data

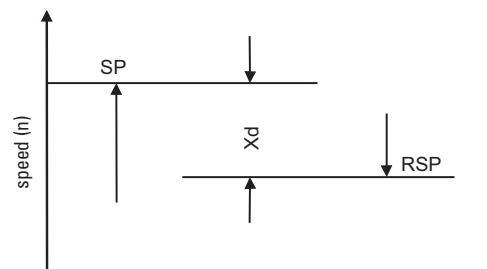
Mechanical characteristics	
Speed	max. 6000 min ⁻¹
Starting torque with seal – at 20°C [68°F]	~ 2 Ncm
Load capacity of shaft	radial 400 N axial 300 N
Weight	H100 ~ 1.8 kg [63.49 oz] H100 + speed switch ~ 2.7 kg [95.24 oz]
Protection acc. to EN 60529	IP66
EX approval for hazardous areas	optional zone 2 and 22
Working temperature range (surface of housing)	-40°C ... +100°C [-40°F ... + 212°F]
Materials	shaft stainless steel housing die-cast aluminium (EN AC-44300), seawater-resistant coating flange seawater resistant aluminium, Type Al Si Mg Mn (EN AW-6082)
Shock resistance acc. EN 60068-2-27	< 300 g ~ 3000 m/s ² (1 ms)
Vibration resistance acc. EN 60068-2-27	< 10 g ~ 100 m/s ² < 5 g ~ 50 m/s ² for switching speed 750 or 1000

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 $\Delta n = 955 \text{ min}^{-1}/\text{s}$)	+/- 4% of ns
Switching difference CW/CCW rotation	~ 3 %
Switching hysteresis (Xd)	~ 40% up to 80% of ns
Switching capacity	3 A / 230 V AC 1 A / 125 V DC

(more details see manual)

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 / channel	max. ± 20 mA	max. ± 30 mA
Pulse frequency	max. 300 kHz	max. 300 kHz
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.5 V max. 0.5 V
Rising edge time t_r	max. 200 ns	max. 1 μ s
Falling edge time t_f	max. 200 ns	max. 1 μ s
Short circuit proof outputs²⁾	yes ³⁾	yes
Reverse polarity protection of the power supply	yes	yes
CE-compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Definition Switching hysteresis (Xd)



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

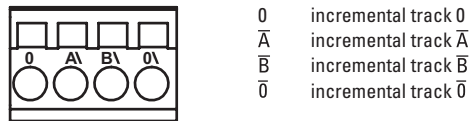
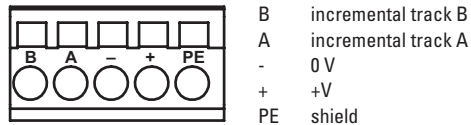
1) XXXX = cable length in meters
2) If supply voltage +V correctly applied
3) Only one channel allowed to be shorted-out:
At +V short circuit to channel or 0 V is permitted.

Incremental Encoders

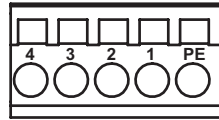
Heavy Duty Shaft, optical	Sendix Heavy Duty H100 (Shaft)	Push-Pull / RS422 / Speed switch
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Terminal assignment terminal connections

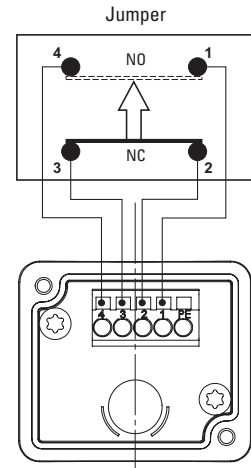
Incremental encoders



Speed switch



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

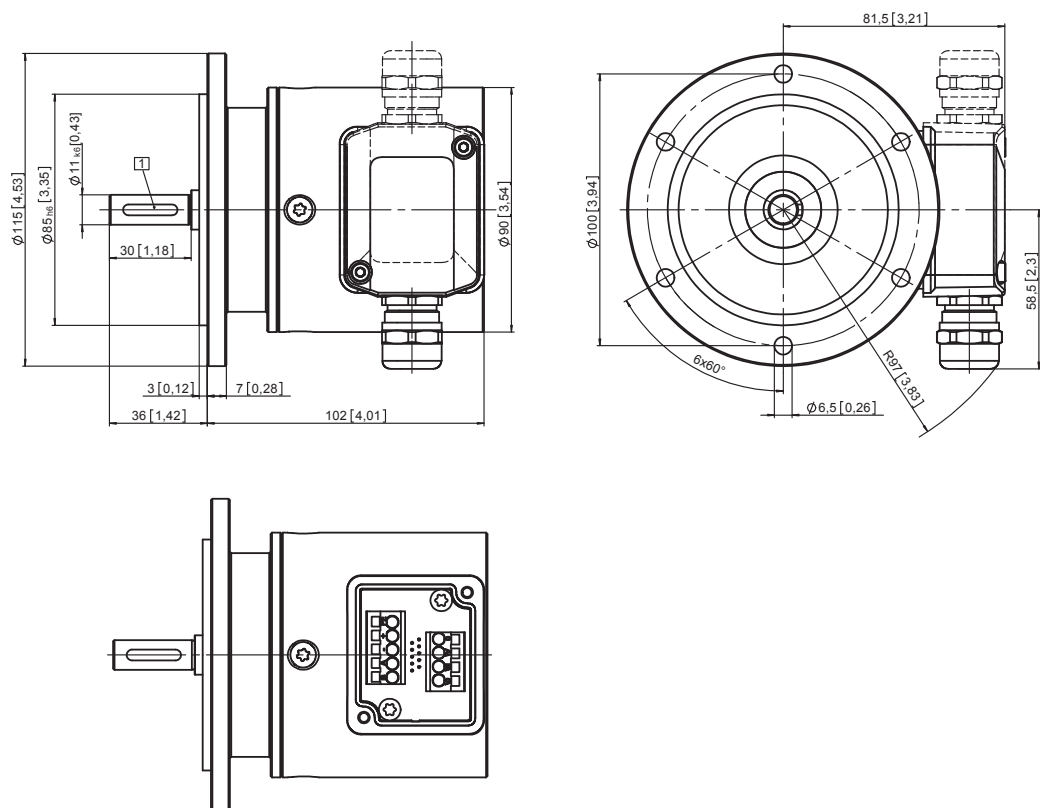


Dimensions

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]



Incremental Encoders

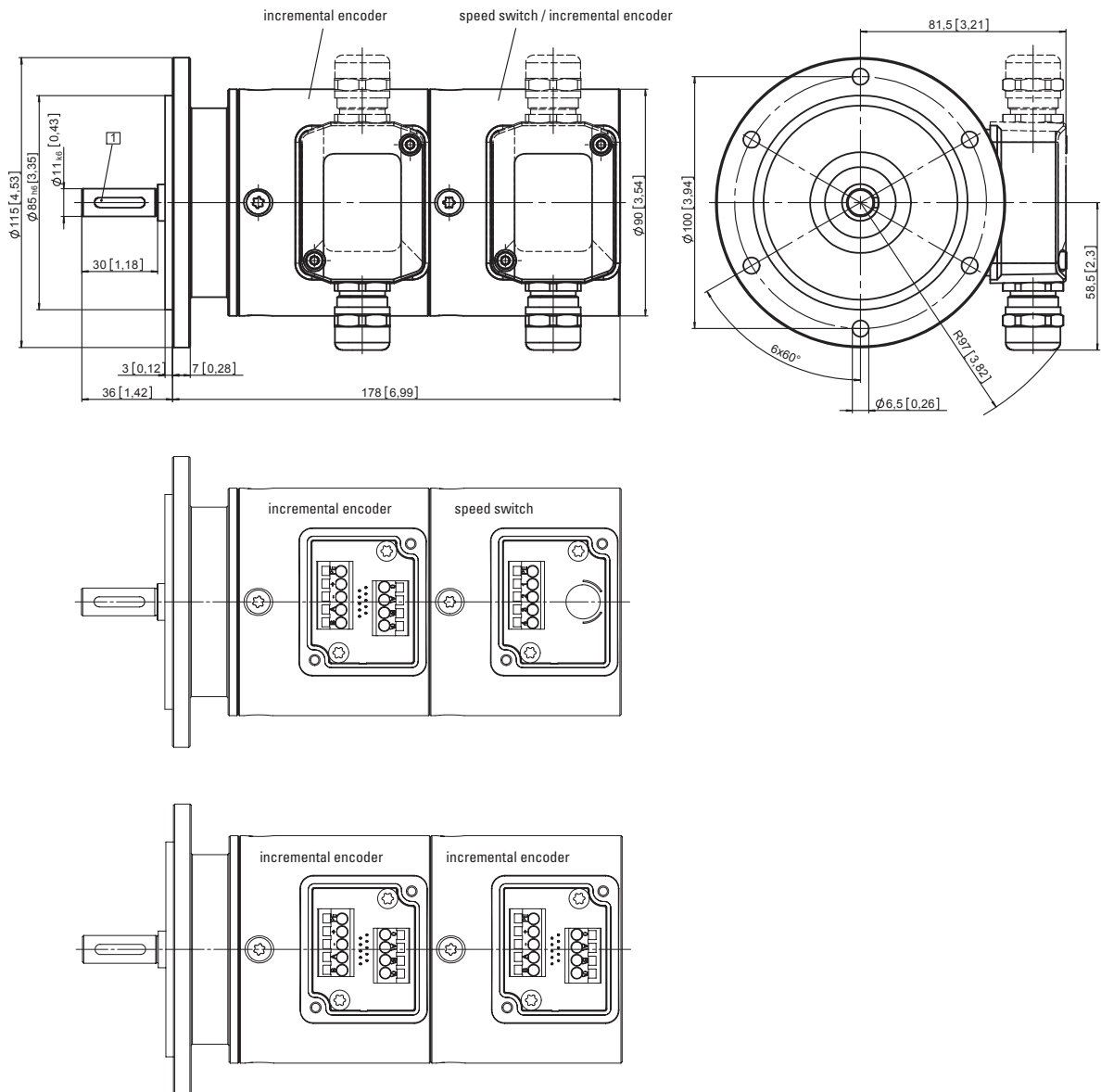
Heavy Duty Shaft, optical	Sendix Heavy Duty H100 (Shaft)	Push-Pull / RS422 / Speed switch
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Dimensions

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]



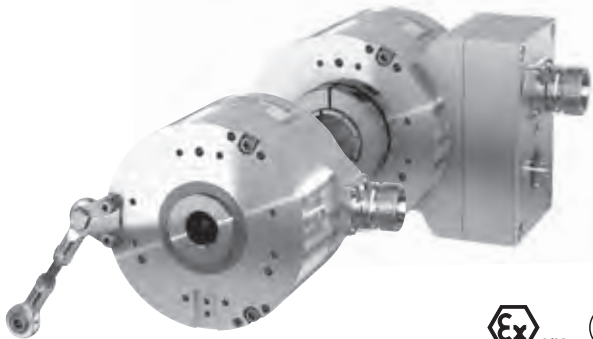
Incremental Encoders

Incremental Encoders

**Heavy Duty
Hollow shaft, optical**

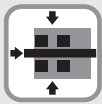
Sendix Heavy Duty H120 (Hollow shaft)

Push-Pull / RS422 / Optical fibre



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

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



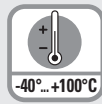
HD-Safety-Lock™



2.5 kV bearing isolation



Dual protection of the shaft



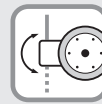
Temperature range
-40°...+100°C



High protection level
IP66/67



Shock/vibration resistant



Terminal box rotatable - 180°



Plug-in cage-clamp connectors



Hollow shaft up to ø 28 mm



Optical sensor



Seawater-resistant

Robust

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

Seawaterresistant

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

Order code Hollow shaft version

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

a Flange

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

b Through hollow shaft

- 2 = ø 16 mm [0.63"]
- 3 = ø 20 mm [0.79"]
- 5 = ø 25 mm [0.98"]
- 7 = ø 28 mm [1.10"]
- 6 = ø 1"

Blind hollow shaft, with central fastening

- A = ø 12 mm [0.47"]
- B = ø 16 mm [0.63"]
- K = cone, ø 17 mm [0.67"], 1 : 10

c Output circuit / Power supply

- 4 = RS422 (with inverted signal) / 5 V DC
- 1 = RS422 (with inverted signal) / 10 ... 30 V DC
- 5 = Gegentakt (with inverted signal) / 10 ... 30 V DC
- B = LWL + RS422 (with inverted signal) / 5 V DC²⁾
- A = LWL + RS422 with inverted signal) / 10 ... 30 V DC²⁾
- C = LWL + Push-Pull (with inverted signal) / 10 ... 30 V DC²⁾

d Type of connection

- 1 = radial cable, 1 m [3.28'] PVC cable
- 2 = M12 connector, 8-pin, radial, ccw
- 4 = M23 connector, 12-pin, radial, ccw
- D = M23 connector, 12-pin, radial, cw
- K = Terminal box with plug-in spring terminal connectors, rotatable through 180°
- L = Optical fibre connector + M23 connector, 12-pin, radial, cw³⁾

e Pulse rate

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

optional on request

- Ex 2/22
- special cable length

1) Enclosed, not mounted

2) Can only be ordered with connection type L

3) Can only be ordered with output circuits A, B or C

Incremental Encoders

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

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

Technical data

Mechanical characteristics		
Speed	max.	6000 min ⁻¹ at 60°C [140°F] max. 3500 min ⁻¹
Starting torque – at 20°C [68°F]		0.05 Nm
Load capacity of shaft	radial axial	400 N 300 N
Weight		approx. 1.8 kg [63.49 oz]
Protection acc. to EN 60529		IP66 + IP67
EX approval for hazardous areas		optional zone 2 and 22
Working temperature range		-40°C ²⁾ ... +100°C ³⁾ [-40°F ³⁾ ... +212°F ³⁾
Materials	shaft housing, flange	stainless steel, bore tolerance H7 seawater resistant
Shock resistance acc. to EN 60068-2-27		2000 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		150 m/s ² , 10...2000 Hz

Electrical characteristics		
Output circuit	RS422 (TTL-compatible))	Push-Pull
Power supply	5 V DC (±5 %) or 10 ... 30 V DC	10 ... 30 V DC
Power consumption (no load)	typ. 40 mA / max. 90 mA	typ. 80 mA / max. 150 mA
Permissible load / channel	max. ±20 mA	max. ±30 mA
Pulse frequency	max. 300 kHz	max. 300 kHz
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 3 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 ⁴⁾	yes	yes
Reverse polarity protection of the power supply	yes	yes
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Technical data for optical fibre connection	
Power consumption per module	< 2 W
Input level optical fibre transmitter	10...30 V DC or RS422
Optical wavelength	850 nm
Optical transmission rate	120 Mbit/s
Optical fibre synchronisation display	LED on the receiver
Optical fibre connection	ST connector, ø 9 mm [0.35"]
Glass fibre	multimode fibre, 50/125 µm, 62,5/125 µm
Optical fibre transmission distance	max. 1000 m [3280.84']

- 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 supply voltage correctly applied

Incremental Encoders

**Heavy Duty
Hollow shaft, optical**

Sendix Heavy Duty H120 (Hollow shaft)

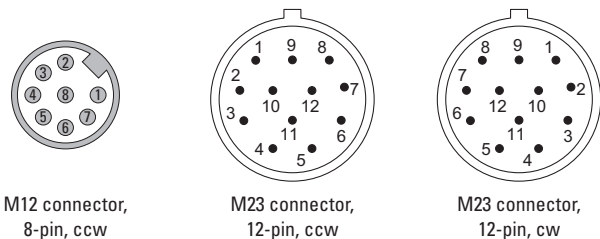
Push-Pull / RS422 / Optical fibre

Terminal assignment

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



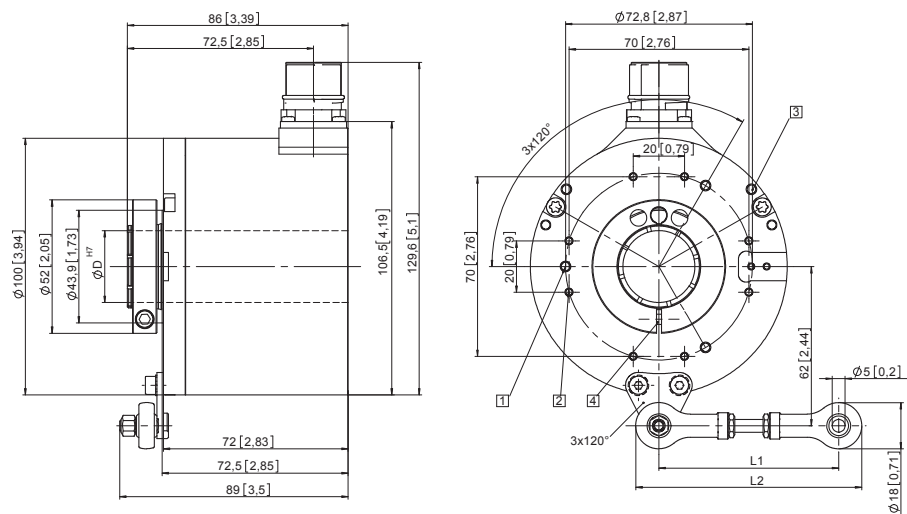
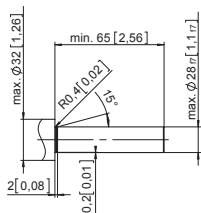
Dimensions

Dimensions in mm [inch]

Flange with fastening arm Through hollow shaft

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

Shaft connection to the application



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

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

Incremental Encoders

Heavy Duty Hollow shaft, optical	Sendix Heavy Duty H120 (Hollow shaft)	Push-Pull / RS422 / Optical fibre
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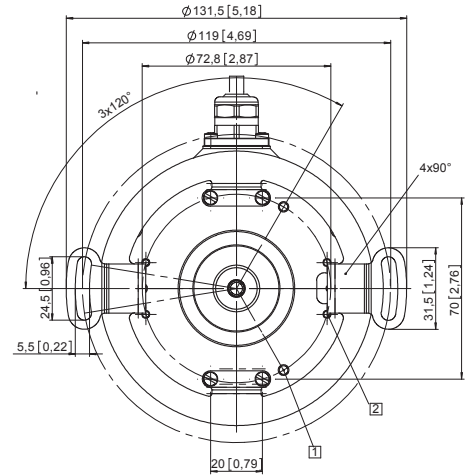
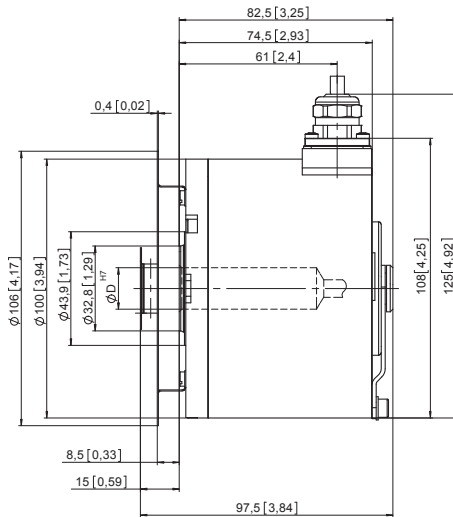
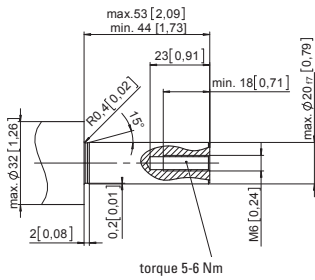
Dimensions

Dimensions in mm [inch]

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

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

Shaft connection to the application

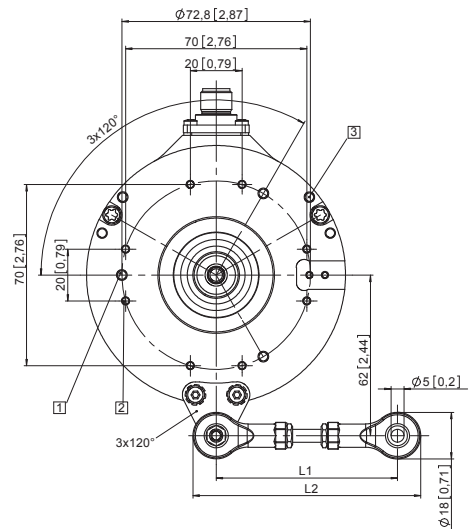
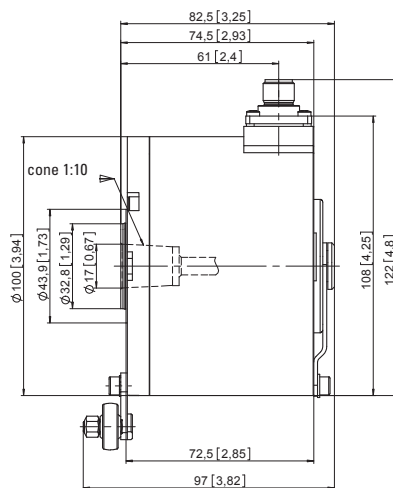
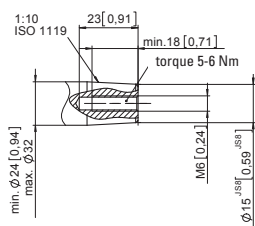


Incremental Encoders

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

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

Shaft connection to the application



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

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

Incremental Encoders

Heavy Duty Hollow shaft, optical

Sendix Heavy Duty H120 (Hollow shaft)

Push-Pull / RS422 / Optical fibre

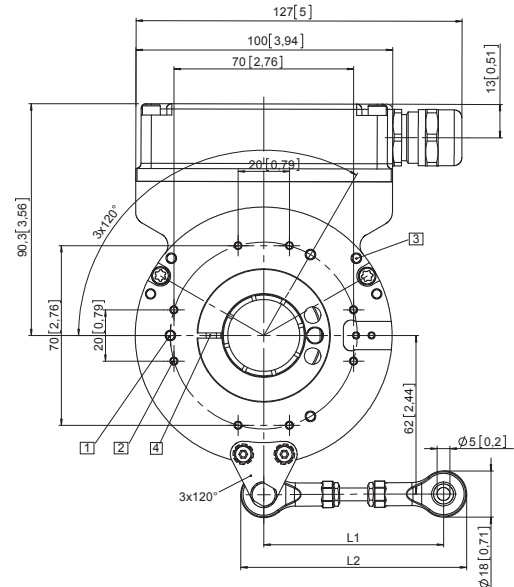
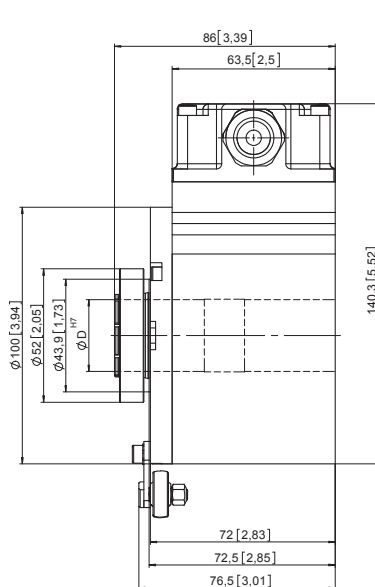
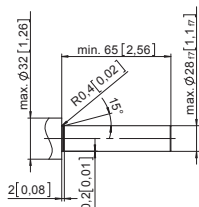
Dimensions

Dimensions in mm [inch]

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

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

Shaft connection to the application

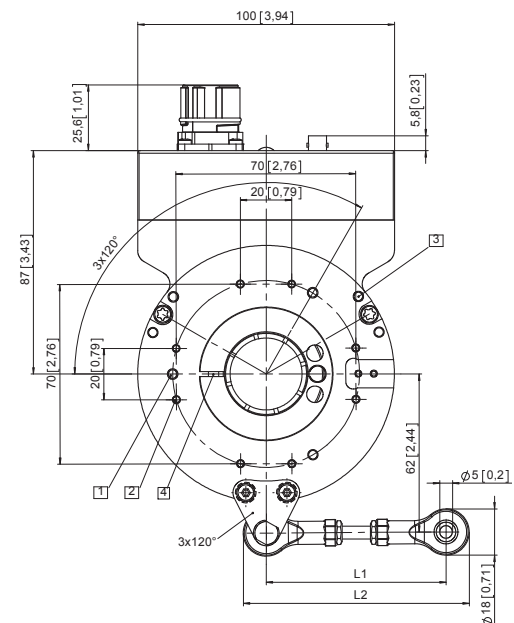
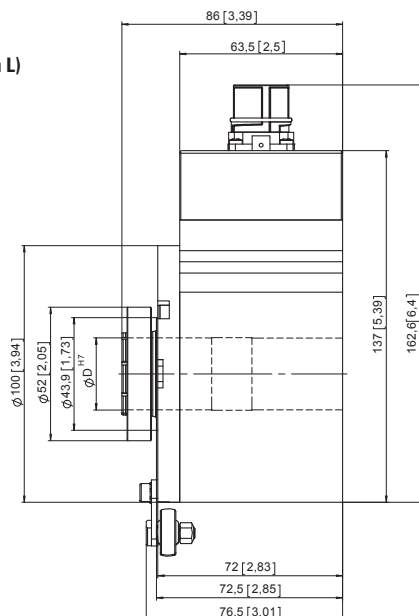
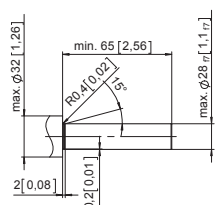


Fastening arm	L1	L2
70 mm [2.76]	64 ... 74 [2.51 ... 2.91]	82 ... 92 [3.23 ... 3.62]
100 mm [3.93]	94 ... 104 [3.70 ... 4.09]	112 ... 122 [4.41 ... 4.80]
150 mm [5.91]	144 ... 154 [5.67 ... 6.06]	162 ... 172 [6.38 ... 6.77]

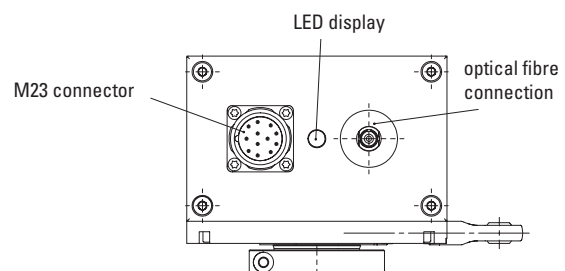
Flange with fastening arm Through hollow shaft and optical fibre connection (type of connection L)

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

Shaft connection to the application



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



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

Incremental Encoders

Bearingless Magnetic	RI20 / Limes LI20 (Hollow shaft)	Push-Pull / RS422
---------------------------------	---	--------------------------



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI20 / 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.

NEW: Version for outdoor use with extremely sturdy aluminium housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



Incremental Encoders

High rotational speed	High protection level	Shock / vibration resistant	Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78)
- Non-contact measuring system, free from wear, ensures a long service life

Fast start-up

- Requires very little installation space
- Large mounting tolerance between magnetic band and sensor head
- Slotted hole fixing ensures simple alignment
- Function display via LED

Selection guide magnetic ring RI20 / Limes LI20

Pulse rates / PPR ¹⁾ (further PPR on request)	Order code Magnetic ring RI20	Order code Magnetic sensor Limes LI20	Max. rotational speed RPM ²⁾
250	8.RI20.031.XXXX.111	8.LI20.11X1.2005	12000
1000	8.RI20.031.XXXX.111	8.LI20.11X1.2020	2400
2500	8.RI20.031.XXXX.111	8.LI20.11X1.2050	3900
1024	8.RI20.041.XXXX.111	8.LI20.11X1.2016	7000
360	8.RI20.045.XXXX.111	8.LI20.11X1.2005	12000
3600	8.RI20.045.XXXX.111	8.LI20.11X1.2050	2700

Order code Magnetic ring RI20

8.RI20 . XXX . XXXX . 111

Type **a** **b**

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"] ²⁾ 2540 = 1" ²⁾ 1500 = 15 mm [0.59"] 3000 = 30 mm [1.18"] ²⁾	Stock types 8.RI20.031.0800.111 8.RI20.045.0800.111 8.RI20.031.1000.111 8.RI20.045.0952.111 8.RI20.031.1200.111 8.RI20.045.1200.111 8.RI20.031.1587.111 8.RI20.045.1500.111 8.RI20.041.0800.111 8.RI20.045.2500.111
--	---	--

Order code Magnetic sensor Limes LI20

8.LI20 . X1X1 . 2XXX

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	d Reference signal 2 = Index periodical	Stock types 8.LI20.1111.2005 8.LI20.1121.2005 8.LI20.1111.2020 8.LI20.1121.2020 8.LI20.1111.2050 8.LI20.1121.2050
c Type of connection 1 = cable PUR, 2 m [6.56'] length		e Interpolation factor ³⁾ 005, 016, 020, 050	

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters.

2) Only possible for outer diameters 041 and 045

3) With an input frequency of the evaluation unit of 250 kHz

Incremental Encoders

Bearingless Magnetic	RI20 / Limes LI20 (Hollow shaft)	Push-Pull / RS422
---------------------------------	---	--------------------------

Accessories / Display type 572	Order No.
Position display, 6-digit	with 4 fast switch outputs and serial interface 6.572.0116.D05
	with 4 fast switch outputs and serial interface and scalable analogue output 6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface 6.572.0118.D05
	with 4 fast switch outputs and serial interface and scalable analogue output 6.572.0118.D95

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

Technical data

Mechanical characteristics	
Speed	max. 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	500 g / 1 ms
Vibration resistance	30 g / 10 ... 2000 Hz
Pole gap	2 mm from pole to pole
Housing (Sensor)	aluminium
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse-index red Error; Speed too high or magnetic fields too weak (8.LI20.XXXX.X050 and 8.LI20.XXXX.X250)
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

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	
Permissible load/channel	120 Ohm	±20 mA
Min. pulse edge interval	1 µs	
Signal level	HIGH min. 2.5 V LOW max. 0.5 V	min. +V - 2.0 V max. 0.5 V
Reference signal	Index periodical	
System accuracy	typ 0.3° with shaft tolerance g6	

Terminal assignment

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

- +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)

1) Shield is attached to connector housing

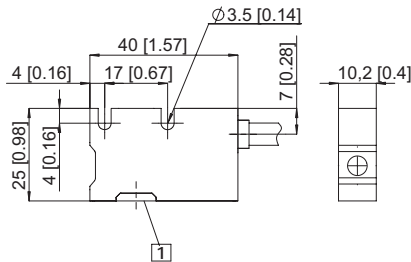
Incremental Encoders

Bearingless Magnetic	RI20 / Limes LI20 (Hollow shaft)	Push-Pull / RS422
---------------------------------	---	--------------------------

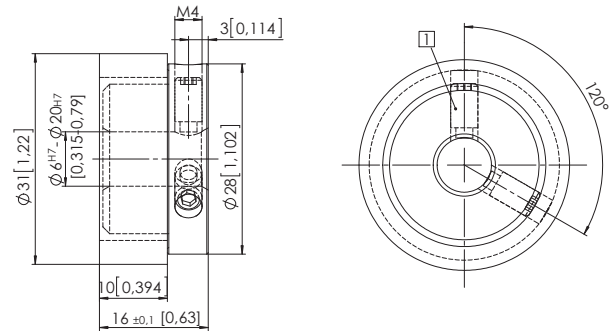
Dimensions

Dimensions in mm [inch]

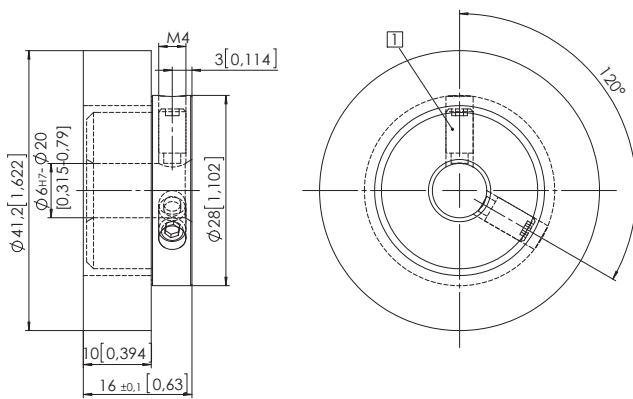
Measuring head Limes LI20



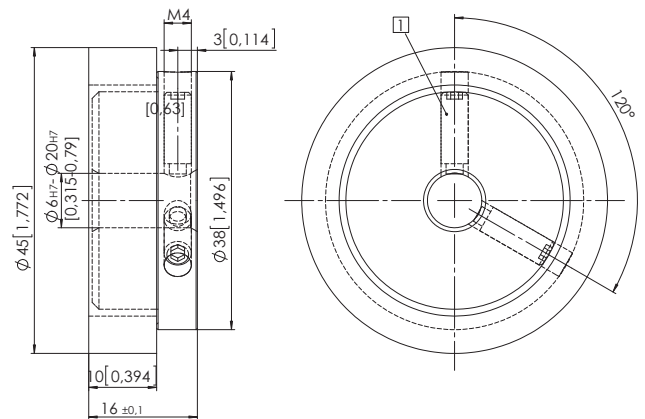
Magnetic ring, ø 31 [1.22], 8.RI20.031.XXXX.111



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



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

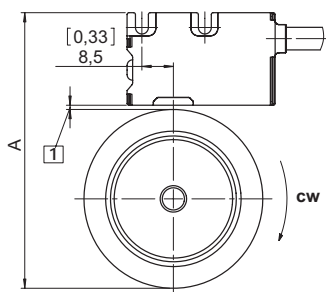


1 Set screw M4

Recommended tolerance of the drive shaft diameter: g6

Mounting orientation and permissible mounting tolerances

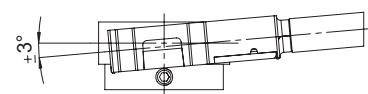
Distances



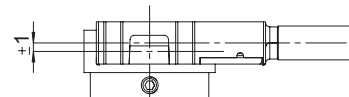
1 Distance Sensor / Magnetic ring:
0.1 ... 1.0 (0.4 [0.02] recommended)

Magnetic ring	A for distance sensor / magnetic ring: = 0.4 [0.02]
8.RI20.031.XXXX.111	56.4 [2.22]
8.RI20.041.XXXX.111	66.6 [2.62]
8.RI20.045.XXXX.111	70.4 [2.77]

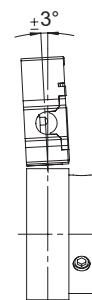
Torsion



Offset



Tilting



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

Incremental Encoders

Bearingless
Zero pulse, magnetic

RI50 / Limes LI50 (Hollow shaft)

Push-Pull / RS422



Thanks to its installation depth of only 16 mm, the bearingless magnetic rotary encoder RI50 / 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 / LI20, a single zero pulse is also implemented here.

NEW: Version for outdoor use with extremely sturdy aluminium housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



High rotational speed



High protection level



Shock / vibration resistant



Reverse polarity protection

Hard-wearing and robust

- High shock and vibration resistance
- Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78)
- Non-contact measuring system, free from wear, ensures a long service life

Fast start-up

- Function display via LED
- Large mounting tolerance between magnetic band and sensor head
- Requires very little installation space
- Slotted hole fixing ensures simple alignment

Selection guide magnetic ring RI50 / Limes LI50

Pulse rates/PPR ¹⁾	Order code Magnetic ring RI50	Order code Magnetic sensor Limes LI50	Max. rotational speed (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

a Outer diameter

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

b Bore diameter

0600 = 6 mm [0.24"] 1500 = 15 mm [0.59"] 3500 = 35 mm [1.34"] ⁴⁾
0800 = 8 mm [0.32"] 2000 = 20 mm [0.79"]
1000 = 10 mm [0.39"] 2500 = 25 mm [0.98"] ³⁾
1200 = 12 mm [0.47"] 3000 = 30 mm [1.18"] ³⁾ 2540 = 1" ³⁾

Stock types

8.RI50.048.0600.112

Order code Magnetic sensor Limes LI50

8.LI50 . X1X1 . 1XXX
Type a b c d e

a Model

1 = IP67, standard
2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b Output circuit / Power supply

1 = RS422 / 4.8 ... 26 V DC
2 = Push-Pull / 4.8 ... 30 V DC

c Type of connection

1 = cable PUR, 2 m [6.56'] length

d Reference signal

1 = separate index signal (linked with A and B)

e Interpolation factor ²⁾

032, 050, 064, 100

Stock types

8.LI50.1121.1032

1) The pulse rate (ppr) results from the combination of the magnetic sensor with the various outer diameters
2) With an input frequency of the evaluation unit of 250 kHz

3) Only possible for outer diameters 048 and 055
4) Only possible for outer diameter 055

Incremental Encoders

Bearingless Zero pulse, magnetic	RI50 / Limes LI50 (Hollow shaft)	Push-Pull / RS422
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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 analogue output	6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface	6.572.0118.D05
	with 4 fast switch outputs and serial interface and scalable analogue output	6.572.0118.D95

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

Technical data

Mechanical characteristics	
Speed	max. 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	500 g / 1 ms
Vibration resistance	30 g / 10 ... 2000 Hz
Pole gap	5 mm from pole to pole
Housing (Sensor)	Aluminium
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 26], shielded, may be used in trailing cable installations
Status LED	green pulse-index red Error; Speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

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		
Permissible load/channel	max. 20 mA		
Min. pulse edge interval	1 µs		
Signal level	HIGH	min. 2.5 V	min. +V - 2.0 V
	LOW	max. 0.5 V	max. 0.5 V
Reference signal	fixed		
System accuracy	typ 0.3° with shaft tolerance g6		

Terminal assignment

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

- +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
- \perp : Plug connector housing (Shield)

1) Shield is attached to connector housing

Incremental Encoders

Bearingless
Zero pulse, magnetic

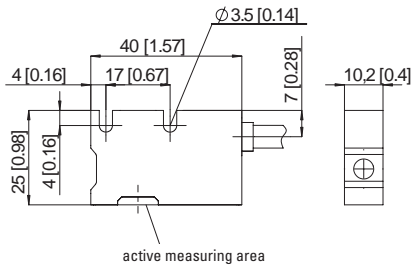
RI50 / Limes LI50 (Hollow shaft)

Push-Pull / RS422

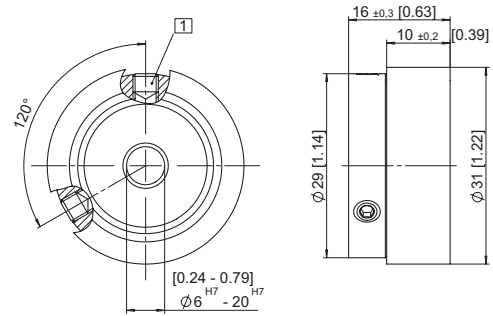
Dimensions

Dimensions in mm [inch]

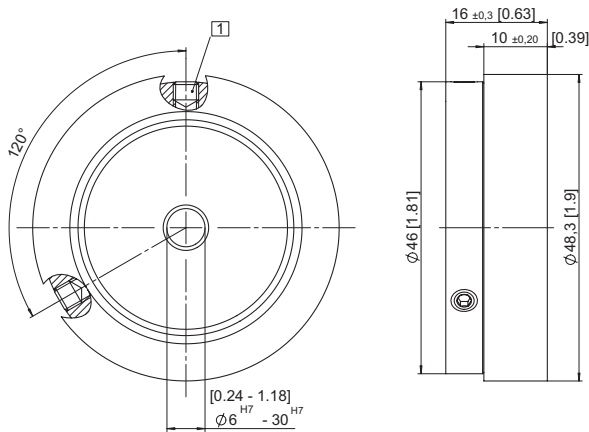
Measuring head Limes LI50



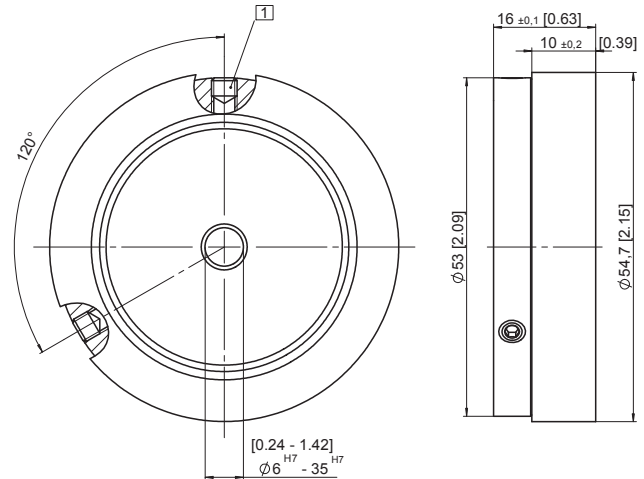
Magnetic ring, ø 31 [1.22], 8.RI50.031.XXXX.112



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



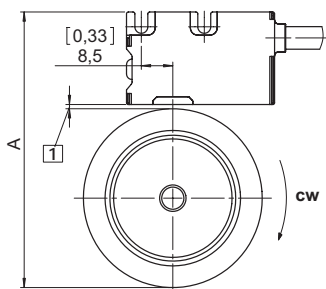
Magnetic ring, ø 54.7 [2.15], 8.RI50.055.XXXX.112



1 M4 Set screw

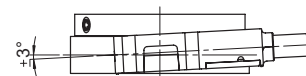
Mounting orientation and permissible mounting tolerances

Distances

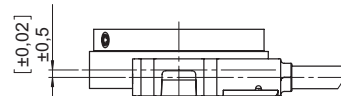


1 Distance Sensor / Magnetic ring:
0.1 ... 1.5 [0.004 ... 0.06]
(1 [0.04] recommended)

Torsion



Offset



Tilting







Magnetic ring	A for distance sensor / magnetic ring = 1 [0.04]
8.RI50.031.XXXX.112	57.0 [2.24]
8.RI50.048.XXXX.112	74.3 [2.93]
8.RI50.055.XXXX.112	80.7 [3.18]

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

Incremental Encoders



Absolute Encoders - Singleturn

Series	Type	Interface	Page
Miniature, magnetic	2450 / 2470 (Shaft / Hollow shaft)	SSI	116
Compact, magnetic	Sendix 3650 / 3670 (Shaft / Hollow shaft)	SSI	119
	Sendix 3651 / 3671 (Shaft / Hollow shaft)	Analogue	122
	Sendix M3658 / M3678 (Shaft / Hollow shaft)	CANopen	127
	Sendix M3658 / M3678 (Shaft / Hollow shaft)	SAE J1939	131
Compact, optical (patented technology)	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C	135
	Sendix F3658 / F3678 (Shaft / Hollow shaft)	CANopen	141
Standard, optical	5850 / 5870 (Shaft / Hollow shaft)	Parallel, Analogue	145
	5852 / 5872 (Shaft / Hollow shaft)	Parallel, Highspeed	150
	Sendix 5853 / 5873 (Shaft / Hollow shaft)	SSI / BiSS-C	153
	 SIL2/PLd Sendix SIL 5853FS2 / 5873FS2 (Shaft / Hollow shaft)	SSI / BiSS-C + SinCos	160
	 SIL3/PLe Sendix SIL 5853FS3 / 5873FS3 (Shaft / Hollow shaft)	SSI / BiSS-C + SinCos	165
	Sendix 5858 / 5878 (Shaft / Hollow shaft)	PROFIBUS DP	170
	Sendix 5858 / 5878 (Shaft / Hollow shaft)	CANopen	175
	Sendix 5858 / 5878 (Shaft / Hollow shaft)	EtherCAT	183
	Sendix 5858 / 5878 (Shaft / Hollow shaft)	PROFINET IO	188
	Stainless steel 5876 (Hollow shaft)	SSI, Parallel	193
	ATEX Sendix 7053 (Shaft)	SSI / BiSS-C	197
	 ATEX, SIL2/PLd Sendix 7053FS2 (Shaft)	SSI / BiSS-C + SinCos	200
	 ATEX, SIL3/PLe Sendix 7053FS3 (Shaft)	SSI / BiSS-C + SinCos	203
	ATEX Sendix 7058 (Shaft)	PROFIBUS DP	206
	ATEX Sendix 7058 (Shaft)	CANopen	209

Absolute Encoders - Singleturn

**Miniature
Magnetic**

2450 / 2470 (Shaft / Hollow shaft)

SSI



The absolute singleturn encoders 2450 and 2470 with SSI interface and magnetic sensor technology are the specialists when space is tight.

Because of their high 12 bit resolution with 4096 different positions for 360° they offer exceptional repeat accuracy.



High rotational speed



Temperature range
-20°...+85°C



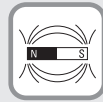
Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic sensor

Minimal space requirement

- The outer diameter measures 24 mm; the shaft diameter up to max. 6 mm
- Flexible connection with radial or axial cable outlet

Durable and accurate

- Long service life and freedom from wear due to non-contact measuring system
- Wide temperature range from -20°C up to +85°C
- High 12 bit resolution with 4096 different positions for 360°

Order code Shaft version

8.2450 . **XX1X** . **G121**
Type a b c d e

a Flange

- 1 = ø 24 mm [0.94"]
- 3 = ø 28 mm [1.10"]
- 2 = ø 30 mm [1.18"]

b Shaft (ø x L)

- 1 = ø 4 x 10 mm [0.16 x 0.39"]
- 3 = ø 5 x 10 mm [0.20 x 0.39"], with flat
- 2 = ø 6 x 10 mm [0.24 x 0.39"]

c Interface / Power supply

- 1 = SSI / 5 V DC

e Gray-Code

- 12 bit resolution

d Type of connection

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

Order code Hollow shaft

8.2470 . **1X1X** . **G121**
Type a b c d e

a Flange

- 1 = ø 24 mm [0.94"]

b Blind hollow shaft

- insertion depth max. 14 mm [0.55"]
- 1 = ø 4 mm [0.16"]
- 2 = ø 6 mm [0.24"]

c Interface / Power supply

- 1 = SSI / 5 V DC

e Gray-Code

- 12 bit resolution

d Type of connection

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

Mounting accessory for shaft encoders

Order No.

Coupling

Bellows coupling ø 15 mm [0.59"] for shaft 4 mm [0.16"]

8.0000.1201.0404

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

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

Absolute Encoders - Singleturn

Miniature Magnetic	2450 / 2470 (Shaft / Hollow shaft)	SSI
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Technical data

Mechanical characteristics		
Speed		max. 12.000 min ⁻¹
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]
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 SSI Interface	
Sensor	
Power supply	5 (+0.4) V DC ¹⁾
Power consumption (no load)	< 40 mA
Reverse polarity protection of the power supply	yes
Measuring range	360°
Resolution / Code	12 bit / Gray
Linearity, 25°C [77°F]	< 1.5°
Repeat accuracy	≤ 0.4°
Data refresh rate	typ 100 µs
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC
SSI interface	
SSI clock speed	100 kHz ... 750 kHz
Output driver	RS485
Monoflop time typ / max.	16 µs / 20 µs
Short circuit proof output	yes ²⁾
Permissible load / channel	typ. 60 Ohm (acc. to RS485)

 Absolute Encoders
Singleturn

Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)							
		Signal:	0 V	+V	C+	C-	D+	D-	
1	1, 2	Cable colour:	WH	BN	GN	YE	GY	PK	

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

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

Absolute Encoders - Singleturn

**Miniature
Magnetic**

2450 / 2470 (Shaft / Hollow shaft)

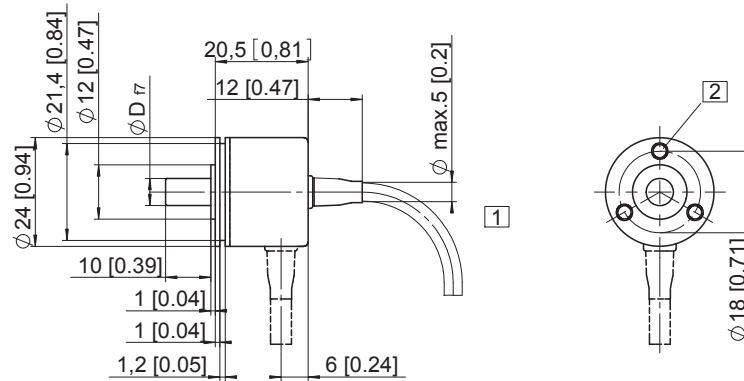
SSI

Dimensions shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

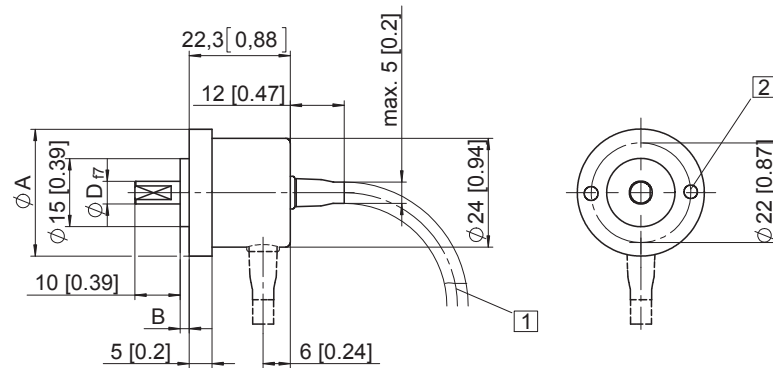
- 1 min R50 [1.97]
- 2 3 x M3, 4 [0.16] deep



Flange type 2, ø 30 [1.18]

Flange type 3, ø 28 [1.10]

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



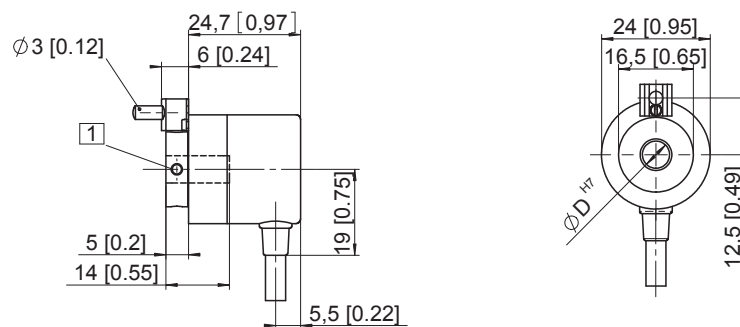
Flange type	A	B
2	ø 30 [1.18]	3 [0.12]
3	ø 28 [1.10]	2 [0.08]

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange type 1, ø 24 [0.94]

- 1 4 x M3 DIN 915 - SW1.5



Absolute Encoders - Singleturn

Compact Magnetic	Sendix 3650 / 3670 (Shaft / Hollow shaft)	SSI
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The Sendix 3650 and Sendix 3670 singleturn encoders with SSI interface and magnetic sensor technology boast a resolution of 9 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.



Absolute Encoders Singleturn

Safety-Lock™	High rotational speed	Temperature range -40°... +85°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Short-circuit proof	Reverse polarity protection	Magnetic sensor	Seawater-resistant version on request

Safe use

- Non-contact measurement system offers a long-service life, free of wear
- Rugged die-cast housing and protection up to IP69k for an exceptional tightness
- High resistance to shock and vibration for excellent durability

Compact and powerful

- Outer diameter of only 36 mm
- Hollow shaft version can accommodate a blind hollow shaft of up to 10 mm, which can be fixed individually via a torque stop pin or stator coupling
- 360° divided in 512 different positions

Order code	8.3650	Shaft version	Type	. 2 X 2 2 .	B9 X X	If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.	10 by 10			
a	<u>2</u> = synchro flange, ø 36 mm [1.42"]	b	<u>3</u> = ø 6 x 12.5 mm [0.24 x 0.49"] 5 = ø 1/4" x 12.5 mm [1/4" x 0.49"]	c	<u>2</u> = SSI / 5 ... 30 V DC			e	<u>B9</u> = 9 bit binary	g
d	<u>2</u> = radial cable, 1 m [3.28'] PUR	f	<u>1</u> = count direction cw ¹⁾ 2 = count direction ccw ²⁾	g	<u>1</u> = IP67 2 = IP69k					

Order code	8.3670	Hollow shaft	Type	. X X 2 2 .	B9 X X	If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.	10 by 10			
a	<u>2</u> = with spring element long <u>5</u> = with stator coupling ø 46 mm [1.77"]	b	<u>2</u> = ø 6 mm [0.24"] 4 = ø 8 mm [0.32"] 6 = ø 10 mm [0.39"] 3 = ø 1/4"	c	<u>2</u> = SSI / 5 ... 30 V DC			e	<u>B9</u> = 9 bit binary	g
d	<u>2</u> = radial cable, 1 m [3.28'] PUR	f	<u>1</u> = count direction cw ¹⁾ 2 = count direction ccw ²⁾							

1) cw = Increasing code values when shaft turning clockwise (cw). Top view on shaft.
2) ccw = Increasing code values when shaft turning counterclockwise (ccw). Top view on shaft.

Absolute Encoders - Singleturn

Compact Magnetic	Sendix 3650 / 3670 (Shaft / Hollow shaft)	SSI
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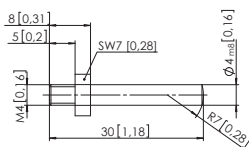
Mounting accessory for shaft encoders

Coupling	Bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	Order No. 8.0000.1101.0606
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Mounting accessory for hollow shaft encoders

Cylindrical pin, long	With fixing thread	8.0010.4700.0000
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for torque stops



Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional 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		6000 min ⁻¹
Starting torque – at 20°C [68°F]		< 0.06 Nm
Load capacity of shaft	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP67 / IP69k
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	cabel	PUR
Shock resistance acc. EN 60068-2-27		5000 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		300 m/s ² , 10 ... 2000 Hz
Permanent shock resistance acc. EN 60068-2-27		1000 m/s ² , 2 ms
Vibration (broad-band random) acc. EN 60068-2-64		5 ... 2500 Hz, 100 m/s ²

Electrical characteristics SSI interface		
Sensor		
Power supply		5 ... 30 V DC ¹⁾
Current consumption (no load)		max. 41 mA
Reverse polarity protection of the power supply		yes
Measuring range		360°
Resolution		9 bit / Binary (512 steps)
Linearity		< 1.0 %
Repeat accuracy, 25°C [77°F]		< 0.2 %
Status LED	green	reference point display turns ON at 2.1°
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC
SSI interface		
SSI clock rate		100 kHz ... 750 kHz
Output driver		RS485
Monoflop time	typ / max.	16 μ s / 20 μ s
Short circuit proof outputs		yes ²⁾
Permissible load / channel		typ. 120 Ohm (acc. to RS485)

Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)								
2	2	Signal:	0 V	+Vsens	0 Vsens	+V	C+	C-	D+	D-
		Cable colour:	WH	BN	BU	RD	GN	YE	GY	PK

+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

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

Absolute Encoders - Singleturn

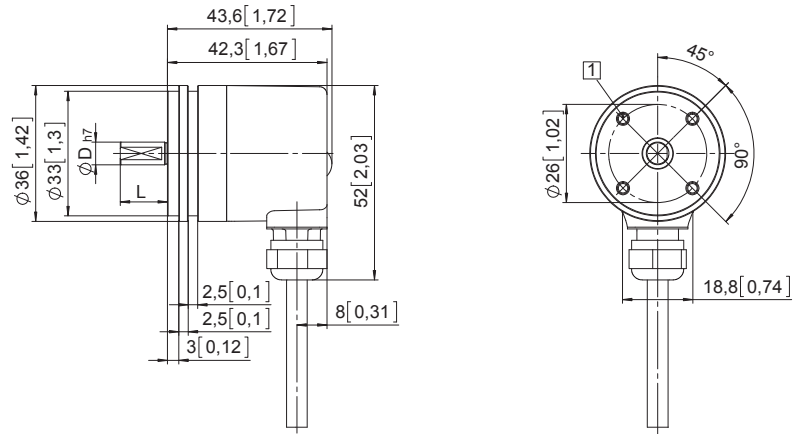
Compact Magnetic	Sendix 3650 / 3670 (Shaft / Hollow shaft)	SSI
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Dimensions shaft version

Dimensions in mm [inch]

Synchro flange, \varnothing 36 [1.42] Flange type 2

- 1 M3, 6 [0.24] deep



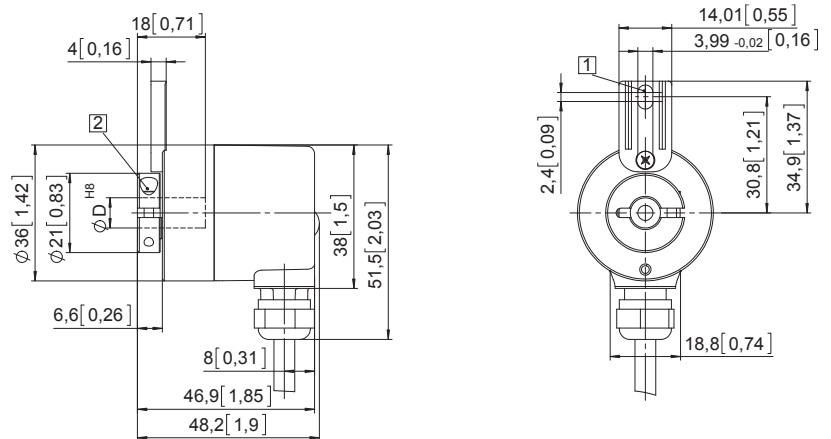
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
1/4"	12.5 [0.49]	h7

Dimensions hollow shaft version

Dimensions in mm [inch]

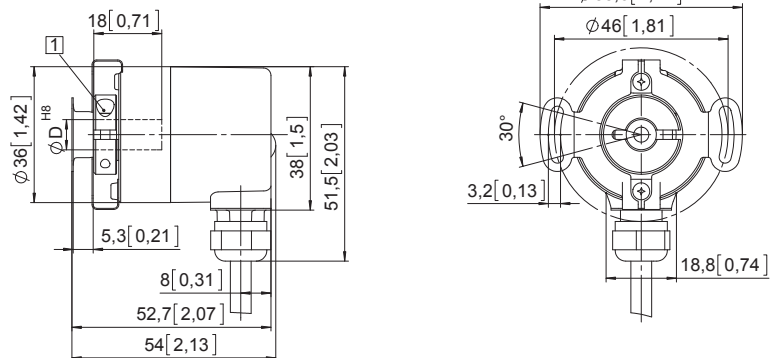
Flange with spring element long Flange type 2

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



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

- 1 Recommended torque for the
clamping ring 0.7 Nm



Absolute Encoders - Singleturn

**Compact
Magnetic**

Sendix 3651 / 3671 (Shaft / Hollow shaft)

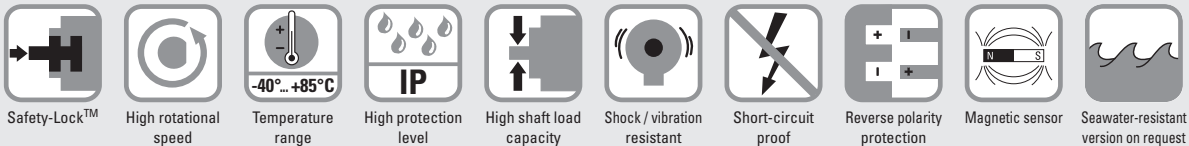
Analogue



Thanks to their different interfaces and measurement ranges, the Sendix 3651 and Sendix 3671 singleturn encoders with analogue interface, in shaft and hollow shaft versions, are particularly flexible in use. A green and a red LED, acting as reference point and fault indicators, ensure easy installation and troubleshooting.

Protected up to IP69k, resistance against shock and extreme temperature fluctuations, the Sendix are suitable even for demanding outdoor applications.

These encoders have an e1-approval from the German Federal Motor Transport Authority.



Safe operation

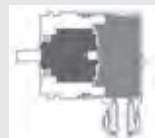
- Non-contact measuring system for long-life non-wear applications
- Rugged die-cast-housing and protection up to IP69k for an exceptional tightness
- High shock and vibration resistance for an exceptional robustness

Compact and effective

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

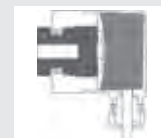
Safety-Lockplus™

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



Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly



Order code Shaft version

8.3651 . **2**X**X**X . X**X**X**X**
Type **a** **b** **c** **d** **e** **f** **g** **h**

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



a Flange

2 = synchro flange, ø 36 mm [1.42"]

b Shaft (ø x L), with flat

3 = ø 6 x 12.5 mm [0.24 x 0.49"]

6 = ø 8 x 12.5 mm [0.32 x 0.49"]

5 = ø 1/4" x 12.5 mm [0.49"]

c Output circuit ¹⁾

3 = current output

4 = voltage output

d Type of connection

1 = axial cable, 1 m [3.28'] PUR

2 = radial cable, 1 m [3.28'] PUR

3 = M12 connector, axial, 5-pin

4 = M12 connector, radial, 5-pin

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

e Measuring range

1 = 1 x 360°

2 = 1 x 180°

3 = 1 x 90°

4 = 1 x 45°

g Option 1

1 = count direction cw ²⁾

2 = count direction ccw ³⁾

h Option 2

1 = IP67

2 = IP69k

optional on request

- Ex 2/22

- seawater-resistant

- special cable length

1) Output circuit "3" only in conjunction with interface "3", Output circuit "4" only in conjunction with interface "4" or "5".

2) cw = Increasing code values when shaft turning clockwise (cw). Top view on shaft.

3) ccw = Increasing code values when shaft turning counterclockwise (ccw). Top view on shaft.

Absolute Encoders - Singleturn

Compact Magnetic	Sendix 3651 / 3671 (Shaft / Hollow shaft)	Analogue
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Order code	Hollow shaft	8.3671	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.		
a Flange 2 = with spring element long <u>5 = with stator coupling, ø 46 mm [1.81"]</u>	b Hollow shaft <u>2 = ø 6 mm [0.24"]</u> 4 = ø 8 mm [0.32"] 6 = ø 10 mm [0.39"] 3 = ø 1/4"	c Output circuit ¹⁾ <u>3 = current output</u> <u>4 = voltage output</u>	d Type of connection 1 = axial cable, 1 m [3.28'] PUR <u>2 = radial cable, 1 m [3.28'] PUR</u> 3 = M12 connector, axial, 5-pin 4 = M12 connector, radial, 5-pin	e Measuring range <u>1 = 1 x 360°</u> 2 = 1 x 180° 3 = 1 x 90° 4 = 1 x 45°			f Interface / Power supply <u>3 = 4 ... 20 mA / 10 ... 30 V DC</u> <u>4 = 0 ... 10 V / 15 ... 30 V DC</u> 5 = 0 ... 5 V / 10 ... 30 V DC

Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long	With fixing thread	8.0010.4700.0000
for torque stops		
Connection technology		
Connector, self-assembly (straight)	M12 female connector with coupling nut	8.0000.5116.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6081.2211.002M

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

Technical data		
Mechanical characteristics		
Max. speed		6000 min ⁻¹
Starting torque - at 20°C [68°F]		< 0.06 Nm
Load capacity of shaft	radial	40 N
	axial	20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9		IP67 / IP69k
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	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		
e1 compliant acc. to		EU guideline 2009/19/EC (acc. to EN 55025, ISO 11452 and ISO 7637)
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC

1) Output circuit "3" only in conjunction with interface "3", Output circuit "4" only in conjunction with interface "4" or "5".
 2) cw = Increasing code values when shaft turning clockwise (cw). Top view on shaft.
 3) ccw = Increasing code values when shaft turning counterclockwise (ccw). Top view on shaft.

Absolute Encoders - Singleturn

Compact Magnetic	Sendix 3651 / 3671 (Shaft / Hollow shaft)	Analogue
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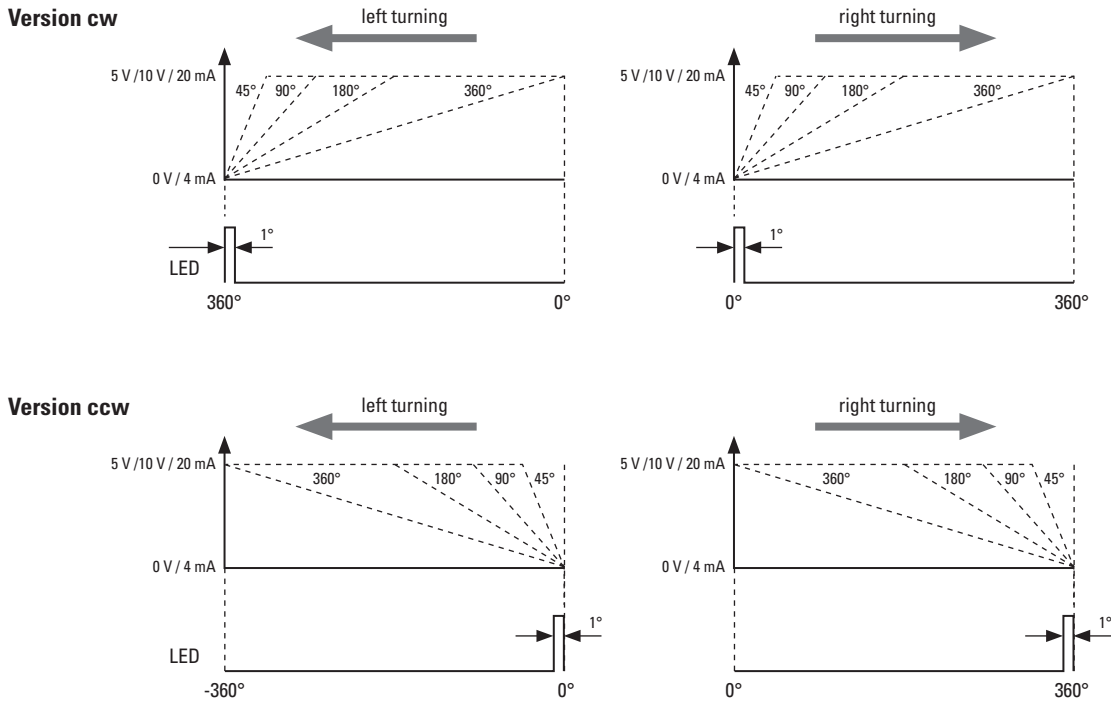
Electrical characteristics current interface 4 ... 20 mA									
Sensor									
Power supply	10 ... 30 V DC								
Current consumption (no load)	max. 38 mA								
Reverse polarity protection of the power supply	yes								
Measuring range	45°, 90°, 180° or 360°								
Resolution	12 bit								
Absolute accuracy, 25°C [77°F]	± 1°								
Repeat accuracy, 25°C [77°F]	± 0.2°								
Status LED	<table border="0"> <tr> <td style="padding-right: 20px;">red</td> <td>break in current loop, input load too high.</td> </tr> <tr> <td>green</td> <td>reference point display turns ON</td> </tr> <tr> <td></td> <td>at cw: betw. 0° and 1°</td> </tr> <tr> <td></td> <td>at ccw: betw. 0° and -1°</td> </tr> </table>	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°
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	<table border="0"> <tr> <td style="padding-right: 20px;">output 0 ... 5 V</td> <td>10 ... 30 V DC</td> </tr> <tr> <td>output 0 ... 10 V</td> <td>15 ... 30 V DC</td> </tr> </table>	output 0 ... 5 V	10 ... 30 V DC	output 0 ... 10 V	15 ... 30 V DC
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	<table border="0"> <tr> <td style="padding-right: 20px;">green</td> <td>reference point display turns ON</td> </tr> <tr> <td></td> <td>at cw: betw. 0° and 1°</td> </tr> <tr> <td></td> <td>at ccw: betw. 0° and -1°</td> </tr> </table>	green	reference point display turns ON		at cw: betw. 0° and 1°		at ccw: betw. 0° and -1°
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°



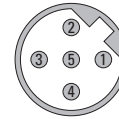
Absolute Encoders - Singleturn

Compact Magnetic	Sendix 3651 / 3671 (Shaft / Hollow shaft)	Analogue
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Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)
3 (current)	1, 2	Signal: 0 V +V +I -I
		Cable colour: WH BN GN YE
Interface	Type of connection	M12 connector, 5-pin
3 (current)	3, 4	Signal: 0 V +V +I -I
		Pin: 3 2 4 5
Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)
4, 5 (voltage)	1, 2	Signal: 0 V +V +U -U
		Cable colour: WH BN GN YE
Interface	Type of connection	M12 connector, 5-pin
4, 5 (voltage)	3, 4	Signal: 0 V +V +U -U
		Pin: 3 2 4 5

Top view of mating side, male contact base



M12 connector, 5-pin

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- +U / -U : Voltage + / Voltage -
- +I / -I : Current + / Current -

Dimensions shaft version

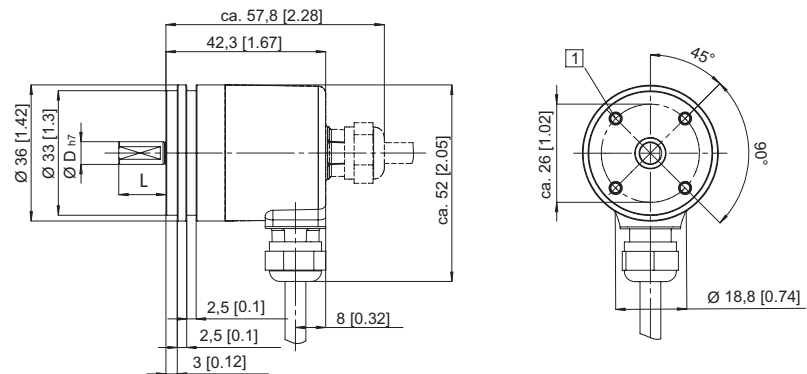
Dimensions in mm [inch]

Synchro flange, ø 36 [1.42]

Flange type 2

(Drawing with cable)

1 M3, 6 [0.24] deep



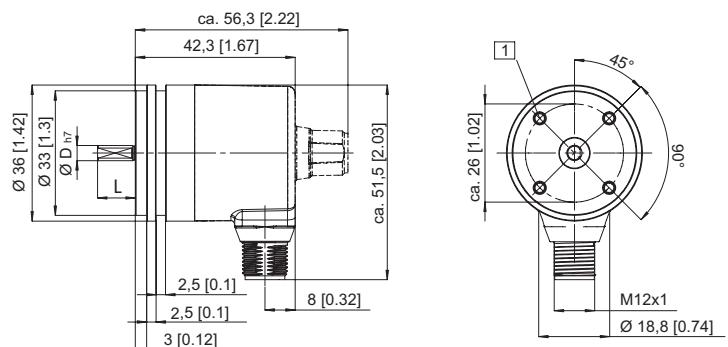
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	12.5 [0.49]	h7
1/4"	12.5 [0.49]	h7

Synchro flange, ø 36 [1.42]

Flange type 2

(Drawing with M12 connector)

1 M3, 6 [0.24] deep



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

Absolute Encoders - Singleturn

**Compact
Magnetic**

Sendix 3651 / 3671 (Shaft / Hollow shaft)

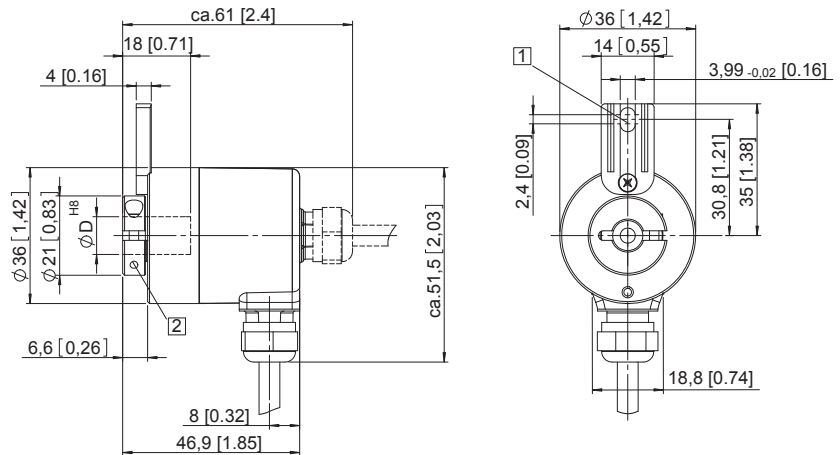
Analogue

Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element long Flange type 2

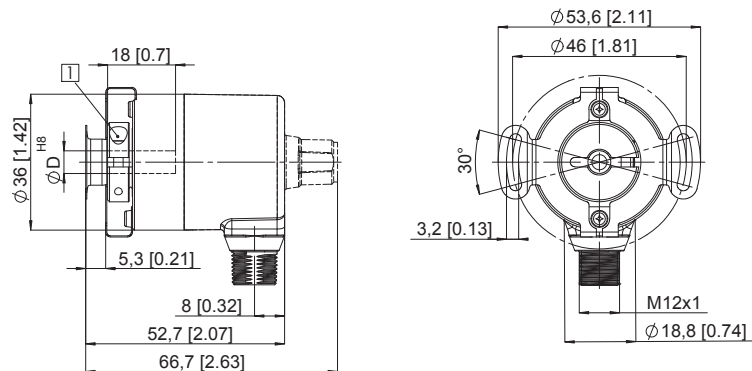
- 1 Torque stop slot,
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 Recommended torque for the
clamping ring 0.7 Nm



Flange with stator coupling, \varnothing 46 [1.81]

Flange type 5

- 1 Recommended torque for the
clamping ring 0.7 Nm



Absolute Encoders - Singleturn

Compact Magnetic	Sendix M3658 / M3678 (Shaft / Hollow shaft)	CANopen
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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.



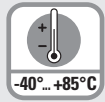
Absolute Encoders Singleturn



Safety-Lock™



High rotational speed



Temperature range
-40...+85°C



High protection level



High shaft load capacity



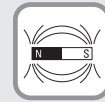
Shock / vibration resistant



Short-circuit proof



Reverse polarity protection



Magnetic sensor



Seawater-resistant version on request

Safe technology

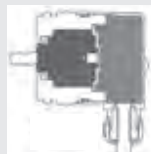
- Increased resistance against vibration and installation errors
- Sturdy bearing construction in Safety-Lock™ Design
- Resistant die-cast-housing and protection up to IP69k

Versatile applications

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

Safety-Lockplus™

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



Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly



Order code	8.M3658	2XCX	21	1X	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	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
4 = M12 connector, 5-pin, radial

e Fieldbus profile
21 = CANopen Encoderprofil DS406 V3.2

f Protection
1 = IP67
2 = IP69k
optional on request
- Ex 2/22
- seawater-resistant
- special cable length

Order code	8.M3678	XXCX	21	1X	If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.	
Hollow shaft	Type	a b c d	e	f		

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

b Hollow shaft
2 = ø 6 mm [0.24"]
4 = ø 8 mm [0.32"]
6 = ø 10 mm [0.39"]
3 = ø 1/4"

c Interface / Power supply
C = CANopen DS301 V4.02 / 8 ... 30 V DC

d Type of connection
2 = radial cable, 1 m [3.28] PUR
4 = M12 connector, 5-pin, radial

e Fieldbus profile
21 = CANopen Encoderprofil DS406 V3.2

f Protection
1 = IP67
2 = IP69k
optional on request
- Ex 2/22
- seawater-resistant
- special cable length

Absolute Encoders - Singleturn

Compact Magnetic	Sendix M3658 / M3678 (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 6 mm [0.24"]	8.0000.1101.0606
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Mounting accessory for hollow shaft encoders	Order No.
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Cylindrical pin, long for torque stops		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	8.0000.5116.0000
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Cordset, pre-assembled	M12 female connector with coupling nut, 6 m [19.69'] PVC cable	05.00.6091.A211.006M
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Programming set	Order No.
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Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0015
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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	
Max. speed	6000 min ⁻¹
Starting torque - at 20°C [68°F]	< 0.06 Nm
Load capacity of shaft	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9	IP67 / IP69k
EX approval for hazardous areas	optional Zone 2 and 22
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Material	shaft/hollow shaft stainless steel flange aluminium housing zinc die-cast housing cable PUR
Shock resistance acc. EN 60068-2-27	5000 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz
Permanent shock resistance acc. EN 60068-2-27	1000 m/s ² , 2 ms
Vibration (broad-band random) acc. EN 60068-2-64	5 ... 2500 Hz, 100 m/s ² - rms

Interface characteristics CANopen	
Resolution	1 ... 16384 (14 bit), (scaleable: 1 ... 16384)
Default value	16384 (14 bit)
Code	Binary
Interface	CAN High-Speed according to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
Protocol	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

Electrical characteristics	
Power supply	8 ... 30 V DC
Current consumption (no load)	max. 25 mA
Reverse polarity protection of the power supply (+V)	yes
Measuring range	360°
Absolute accuracy, 25°C [77°F]	± 1°
Repeat accuracy, 25°C [77°F]	± 0.2°
Data refresh rate	400 µs
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Diagnostic LED (two-colour, red/green)	
LED ON or blinking	
red	Error display
green	Status display

Absolute Encoders - Singleturn

**Compact
Magnetic**

Sendix M3658 / M3678 (Shaft / Hollow shaft) CANopen

General information about CANopen

The CANopen encoders of the M3658 and M3678 series 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. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus.

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

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

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

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

The two colour LED located on the back indicates the operating or fault status of the CANbus, as well as the status of the internal diagnostics.

CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated.

Class C2 functionality:

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

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

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

LSS Protocol Profile DS305 V2.0

- Global support of Node-ID and baud rate
- 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 .

$L_u < 5$ m [16.40'] cable length for 125 Kbit

$L_u < 2$ m [6.56'] cable length for 250 Kbit

$L_u < 1$ m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

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

Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)					
C	2	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable colour:	BN	WH	GY	GN	YE
Interface	Type of connection	M12 connector					
C	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

Absolute Encoders - Singleturn

Compact Magnetic

Sendix M3658 / M3678 (Shaft / Hollow shaft) CANopen

Dimensions shaft version

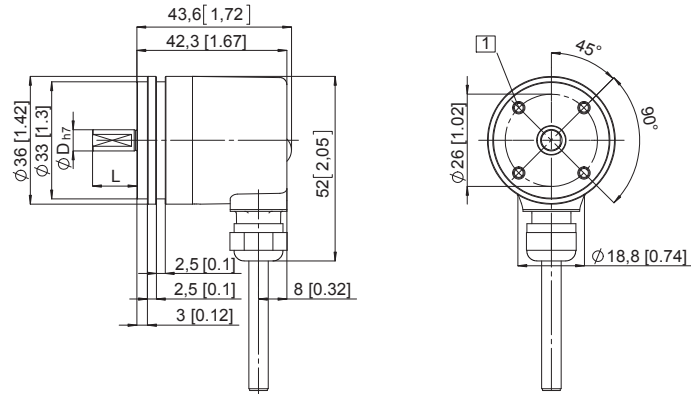
Dimensions in mm [inch]

Synchro flange, \varnothing 36 [1.42]

Flange type 2

(Drawing with cable)

- 1 4 x M3, 6 [0.24] deep

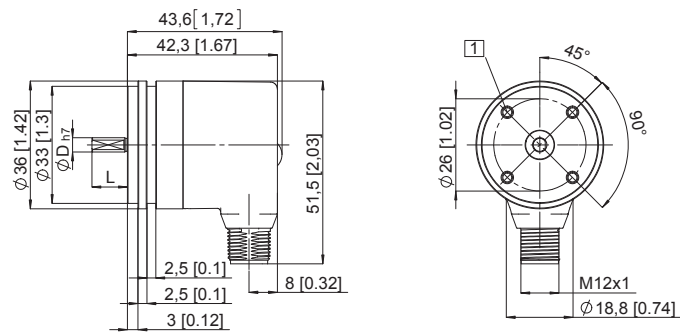


Synchro flange, \varnothing 36 [1.42]

Flange type 2

(Drawing with M12 connector)

- 1 4 x M3, 6 [0.24] deep



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

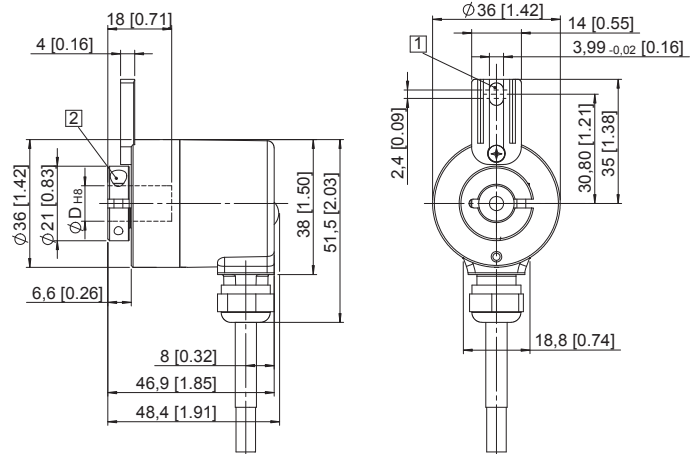
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element long

Flange type 2

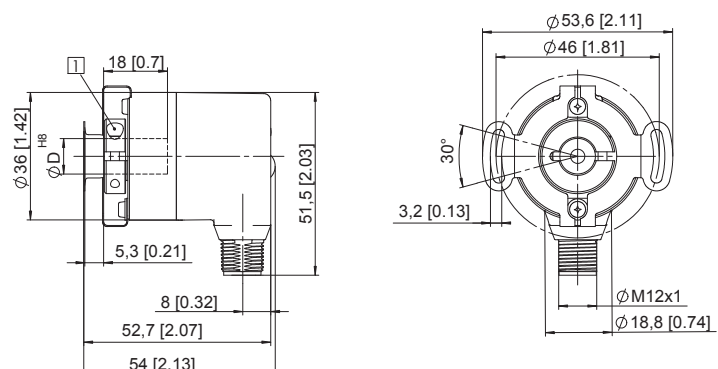
- 1 Torque stop slot, Recommendation: Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 Recommended torque for the clamping ring 0.7 Nm



Flange with stator coupling, \varnothing 46 [1.81]

Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm



Absolute Encoders - Singleturn

**Compact
Magnetic**

Sendix M3658 / M3678 (Shaft / Hollow shaft) SAE J1939



The absolute Sendix encoders M3658 and M3678 with SAE J1939 interface support all common requirements of the special protocol for utility vehicles and make a considerable contribution to the comprehensive system diagnostics or to fast fault localisation.

The encoders offer fast, error-free start-up with no need to set switches; the encoder address is assigned automatically via Address Claiming (ACL).



SAE J1939



Safety-Lock™
(Shaft)



High rotational
speed



Temperature
range
-40... +85°C



High protection
level
IP



High shaft load
capacity



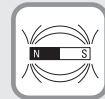
Shock / vibration
resistant



Short-circuit
proof



Reverse polarity
protection



Magnetic sensor



Seawater-resistant
version on request

Safe technology

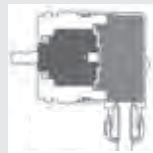
- Increased resistance against vibration and installation errors
- Sturdy bearing construction in Safety Lock™ Design
- Resistant die cast housing and protection up to IP69k

Versatile applications

- Up-to-the-minute Fieldbus performance in the application: SAE J1939 with CAN-Highspeed to ISO 11898
- Fast determination of the operating status via two-colour LED
- Fast, error-free start up with no need to set switches; with automatic Address Claiming (ACL)

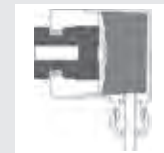
Safety-Lockplus™

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



Sensor-Protect™

Fully encapsulated electronics, separate mechanical bearing assembly



Order code
Shaft version

8.M3658 . **2XCX** . **321X**
Type

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

10 by 10

a Flange
2 = synchro flange, ø 36 mm [1.42"]

c Interface / Power supply
C = CAN Highspeed / 8 ... 30 V DC

e Fieldbus profile
32 = J1939 optional on request
- Ex 2/22
- seawater-resistant
- special cable length

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"]

d Type of connection
2 = radial cable, 1 m [3.28] PUR
4 = M12 connector, 5-pin, radial

f Protection
1 = IP67
2 = IP69k

Order code
Hollow shaft

8.M3678 . **XXCX** . **321X**
Type

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

10 by 10

a Flange
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

e Fieldbus profile
32 = J1939 optional on request
- Ex 2/22
- seawater-resistant
- special cable length

b Hollow shaft
2 = ø 6 mm [0.24"]
4 = ø 8 mm [0.32"]
6 = ø 10 mm [0.39"]
3 = ø 1/4"

d Type of connection
2 = radial cable, 1 m [3.28] PUR
4 = M12 connector, 5-pin, radial

f Protection
1 = IP67
2 = IP69k

Absolute Encoders - Singleturn

Compact Magnetic	Sendix M3658 / M3678 (Shaft / Hollow shaft)	SAE J1939
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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 6 mm [0.24"]	8.0000.1101.0606
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Mounting accessory for hollow shaft encoders	Order No.
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Cylindrical pin, long for torque stops		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	8.0000.5116.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 6 m [19.69'] PVC cable	05.00.6091.A211.006M

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

Technical data

Mechanical characteristics	
Max. speed	6000 min ⁻¹
Starting torque - at 20°C [68°F]	< 0.06 Nm
Load capacity of shaft	radial 40 N axial 20 N
Weight	approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529/DIN 40050-9	IP67 / IP69k
EX approval for hazardous areas	optional Zone 2 and 22
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Material	shaft/hollow shaft stainless steel flange aluminium housing zinc die-cast housing cable PUR
Shock resistance acc. EN 60068-2-27	5000 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6	300 m/s ² , 10 ... 2000 Hz
Permanent shock resistance acc. EN 60068-2-27	1000 m/s ² , 2 ms
Vibration (broad-band random) acc. EN 60068-2-64	5 ... 2500 Hz, 100 m/s ² - rms

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

Diagnostic LED (two-colour, red/green)	
LED ON or blinking	
red	Error display
green	Status display

Electrical characteristics	
Power supply	8 ... 30 V DC
Current consumption (no load)	max. 25 mA
Reverse polarity protection of the power supply (+V)	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 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Absolute Encoders - Singleturn

Compact Magnetic	Sendix M3658 / M3678 (Shaft / Hollow shaft)	SAE J1939
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General Information concerning SAE J1939

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

This protocol is a multimaster system with decentralised network management that does not involve channel-based communication.

It supports up to 254 logic nodes and 30 physical control devices per segment. The information is described as Parameters (signals) and combined on 4 memory pages (Data Pages) into Parameter Groups (PGs). Each Parameter Group can be identified via a unique number, the Parameter Group Number (PGN). Independently of this, each signal is assigned a unique SPN (Suspect Parameter Number).

The major part of the communication occurs cyclically and can be received by all control devices without the explicit request for data (Broadcast). Furthermore the Parameter Groups are optimised to a length of 8 data bytes. This enables very efficient utilization of the CAN protocol. If greater amounts of data need to be transferred, then transport protocols (TP) can be used: BAM (Broadcast Announce Message) and CMTD (Connection Mode Data Transfer). With BAM TP the transfer of data occurs as a broadcast.

Encoder Implementation SAE J1939

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

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



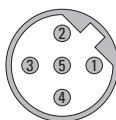
Absolute Encoders Singleturn

Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)					
C	2	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Cable colour:	BN	WH	GY	GN	YE

Interface	Type of connection	M12 connector					
C	4	Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
		Pin:	2	3	1	4	5

Top view of mating side, male contact base



M12 connector, 5-pin

Absolute Encoders - Singleturn

Compact Magnetic

Sendix M3658 / M3678 (Shaft / Hollow shaft) SAE J1939

Dimensions shaft version

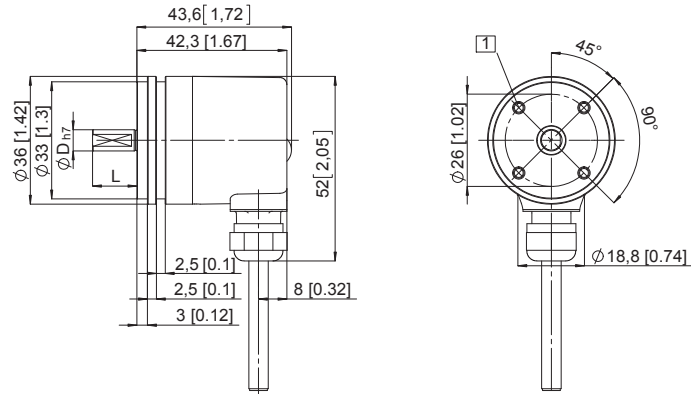
Dimensions in mm [inch]

Synchro flange, \varnothing 36 [1.42]

Flange type 2

(Drawing with cable)

- 1 4 x M3, 6 [0.24] deep

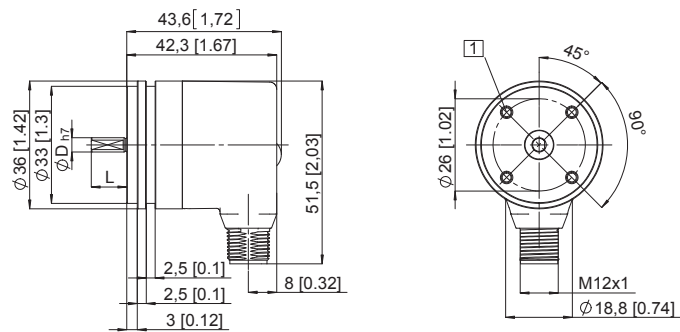


Synchro flange, \varnothing 36 [1.42]

Flange type 2

(Drawing with M12 connector)

- 1 4 x M3, 6 [0.24] deep



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

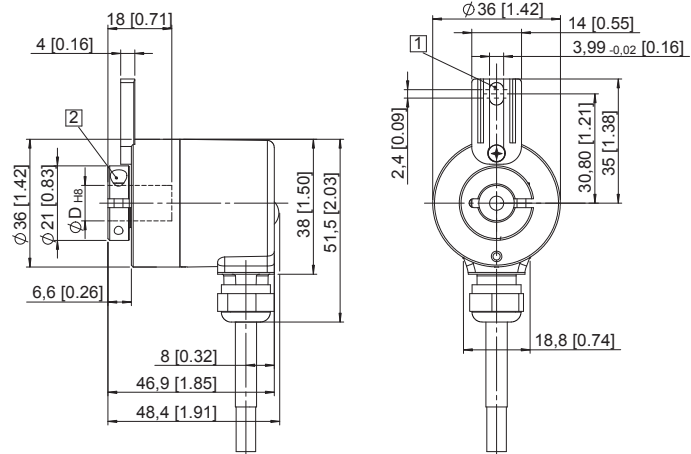
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element long

Flange type 2

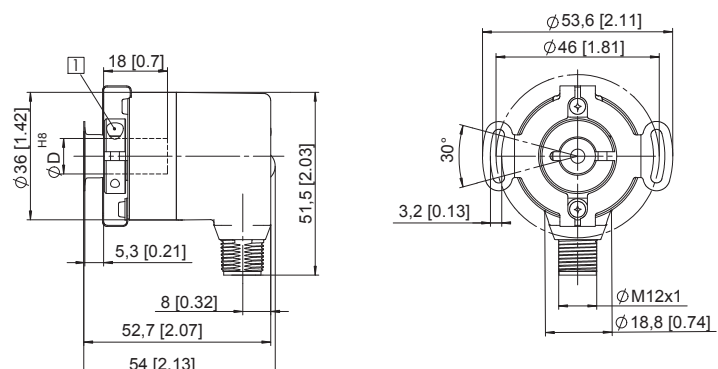
- 1 Torque stop slot, Recommendation: Cylindrical pin DIN 7, \varnothing 4 [0.16]
 2 Recommended torque for the clamping ring 0.7 Nm



Flange with stator coupling, \varnothing 46 [1.81]

Flange type 5

- 1 Recommended torque for the clamping ring 0.7 Nm



Absolute Encoders - Singleturn

Compact Optical	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C
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The Sendix F36 singleturn with the patented Intelligent Scan Technology™ and SSI or BiSS-C 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.



Absolute Encoders Singleturn

Safety-Lock™	Temperature range -40°...+90°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Short-circuit proof	Reverse polarity protection	SinCos	Optical sensor	Seawater-resistant version on request

Reliable and magnetically insensitive

- Sturdy bearing construction in Safety-Lock™ Design for resistance against vibration and installation errors
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +90°C
- Patented Intelligent Scan Technology™ with all singleturn and multiturn functions on one single OptoASIC - offering highest reliability, a high resolution up to 17 bits and 100% magnetic field insensitiveness

Optimised performance

- High-precision with a data refresh rate of the position value $\leq 1\mu s$
- 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-C up to 10 MHz

Order code	8.F3653	.XXXX.XX12	If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.
Shaft version	Type	a b c d e f	
a Flange	c Interface / Power supply	e Code	
1 = clamping flange, IP67, \varnothing 36 mm [1.42"]	1 = SSI or BiSS-C / 5 V DC	B = SSI, Binary	
3 = clamping flange, IP65, \varnothing 36 mm [1.42"]	2 = SSI or BiSS-C / 10 ... 30 V DC	C = BiSS-C, Binary	
2 = synchro flange, IP67, \varnothing 36 mm [1.42"]	3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC	G = SSI, Gray	
4 = synchro flange, IP65, \varnothing 36 mm [1.42"]	4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC	f Resolution	
b Shaft ($\varnothing \times L$), with flat	5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC	A = 10 bit ST	
1 = \varnothing 6 x 12.5 mm [0.24 x 0.49"]	6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC	2 = 12 bit ST	
3 = \varnothing 8 x 15 mm [0.32 x 0.59"]	7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC	3 = 13 bit ST	
5 = \varnothing 10 x 20 mm [0.39 x 0.79"]	8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC	4 = 14 bit ST	
2 = \varnothing 1/4" x 12.5 mm [0.49"]	d Type of connection	7 = 17 bit ST	
4 = \varnothing 3/8" x 5/8"	1 = cable, tangential, 1 m [3.28] PUR	optional on request	
	3 = cable tangential, 5 m [16.40] PUR	- Ex 2/22	
	8 = M12 connector, 8-pin, axial ¹⁾	- seawater-resistant	
		- special cable length	

1) Only with output circuits 1 and 2

Absolute Encoders - Singleturn

Compact Optical	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C
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Order code	Hollow shaft	8.F3673	.XXXXX	.XX12	<p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p>	
	Type		a b c d e f			
a Flange	1 = with spring element short, IP65 3 = with spring element long, IP65 <u>2 = with stator coupling, IP65, ø 46 mm [1.81"]</u>	c Interface / Power supply	1 = SSI or BiSS-C / 5 V DC <u>2 = SSI or BiSS-C / 10 ... 30 V DC</u> 3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC 4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC 5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC 6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC 7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC 8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC	e Code	B = SSI, Binary C = BiSS-C, Binary <u>G = SSI, Gray</u>	
b Hollow shaft	1 = ø 6 mm [0.24"] 3 = ø 8 mm [0.32"] <u>4 = ø 10 mm [0.39"], blind hollow shaft</u> 2 = ø 1/4"	d Type of connection	<u>1 = cable, tangential, 1 m [3.28'] PUR</u> 3 = cable tangential, 5 m [16.40'] PUR 8 = M12 connector, 8-pin, axial ¹⁾	f Resolution	A = 10 bit ST 2 = 12 bit ST <u>3 = 13 bit ST</u> 4 = 14 bit ST 7 = 17 bit ST	
					optional on request - Ex 2/22 - seawater-resistant - special cable length	

Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long	With fixing thread	8.0010.4700.0000
for torque stops		
Connection technology		
Connector, self-assembly (straight)	M12 female connector with coupling nut (suitable for connection type 8)	05.CMB 8181-0
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable (suitable for connection type 8)	05.00.6041.8211.002M

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

Technical data		
Mechanical characteristics		
Maximum speed		
Shaft- or blind hollow shaft version without shaft seal (IP65)	12 000 min ⁻¹ 10 000 min ⁻¹ (continuous)	
Shaft version (IP67) or hollow shaft version (IP65) with shaft seal	10 000 min ⁻¹ 8 000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]	without shaft seal < 0.007 Nm with shaft seal (IP67) < 0.01 Nm	
Load capacity of shaft	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)	
EX approval for hazardous areas	optional Zone 2 and 22	
Working temperature range	-40°C ... +90°C [-40°F ... +194°F]	
Material	shaft / hollow shaft stainless steel flange aluminium housing zinc die-cast cable PUR	
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz	

1) Only with interfaces 1 and 2 in combination with blind hollow shaft 10 mm [0.39"]

Absolute Encoders - Singleturn

Compact Optical	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C
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Electrical characteristics	
Power supply	5 V DC \pm 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 60 mA 10 ... 30 V DC max. 30 mA
Reverse polarity protection of the power supply	yes (only with 10 ... 30 V DC)
Short-circuit proof outputs	yes ¹⁾
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

SSI interface	
Output driver	RS485 transceiver type
Permissible load/channel	max. \pm 30 mA
Signal level	HIGH typ 3.8 V LOW with $I_{Load} = 20$ mA typ 1.3 V
Resolution, singleturn	10 ... 17 bit
Code	Binary or Gray
SSI clock rate	resolution \leq 14 bit 50 kHz ... 2 MHz resolution \geq 15 bit 50 kHz ... 125 kHz
Monoflop time	\leq 15 μ s
Note:	If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.
Data refresh rate	resolution \leq 14 bit \leq 1 μ s resolution \geq 15 bit 4 μ s
Status and parity bit	on request

BiSS-C interface	
Resolution, singleturn	10 ... 17 bit
Code	Binary
BiSS-C clock rate	up to 10 MHz
Max. update rate	$<$ 10 μ s, depends on the clock rate and the data length
Data refresh rate	\leq 1 μ s
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

Incremental outputs (A/B), 2048 ppr		
	SinCos	RS422 TTL-compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (\pm 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes ¹⁾	yes ¹⁾

SET input	
Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V
Input current	$<$ 0.5 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-C. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. The SET function should be carried out whilst the encoder is at rest.

DIR input	
A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.	
Response time (DIR input)	1 ms

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.	

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.	

Absolute Encoders Singleturn

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-C
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Terminal assignment

Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
1, 2	1, 3	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat \perp
			Cable colour: WH BN GN YE GY PK BU RD VT Shield
1, 2	8	SET, DIR	M12 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR \perp
3, 4	1, 3	SET, DIR, 2048 SinCos	M12 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
5	1, 3	SET, DIR, Sensor output	M12 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR 0 Vsens +Vsens \perp
6	1, 3	2048 SinCos, Sensor output	M12 connector
			Signal: 0 V +V C+ C- D+ D- 0 Vsens +Vsens A \bar{A} B \bar{B} \perp
7, 8	1, 3	2048 incr. RS422	M12 connector
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} \perp
			Cable (Isolate unused wires individually before initial start-up)
			Cable colour: WH BN GN YE GY PK BK VT GY-PK RD-BU Shield

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

Top view of mating side, male contact base



M12 connector, 8-pin

Absolute Encoders - Singleturn

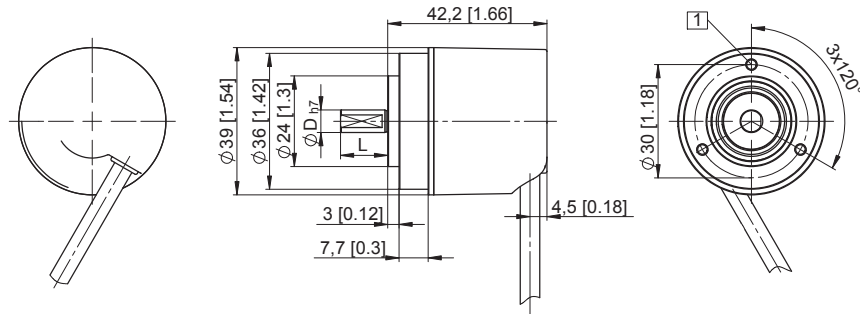
Compact Optical	Sendix F3653 / F3673 (Shaft / Hollow shaft)	SSI / BiSS-C
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Dimensions shaft version

Dimensions in mm [inch]

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

1 3 x M3, 6 [0.24] deep

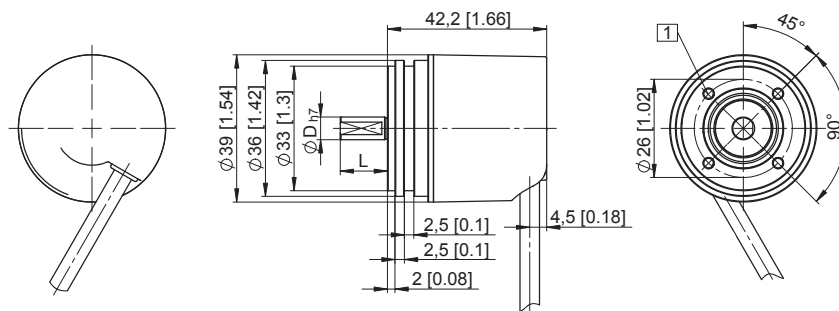


D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

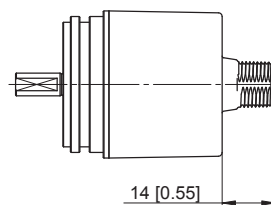
Synchro flange, \varnothing 36 [1.42]

Flange type 2 and 4
 (Drawing with cable)

1 3 x M3, 6 [0.24] deep



Drawing with M12 connector
 Type of connection 8



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

Absolute Encoders - Singleturn

**Compact
Optical**

Sendix F3653 / F3673 (Shaft / Hollow shaft)

SSI / BiSS-C

Dimensions hollow shaft version

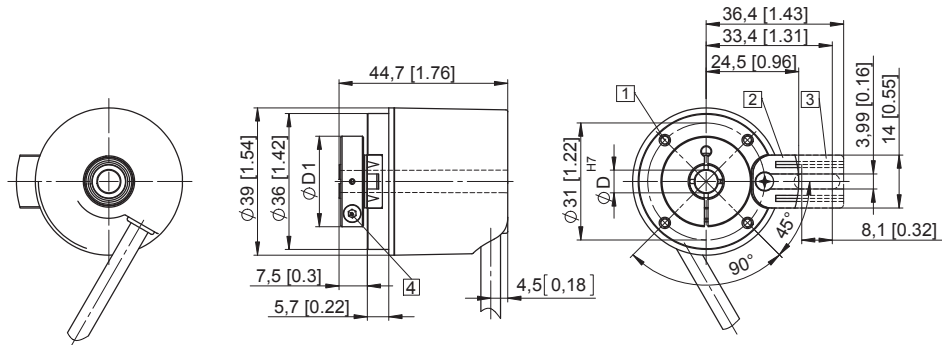
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

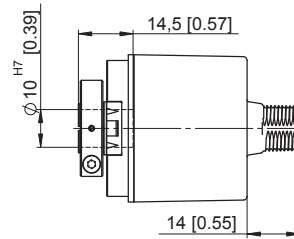
(Drawing with spring element short, spring element long is shown dashed)

- 1 M2.5, 5 [0.2] deep
- 2 Spring element short
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Spring element long
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 4 Recommended torque for the clamping ring 0.7 Nm



Drawing with M12 connector
Type of connection 8

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

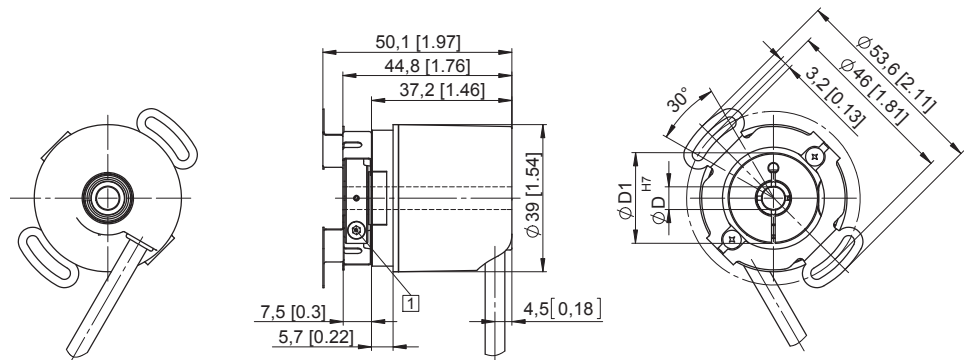


Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, \varnothing 46 [1.81]

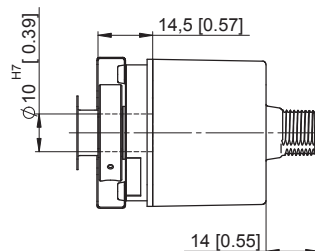
Flange type 2

- 1 Recommended torque for the clamping ring 0.7 Nm



Drawing with M12 connector
Type of connection 8

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



Insertion depth for blind hollow shaft 14.5 [0.57]

Absolute Encoders - Singleturn

Compact Optical	Sendix F3658 / F3678 (Shaft / Hollow shaft)	CANopen
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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.



Absolute Encoders Singleturn

Safety-Lock™	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	Seawater-resistant version on request

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 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

Order code	8.F3658	.XX2X	.2112	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 b c d e		

- a Flange**
- 1 = clamping flange, IP67, ø 36 mm [1.42"]
 - 3 = clamping flange, IP65, ø 36 mm [1.42"]
 - 2 = synchro flange, IP67, ø 36 mm [1.42"]
 - 4 = synchro flange, IP65, ø 36 mm [1.42"]
- b Shaft (ø x L), with flat**
- 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
 - 3 = ø 8 x 15 mm [0.32 x 0.49"]
 - 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 = cable, tangential, 1 m [3.28'] PUR
 - 3 = cable, tangential, 5 m [16.40'] PUR
- e Fieldbus profile**
- 21 = CANopen Encoderprofil DS406 V3.2

- optional on request
- Ex 2/22
 - seawater-resistant
 - special cable length

Order code	8.F3678	.XX2X	.2112	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 b c d e		

- a Flange**
- 1 = with spring element short, IP65
 - 3 = with spring element long, IP65
 - 2 = with stator coupling, IP65, ø 46 mm [1.81"]
- b Blind hollow shaft**
- 5 = ø 6 mm [0.24"]
 - 7 = ø 8 mm [0.32"]
 - 4 = ø 10 mm [0.39"]
 - 6 = ø 1/4"

- c Interface / Power supply**
- 2 = CANopen DS301 V4.02 / 10 ... 30 V DC
- d Type of connection**
- 1 = cable, tangential, 1 m [3.28'] PUR
 - 3 = cable, tangential, 5 m [16.40'] PUR
- e Fieldbus profile**
- 21 = CANopen Encoderprofil DS406 V3.2

- optional on request
- Ex 2/22
 - seawater-resistant
 - special cable length

Absolute Encoders - Singleturn

Compact Optical	Sendix F3658 / F3678 (Shaft / Hollow shaft)	CANopen
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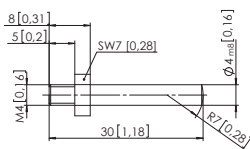
Mounting accessory for shaft encoders	Order No.
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Coupling	Bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0808
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Mounting accessory for hollow shaft encoders	Order No.
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Cylindrical pin, long	With fixing thread	8.0010.4700.0000
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for torque stops



Programming set	Order No.
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Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0015
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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)		12 000 min ⁻¹ 10 000 min ⁻¹ (continuous)
Shaft version (IP67) or hollow shaft version (IP65) with shaft seal		10 000 min ⁻¹ 8 000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	without shaft seal with shaft seal (IP67)	< 0.007 Nm < 0.01 Nm
Load capacity of shaft	radial axial	40 N 20 N
Weight		approx. 0.2 kg [7.06 oz]
Protection acc. to EN 60529	housing side shaft side	IP67 IP65 (solid shaft version opt. IP67)
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	shaft / hollow shaft flange housing cable	stainless steel aluminium zinc die-cast PUR
Shock resistance acc. to EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 80 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics CANopen	
Resolution Singleturn	1 ... 65536 (16 bit) scaleable: 1 ... 65536
Default value Singleturn	8192 (13 bit)
Code	Binary
Interface	CAN High-Speed according to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
Protocol	CANopen profile 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

Diagnostic LED (two-colour, red/green)		
LED ON or blinking	red	Error display
	green	Status display

Absolute Encoders - Singleturn

Compact Optical	Sendix F3658 / F3678 (Shaft / Hollow shaft)	CANopen
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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-colour LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated. Class C2 functionality:

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

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

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

LSS Layer Setting Services DS305 V2.0

- Global support of Node-ID and baud rate
- 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 .

$L_u < 5$ m [16.40'] cable length for 125 Kbit

$L_u < 2$ m [6.56'] cable length for 250 Kbit

$L_u < 1$ 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.

 Absolute Encoders
Singleturn

Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	1, 3	Cable colour:	BN	WH	GY	GN	YE

Absolute Encoders - Singleturn

**Compact
Optical**

Sendix F3658 / F3678 (Shaft / Hollow shaft)

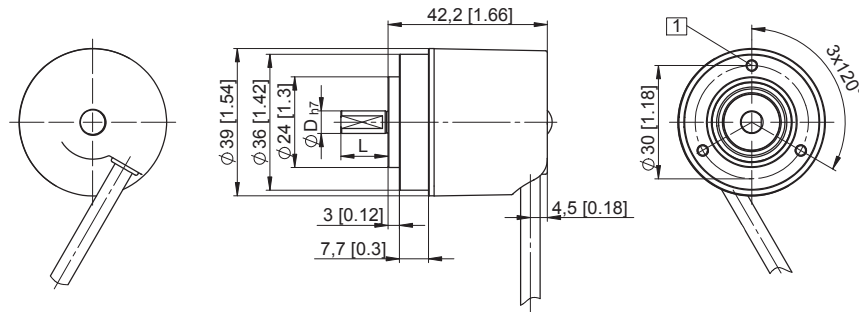
CANopen

Dimensions shaft version

Dimensions in mm [inch]

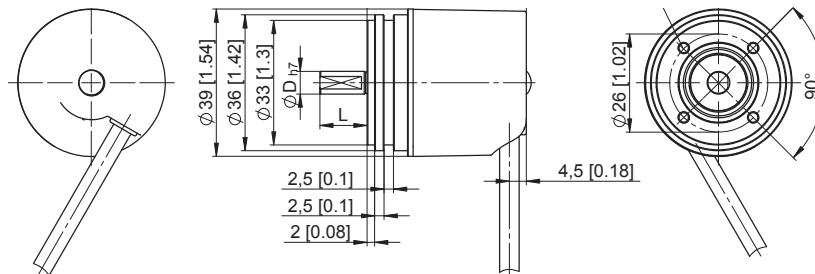
Clamping flange, $\varnothing 36$ [1.42] Flange type 1 and 3

- 1 M3, 6 [0.24] deep



Synchro flange, $\varnothing 36$ [1.42] Flange type 2 and 4

- 1 M3, 6 [0.24] deep



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

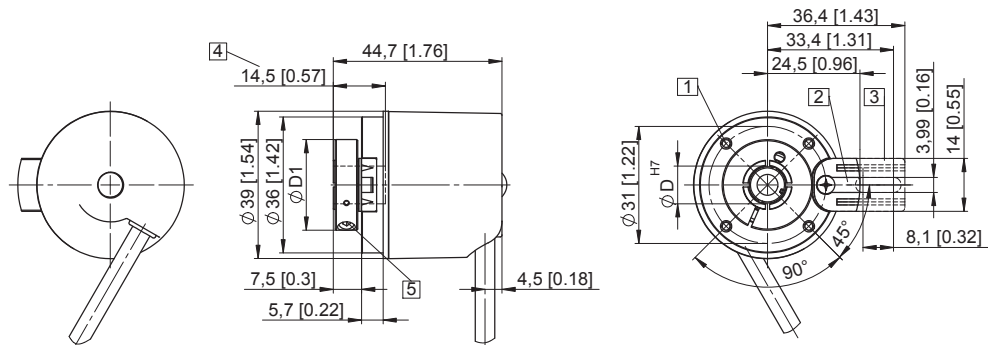
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element Flange type 1 and 3

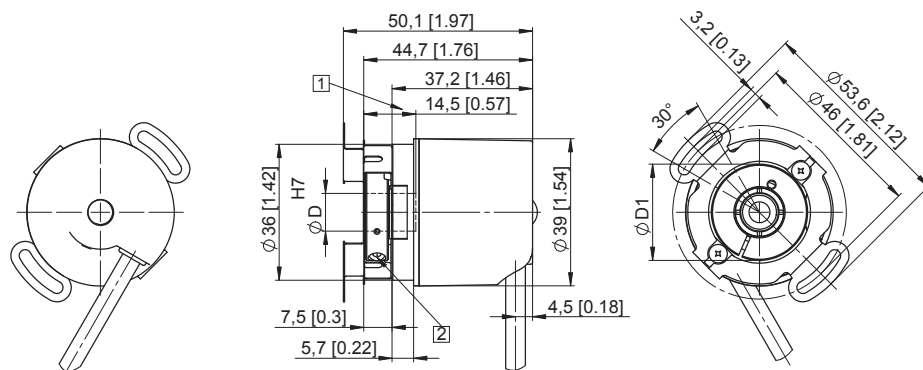
(Drawing with spring element short, spring element long is shown dashed)

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



Flange with stator coupling, $\varnothing 46$ [1.81"] Flange type 2

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



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

Absolute Encoders - Singleturn

Standard Optical	5850 / 5870 (Shaft / Hollow shaft)	Parallel / Analogue
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The singleturn encoders 5850 and 5870 with parallel or analogue interface and optical sensor technology feature a refresh rate of the position data of 1.6 kHz.

With the parallel output a resolution of max. 14 bit can be achieved – with the analogue output the 4 ... 20 mA signals can achieve a resolution of 13 bits.



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

Adaptable

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

Robust

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

Absolute Encoders
Singleturn

Order code	8.5850	.XXXXX	.XXXXX				
Shaft version	Type	a	b	c	d	e	f

a Flange

1 = clamping flange, ø 58 mm [2.28"]

2 = synchro flange, ø 58 mm [2.28"]

b Shaft (ø x L), with flat

1 = 6 x 10 mm [0.24 x 0.39"]

2 = 10 x 20 mm [0.39 x 0.79"]

c Interface / Power supply

3 = Parallel / 5 V DC

4 = Parallel / 10 ... 30 V DC

7 = 4 ... 20 mA / 5 V DC

8 = 4 ... 20 mA / 10 ... 30 V DC

d Type of connection

1 = axial cable, 1 m [3.28'] PVC

2 = radial cable, 1 m [3.28'] PVC

3 = M23 connector, axial, without mating connector

5 = M23 connector, radial, without mating connector

e Code type and division

G13 = 13 bit (for interface 7 and 8, 4 ... 20 mA) see table 1 (for interface 3 and 4, Parallel)

f Options

2 = SET ¹⁾ and V/R

3 = SET and Latch ¹⁾

4 = V/R ¹⁾ and Latch

Order code	8.5870	.XXXXX	.XXXXX				
Hollow shaft	Type	a	b	c	d	e	f

a Flange

1 = hollow shaft with spring element short

2 = blind hollow shaft with spring element short

3 = hollow shaft mit stator coupling, ø 65 mm [2.56"]

4 = blind hollow shaft with stator coupling, ø 65 mm [2.56"]

b Hollow shaft

6 = ø 10 mm [0.39"]

8 = ø 12 mm [0.47"]

c Interface / Power supply

3 = Parallel / 5 V DC

4 = Parallel / 10 ... 30 V DC

d Type of connection

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

2 = M23 connector, radial, without mating connector

e Code type and division

see table 1 (for interface 3 and 4, Parallel)

f Options

2 = SET ¹⁾ and V/R

3 = SET and Latch ¹⁾

4 = V/R and Latch ¹⁾

1) For parallel version, 14 bit and 17 pin connector

Absolute Encoders - Singleturn

Standard Optical	5850 / 5870 (Shaft / Hollow shaft)	Parallel / Analogue
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Table 1: Code type and divisions for encoders with parallel output										Interface and power supply, version 3 or 4 (parallel)										
Division	250	360	500	720	900	1000	1024 10 bit	1250	1440	1800	2000	2500	2880	3600	4000	4096 12 bit	5000	7200	8192 13 bit	16384 14 bit
Order code Gray/Gray-Excess	E02	E03	E05	E07	E09	E01	G10	E12	E14	E18	E20	E25	E28	E36	E40	G12	E50	E72	G13	G14
Order code Binary	B02	B03	B05	B07	B09	B01	B10	BA2	BA1	B18	B20	B25	B28	B36	B40	B12	B50	B72	B13	B14
Order code BCD	D02	D03	D05	D07	D09	D01	D10	DA2	DA1	D18	D20									

Mounting accessory for shaft encoders Order No.

Coupling	Bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010

Mounting accessory for hollow shaft encoders

Cylindrical pin, long for torque stops		With fixing thread	8.0010.4700.0000
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Connection technology

Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin for analogue interface	8.0000.5012.0000
	M23 female connector with coupling nut, 17-pin for parallel interface	8.0000.5042.0000
Cordset, pre-assembled	M23 female connector w. coupling nut, for analogue interf., 2 m [6.56'] PVC cable	8.0000.6901.0002.0031
	M23 female connector w. coupling nut, for parallel interf., 2 m [6.56'] PVC cable	8.0000.6741.0002

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

Technical data

Mechanical characteristics			Protection acc. to EN 60529		
Max. speed	shaft version	max. 12000 min ⁻¹	shaft version	IP65	
	hollow shaft version	max. 6000 min ⁻¹ 1)	hollow shaft version	IP66	
Moment of inertia	shaft version	approx. 1.8 x 10 ⁻⁶ kgm ²	Working temperature range		
	hollow shaft version	approx. 6 x 10 ⁻⁶ kgm ²	-20°C ... +85°C 2) 3) [-4°F ... +185°F] 2) 3)		
Starting torque at 20°C [68°F]	shaft version	< 0.01 Nm	Material		
	hollow shaft version	< 0.05 Nm	shaft / hollow shaft stainless steel		
Load capacity of shaft	radial	80 N	Shock resistance acc. EN 60068-2-27		
	axial	40 N	2500 m/s ² , 6 ms		
Weight	approx. 0.4 kg [14.11 oz]		Vibration resistance acc. EN 60068-2-6		
			100 m/s ² , 10...2000 Hz		

1) For continuous operation max. 1500 min⁻¹
 2) 80°C [176°F] for shaft version and cable connection
 3) 70°C [158°F] for hollow shaft version and cable connection

Absolute Encoders - Singleturn

Standard Optical	5850 / 5870 (Shaft / Hollow shaft)	Parallel / Analogue
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Electrical characteristics parallel interface		
Power supply (+V)	5 V DC ($\pm 5\%$)	10 ... 30 V DC
Output driver	Push-Pull	Push-Pull
Power consumption (no load)	typ. 109 mA max. 169 mA	109 mA 169 mA
Permissible load / channel	max. +/- 10 mA	max. +/- 10 mA
Refresh rate of the position data	1.600/s	1.600/s
Signal level	HIGH min. 3.4 V LOW ($I_{Load} = 10\text{ mA}$) max. 1.5 V LOW ($I_{Load} = 1\text{ mA}$) max. 0.3 V	min. +V - 2.8 V max. 1.8 V -
Rising edge time t_r (without cable)	max. 0.2 μs	max. 1 μs
Falling edge time t_f (without cable)	max. 0.2 μs	max. 1 μs
Short circuit proof outputs	no	no
Reverse polarity protection of the power supply	no	yes
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Electrical characteristics voltage interface 4 ... 20 mA		
(only shaft version)		
Sensor		
Interface type	4 ... 20 mA	4 ... 20 mA
Power supply (+V)	10 ... 30 V DC	5 V DC
Power consumption (no load)	typ. 70 mA max. 84 mA	70 mA 84 mA
Current loop		
Power supply (+V)	10 ... 30 V DC	
Analogue signal	4 ... 20 mA	
Max. input resistance of the input circuit	200 Ohm ($U_s = 10\text{ V}$), 1 kOhm ($U_s = 30\text{ V}$)	
Measuring range	0 ... 360°	
Max. error, 25°C [77°F]	0.2°	
Resolution	13 bit	
Setting time	max. 2 ms	
Temperature coefficient	0.1°/10 K	
Current with scan error	$\leq 3.5\text{ mA}$	
Sensor component and current loop are galvanically isolated		
UL-certified	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Absolute Encoders Singleturn

Control inputs

Switching levels of the control inputs

Power supply	5 V DC	10 ... 30 V DC
Switching level	LOW $\leq 1.7\text{ V}$ HIGH $\geq 3.4\text{ V}$	$\leq 4.5\text{ V}$ $\geq 8.7\text{ V}$

Up/Down input to switch the counting direction

As a standard, absolute encoders deliver increasing code values when the shaft rotates clockwise (cw), when looking from the shaft side. When the shaft rotates counter-clockwise (ccw), the output delivers accordingly decreasing code values. The same applies to models with current interfaces. When the shaft rotates clockwise, the output delivers increasing current values, and decreasing values when it rotates counter-clockwise. As long as the Up/Down input receives the corresponding signal (HIGH), this feature is reversed. Clockwise rotation will deliver decreasing code/current values while counter-clockwise rotation will deliver increasing code/current values.

The response time is: for 5 V DC power supply, 0.4 ms
for 10 ... 30 V DC power supply, 2 ms

SET input

This input is used to reset (zero) the encoder. A control pulse (HIGH) sent to this input allows the current position value to be saved as the new zero position in the encoder.

For models equipped with a current interface, the analogue output (4 ... 20 mA) will be set accordingly to the value 4 mA.

Note : After applying power to the encoder and before activating the SET input, a count direction (cw or ccw) must be clearly defined on the Up/Down input!

The response time is: for 5 V DC power supply, 0.4 ms
for 10 ... 30 V DC power supply, 2 ms

LATCH input

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

The response time is: for 5 V DC power supply, 140 μs ,
for 10 ... 30 V DC power supply, 200 μs

Absolute Encoders - Singleturn

Standard Optical	5850 / 5870 (Shaft / Hollow shaft)	Parallel / Analogue
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Terminal assignment

max. 13 bit, max. 2 options

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

14 bit, max. 2 options

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

max. 13 bit, max. 2 options

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

14 bit, max. 1 option

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

14 bit

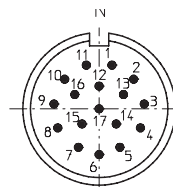
Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)																		
		Signal	0 V	+V	-	-	+I	-I	ST	VR										
7, 8 (4 ... 20 mA)	5850: 1, 2																			
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY	PK	RD	BU				

14 bit

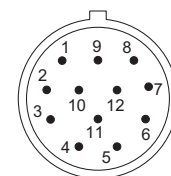
Interface	Type of connection	M23 connector, 12-pin														
		Signal	0 V	+V	-	-	+I	-I	ST	VR					⊥	
7, 8 (4 ... 20 mA)	5850: 3, 5															
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH	

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- Sig.: 1 =MSB; 2 = MSB-1; 3 = MSB-2 usw.
- ST: SET input
- Parallel: The current position value is stored as new zero position.
- 4 ... 20 mA: measured value set to 4 mA
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
- +I: Current loop input
- I: Current loop output
- LH: LATCH input. Active HIGH. The current position is saved and is statically available at the output.
- PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base:



M23 connector, 17-pin (parallel)



M12 connector, 12-pin (4... 20 mA)

Absolute Encoders - Singleturn

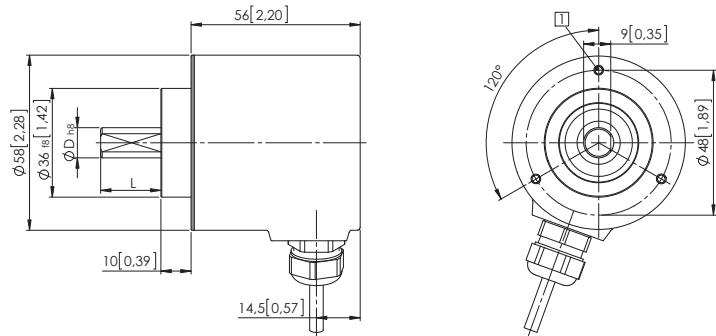
Standard Optical	5850 / 5870 (Shaft / Hollow shaft)	Parallel / Analogue
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Dimensions shaft version

Dimensions in mm [inch]

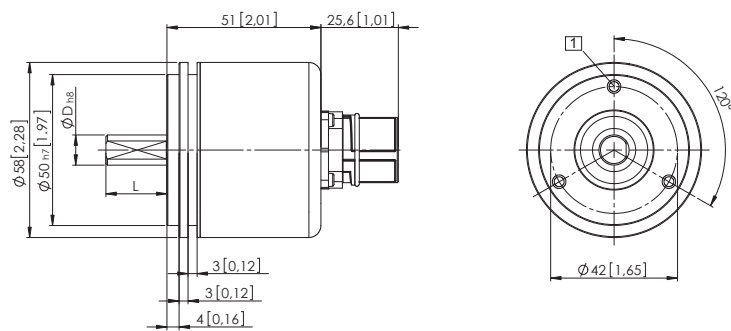
**Clamping flange, \varnothing 58 [2.28]
with shaft, \varnothing 10 [0.39]
Flange type 1**

1 3 x M3, 5 [0.20] deep



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

1 3 x M3, 5 [0.20] deep



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

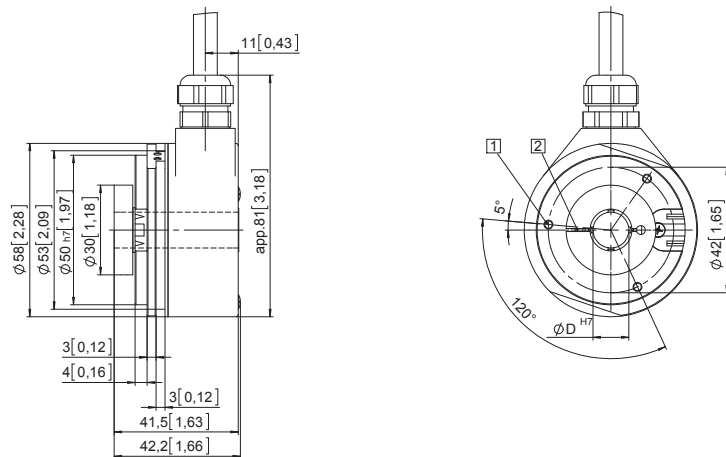
Dimensions hollow shaft version

Dimensions in mm [inch]

**Flange with spring element short
Flange type 1 and 2**

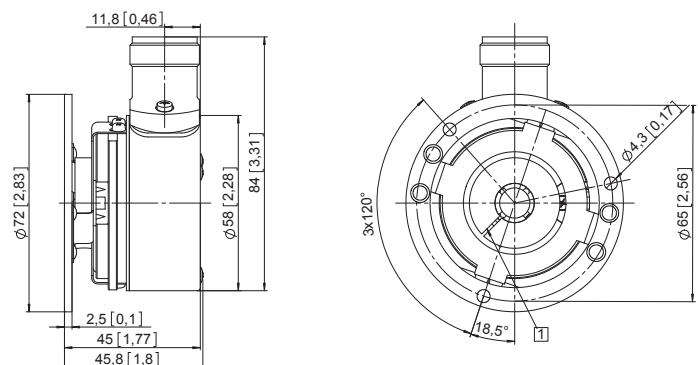
1 3 x M3, 5 [0.20] deep

2 Recommended torque for the clamping ring 0.6 Nm



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

1 Recommended torque for the clamping ring 0.6 Nm



Absolute Encoders - Singleturn

**Standard
Optical**

5852 / 5872 (Shaft / Hollow shaft)

Parallel, Highspeed



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



High rotational speed



Temperature range
-20°...+85°C



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Optical sensor

Adaptable

- Power supply 5 V DC or 10 ... 30 V DC
- Cable or connector M23

Fast

- Refresh rate of the position data 40 kHz

Order code Shaft version

8.5852 . **XXXX** . **XXX 1**
Type **a** **b** **c** **d**

a Flange, shaft

12 = clamping flange, ø 58 mm [2.28"]
with shaft 10 x 20 mm [0.39 x 0.79"]
21 = synchro flange, ø 58 mm [2.28"]
with shaft 6 x 10 mm [0.24 x 0.39"]

c Interface / Power supply

1 = Parallel (CMOS-TTL) / 5 V DC
3 = Parallel / 10 ... 30 V DC

d Type of connection

1 = axial cable, 1 m [3.28'] PVC
2 = radial cable, 1 m [3.28'] PVC
3 = M23 connector, axial, 17-pin, without mating connector
5 = M23 connector, radial, 17-pin, without mating connector

e Code type and division

E03 = 360 Gray-Excess
E01 = 1000 Gray-Excess
E14 = 1440 Gray-Excess
E20 = 2000 Gray-Excess
G10 = 1024 (10 bit) Gray
G12 = 4096 (12 bit) Gray
G13 = 8192 (13 bit) Gray
G14 = 16384 (14 bit) Gray
(Other divisions and code types on request)

Order code Hollow shaft

8.5872 . **XXXX** . **XXX 1**
Type **a** **b** **c** **d** **e**

a Flange

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

b Hollow shaft

6 = ø 10 mm [0.39"]
8 = ø 12 mm [0.47"]

c Interface / Power supply

1 = Parallel (CMOS-TTL) / 5 V DC
3 = Parallel / 10 ... 30 V DC

d Type of connection

1 = radial cable, 1 m [3.28'] PVC
2 = M23 connector, radial, 17-pin, without mating connector

e Code type and division

E03 = 360 Gray-Excess
E01 = 1000 Gray-Excess
E14 = 1440 Gray-Excess
E20 = 2000 Gray-Excess
G10 = 1024 (10 bit) Gray
G12 = 4096 (12 bit) Gray
G13 = 8192 (13 bit) Gray
G14 = 16384 (14 bit) Gray
(Other divisions and code types on request)

Reverse count direction

(Only with output type 3 and up to 13 bit Gray code available)

Normal operation:

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

Reverse operation:

Output MSB inverted (pin 16) instead of output MSB (pin 3) connected. Falling code values when shaft turning clockwise (cw). Rising code values when shaft turning counterclockwise (ccw), top view of shaft.

Absolute Encoders - Singleturn

Standard Optical	5852 / 5872 (Shaft / Hollow shaft)	Parallel, Highspeed
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Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010

Mounting accessory for hollow shaft encoders		Order No.
Cylindrical pin, long for torque stops	<p>With fixing thread</p>	8.0010.4700.0000

Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling nut, 17-pin	8.0000.5042.0000
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	8.0000.6741.0002

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

Technical data

Mechanical characteristics		
Speed	shaft version	max. 12000 min ⁻¹
	hollow shaft version	max. 6000 min ⁻¹ 1)
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 (\pm 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	40.000/s	40.000/s
Signal level	HIGH	min. 3.4 V
	LOW	max. 0.3 V
		min. +V - 2.8 V max. 1.8 V
Rising edge time t_r (without cable)	max. 0.2 μ s	max. 1 μ s
Falling edge time t_f (without cable)	max. 0.2 μ s	max. 1 μ s
Short circuit proof outputs 3)	yes	yes
Reverse polarity protection of the power supply	no	yes
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

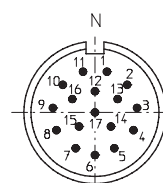
Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)
1, 3	5852: 1, 2	Signal
	5872: 1	Cable colour: WH BN GN YE GY PK BU RD BK VT GY RD WH BN WH YE BN

Interface	Type of connection	M23 connector, 17-pin
1, 3	5852: 3, 5	Signal
	5872: 2	Pin: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 PH

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- Signal: 1 = MSB; 2 = MSB-1; 3 = MSB-2 usw.
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
- PH \perp : Plug connector housing (Shield)

Top view of mating side, male contact base



M23 connector, 17-pin (parallel)

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

Absolute Encoders - Singleturn

**Standard
Optical**

5852 / 5872 (Shaft / Hollow shaft)

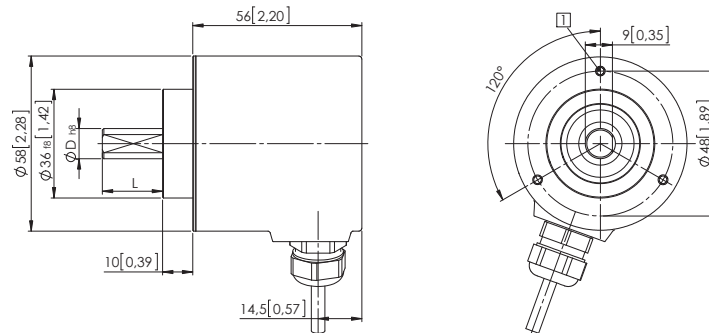
Parallel, Highspeed

Dimensions shaft version

Dimensions in mm [inch]

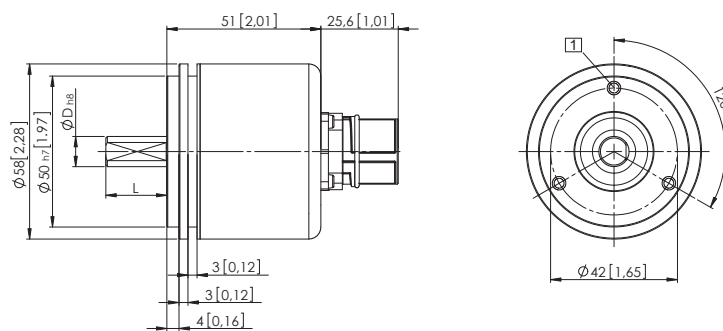
**Clamping flange, \varnothing 58 [2.28]
with shaft, \varnothing 10 [0.39]
Flange type 12**

1 3 x M3, 5 [0.20] deep



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

1 3 x M3, 5 [0.20] deep



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

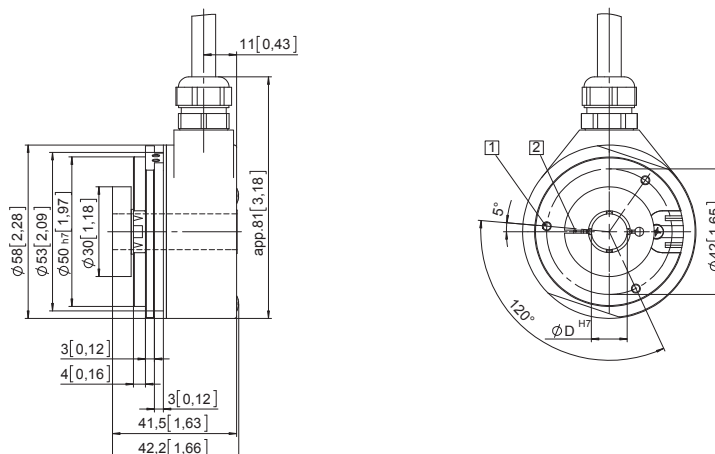
Dimensions hollow shaft version

Dimensions in mm [inch]

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

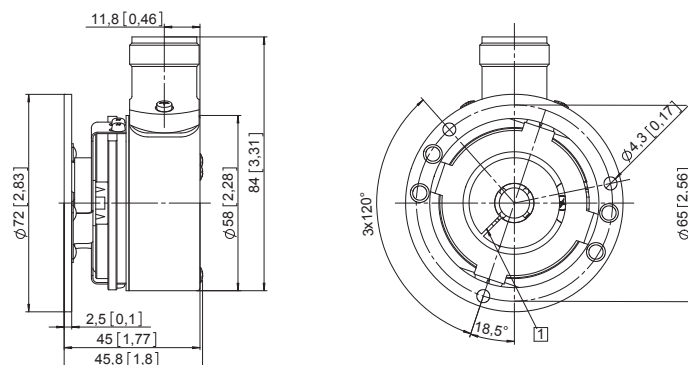
1 3 x M3, 5 [0.20] deep

2 Recommended torque for the clamping ring 0.6 Nm



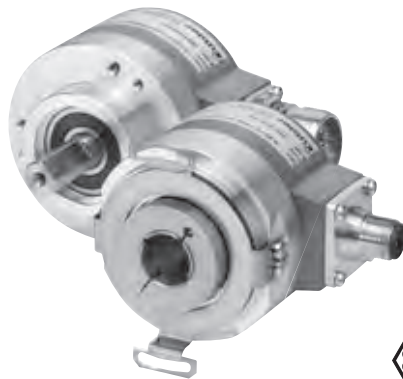
**Flange with stator coupling, \varnothing 65 [2.56]
Flange type 3**

1 Recommended torque for the clamping ring 0.6 Nm



Absolute Encoders - Singleturn

Standard Optical	Sendix 5853 / 5873 (Shaft / Hollow shaft)	SSI / BiSS-C
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The Sendix 5853 and Sendix 5873 singleturn encoders with SSI or BiSS-C interface and optical sensor technology can achieve a resolution of max. 17 bits.

These encoders are also available with an optional SinCos output or RS422 incremental track.

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



Absolute Encoders Singleturn

Safety-Lock™	Temperature range -40°...+90°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Short-circuit proof	Reverse polarity protection	SinCos	Optical sensor	Seawater-resistant version on request

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 incremental outputs SinCos and RS422
- Short control cycles, clock rate with SSI up to 2 MHz / with BiSS-C up to 10 MHz

Order code

Shaft version

8.5853 . XXXX . XX2X
Type a b c d e f g h

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



a Flange

- 1 = clamping flange, IP65 \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, IP65 \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

- 1 = SSI or BiSS-C / 5 V DC
- 2 = SSI or BiSS-C / 10 ... 30 V DC**
- 3 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC
- 4 = SSI or BiSS-C, 2048 ppr SinCos / 10 ... 30 V DC
- 5 = SSI or BiSS-C / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 7 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC
- 8 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 10 ... 30 V DC
- 9 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC, with sensor output for monitoring the voltage on the encoder

d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- 2 = radial cable, 1 m [3.28'] PVC**
- 3 = M23 connector, 12-pin, axial
- 4 = M23 connector, 12-pin, radial**
- 5 = M12 connector, 8-pin, axial³⁾
- 6 = M12 connector, 8-pin, radial³⁾

e Code

- B = SSI, Binary
- C = BiSS-C, Binary
- G = SSI, Gray**

f Resolution⁴⁾

- A = 10 bit ST
- 1 = 11 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST**
- 4 = 14 bit ST
- 7 = 17 bit ST

g Inputs / Outputs⁴⁾

- 2 = SET, DIR input**
additional status output

h Options (Service)

- 1 = no option
- 2 = Status LED
- 3 = SET button and Status LED**

optional on request

- Ex 2/22
- seawater-resistant
- special cable length

1) Preferred type only in conjunction with flange type 2
 2) Preferred type only in conjunction with flange type 1
 3) Can be combined only with interface 1 and 2
 4) Resolution, preset value and counting direction factory-programmable

Absolute Encoders - Singleturn

**Standard
Optical**

Sendix 5853 / 5873 (Shaft / Hollow shaft)

SSI / BiSS-C

**Order code
Hollow shaft**

8.5873 . **XXXX** . **XX2X**
Type **a b c d** **e f g h**

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



a Flange

- 1 = 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"]
- E = with stator coupling, IP65 mounting without screws ¹⁾
- F = with stator coupling, IP67 mounting without screws ¹⁾
- G = with stator coupling, IP65 \varnothing 72 mm [2.83"] ¹⁾

b Hollow shaft

- 3 = \varnothing 10 mm [0.39"]
- K = \varnothing 10 mm [0.39"], with tapered shaft
- 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

- 1 = SSI or BiSS-C / 5 V DC
- 2 = SSI or BiSS-C / 10 ... 30 V DC
- 3 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC
- 4 = SSI or BiSS-C, 2048 ppr SinCos / 10 ... 30 V DC
- 5 = SSI or BiSS-C / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 7 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC
- 8 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 10 ... 30 V DC
- 9 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC, with sensor output for monitoring the voltage on the encoder

d Type of connection

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

e Code

- B = SSI, Binary
- C = BiSS-C, Binary
- G = SSI, Gray

f Resolution ³⁾

- A = 10 bit ST
- 1 = 11 bit ST
- 2 = 12 bit ST
- 3 = 13 bit ST
- 4 = 14 bit ST
- 7 = 17 bit ST

g Inputs / Outputs ³⁾

- 2 = SET, DIR input
- additional status output

h Options (Service)

- 1 = no option
- 2 = Status LED
- 3 = SET button and Status LED

optional on request
- Ex 2/22
- seawater-resistant
- special cable length

Mounting accessory for shaft encoders

Order No.

Coupling

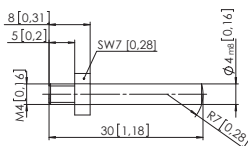
- Bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]
- Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]

8.0000.1101.0606
8.0000.1101.1010

Mounting accessory for hollow shaft encoders

Cylindrical pin, long

for torque stops



With fixing thread

8.0010.4700.0000

Connection technology

Connector, self-assembly (straight)

- M12 female connector with coupling nut
- M23 female connector with coupling nut

05.CMB 8181-0
8.0000.5012.0000

Cordset, pre-assembled

- M12 female connector with coupling nut, 2 m [6.56'] PVC cable
- M23 female connector with coupling nut, 2 m [6.56'] PVC cable

05.00.6041.8211.002M
8.0000.6901.0002.0031

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

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

1) Can be combined only with shaft K and type of connection E
2) Can be combined only with interface 1 and 2
3) Resolution, preset value and counting direction factory-programmable

Absolute Encoders - Singleturn

Standard Optical	Sendix 5853 / 5873 (Shaft / Hollow shaft)	SSI / BiSS-C
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Technical data

Mechanical characteristics		
Max. speed, shaft version	IP65 up to 70°C [158°F]	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	11 000 min ⁻¹ , 9 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
Max. speed, hollow shaft version	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	4 000 min ⁻¹ , 2 000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 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. 0.35 kg [12.35 oz]
Protection acc. to EN 60529	housing side	IP67
	shaft side	IP65, opt. IP67
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +90°C ¹⁾ [-40°F ... +194°F] ¹⁾
Materials	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	cable	PVC
Shock resistance acc. EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics		
Power supply		5 V DC + 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply (+V)		yes
Short circuit proof outputs		yes ²⁾
UL approval		File 224618
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC

SSI interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I _{Load} = 20 mA	typ. 1.3 V
Singleturn resolution		10 ... 14 bit and 17 bit ³⁾
Code		Binary or Gray
SSI clock rate	resolution ≤ 14 bit	50 kHz ... 2 MHz
	resolution ≥ 15 bit	50 kHz ... 125 kHz
Monoflop time		≤ 15 µs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.		
Data refresh rate	resolution ≤ 14 bit	≤ 1 µs
	resolution ≥ 15 bit	4 µs
Status and parity bit		on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ³⁾ Programming with the customer ³⁾
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs
Note:	<ul style="list-style-type: none"> - Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification

SET input or SET button		
Input		active HIGH
Input type		comparator
Signal level	HIGH	min: 60 % of +V (power supply) max: +V
	LOW	max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms
Response time (DIR input)		1 ms
The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.		

Option incremental outputs (A/B), 2048 ppr		
	SinCos	RS422 TTL-compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 V _{pp} (± 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes	yes

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 22k).	
An active status output (LOW) displays: <ul style="list-style-type: none"> - Sensor error, singleturn or multiturn (soiling, glass breakage etc.) - LED fault (failure or ageing) - over- or under-temperature 	
In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.	

- 1) Cable version: -30°C ... +75°C [-22°F ... +167°F]
- 2) Short circuit to 0V or to output, one channel at a time, power supply correctly applied
- 3) Other options on request

Absolute Encoders - Singleturn

Standard Optical

Sendix 5853 / 5873 (Shaft / Hollow shaft)

SSI / BiSS-C

DIR input

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

Power-ON delay

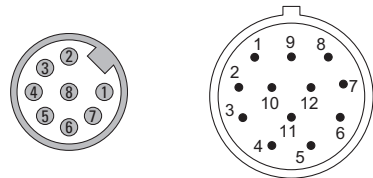
After Power-ON the encoder requires a time of approx. 150 ms before valid data can be read.

Terminal assignment

Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
1, 2	1, 2, E	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - - - shield
Interface	Type of connection	Features	M23 connector
1, 2	3, 4	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
5	1, 2, E	SET, DIR, Status sensor output	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield
Interface	Type of connection	Features	M23 connector
5	3, 4	SET, DIR, Status sensor output	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
3, 4, 7, 8	1, 2, E	SET, DIR, SinCos or incr. RS422	Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
			Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
Interface	Type of connection	Features	M23 connector
3, 4, 7, 8	3, 4	SET, DIR, SinCos or incr. RS422	Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
6, 9	1, 2, E	SinCos o. incr. RS422 sensor output	Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
Interface	Type of connection	Features	M23 connector
6, 9	3, 4	SinCos o. incr. RS422 sensor output	Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	M12 connector
1, 2	5, 6	SET, DIR	Signal: 0 V +V C+ C- D+ D- SET DIR \perp
			Pin: 1 2 3 4 5 6 7 8 PH

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- Stat: Status output
- 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-C
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Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, $\varnothing 58$ [2.28]

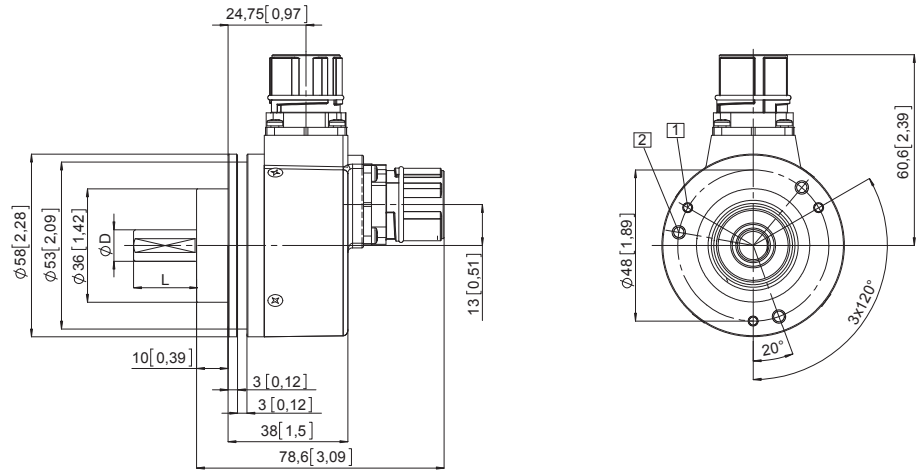
Flange type 1 and 3

(Drawing with M23 connector)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

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



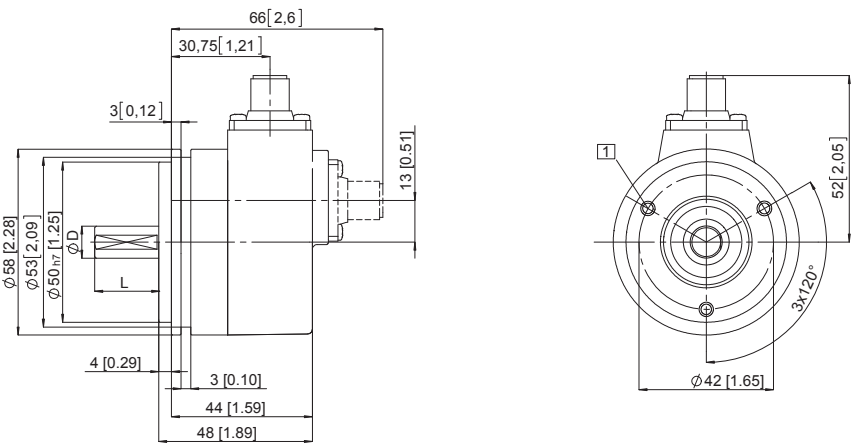
Synchro flange, $\varnothing 58$ [2.28]

Flange type 2 and 4

(Drawing with M12 connector)

1 3 x M4, 6 [0.24] deep

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

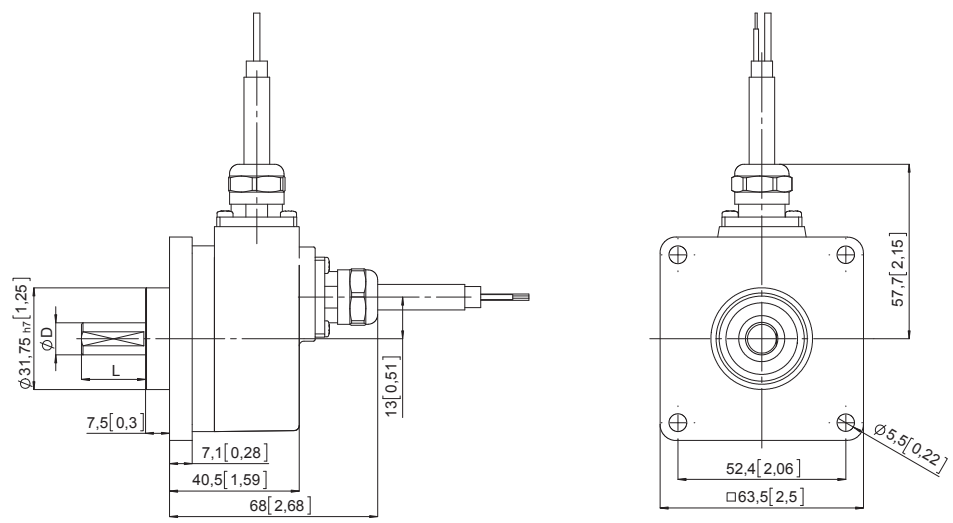


Square flange, $\square 63.5$ [2.5]

Flange type 5 and 7

(Drawing with cable)

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



Absolute Encoders - Singleturn

**Standard
Optical**

Sendix 5853 / 5873 (Shaft / Hollow shaft)

SSI / BiSS-C

Dimensions hollow shaft version

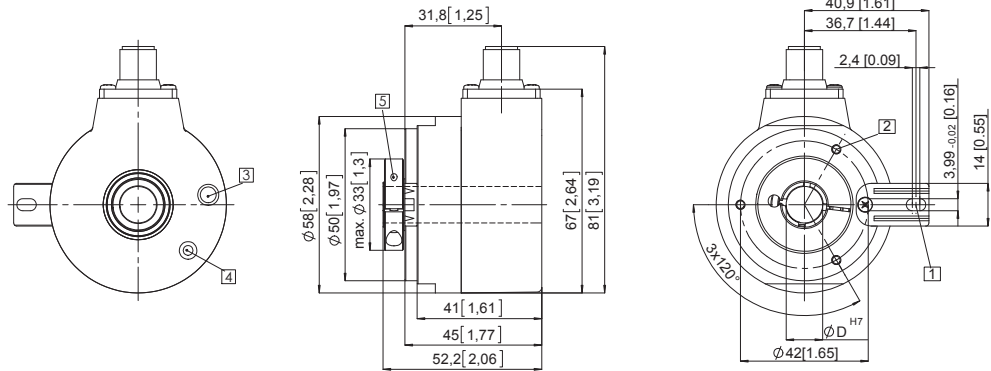
Dimensions in mm [inch]

Flange with spring element long

Flange type 1 and 2

(drawing with M12 connector)

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

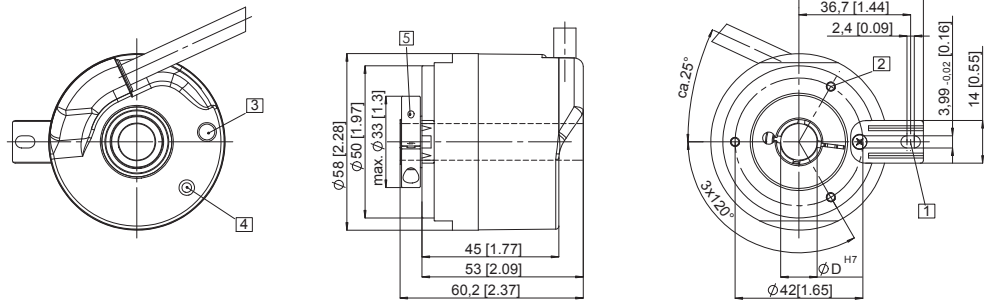


Flange with spring element long

Flange type 1 and 2

(drawing with tangential cable)

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



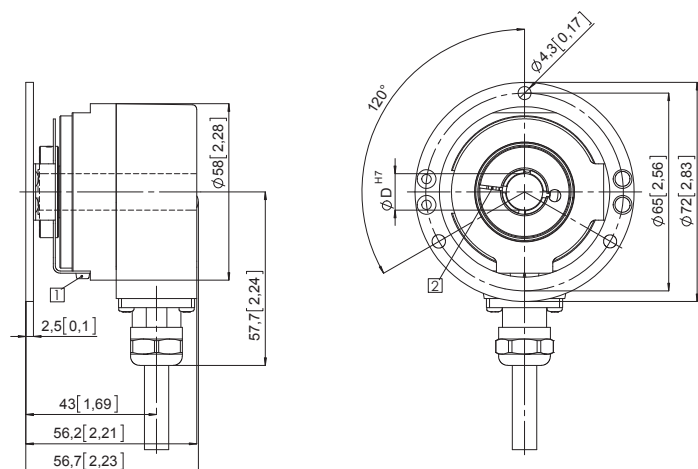
Flange with stator coupling, $\varnothing 65$ [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(Drawing with cable)

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



Absolute Encoders - Singleturn

Standard Optical	Sendix 5853 / 5873 (Shaft / Hollow shaft)	SSI / BiSS-C
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Dimensions hollow shaft version

Dimensions in mm [inch]

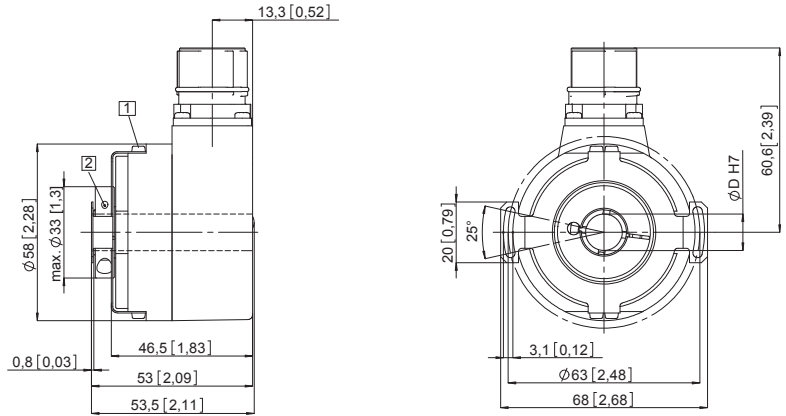
Flange with stator coupling, ø 63 [2.48]

Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(Drawing with M23 connector)

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

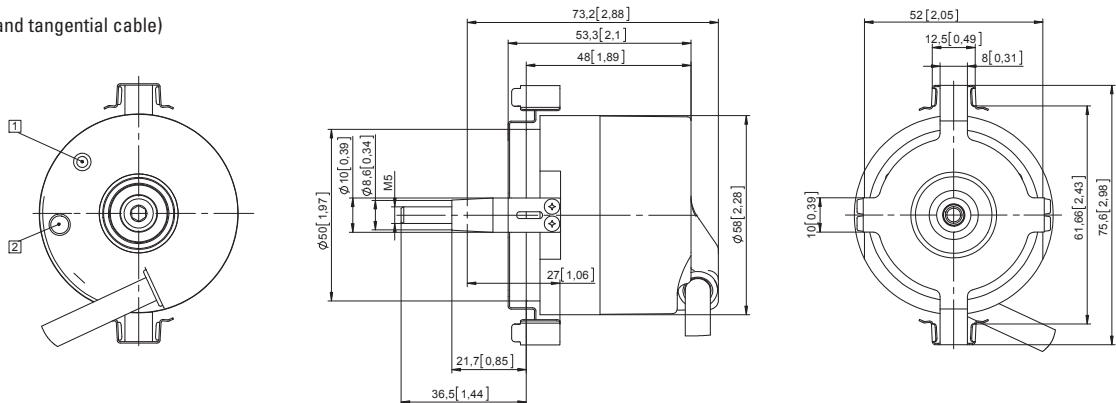


Flange with stator coupling, mounting without screws

Flange type E and F

(with tapered shaft K and tangential cable)

- 1 Status LED
- 2 SET Button

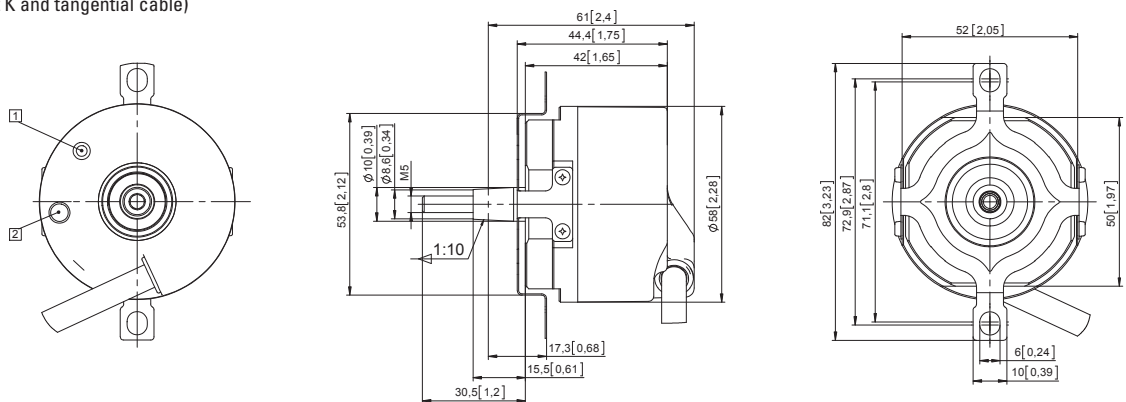


Flange with stator coupling, ø 72 [2.83]

Flange type G

(with tapered shaft K and tangential cable)

- 1 Status LED
- 2 SET Button



Absolute Encoders - Singleturn

Standard
SIL2/PLd, optical

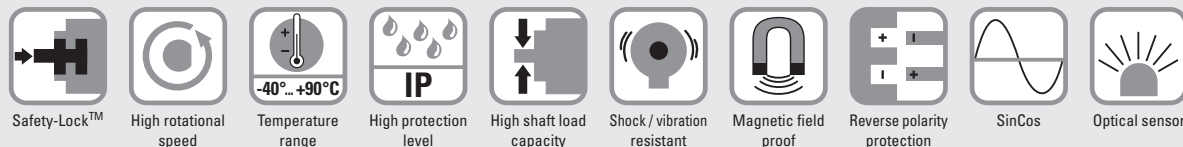
Sendix SIL 5853FS2 / 5873FS2 (Shaft / Hollow shaft)

SSI/BiSS-C + SinCos



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

The extra strong Safety-Lock™ Design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP67.



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-C interface with incremental SinCos tracks with 2048 ppr
- Certified mechanical mounting + electronic

Flexible

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

Order code
Shaft version

8.5853FS2 . 1 X X X . X X 2 X
Type a b c d e f g h

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



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 or BiSS-C + 2048 ppr SinCos / 5 V DC

4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

d Type of connection

1 = axial cable, 1 m [3.28"] PVC

2 = radial cable, 1 m [3.28"] PVC

3 = M23 connector, 12 pin, axial

4 = M23 connector, 12 pin, radial

e Code

B = SSI, Binary

C = BiSS-C, Binary

G = SSI, Gray

f Resolution ¹⁾

A = 10 bit ST

1 = 11 bit ST

2 = 12 bit ST

3 = 13 bit ST

4 = 14 bit ST

7 = 17 bit ST

g Input/output ¹⁾

2 = SET, DIR input

h Options (Service)

1 = no option

2 = Status LED

3 = SET button and status LED

optional on request

- special cable length

- Ex 2/22

Order code
Hollow shaft

8.5873FS2 . X X X X . X X 2 X
Type a b c d e f g h

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



a Flange

A = with torque stop set, IP65

B = with stator coupling, IP65, ø 63 mm [2.48"]

b Hollow shaft

3 = ø 10 mm [0.39"]

4 = ø 12 mm [0.47"]

5 = ø 14 mm [0.55"]

K = ø 10 mm [0.39"], tapered shaft

c Interface / Power supply

3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC

4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

d Type of connection

2 = radial cable, 1 m [3.28"] PVC

E = tangential cable, 1 m [3.28"] PVC

4 = M23 connector, 12 pin, radial

e Code

B = SSI, Binary

C = BiSS-C, Binary

G = SSI, Gray

f Resolution ¹⁾

A = 10 bit ST

1 = 11 bit ST

2 = 12 bit ST

3 = 13 bit ST

4 = 14 bit ST

7 = 17 bit ST

g Input/output ¹⁾

2 = SET, DIR input

h Options (Service)

1 = no option

2 = Status LED

3 = SET button and status LED

optional on request

- special cable length

- Ex 2/22

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

Absolute Encoders - Singleturn

Standard SIL2/PLd, optical	Sendix SIL 5853FS2 / 5873FS2 (Shaft / Hollow shaft)	SSI / BiSS-C + SinCos
Accessory safety technology		Order No.
Safety-M, basic modules	speed / position monitoring for 1 axis	8.MSP1.000
	speed / position monitoring for 2 axes (analogue inputs optional)	8.MSP2.XXX
Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling	8.0000.5012.0000
	M23 female connector with coupling, Ex zone 2/22	8.0000.5012.0000.Ex
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [2.19'] PVC cable	8.0000.6901.0002.0031

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for functional safety under www.kuebler.com/safety

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed, shaft version	
up to 70°C [158°F]	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)
up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
Max. speed, hollow shaft version	
up to 70°C [158°F]	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	
shaft version	< 0.01 Nm
hollow shaft version	< 0.03 Nm
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
Working temperature range	
	-40°C ... +90°C ²⁾ [-40°F ... +194°F] ²⁾
Material	
shaft / hollow shaft	stainless steel
flange	aluminium
housing	zinc die-cast housing
cable	PVC
Shock resistance acc. EN 60068-2-27	
	500 m/s ² , 11 ms
Vibration resistance acc. EN 60068-2-6	
	200 m/s ² , 10 ... 150 Hz

Electrical characteristics	
Power supply	5 V DC ± 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 70 mA 10 ... 30 V DC max. 45 mA
Reverse polarity protection of the power supply (+V)	yes
Short circuit proof outputs	yes ³⁾
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

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

Absolute Encoders - Singleturn

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

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Singleturn resolution	10 ... 14 bit and 17 bit ¹⁾
Code	Binary or gray
SSI clock rate	resolution ≤ 14 bit 50 kHz ... 2 MHz resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	
Data refresh rate	resolution ≤ 14 bit ≤ 1 μs resolution ≥ 15 bit 4 μs
Status and parity bit	on request

BiSS-C interface	
Resolution singleturn	10 ... 14 bit and 17 bit ¹⁾
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note:	<ul style="list-style-type: none"> - Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification

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

SET input or SET button	
Input	active HIGH
Input type	comparator
Signal level	HIGH min: 60 % of +V, max: +V LOW max: 25 % of +V (Power supply)
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Reaction time (DIR input)	1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

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

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

LED	
The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.	
If the LED is ON 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.	

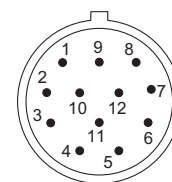
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	1, 2, E	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	M23 connector, 12-pin													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	3, 4	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- A, \bar{A} : cosine signal
- B, \bar{B} : sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

1) Other options on request

Absolute Encoders - Singleturn

Standard
SIL2/PLd, optical

Sendix SIL 5853FS2 / 5873FS2 (Shaft / Hollow shaft)

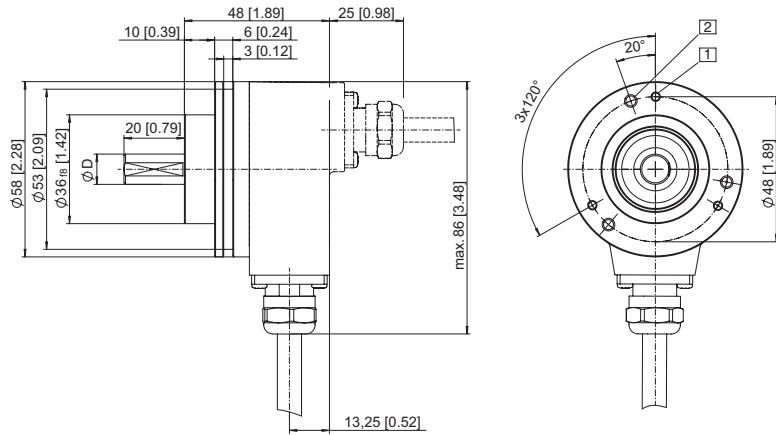
SSI/BiSS-C + SinCos

Dimensions shaft version

Dimensions in mm [inch]

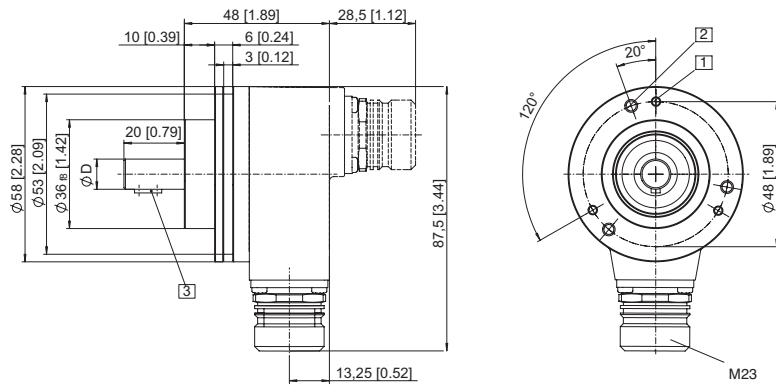
Clamping flange, \varnothing 58 [2.28]
Flange type 1 with shaft type 2
(Drawing with cable)

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



Clamping flange, \varnothing 58 [2.28]
Flange type 1 with shaft type A
(Drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6
- D = 10 ^{H7} [0.39]



Absolute Encoders - Singleturn

**Standard
SIL2/PLd, optical**

Sendix SIL 5853FS2 / 5873FS2 (Shaft / Hollow shaft)

SSI/BiSS-C + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

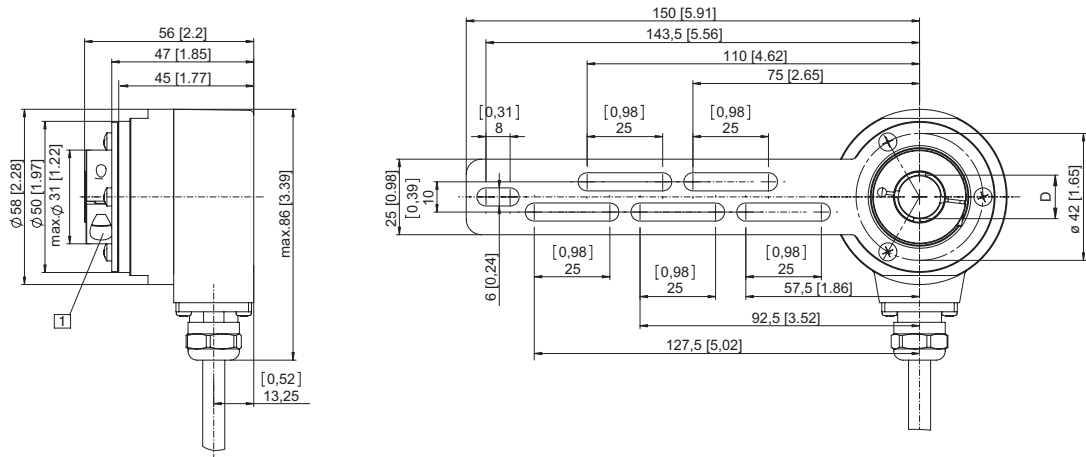
Flange with torque stop set

Flange type A

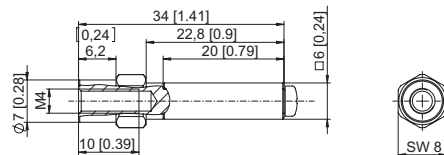
(Drawing with cable)

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

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



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



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

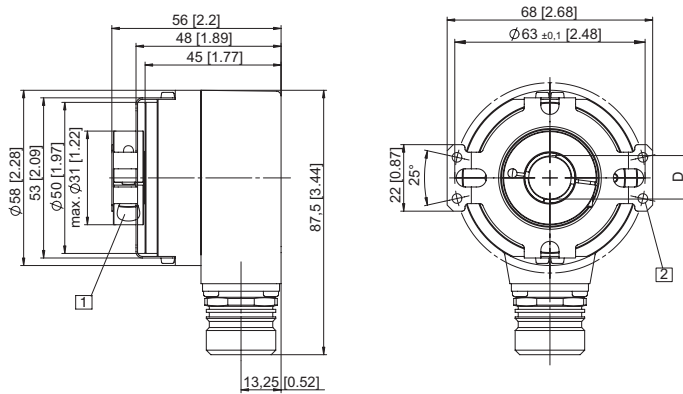
Flange type B

(Drawing with M23 connector)

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

- 2 for (4x) M3 screw

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



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

Flange type B

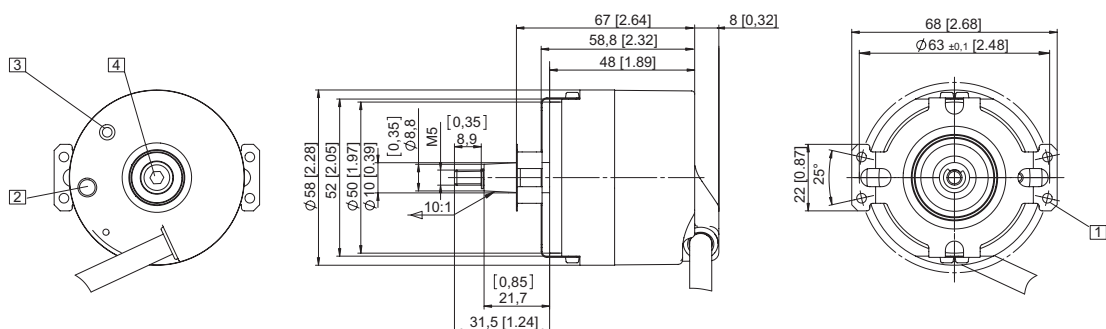
(Drawing with tangential cable outlet)

- 1 for (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



Absolute Encoders - Singleturn

Standard SIL3/PLe, optical	Sendix SIL 5853FS3 / 5873FS3 (Shaft / Hollow shaft)	SSI / BiSS-C + SinCos
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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 IP67.



Safety-Lock™



High rotational speed



Temperature range



High protection level



High shaft load capacity



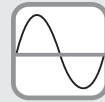
Shock / vibration resistant



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-C 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	.	<u>1</u>	<u>X</u>	<u>X</u>	<u>X</u>	.	<u>X</u>	<u>X</u>	<u>2</u>	<u>X</u>
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.



- 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 or BiSS-C + 2048 ppr SinCos / 5 V DC
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

- d Type of connection**
1 = axial cable, 1 m [3.28'] PVC
2 = radial cable, 1 m [3.28'] PVC
3 = M23 connector, 12 pin, axial
4 = M23 connector, 12 pin, radial
- e Code**
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray

- f Resolution ¹⁾**
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

- g Input / output ¹⁾**
2 = SET, DIR input

- h Options (Service)**
1 = no option
2 = Status LED
3 = SET button and status LED
- optional on request*
- special cable length
- Ex 2/22

Order code	8.5873FS3	.	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	.	<u>X</u>	<u>X</u>	<u>2</u>	<u>X</u>
Hollow shaft	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.



- a Flange**
A = with torque stop set, IP65
B = with stator coupling, IP65, ø 63 mm [2.48"]
- b Hollow shaft**
3 = ø 10 mm [0.39"]
4 = ø 12 mm [0.47"]
5 = ø 14 mm [0.55"]
K = ø 10 mm [0.39"], tapered shaft
- c Interface / Power supply**
3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

- d Type of connection**
2 = radial cable, 1 m [3.28'] PVC
E = tangential cable, 1 m [3.28'] PVC
4 = M23 connector, 12 pin, radial
- e Code**
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray

- f Resolution ¹⁾**
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

- g Input / output ¹⁾**
2 = SET, DIR input

- h Options (Service)**
1 = no option
2 = Status LED
3 = SET button and status LED
- optional on request*
- special cable length
- Ex 2/22

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

Absolute Encoders - Singleturn

Standard SIL3/PLe, optical	Sendix SIL 5853FS3 / 5873FS3 (Shaft / Hollow shaft)	SSI/BiSS-C + SinCos
Accessory safety technology		Order No.
Safety-M, basic modules	speed / position monitoring for 1 axis	8.MSP1.000
	speed / position monitoring for 2 axes (analogue inputs optional)	8.MSP2.XXX
Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling	8.0000.5012.0000
	M23 female connector with coupling, Ex zone 2/22	8.0000.5012.0000.Ex
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [2.19'] PVC cable	8.0000.6901.0002.0031

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for functional safety under www.kuebler.com/safety

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics		
Max. speed, shaft version		
up to 70°C [158°F]	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)	
up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)	
Max. speed, hollow shaft version		
up to 70°C [158°F]	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)	
up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)	
Starting torque - at 20°C [68°F]		
shaft version	< 0.01 Nm	
hollow shaft version	< 0.03 Nm	
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	
Working temperature range		
-40°C ... +90°C ²⁾ [-40°F ... +194°F] ²⁾		
Material		
shaft / hollow shaft	stainless steel	
flange	aluminium	
housing	zinc die-cast housing	
cable	PVC	
Shock resistance acc. EN 60068-2-27		
500 m/s ² , 11 ms		
Vibration resistance acc. EN 60068-2-6		
200 m/s ² , 10 ... 150 Hz		

Electrical characteristics		
Power supply	5 V DC ± 5% or 10 ... 30 V DC	
Current consumption (no load)	5 V DC	max. 70 mA
	10 ... 30 V DC	max. 45 mA
Reverse polarity protection of the power supply (+V)	yes	
Short circuit proof outputs	yes ³⁾	
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC Machinery directive 2006/42/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

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

Absolute Encoders - Singleturn

Standard SIL3/PLe, optical	Sendix SIL 5853FS3 / 5873FS3 (Shaft / Hollow shaft)	SSI/BiSS-C + 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
Singleturn resolution	10 ... 14 bit and 17 bit ¹⁾
Code	Binary or gray
SSI clock rate	resolution ≤ 14 bit 50 kHz ... 2 MHz resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	
Data refresh rate	resolution ≤ 14 bit ≤ 1 μs resolution ≥ 15 bit 4 μs
Status and parity bit	on request

BiSS-C interface	
Resolution singleturn	10 ... 14 bit and 17 bit ¹⁾
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note:	<ul style="list-style-type: none"> - Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification

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

SET input or SET button	
Input	active HIGH
Input type	comparator
Signal level	HIGH min: 60 % of +V, max: +V LOW max: 25 % of +V (Power supply)
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Reaction time (DIR input)	1 ms
The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.	

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

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

LED	
The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.	
If the LED is ON this indicates:	
<ul style="list-style-type: none"> - Sensor error, singleturn or multturn (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.	

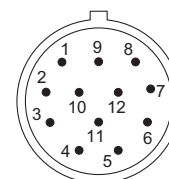
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	1, 2, E	Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	M23 connector, 12-pin													
		Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
3, 4	3, 4	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- A, \bar{A} : cosine signal
- B, \bar{B} : sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

1) Other options on request

Absolute Encoders - Singleturn

Standard
SIL3/PLe, optical

Sendix SIL 5853FS3 / 5873FS3 (Shaft / Hollow shaft)

SSI/BiSS-C + SinCos

Dimensions shaft version

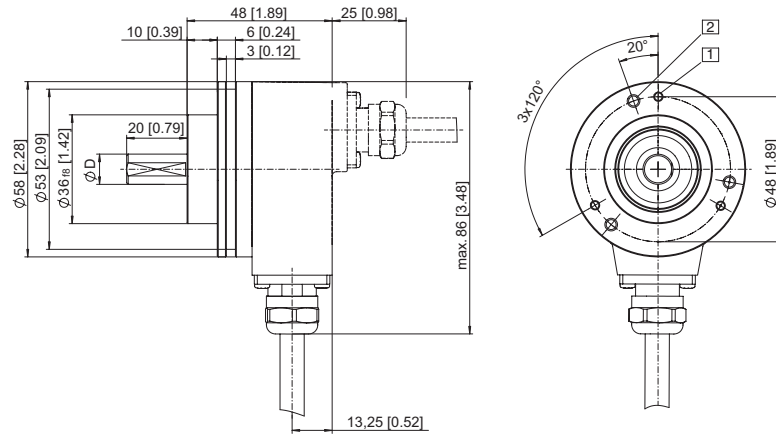
Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]

Flange type 1 with shaft type 2

(Drawing with cable)

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

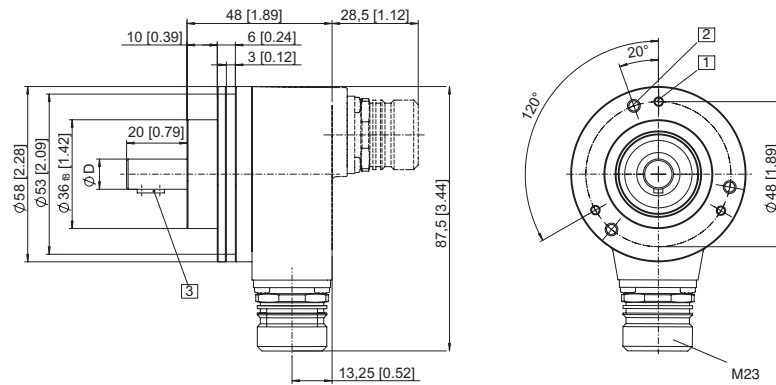


Clamping flange, ø 58 [2.28]

Flange type 1 with shaft type A

(Drawing with M23 connector)

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



Absolute Encoders - Singleturn

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

Dimensions in mm [inch]

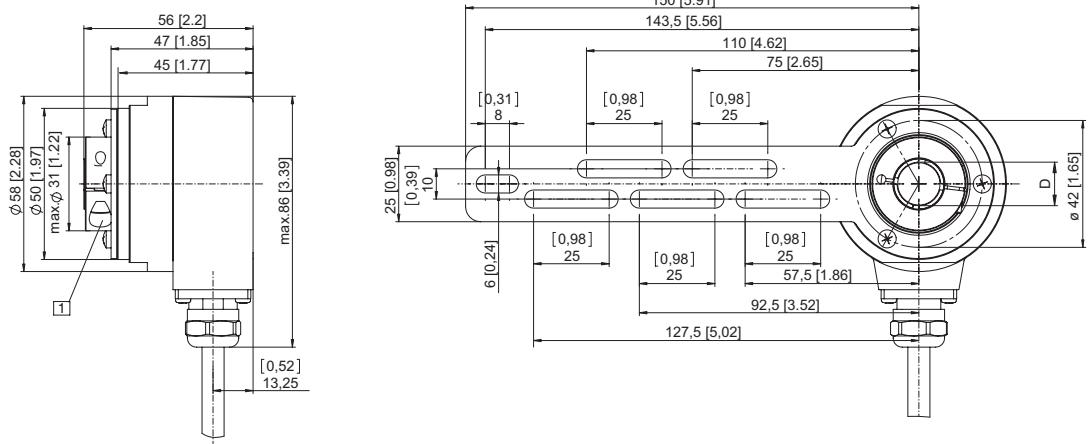
Flange with torque stop set

Flange type A

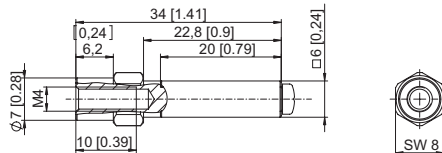
(Drawing with cable)

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

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



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



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

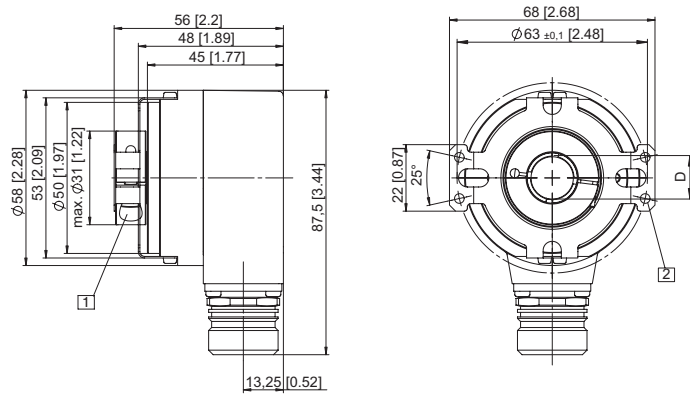
Flange type B

(Drawing with M23 connector)

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

- 2 for (4x) M3 screw

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

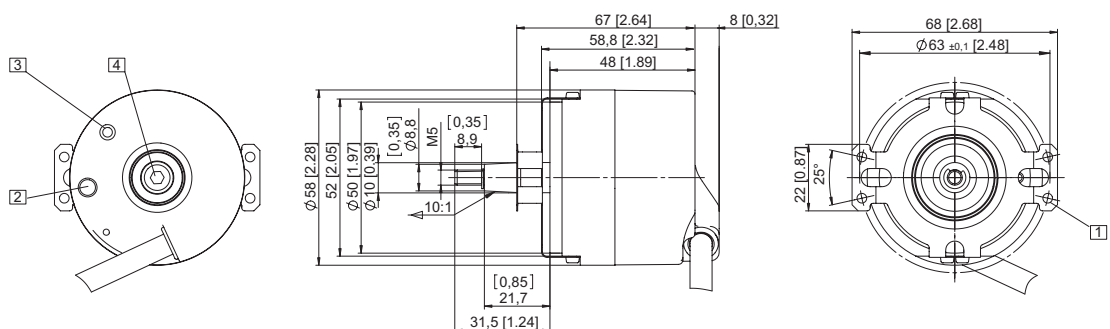


Flange with stator coupling, $\varnothing 63 [2.48]$ and tapered shaft

Flange type B

(Drawing with tangential cable outlet)

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



Absolute Encoders
Singleturn

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.



Safety-Lock™



High rotational speed



Temperature range
-40...+80°C



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater-resistant version on request

Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C

Flexible

- Fast, simple, error-free connection using versions with M12 connector
- Wide-ranging programming options thanks to latest encoder profile

Order code Shaft version

8.5858
Type

. XX3X . 311X
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, IP65 □ 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"

d Type of connection

- 1 = removable bus terminal cover, with cable gland fitting, radial
- 2 = removable bus terminal cover, with 3 x M12 connectors, radial**

f Options (Service)

- 2 = no option
- 3 = SET button**

c Interface / Power supply

- 3 = PROFIBUS DP V0**
encoder profile V 1.1, 10 ... 30 V DC

e Fieldbus profile

- 31 = PROFIBUS DP V0**
encoder profile Class 2

optional on request

- Ex 2/22

- seawater-resistant

Order code Hollow shaft

8.5878
Type

. XX3X . 311X
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
- 2 = with spring element long, IP67
- 3 = with stator coupling, IP65 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]**
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b Blind hollow shaft

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

d Type of connection

- 1 = removable bus terminal cover, with cable gland fitting, radial
- 2 = removable bus terminal cover, with 3 x M12 connectors, radial**

f Options (Service)

- 2 = no option
- 3 = SET button**

c Interface / Power supply

- 3 = PROFIBUS DP V0**
encoder profile V 1.1, 10 ... 30 V DC

e Fieldbus profile

- 31 = PROFIBUS DP V0**
encoder profile Class 2

optional on request

- Ex 2/22

- seawater-resistant

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

Absolute Encoders - Singleturn

Standard Optical		Sendix 5858 / 5878 (Shaft / Hollow shaft)	PROFIBUS DP
Mounting accessory for shaft encoders			Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]		8.0000.1101.1010
Mounting accessory for hollow shaft encoders			
Cylindrical pin, long for torque stops		With fixing thread	8.0010.4700.0000
Connection technology			
Connector, self-assembly (straight)	Coupling M12 for Bus in		05.BMWS 8151-8.5
	Connector M12 for Bus out		05.BMSWS 8151-8.5
	Connector M12 for power supply		05.B8141-0
Cordset, pre-assembled	M12 cordset for Bus in , 6 m [19.68'] PUR cable		05.00.6011.3211.006M
	M12 cordset for Bus out, 6 m [19.68'] PUR cable		05.00.6011.3411.006M
	M12 cordset for power supply, 2 m [6.56'] PUR cable		05.00.6061.6211.002M

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

Technical data		
Mechanical characteristics		
Max. speed	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 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	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
EX approval for hazardous areas		optional zone 2 and 22
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	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		10 ... 30 V DC
Power consumption (no load)		max. 110 mA
Reverse polarity protection of the power supply (+V)		yes
UL approval		File 224618
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC
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	
Singleturn resolution	1 ... 65536 (16 bit), scaleable
Default value	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 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	Signal:	BUS IN				BUS OUT				The shield of the connection cable must be connected over a large area via the cable gland.
			B	A	0 V	+ V	0 V	+ V	B	A	
3	1 (terminal box)	Terminal:	1	2	3	4	5	6	7	8	

Interface	Type of connection	Function	Signal:								
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

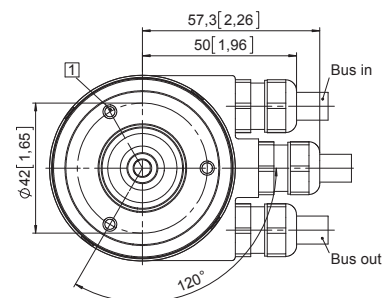
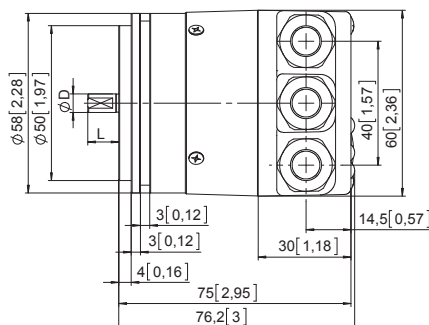
Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(Drawing with cable)

1 3 x M4, 6 [0.24] deep



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

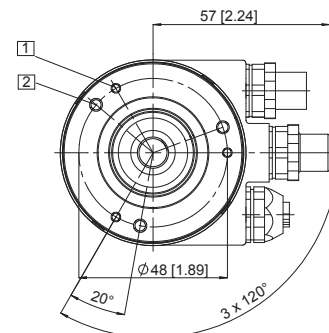
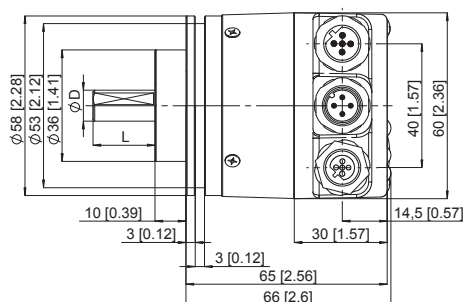
Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

(Drawing with 3 x M12 connector)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

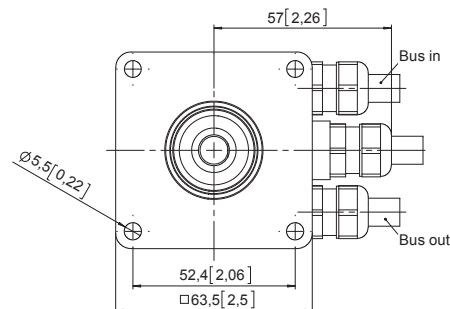
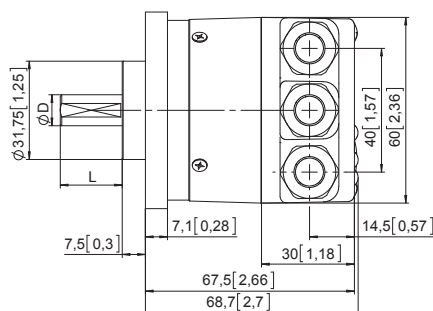


D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(Drawing with cable)



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

Absolute Encoders - Singleturn

**Standard
Optical**

Sendix 5858 / 5878 (Shaft / Hollow shaft)

PROFIBUS DP

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

Dimensions in mm [inch]

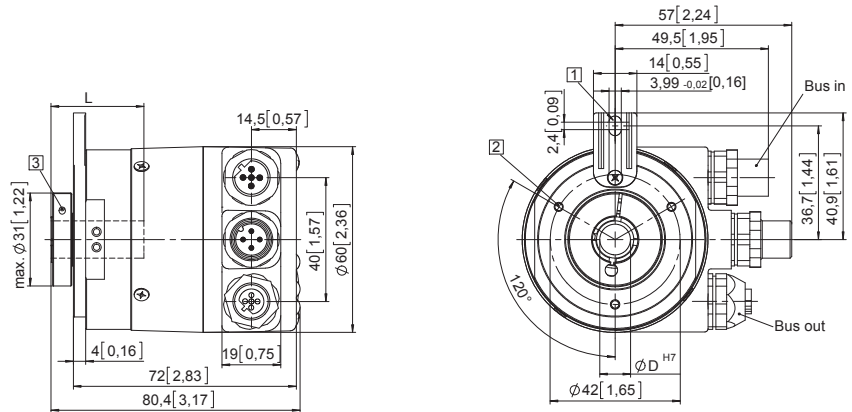
Flange with spring element long

Flange type 1 and 2

(drawing with 3 x M12 connector)

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

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



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

Flange type 5 and 6

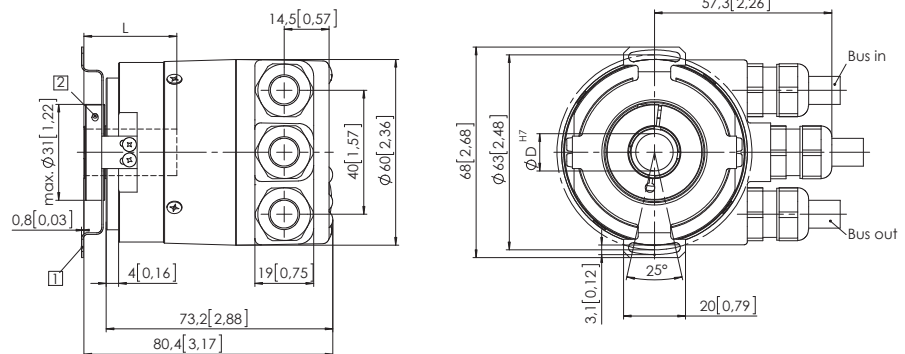
Pitch circle diameter for fixing screws 63 [2.48]

(Drawing with cable)

- 1 Fixing screws DIN 912 M3 x 8
(Washer included in delivery)

- 2 Recommended torque for the
clamping ring 0.6 Nm

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



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

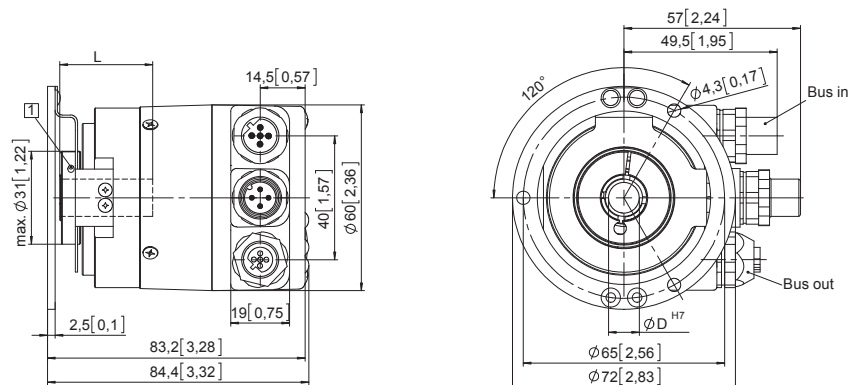
Flange type 3 and 4

Pitch circle diameter for fixing screws, 65 [2.56]

(Drawing with cable)

- 1 Recommended torque for the
clamping ring 0.6 Nm

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



Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	CANopen
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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.



Absolute Encoders Singleturn

Safety-Lock™	High rotational speed	Temperature range -40...+80°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Magnetic field proof	Reverse polarity protection	Optical sensor	Seawater-resistant version on request

Reliable

- Tried-and-tested in applications with the highest demands, such as in mobile automation or medical technology.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +80°C

Flexible

- Node address can be set via rotary switches or software
- Baud rate and termination can be set via DIP switches or software
- With bus terminal cover or fixed connection, as well as M12 connectors or cable connection

Order code	Shaft version	8.5858	Type	. X	. X	. 2	. X	. 21	. 1	. X
				a	b	c	d	e	f	10 by 10
a Flange		b Shaft (ø x L), with flat		d Type of connection		e Fieldbus profile³⁾				
1 = clamping flange, IP65 ø 58 mm [2.28"]		1 = 6 x 10 mm [0.24 x 0.39"] ¹⁾		removable bus terminal cover		21 = CANopen				
3 = clamping flange, IP67 ø 58 mm [2.28"]		2 = 10 x 20 mm [0.39 x 0.79"] ²⁾		1 = cable gland radial		Encoder profile DS406 V3.2				
2 = synchro flange, IP65 ø 58 mm [2.28"]		3 = 1/4" x 7/8"		2 = 2 x M12 connector						
4 = synchro flange, IP67 ø 58 mm [2.28"]		4 = 3/8" x 7/8"		Fixed connection without bus terminal cover						
5 = square flange, IP65 □ 63.5 mm [2.5"]		c Interface / Power supply		A = cable outlet PVC, radial, length 2 m [6.56']						
7 = square flange, IP65 □ 63.5 mm [2.5"]		2 = CANopen DS301 V4.02 / 10 ... 30 V DC		E = 1 x M12 connector, radial						
				F = 2 x M12 connector, radial						
				I = 1 x M23 connector, radial						
				J = 2 x M23 connector, radial						
								3 = SET button		
								optional on request		
								- Ex 2/22		
								- seawater-resistant		
								- special cable length		

Order code	Hollow shaft	8.5878	Type	. X	. X	. 2	. X	. 21	. 1	. X
				a	b	c	d	e	f	10 by 10
a Flange		b Blind hollow shaft		d Type of connection		e Fieldbus profile³⁾				
1 = with spring element long, IP65		3 = ø 10 mm [0.39"]		removable bus terminal cover		21 = CANopen				
2 = with spring element long, IP67		4 = ø 12 mm [0.47"]		1 = cable gland radial		Encoder profile DS406 V3.2				
3 = with stator coupling, IP65 ø 65 mm [2.56"]		5 = ø 14 mm [0.55"]		2 = 2 x M12 connector						
4 = with stator coupling, IP67 ø 65 mm [2.56"]		6 = ø 15 mm [0.59"]		Fixed connection without bus terminal cover						
5 = with stator coupling, IP65 ø 63 mm [2.48"]		8 = ø 3/8"		A = cable outlet PVC, radial, length 2 m [6.56']						
6 = with stator coupling, IP67 ø 63 mm [2.48"]		9 = ø 1/2"		E = 1 x M12 connector, radial						
		c Interface / Power supply		F = 2 x M12 connector, radial						
		2 = CANopen DS301 V4.02 / 10 ... 30 V DC		I = 1 x M23 connector, radial						
				J = 2 x M23 connector, radial						
								3 = SET button		
								optional on request		
								- Ex 2/22		
								- seawater-resistant		
								- special cable length		

1) Preferred type only in conjunction with Flange type 2
2) Preferred type only in conjunction with Flange type 1

3) CAN parameters can also be factory pre-set

Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	CANopen
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling \varnothing 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	With fixing thread	8.0010.4700.0000
Connection technology		
Connector, self-assembly (straight)	Coupling M12 for Bus in	8.0000.5116.0000
	Connector M12 for Bus out	8.0000.5111.0000
Cordset, pre-assembled	M12, for Bus in, 6 m [19.68'] PVC cable	05.00.6091.A211.006M
	M12, for Bus out, 6 m [19.68'] PVC cable	05.00.6091.A411.006M
Programming set		
Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0015

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
Additional 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	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 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	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
EX approval for hazardous areas	optional Zone 2 and 22	
Working temperature range	-40°C ... +80°C ¹⁾ [-40°F ... +176°F] ¹⁾	
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	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	10 ... 30 V DC	
Power consumption (no load)	max. 90 mA	
Reverse polarity protection of the power supply (+V)	yes	
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	
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	

1) Cable version: -30°C ... +75°C [-22°F ... +167°F]

Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	CANopen
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Interface characteristics CANopen	
Singleturn resolution	1 ... 65536 (16 bit), scalable
Default value	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. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

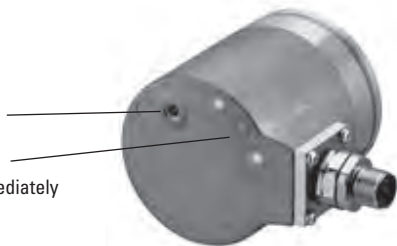
When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

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

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

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

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



CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated.

Class C2 functionality

- NMT Slave
- Heartbeat Protocol
- High Resolution Sync Protocol
- Identity Object
- Error Behaviour Object
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's
- Node address, baud rate and CANbus
- Programmable termination

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode
- Units for speed selectable (steps/sec or RPM)
- Factor for speed calculation (e.g. circumference of measuring wheel)
- Integration time for the speed value from 1 ... 32
- 2 working areas with 2 upper and lower limits and the corresponding output states
- Variable PDO mapping for position, speed, work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status - 3 LED's
- Optional - 32 CAMs programmable
- Customer-specific memory - 16 Bytes
- "Watchdog controlled" device

All profiles stated here: Key-features

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

Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	CANopen
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Terminal assignment

Interface	Type of connection	Cable gland (Bus terminal cover with terminal box)										
2	1	Bus OUT					Bus IN					
		Signal:	CAN_GND	CAN_L	CAN_H	0 V power supply	+V power supply	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Abbreviation:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)										
2	A	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND					
		Cable colour:	WH	BN	YE	GN	GY					
Interface	Type of connection	2 x M12 connector										
2	2, F	Bus OUT										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	3	2	5	4	1					
		Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND					
		Pin:	3	2	5	4	1					
Interface	Type of connection	1 x M12 connector										
2	E	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	3	2	5	4						1
Interface	Type of connection	2 x M23 connector										
2	J	Bus OUT										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	10	12	2	7						3
		Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	10	12	2	7						3
Interface	Type of connection	1 x M23 connector										
2	I	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	10	12	2	7						3

Absolute Encoders - Singleturn

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]

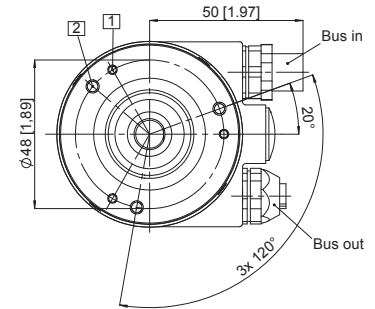
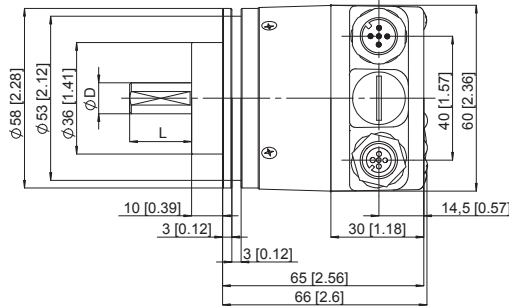
Flange type 1 and 3

(Drawing with 2 x M12 connector)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep

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



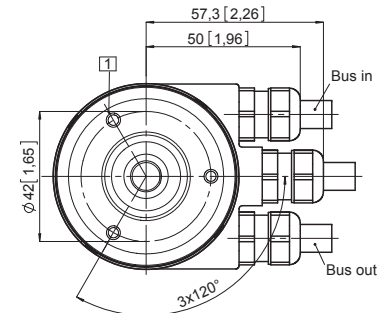
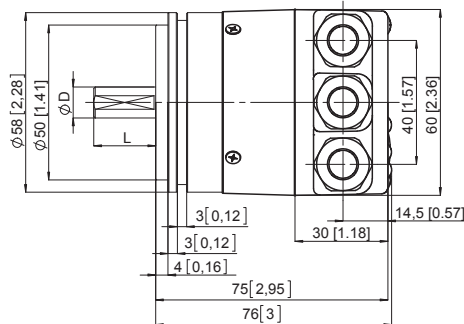
Synchro flange, $\varnothing 58$ [2.28]

Flange type 2 and 4

(Drawing with cable)

1 3 x M4, 6 [0.24] deep

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

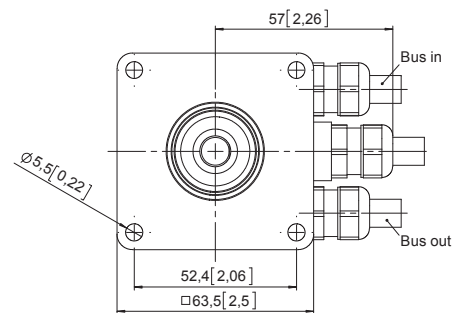
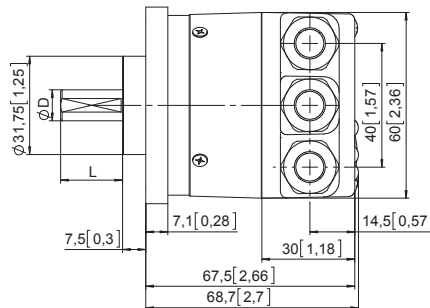


Square flange, $\square 63.5$ [2.5]

Flange type 5 and 7

(Drawing with cable)

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



Absolute Encoders - Singleturn

**Standard
Optical**

Sendix 5858 / 5878 (Shaft / Hollow shaft)

CANopen

Dimensions shaft version, with fixed connection

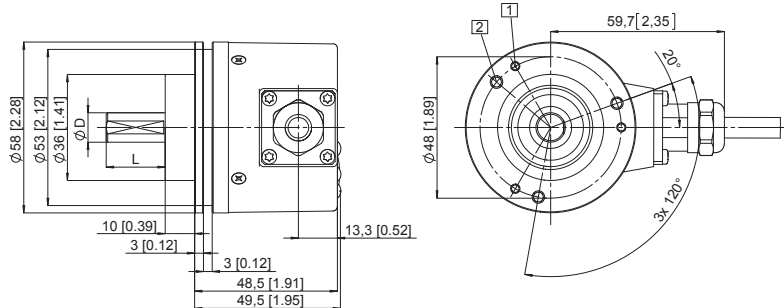
Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

(Drawing cable)

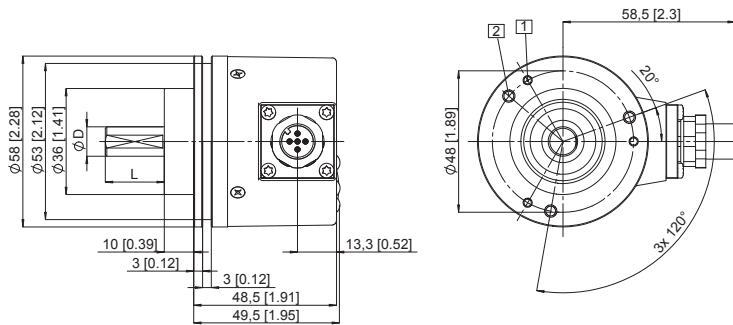
- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



(Drawing with M12 connector)

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

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

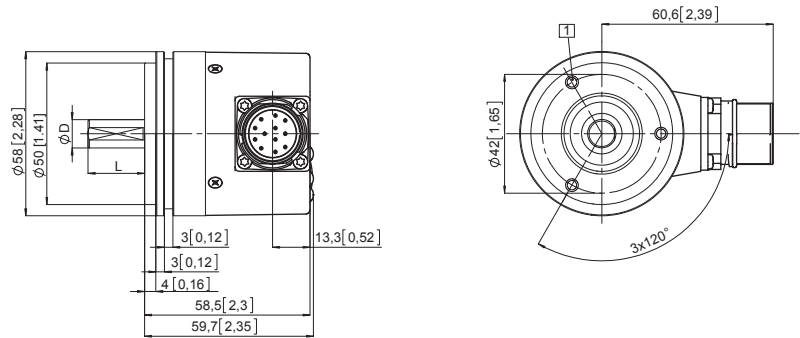


Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(Drawing with M23 connector)

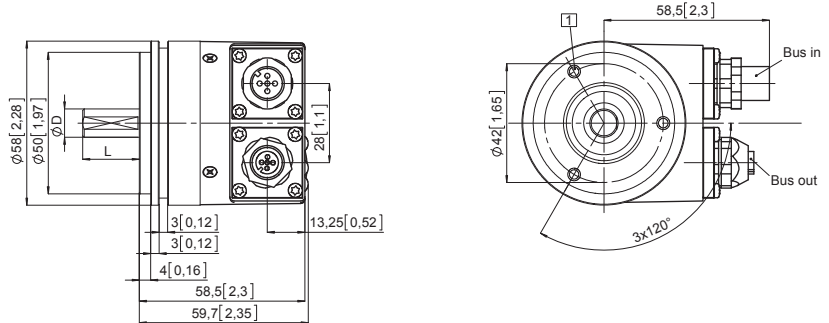
- 1 3 x M4, 6 [0.24] deep



(Drawing with M12 connector)

- 1 3 x M4, 6 [0.24] deep

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

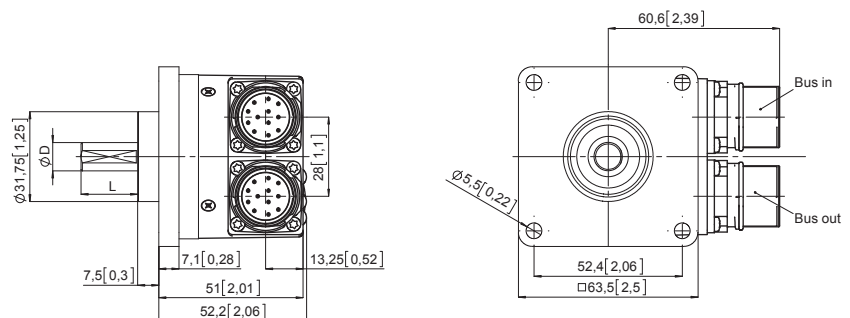


Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(Drawing with 2 x M23 connector)

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



Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	CANopen
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Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

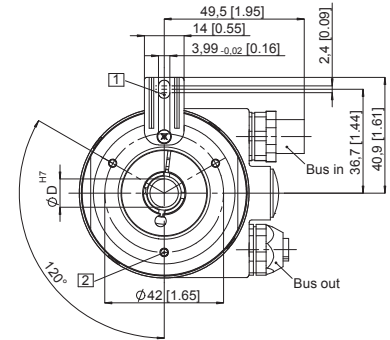
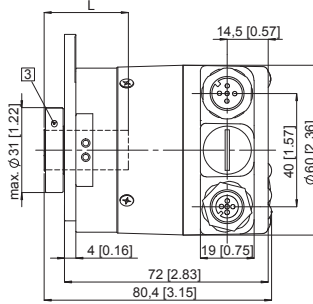
Flange with spring element long

Flange type 1 and 2

(drawing with 2 x M12 connector)

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

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



Flange with stator coupling, \varnothing 63 [2.48]

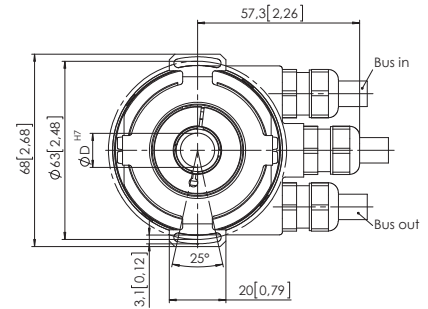
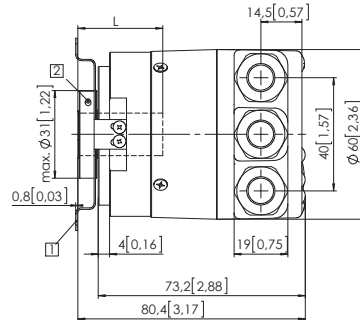
Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(Drawing with cable)

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

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



Flange with stator coupling, \varnothing 65 [2.56]

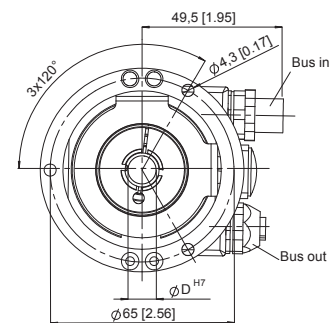
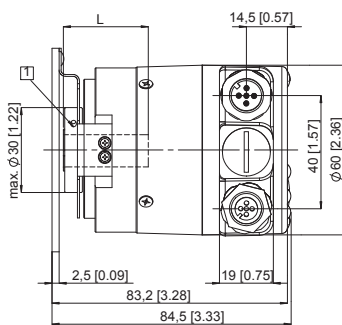
Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(Drawing with cable)

- 1 Recommended torque for the
clamping ring 0.6 Nm

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



Absolute Encoders - Singleturn

**Standard
Optical**

Sendix 5858 / 5878 (Shaft / Hollow shaft)

CANopen

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

Dimensions in mm [inch]

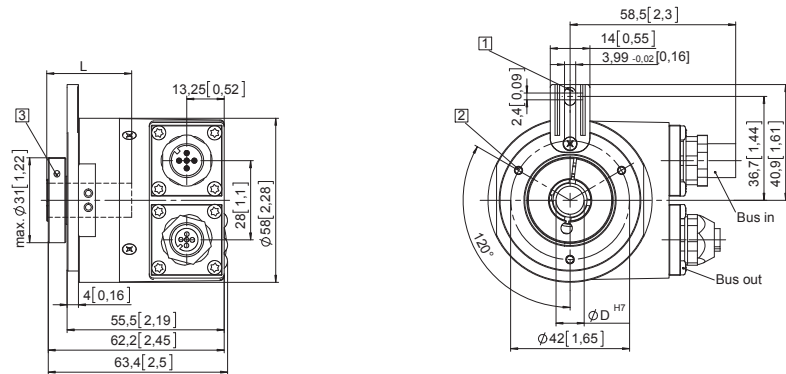
Flange with spring element long

Flange type 1 and 2

(drawing with 2 x M12 connector)

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

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



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

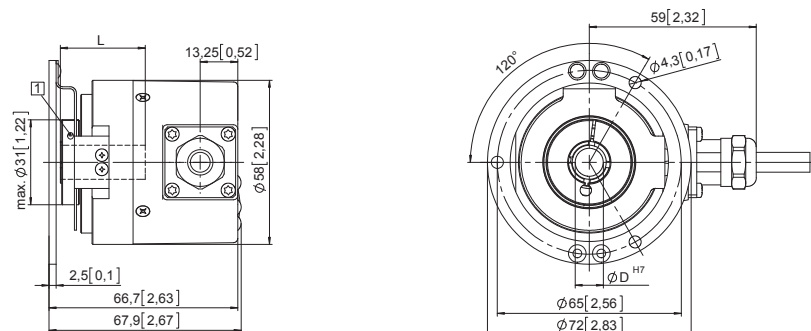
Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(Drawing with cable)

- 1 Recommended torque for the
clamping ring 0.6 Nm

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



Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	EtherCAT
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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.



Absolute Encoders Singleturn

Safety-Lock™	High rotational speed	Temperature range -40°.. +80°C	High protection level IP	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Short-circuit proof	Reverse polarity protection	Optical sensor	Seawater-resistant version on request

<h3>Reliable</h3> <ul style="list-style-type: none"> 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 	<h3>Flexible</h3> <ul style="list-style-type: none"> Use of CoE (CAN over EtherNet) Genuine new position information as a result of minimal cycle time of 62.5 µs in the DC mode Faster, easier error-free connection thanks to M12 connectors
--	---

Order code Shaft version	8.5858 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 <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, IP65 □ 63.5 mm [2.5"]	b Shaft (ø x L), with flat <u>1 = 6 x 10 mm [0.24 x 0.39"]¹⁾</u> <u>2 = 10 x 20 mm [0.39 x 0.79"]²⁾</u> 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"	c Interface / Power supply <u>B = EtherCAT / 10 ... 30 V DC</u> d Type of connection <u>removable bus terminal cover</u> <u>2 = 3 x M12 connector</u>	e Fieldbus profile <u>B2= EtherCAT with CoE (CAN over EtherNet)</u> <i>optional on request</i> - Ex 2/22 - seawater-resistant	

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 1 = with spring element long, IP65 2 = with spring element long, IP67 3 = with stator coupling, IP65 ø 65 mm [2.56"] 4 = with stator coupling, IP67 ø 65 mm [2.56"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	c Interface / Power supply <u>B = EtherCAT / 10 ... 30 V DC</u> d Type of connection <u>removable bus terminal cover</u> <u>2 = 3 x M12 connector</u>	e Fieldbus profile <u>B2= EtherCAT with CoE (CAN over EtherNet)</u> <i>optional on request</i> - Ex 2/22 - seawater-resistant	

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

Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	EtherCAT
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	<p>With fixing thread</p>	8.0010.4700.0000
Connection technology		
Connector, self-assembly (straight)	Coupling M12 for Port IN and Port OUT Connector M12 for power supply	05.WASCSY4S 05.B8141-0
Cordset, pre-assembled	M12 for Port IN and Port OUT, 2 m [6.56'] PUR cable M12 for power supply, 2 m [6.56'] PUR cable	05.00.6031.4411.002M 05.00.6061.6211.002M

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

Technical data		
Mechanical characteristics		
Max. 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}	9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous) 7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous) 8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous) 6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65 IP67	< 0.01 Nm < 0.05 Nm
Moment of inertia	shaft version hollow shaft version	3.0 x 10 ⁻⁶ kgm ² 6.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial axial	80 N 40 N
Weight		approx. 0.50 kg [17.64 oz]
Protection acc. to EN 60529	housing side shaft side	IP67 IP65, opt. IP67
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft flange housing	stainless steel aluminium zinc die-cast housing
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. 110 mA
Reverse polarity protection of the power supply (+V)		yes
UL approval		File 224618
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC
Device characteristics		
Singleturn resolution		1 ... 65535 (16 bit), scaleable
Default value		8192 (13 bit)
Total resolution		scaleable from 1 up to 65535 (16 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)

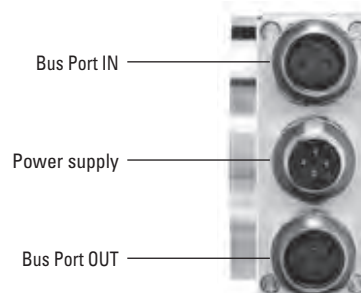
The following parameters are programmable:

- 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, RPM
- 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

Absolute Encoders
Singleturn

Terminal assignment bus

Interface	Type of connection	Function	M12 connector					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
B	2 (3 x M12 connector)	Bus Port IN	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus Port OUT	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	EtherCAT
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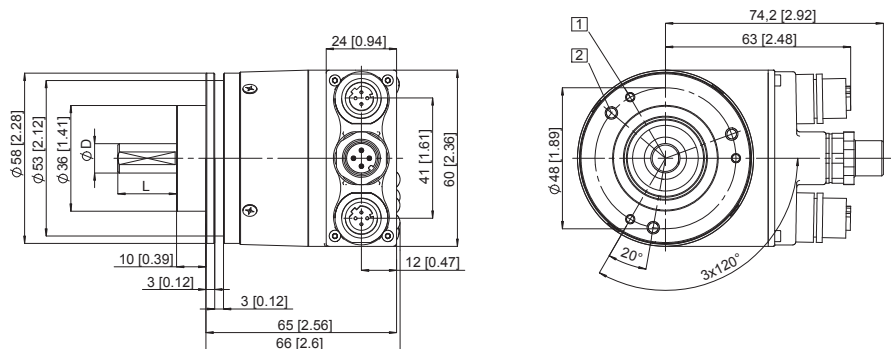
Dimensions shaft version, with removable bus terminal cover

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

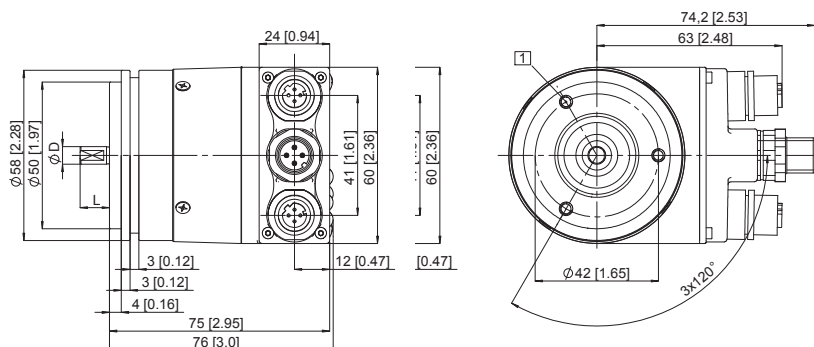
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



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

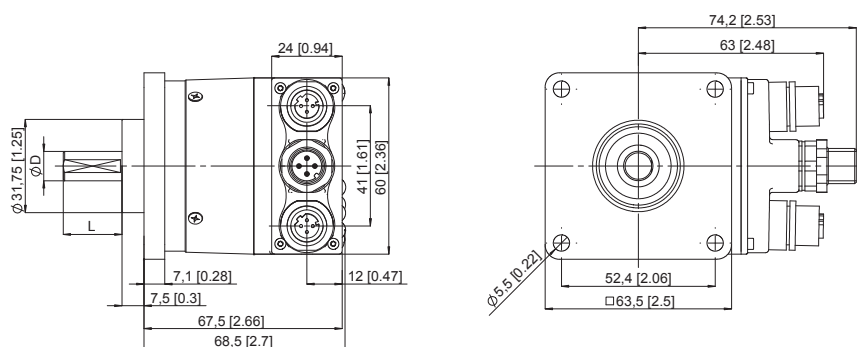
- 1 3 x M4, 6 [0.24] deep

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



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

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



Absolute Encoders - Singleturn

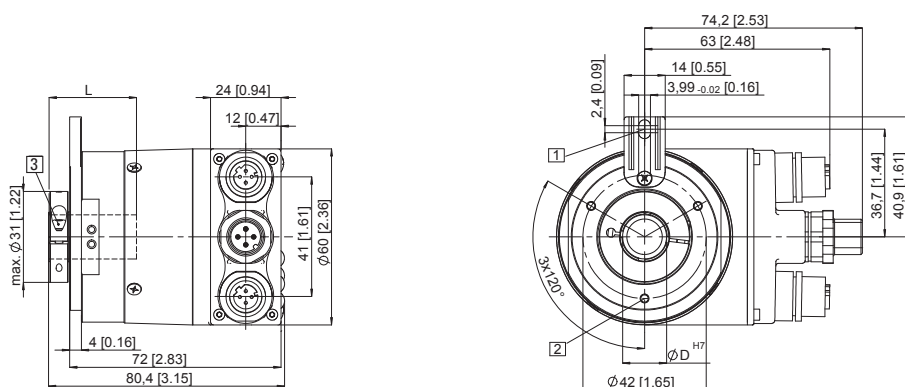
Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	EtherCAT
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Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

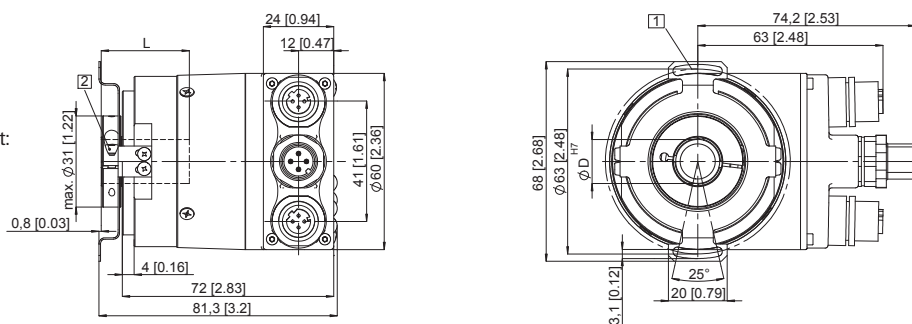
Flange with spring element long Flange type 1 and 2

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



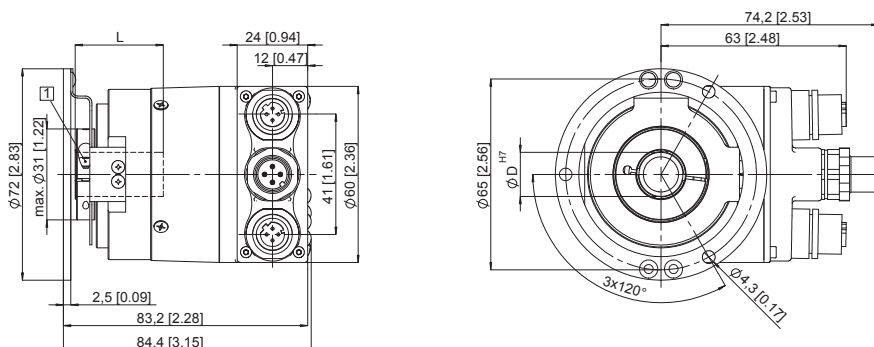
Flange with stator coupling, \varnothing 63 [2.48] Flange type 5 and 6

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



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

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



Absolute Encoders
Singleturn

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.

Easy start-up thanks to the "Ezturn for PROFINET" software supplied with the encoder.



Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction

Flexible

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

Order code Shaft version

8.5858 . **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 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, IP65 □ 63.5 mm [2.5"]

b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]¹⁾
- 2 = 10 x 20 mm [0.39 x 0.79"]²⁾
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c Interface / Power supply

- C = PROFINET IO / 10 ... 30 V DC

e Field bus profile

- C2 = PROFINET IO

d Type of connection

- 2 = 3 x M12 connector
- removable bus terminal cover optional on request
- Ex 2/22
- seawater-resistant

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 ø 65 mm [2.56"]
- 4 = with stator coupling, IP67 ø 65 mm [2.56"]
- 5 = with stator coupling, IP65 ø 63 mm [2.48"]
- 6 = with stator coupling, IP67 ø 63 mm [2.48"]

b Blind hollow shaft

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

c Interface / Power supply

- C = PROFINET IO / 10 ... 30 V DC

e Field bus profile

- C2 = PROFINET IO

d Type of connection

- 2 = 3 x M12 connector
- removable bus terminal cover optional on request
- Ex 2/22
- seawater-resistant

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

Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	PROFINET IO
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	With fixing thread	8.0010.4700.0000
Connection technology		
Connector, self-assembly (straight)	Coupling M12 for Port 1 and Port 2	05.WASCSY4S
	Connector M12 for power supply	05.B8141-0
Cordset, pre-assembled	M12 for Port 1 and Port 2, 2 m [6.56'] PUR cable	05.00.6031.4411.002M
	M12 for power supply, 2 m [6.56'] PUR cable	05.00.6061.6211.002M

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

Technical data

Mechanical characteristics	
Max. speed	IP65 up to 70°C [158°F] 9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous) IP65 up to T _{max} 7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous) IP67 up to 70°C [158°F] 8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous) IP67 up to T _{max} 6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65 < 0.01 Nm IP67 < 0.05 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. 0.50 kg [17.64 oz]
Protection acc. to EN 60529	housing side IP67 shaft side IP65, opt. IP67
EX approval for hazardous areas	optional Zone 2 and 22
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]
Material	shaft/hollow shaft stainless steel flange aluminium housing zinc die-cast housing
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. 200 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Device characteristics	
Singleturn resolution	1 ... 65535 (16 bit), scalable
Default value	8192 (13 bit)
Total resolution	scalable from 1 up to 65535 (13 bit)
Code	binary
Protocol	PROFINET IO

Link 1 and 2, LED (green / yellow)	
two coloured	green active link yellow data transfer

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

Ezturn software for PROFINET IO (supplied with the encoder)
<ul style="list-style-type: none"> Monitoring of cyclic data (e.g. position, speed) Monitoring of acyclic data (e.g. IMO, electronic name plate, encoder parameters, warnings and error messages, preset) Setting of preset values Firmware updates via the bus

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

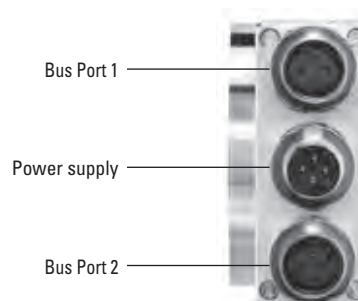
The complete encoder profile according to Profile Encoder Version 4.1 as well as the Identification & Maintenance functionality Version 1.16 has been implemented. IM blocks 0, 1, 2, 3 and 4 are supported.

The **M**edia **R**edundancy **P**rotokoll is implemented here.

Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

Terminal assignment bus

Interface	Type of connection	Function	M12 connector					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
C	2 (3 x M12 connector)	Bus Port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	-	Voltage -	-	
			Abbreviation:	+ V	-	0 V	-	
			Pin:	1	2	3	4	
		Bus Port 2	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



Absolute Encoders - Singleturn

Standard Optical	Sendix 5858 / 5878 (Shaft / Hollow shaft)	PROFINET IO
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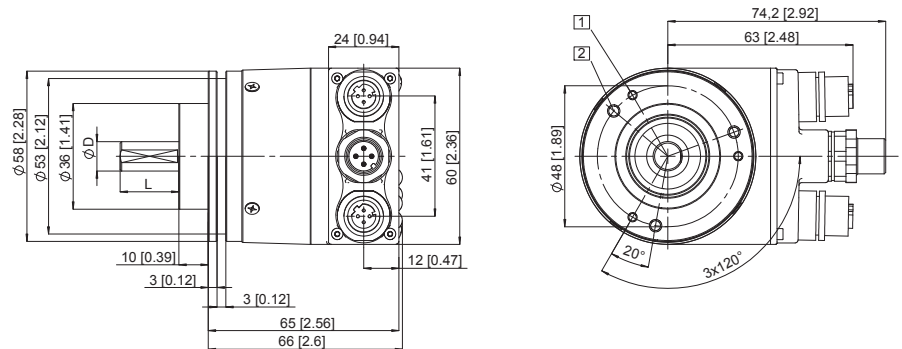
Dimensions shaft version, with removable bus terminal cover

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

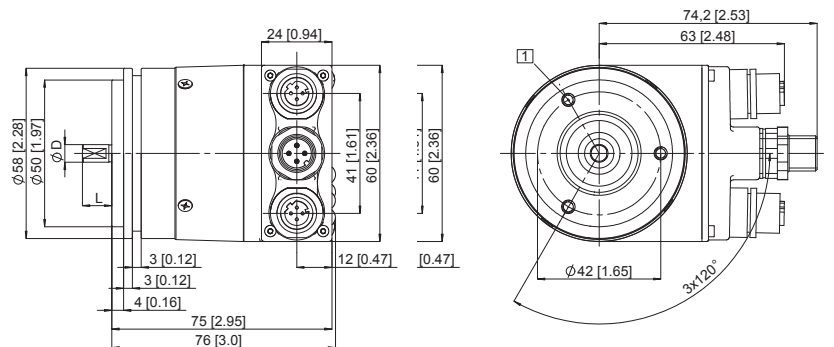
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



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

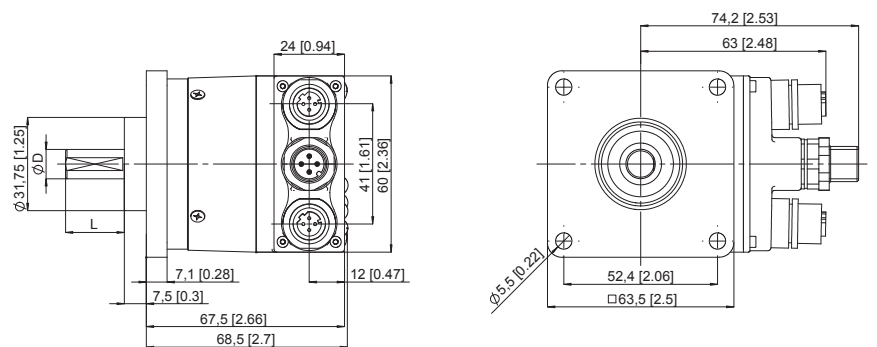
- 1 3 x M4, 6 [0.24] deep

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



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

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



Absolute Encoders - Singleturn

**Standard
Optical**

Sendix 5858 / 5878 (Shaft / Hollow shaft)

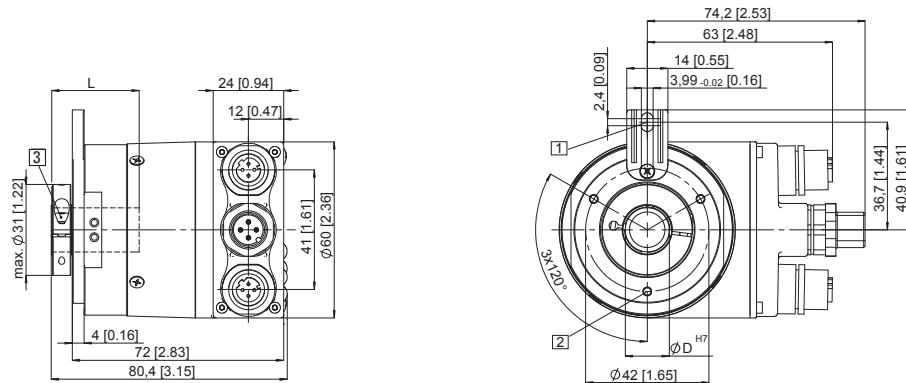
PROFINET IO

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

Dimensions in mm [inch]

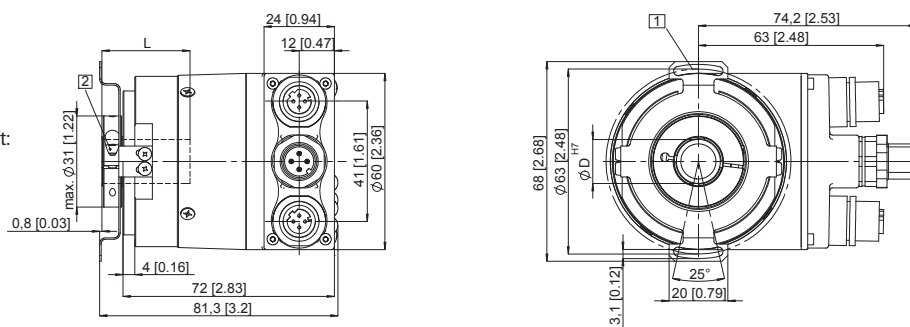
Flange with spring element long Flange type 1 and 2

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



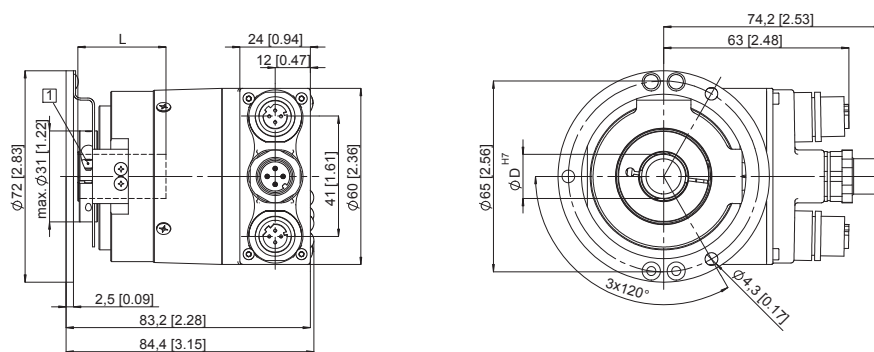
Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

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



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

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



Absolute Encoders - Singleturn

Standard Stainless steel, optical	5876 (Hollow shaft)	SSI, Parallel
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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°.



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

Safe

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

Adaptable

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

Absolute Encoders Singleturn

Order code 8.5876 . XXXX . XXXX
Shaft / Hollow shaft Type a b c d e f

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

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) In conjunction with parallel or SSI output
 2) Only in conjunction with SSI output
 3) Not with SSI interface

Absolute Encoders - Singleturn

Standard Stainless steel, optical	5876 (Hollow shaft)	SSI, Parallel
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Technical data

Mechanical characteristics	
Speed ¹⁾	max. 6000 min ⁻¹
Moment of inertia	approx. 6 x 10 ⁻⁶ kgm ²
Starting torque - at 20°C [68°F]	< 0.05 Nm
Weight	approx. 0.6 kg [21.16 oz]
EX approval for hazardous areas	optional Zone 2 and 22

Protection acc. to EN 60529	IP67
Working temperature range	-20°C ... +80°C ²⁾ [-4°F ... +176°F] ²⁾
Material	shaft / housing stainless steel
Shock resistance acc. 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

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. 15.000/s	max. 15.000/s	40.000/s	40.000/s
SSI clock rate min./max.	100 kHz / 500 kHz	100 kHz / 500 kHz	–	–
Signal level HIGH	typ. 3.8 V	typ. 3.8 V	min. 3.4 V	min. V ₊ - 2.8 V
Signal level LOW	(I _{Load} = 20 mA) typ. 1.3 V (I _{Load} = 10 mA) – (I _{Load} = 1 mA) –	typ. 1.3 V – –	– max. 1.5 V max. 0.3 V	– max. 1.8 V –
Rising edge time t_r (without cable)	max. 100 ns	max. 100 ns	max. 0.2 µs	max. 1 µs
Falling edge time t_f (without cable)	max. 100 ns	max. 100 ns	max. 0.2 µs	max. 1 µs
Short circuit proof outputs ³⁾	yes	yes ⁴⁾	yes	yes
Reverse polarity protection of the power supply	no	yes	no	yes
UL approval	File 224618			
CE compliant acc. to	EMC guideline 2004/108/EC			
RoHS compliant acc. to	guideline 2002/95/EC			

Control inputs

Switching levels of the control inputs

Power supply	5 V DC	10 ... 30 V DC
Switching level	LOW ≤ 1.7 V HIGH ≥ 3.4 V	≤ 4.5 V ≥ 8.7 V

Up/Down input to switch the counting direction

As a standard, absolute encoders deliver increasing code values when the shaft rotates clockwise (cw), when looking from the shaft side. When the shaft rotates counter-clockwise (ccw), the output delivers accordingly decreasing code values.

As long as the Up/Down input receives the corresponding signal (HIGH), this feature is reversed. Clockwise rotation will deliver decreasing code/current values while counter-clockwise rotation will deliver increasing code/current values.

The response time is :

for 5 V DC power supply	0.4 ms
for 10 ... 30 V DC power supply	2 ms

SET input

This input is used to reset (zero) the encoder. A control pulse (HIGH) sent to this input allows the current position value to be saved as the new zero position in the encoder.

Note : After applying power to the encoder and before activating the SET input, a count direction (cw or ccw) must be clearly defined on the Up/Down input!

The response time is :

for 5 V DC power supply	0.4 ms
for 10 ... 30 V DC power supply	2 ms

LATCH input

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

The response time is :

for 5 V DC power supply	140 µs
for 10 ... 30 V DC power supply	200 µs

1) For continuous operation max. 1500 min⁻¹

2) 70°C [158°F] cable version

3) If power supply +V correctly applied

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

Absolute Encoders - Singleturn

Standard Stainless steel, optical	5876 (Hollow shaft)	SSI, Parallel
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Terminal assignment

SSI interface

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

Top view of mating side, male contact base



M12 connector, 8 pin

Interface	Type of connection	M12 connector, 8-pin									
		Signal	0V	+V	C+	C-	D+	D-	ST	VR	
1, 2	2	Signal	0V	+V	C+	C-	D+	D-	ST	VR	
		Pin:	1	2	3	4	5	6	7	8	

Parallel interface up to max. 14 bit and max. 2 options

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

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- ST: Set input. The current position becomes defined as position zero.
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning
- LH: LATCH input. Active HIGH. The current position is saved and is statically available at the output.
- PH ⊥: Plug connector housing (Shield)

Absolute Encoders - Singleturn

Standard
Stainless steel, optical

5876 (Hollow shaft)

SSI, Parallel

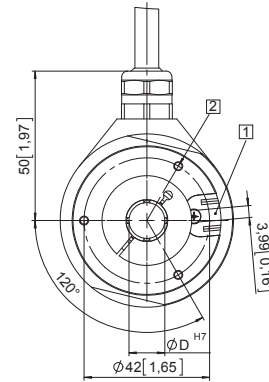
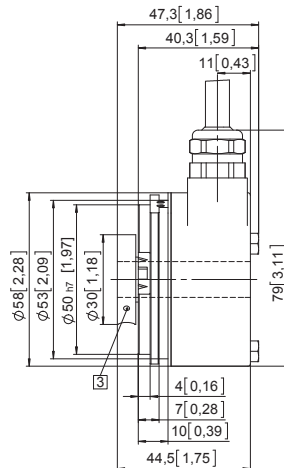
Dimensions

Dimensions in mm [inch]

Flange with through hollow shaft, $\varnothing 58$ [2.28"]

Flange type 1

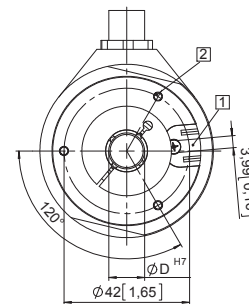
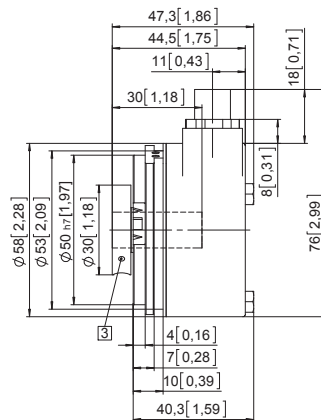
- 1 Torque stop slot
Recommendation:
Cylindrical pin DIN 7, $\varnothing 4$ [0.16]
- 2 3 x M3, 5 [0.2] deep
- 3 Recommended torque for the clamping ring
shaft version 6: 0.7 Nm
shaft version 8: 1.0 Nm



Flange with blind hollow shaft, $\varnothing 58$ [2.28"]

Flange type 2

- 1 Torque stop slot
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



Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7053 (Shaft)	SSI / BiSS-C
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The Sendix 7053 absolute encoders – Singleturn offer Ex protection in a compact 70 mm seawater resistant aluminium housing, with an SSI or BiSS-C 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.



Absolute Encoders
Singleturn

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

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-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection)

Explosion protection

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

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

- | | | |
|---|---|---|
| <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
2 = SSI or BiSS-C / 10 ... 30 V DC</p> <p>d Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see i, e. g.: 0100 = 10 m [32.81']</p> | <p>e Code
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray</p> <p>f Resolution²⁾
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST</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 style="text-align: right;"><i>optional on request
- special cable length</i></p> |
|---|---|---|

Mounting accessory for shaft encoders	Order No.
Coupling	8.0000.1101.1010
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

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

Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7053 (Shaft)	SSI / BiSS-C
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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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

Mechanical characteristics	
Max. speed	6 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Material	shaft stainless steel flange / housing seawater-resistant Al, type AISiMgMn (EN AW-6082) (stainless steel on request) cable PUR
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
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
Short-circuit proof outputs	yes ¹⁾
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC
RoHS compliant acc. to	guideline 2002/95/EC

DIR input	
A High signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed.	
If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.	

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

SSI interface	
Output driver	RS485 Transceiver type
Permissible load/channel	max. 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Singleturn resolution	10...14 bit and 17 bit ²⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	resolution ≤ 14 bit 50 kHz ... 2 MHz resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	< 15 μs ²⁾
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	
Data refresh rate	resolution ≤ 14 bit < 1 μ resolution ≥ 15 bit < 4 μs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ²⁾
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

SET input	
Input	HIGH active
Input type	Comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response time (DIR input)	1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read.

Status output	
Output driver	Open Collector, internal pull-up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH +V LOW < 1 V
Active at	LOW

The status output serves to display various alarm or error messages. The status output is HIGH (Open Collector with internal pull-up 22k) in normal operation.

1) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied
2) Other options on request

Absolute Encoders - Singleturn

Standard	Sendix 7053 (Shaft)	SSI / BiSS-C
ATEX, optical		

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥			
2	1, 2, A, B	SET, DIR	Cable marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield		

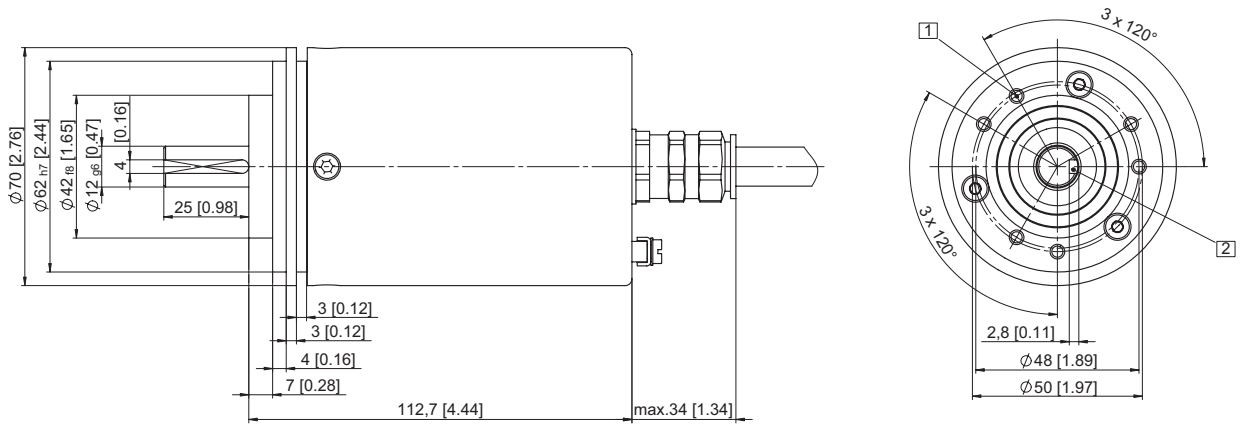
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the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

Dimensions

Dimensions in mm [inch]

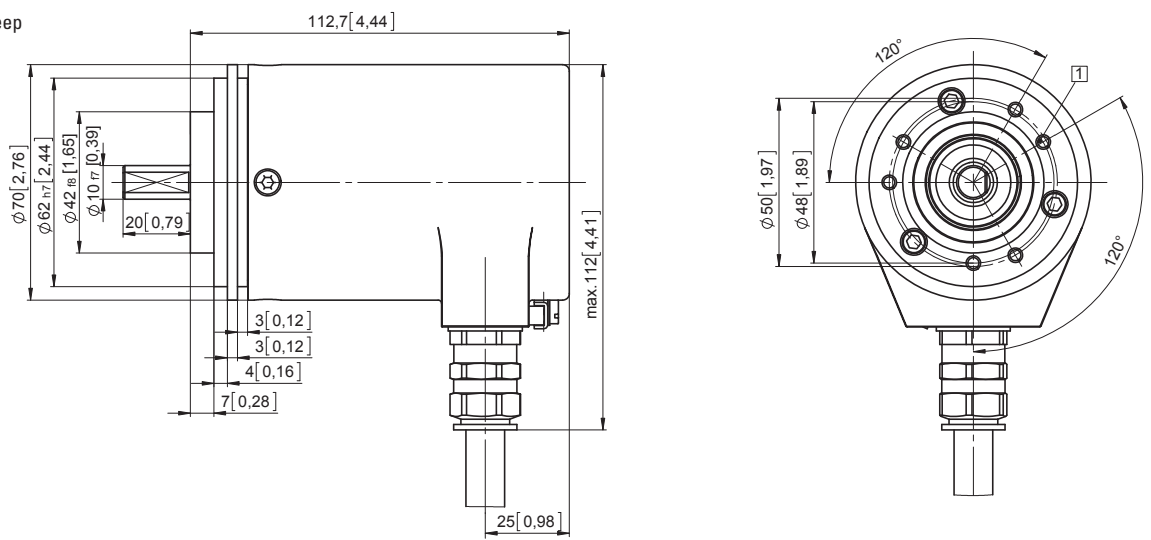
Clamping-synchronous flange, ø 70 [2.76] Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Absolute Encoders
Singleturn

Absolute Encoders - Singleturn

Standard
ATEX, SIL2/PLd, optical

Sendix 7053FS2 (Shaft)

SSI/BiSS-C + SinCos



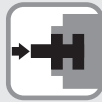
Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 acc. to EN 61800-5-2 or PLd to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater-resistant aluminium.



Ex approval



Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater-resistant

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-C 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 8.7053 FS2 . 1 X 4 X . X X 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 or BiSS-C + 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-C, Binary
G = SSI, Gray

f Resolution²⁾

A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g Inputs / Outputs²⁾

2 = SET, DIR input

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

Accessories safety control

Safety-M, basic modules

Speed and position monitoring for 1 axis

Speed and position monitoring for 2 axes (analogue input optional)

Order No.

8.MSP1.000

8.MSP2.XXX

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

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

You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

1) Not applicable with connection types 1 and 2

2) Resolution, preset value and counting direction factory-programmable

Absolute Encoders - Singleturn

Standard ATEX, SIL2/PLd, optical	Sendix 7053FS2 (Shaft)	SSI/BiSS-C + 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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value ¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Material	shaft stainless steel flange / housing seawater-resistant Al, type AISiMgMn (EN AW-6082) (stainless steel on req.) 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

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Singleturn resolution	10 ... 14 bit and 17 bit ³⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	resolution ≤ 14 bit 50 kHz ... 2 MHz resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	
Data refresh rate	resolution ≤ 14 bit ≤ 1 μs resolution ≥ 15 bit 4 μs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ³⁾
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

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

SET input	
Input	high active
Input type	Comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response time (DIR input)	1 ms

The encoder can be set to zero at any position by means of a High signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read.

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) Other options on request

Absolute Encoders - Singleturn

Standard
ATEX, SIL2/PLd, optical

Sendix 7053FS2 (Shaft)

SSI/BiSS-C + SinCos

DIR input

A HIGH signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed.

If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

Power-ON delay

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)														
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp	\perp
4	1, 2, A, B	SET, DIR	Cable marking:	6	1	2	3	4	5	11	12	7	8	9	10	YE/GN	shield

+V: Encoder power supply +V DC

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

C+, C-: Clock signal

D+, D-: Data signal

SET: Set input. The current position becomes defined as position zero.

DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.

A, \bar{A} : Cosine signal

B, \bar{B} : Sine signal

\perp : Protective earth

Dimensions

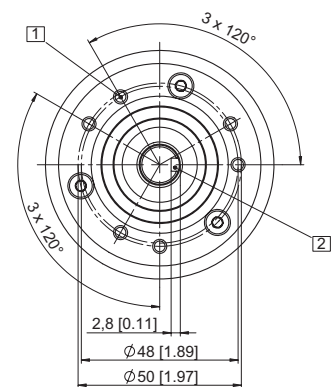
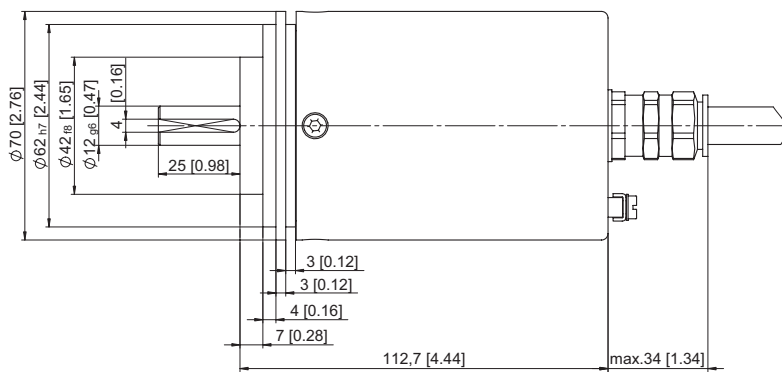
Dimensions in mm [inch]

Clamping-synchronous flange, \varnothing 70 [2.76]

Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep

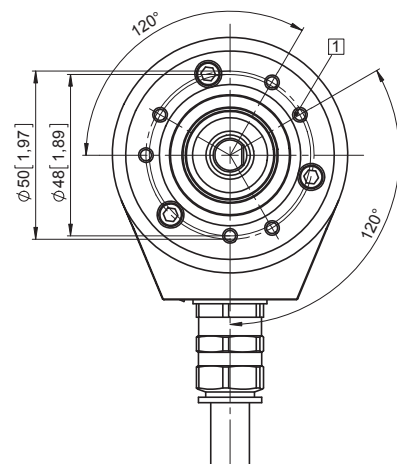
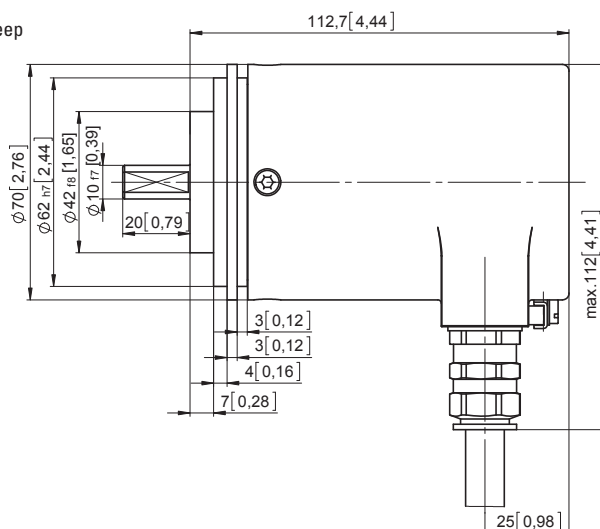
2 Keyway for DIN 6885-A-4x4x25 key



Clamping-synchronous flange, \varnothing 70 [2.76]

Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Absolute Encoders - Singleturn

Standard ATEX, SIL3/PLe, optical	Sendix 7053FS3 (Shaft)	SSI/BiSS-C + SinCos
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Ex protection and Functional Safety in one device.

The absolute singleturn encoders 7053 FS3 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-resistant aluminium.



Functional Safety

- Encoder with individual certificate from IFA / TÜV
- Suitable for applications up to SIL3 acc. to EN 61800-5-2
- Suitable for applications up to PLe acc. to EN ISO 13849-1
- SSI or BiSS-C 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	8.7053 FS3	. 1 X 4 X . XX 2 1 . XXXX
Shaft version	Type	a b c d e f g h i 1)

- | | | |
|---|--|--|
| <p>a Flange
1 = clamping-synchronous flange, IP67, Ø 70 mm [2.76"]</p> <p>b Shaft (Ø x L)
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p>c Interface / Power supply
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC</p> <p>d Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see i, e. g.: 0100 = 10 m [32.81']</p> | <p>e Code
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray</p> <p>f Resolution ²⁾
A = 10 bit ST
1 = 11 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST</p> | <p>g Inputs / Outputs ²⁾
2 = SET, DIR input</p> <p>h Options
1 = no option</p> <p>i Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']</p> <p style="text-align: right;"><i>optional on request
- special cable length</i></p> |
|---|--|--|

Accessories safety control		Order No.
Safety-M, basic modules	Speed and position monitoring for 1 axis	8.MSP1.000
	Speed and position monitoring for 2 axes (analogue input optional)	8.MSP2.XXX

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

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

Absolute Encoders - Singleturn

Standard ATEX, SIL3/PLe, optical	Sendix 7053FS3 (Shaft)	SSI/BiSS-C + 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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value ¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Material	shaft stainless steel flange / housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) stainless steel on req. 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

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Singleturn resolution	10... 14 bit and 17 bit ³⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	resolution ≤ 14 bit 50 kHz ... 2 MHz resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	
Data refresh rate	resolution ≤ 14 bit ≤ 1 μs resolution ≥ 15 bit 4 μs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ³⁾
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

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

SET input	
Input	high active
Input type	Comparator
Signal level	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response time (DIR input)	1 ms

The encoder can be set to zero at any position by means of a High signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read.

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) Other options on request

Absolute Encoders - Singleturn

Standard ATEX, SIL3/PLe, optical	Sendix 7053FS3 (Shaft)	SSI/BiSS-C + SinCos
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DIR input
A HIGH signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed.
If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)														
4	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp	\perp
			Cable marking:	6	1	2	3	4	5	11	12	7	8	9	10	YE/GN	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: Set input. The current position becomes defined as position zero.

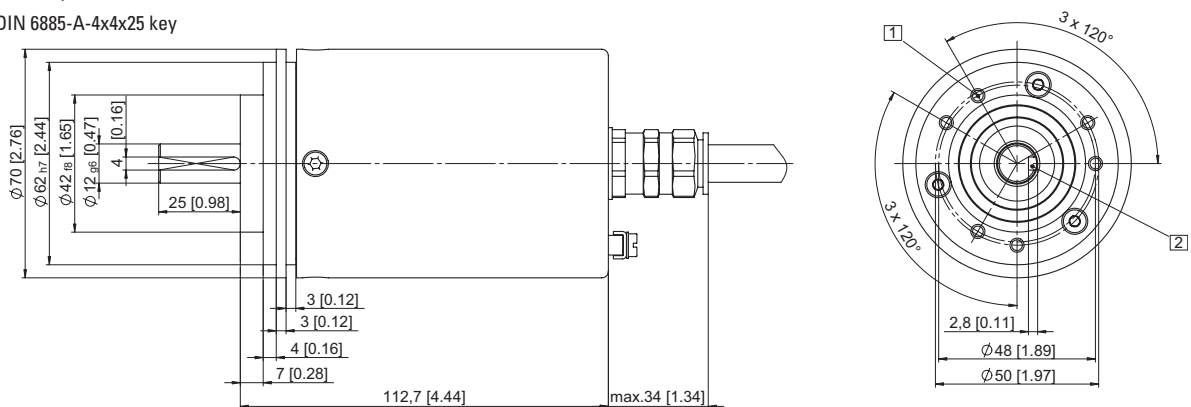
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
A, \bar{A} : Cosine signal
B, \bar{B} : Sine signal
 \perp : Protective earth

Dimensions

Dimensions in mm [inch]

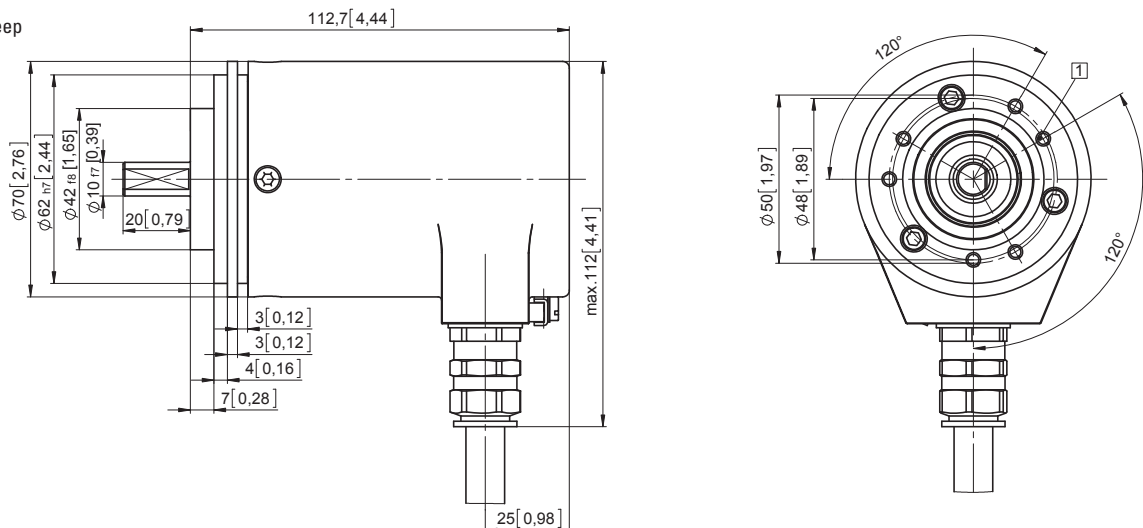
Clamping-synchronous flange, $\varnothing 70$ [2.76] Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7058 (Shaft)	PROFIBUS DP
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The Sendix 7058 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater resistant 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.



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-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection)

Explosion protection

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

Order code	8.7058	. 1 X 3 X . 31 11 . XXXX
Shaft version	Type	a b c d e f 1)

<p>a Flange 1 = clamping-synchronous flange, IP67, \varnothing 70 mm [2.76"]</p> <p>b Shaft ($\varnothing \times L$) 2 = 10 x 20 mm [0.39 x 0.79"], with flat 1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p>c Interface / Power supply 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'] preferred length see f, e. g.: 0100 = 10 m [32.81']</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 - special cable length</i></p>
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Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010

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

1) Not applicable with connection types 1 and 2

Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7058 (Shaft)	PROFIBUS DP
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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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Material	shaft stainless steel flange / housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) (stainless steel on request) cable PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 110 mA
Reverse polarity protection for power supply (+V)	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics PROFIBUS DP	
Resolution Singleturn	1 ... 65536 (16 bit), scalable
Default value	8192 (13 bit)
Code	Binary
Interface	Specification according to PROFIBUS DP 2.0 / Standard (DIN 19245 Part 3) / RS485 galvanically isolated
Protocol	Profibus Encoder Profile V1.1 Class1 and Class 2 with manufacturer-specific add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a CLASS 2-Master. Default address: 125
Termination	active termination can only be switched on externally

Profibus Encoder-Profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS Fieldbus system. The Encoder Profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

The following parameters can be programmed

- Direction of rotation
- Scaling – number of steps per revolution
- Preset value
- Diagnostics mode

The following functionality is integrated

- Galvanic isolation of the Bus stage with DC/DC converter
- Line Driver acc. to RS485 max. 12 MB
- Full Class 1 and Class 2 functionality
- Speed value

Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7058 (Shaft)	PROFIBUS DP
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Terminal assignment

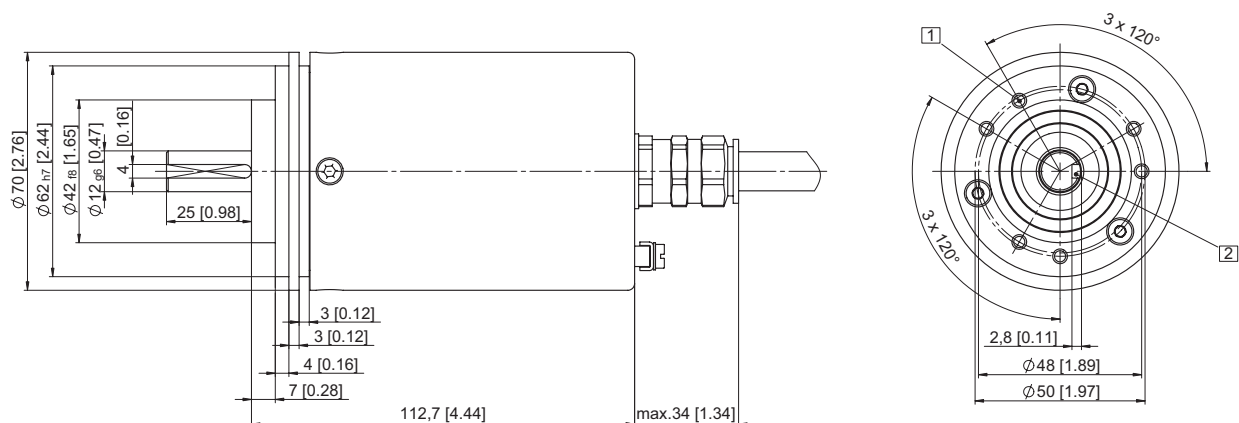
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
		Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_VDC	PB_A OUT	PB_B OUT
3	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

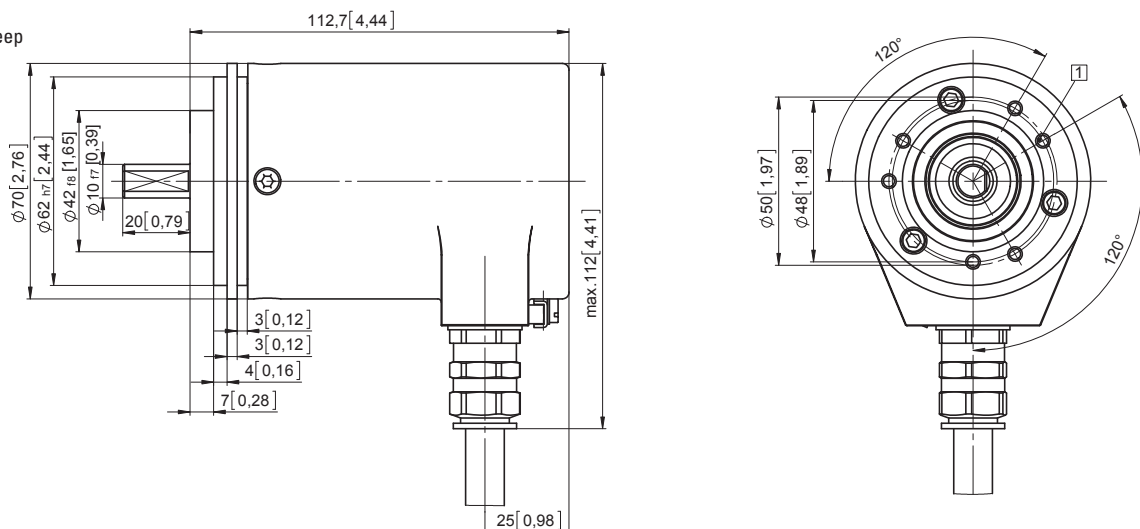
Clamping-synchronous flange, $\varnothing 70$ [2.76] Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7058 (Shaft)	CANopen
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The Sendix 7058 absolute singleturn encoders offer Ex protection in a compact 70 mm seawater resistant 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


 Absolute Encoders
Singleturn

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

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-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection)

Explosion protection

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

Order code	8.7058	.1	X	2	X	.21	11	.XXXX	
Shaft version	Type	a	b	c	d	e	f	1)	
a Flange	1 = clamping-synchronous flange, IP67, ø 70 mm [2.76"]	d Type of connection					f Cable length in dm ¹⁾		
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	1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length > 2 m [6.56'] B = radial cable, length > 2 m [6.56'] preferred length see f , e. g.: 0100 = 10 m [32.81']					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	e Fieldbus profile 21 = CANopen encoder profile DS406 V3.2					optional on request - special cable length		

Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Programming set	Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0015

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

1) Not applicable with connection types 1 and 2

Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7058 (Shaft)	CANopen
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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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Material	shaft stainless steel flange / housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) (stainless steel on req.) cable PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 110 mA
Reverse polarity protection for power supply (+V)	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics CANopen	
Resolution	1 ... 65536 (16 bit) (scalable: 1 ... 65536)
Default value	8192 (13 bit)
Code	Binary
Interface	CAN High-Speed acc. to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
Protocol	CANopen Profile DS406 V3.2 with manufacturer-specific add-ons
Baud rate	10 ... 1000 kbit/s (Software configurable)
Node address	1 ... 127 (Software configurable)
Switchable termination	Software configurable

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 .

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT Slave
- Heartbeat Protocol
- High Resolution Sync Protocol
- Identity Object
- Error Behaviour Object
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's
- Node address, baud rate and CANbus Programmable termination

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode
- Units for speed selectable (Steps/Sec or RPM)
- Factor for speed calculation (e.g. measuring wheel circumference)
Integration time for speed value of 1...32
- 2 work areas with 2 upper and lower limits and the corresponding output states
- Variable PDO mapping of position, speed, acceleration, working area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status - 3 LED's
- Optional - 32 CAMs programmable
- Customer-specific memory - 16 Bytes

Absolute Encoders - Singleturn

Standard ATEX, optical	Sendix 7058 (Shaft)	CANopen
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Terminal assignment

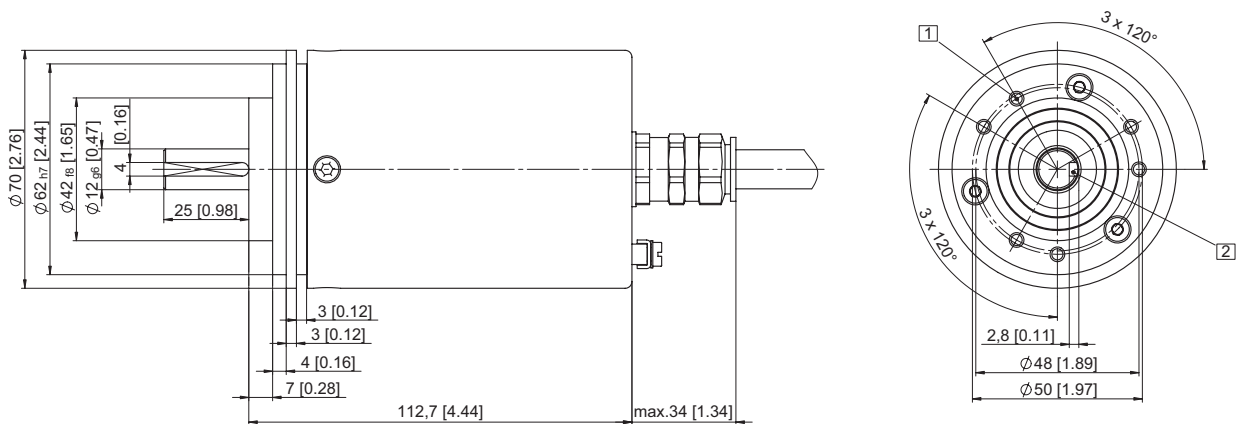
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
		Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
2	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

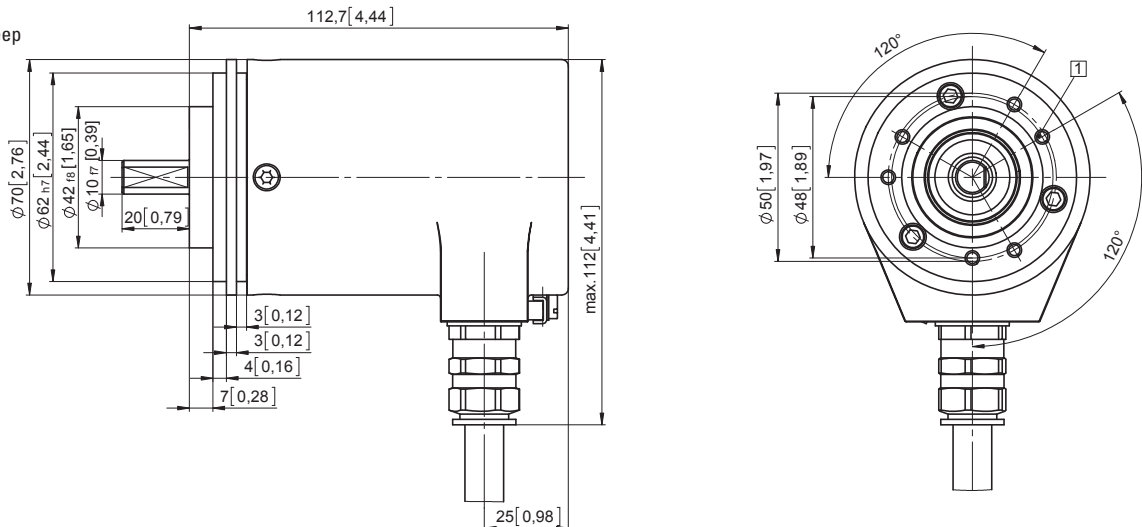
Clamping-synchronous flange, $\varnothing 70$ [2.76] Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep





Type: 8.F3683.1421.G222
10-30 VDC 50 mA
S-Nr: xxxxxxxxxx










Fritz Kübler GmbH
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Kübler

GND	+V
WH	BN
DIR	SET
RD	BU

Absolute Encoders – Multiturn

Series	Type	Interface	Page
Compact, optical	electronic Multiturn	Sendix F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS-C 214
	electronic Multiturn	Sendix F3668 / F3688 (Shaft / Hollow shaft)	CANopen 220
Standard, optical	mechanical Multiturn	Sendix 5863 / 5883 (Shaft / Hollow shaft)	SSI / BiSS-C 225
	 SIL2/PLd, mech. Multiturn	Sendix SIL 5863FS2 / 5883FS2 (Shaft/Hollow shaft)	SSI / BiSS-C + SinCos 232
	 SIL3/PLe, mech. Multiturn	Sendix SIL 5863FS3 / 5883FS3 (Shaft/Hollow shaft)	SSI / BiSS-C + SinCos 237
	 electronic Multiturn	Sendix F5863 / F5883 (Shaft / Hollow shaft)	SSI / BiSS-C 242
	programmable, opt. / magn.	5862 / 5882 (Shaft / Hollow shaft)	SSI 248
	 electronic Multiturn	Sendix F5868 / F5888 (Shaft / Hollow shaft)	CANopen 253
	mechanical Multiturn	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFIBUS DP 258
	mechanical Multiturn	Sendix 5868 / 5888 (Shaft / Hollow shaft)	CANopen / CANopenLift 263
	mechanical Multiturn	Sendix 5868 / 5888 (Shaft / Hollow shaft)	EtherCAT 274
	 mechanical Multiturn	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFINET IO 279
	ATEX, mech. Multiturn	Sendix 7063 (Shaft)	SSI / BiSS 284
	 ATEX, SIL2/PLd, mech. Multiturn	Sendix SIL 7063FS2 (Shaft)	SSI / BiSS-C + SinCos 287
	 ATEX, SIL3/PLe, mech. Multiturn	Sendix SIL 7063FS3 (Shaft)	SSI / BiSS-C + SinCos 290
	ATEX, mechanical Multiturn	Sendix 7068 (Shaft)	PROFIBUS DP 293
	ATEX, mechanical Multiturn	Sendix 7068 (Shaft)	CANopen 296
Large hollow shaft,	9080 (Hollow shaft)	PROFIBUS DP 299	
optical / magnetic	9080 (Hollow shaft)	CANopen / DeviceNet 302	
programmable	9081 (Hollow shaft)	SSI / RS485 306	

Absolute Encoders – Multiturn

**Compact
electronic Multiturn, optical**

Sendix F3663 / F3683 (Shaft / Hollow shaft)

SSI / BiSS-C



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.



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

Optimised performance

- High precision with data refresh rate of the position value $\leq 1\mu\text{s}$
- 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-C up to 10 MHz

Order code Shaft version

8.F3663 . **XXXX** . **XXXX** **2**
Type a b c d e f g

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



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"]
- 4 = \varnothing 3/8" x 5/8"

c Interface / Power supply

- 1 = SSI or BiSS-C / 5 V DC
- 2 = SSI or BiSS-C / 10 ... 30 V DC
- 3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC
- 4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC
- 5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC
- 6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC
- 7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC
- 8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC

d Type of connection

- 1 = cable, tangential, 1 m [3.28'] PUR
- 3 = cable tangential, 5 m [16.40'] PUR
- 5 = cable, tangential, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin ¹⁾

e Code

- B = SSI, Binary
 - C = BiSS-C, Binary
 - G = SSI, Gray
- optional on request
- Ex 2/22
- seawater-resistant
- special cable length

f Resolution (Singleturn)

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

g Resolution (Multiturn)

- 2 = 12 bit MT
- 6 = 16 bit MT
- 4 = 24 bit MT

1) Only with interface 1 and 2

Absolute Encoders – Multiturn

Compact electronic Multiturn, optical	Sendix F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS-C
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Order code Hollow shaft	8.F3683 Type	<table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">X</td><td style="padding: 2px;">2</td> </tr> <tr> <td style="padding: 2px;">a</td><td style="padding: 2px;">b</td><td style="padding: 2px;">c</td><td style="padding: 2px;">d</td> <td style="padding: 2px;">e</td><td style="padding: 2px;">f</td><td style="padding: 2px;">g</td><td style="padding: 2px;">h</td> </tr> </table>	X	X	X	X	X	X	X	2	a	b	c	d	e	f	g	h	<p>If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.</p> <div style="text-align: right; border: 1px solid black; border-radius: 50%; padding: 2px; width: 30px; float: right;">10 by 10</div> <table style="width:100%; border: none;"> <tr> <td style="width: 30%;">a Flange</td> <td style="width: 30%;">c Interface / Power supply</td> <td style="width: 30%;">e Code</td> <td style="width: 10%;"></td> </tr> <tr> <td>1 = with spring element short, IP65</td> <td>1 = SSI or BiSS-C / 5 V DC</td> <td>B = SSI, Binary</td> <td>optional on request</td> </tr> <tr> <td>3 = with spring element long, IP65</td> <td>2 = SSI or BiSS-C / 10 ... 30 V DC</td> <td>C = BiSS-C, Binary</td> <td>- Ex 2/22</td> </tr> <tr> <td>2 = with stator coupling, ø 46 mm [1.81"]</td> <td>3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC</td> <td>G = SSI, Gray</td> <td>- seawater-resistant</td> </tr> <tr> <td>b Hollow shaft</td> <td>4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC</td> <td>f Resolution (Singleturn)</td> <td>- special cable length</td> </tr> <tr> <td>1 = ø 6 mm [0.24"]</td> <td>5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC</td> <td>A = 10 bit ST</td> <td></td> </tr> <tr> <td>3 = ø 8 mm [0.32"]</td> <td>6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC</td> <td>2 = 12 bit ST</td> <td></td> </tr> <tr> <td>4 = ø 10 mm [0.39"], blind hollow shaft</td> <td>7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC</td> <td>3 = 13 bit ST</td> <td></td> </tr> <tr> <td>2 = ø 1/4"</td> <td>8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC</td> <td>4 = 14 bit ST</td> <td></td> </tr> <tr> <td></td> <td>d Type of connection</td> <td>7 = 17 bit ST</td> <td></td> </tr> <tr> <td></td> <td>1 = cable, tangential, 1 m [3.28'] PUR</td> <td>g Resolution (Multiturn)</td> <td></td> </tr> <tr> <td></td> <td>3 = cable tangential, 5 m [16.40'] PUR</td> <td>2 = 12 bit MT</td> <td></td> </tr> <tr> <td></td> <td>5 = cable, tangential, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin ¹⁾</td> <td>6 = 16 bit MT</td> <td></td> </tr> <tr> <td></td> <td></td> <td>4 = 24 bit MT</td> <td></td> </tr> </table>	a Flange	c Interface / Power supply	e Code		1 = with spring element short, IP65	1 = SSI or BiSS-C / 5 V DC	B = SSI, Binary	optional on request	3 = with spring element long, IP65	2 = SSI or BiSS-C / 10 ... 30 V DC	C = BiSS-C, Binary	- Ex 2/22	2 = with stator coupling, ø 46 mm [1.81"]	3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC	G = SSI, Gray	- seawater-resistant	b Hollow shaft	4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC	f Resolution (Singleturn)	- special cable length	1 = ø 6 mm [0.24"]	5 = SSI or BiSS-C, with sensor output for monitoring the voltage on the encoder / 5 V DC	A = 10 bit ST		3 = ø 8 mm [0.32"]	6 = SSI or BiSS-C + 2048 ppr SinCos, with sensor output for monitoring the voltage on the encoder / 5 V DC	2 = 12 bit ST		4 = ø 10 mm [0.39"], blind hollow shaft	7 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 5 V DC	3 = 13 bit ST		2 = ø 1/4"	8 = SSI or BiSS-C + 2048 ppr incr. signals RS422 / 10 ... 30 V DC	4 = 14 bit ST			d Type of connection	7 = 17 bit ST			1 = cable, tangential, 1 m [3.28'] PUR	g Resolution (Multiturn)			3 = cable tangential, 5 m [16.40'] PUR	2 = 12 bit MT			5 = cable, tangential, 1 m [3.28'] PUR with M12 connector for central fastening, 8-pin ¹⁾	6 = 16 bit MT				4 = 24 bit MT	
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		4 = 24 bit MT																																																																									

Mounting accessory for shaft encoders	Order No.
Coupling Bellows coupling ø 19 mm [0.75"] for shaft 8 mm [0.32"]	8.0000.1101.0808

Mounting accessory for hollow shaft encoders	Order No.
Cylindrical pin, long for torque stops <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="margin-left: 10px;">With fixing thread</div> </div>	8.0010.4700.0000

Connection technology	Order No.
Connector, self-assembly (straight) M12 female connector with coupling nut (suitable for connection type 8)	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)	12 000 min ⁻¹ 10 000 min ⁻¹ (continuous)
Shaft version (IP67) or hollow shaft version (IP65) with shaft seal	10 000 min ⁻¹ 8 000 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)
EX approval for hazardous areas	optional Zone 2 and 22
Working temperature range	-40°C ... +90°C [-40°F ... +194°F]
Materials	shaft / hollow shaft stainless steel flange aluminium housing zinc die-cast cable PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

1) Only with output circuits 1 and 2 in combination with blind hollow shaft 10 mm

Absolute Encoders – Multiturn

Compact electronic Multiturn, optical	Sendix F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS-C
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Electrical characteristics	
Power supply	5 V DC \pm 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC max. 60 mA 10 ... 30 V DC max. 30 mA
Reverse polarity protection of the power supply	yes (only with 10 ... 30 V DC)
Short-circuit proof outputs	yes ¹⁾
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

SSI interface	
Output driver	RS485 transceiver type
Permissible load/channel	max. \pm 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	max. 24 bit
Code	Binary or Gray
SSI clock rate	ST resolution \leq 14 bit 50 kHz ... 2 MHz ST resolution \geq 15 bit 50 kHz ... 125 kHz
Monoflop time	\leq 15 μ s
Note:	If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.
Data refresh rate	ST resolution \leq 14 bit \leq 1 μ s ST resolution \geq 15 bit 4 μ s
Status and Parity bit	on request

BiSS-C interface	
Resolution, singleturn	10 ... 17 bit
Number of revolutions	max. 24 bit
Code	Binary
BiSS-C Clock rate	up to 10 MHz
Max. update rate	$<$ 10 μ s, depends on the clock rate and the data length
Data refresh rate	\leq 1 μ s
Note::	<ul style="list-style-type: none"> – Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

Incremental outputs (A/B), 2048 ppr		
	SinCos	RS422 TTL-compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp (\pm 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes ¹⁾	yes ¹⁾

SET input	
Input	active HIGH
Input type	comparator
Signal level (+V = power supply)	HIGH min. 60 % of +V, max: +V LOW max. 30 % of +V
Input current	$<$ 0.5 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-C. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. The SET function should be carried out whilst the encoder is at rest.

Power ON delay	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read. Hot plugging of the encoder should be avoided.	

DIR input	
A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.	
Response time (DIR input)	1 ms

Status output	
Output driver	Open Collector, internal pull up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH +V LOW $<$ 1 V
Active	LOW
The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (Open Collector with int. pull-up 22 kOhm). An active status output (LOW) displays: LED fault (failure or ageing) – over-temperature – undervoltage In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.	

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

Absolute Encoders – Multiturn

Compact electronic Multiturn, optical	Sendix F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS-C
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Terminal assignment

Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
1, 2	1, 3	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat \perp
			Cable colour: WH BN GN YE GY PK BU RD VT Shield
1, 2	8	SET, DIR	M12 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR \perp
1, 2	8	SET, DIR	Pin: 1 2 3 4 5 6 7 8 PH
3, 4	1, 3	SET, DIR, 2048 SinCos	Cable (Isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
3, 4	1, 3	SET, DIR, 2048 SinCos	Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU Shield
5	1, 3	SET, DIR, Sensor outputs	Cable (Isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR 0 Vsens +Vsens \perp
5	1, 3	SET, DIR, Sensor outputs	Cable colour: WH BN GN YE GY PK BU RD VT RD-BU Shield
6	1, 3	2048 SinCos, Sensor outputs	Cable (Isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- 0 Vsens +Vsens A \bar{A} B \bar{B} \perp
6	1, 3	2048 SinCos, Sensor outputs	Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU Shield
7, 8	1, 3	2048 incr. RS422	Cable (Isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} \perp
7, 8	1, 3	2048 incr. RS422	Cable colour: WH BN GN YE GY PK BK VT GY-PK RD-BU Shield

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

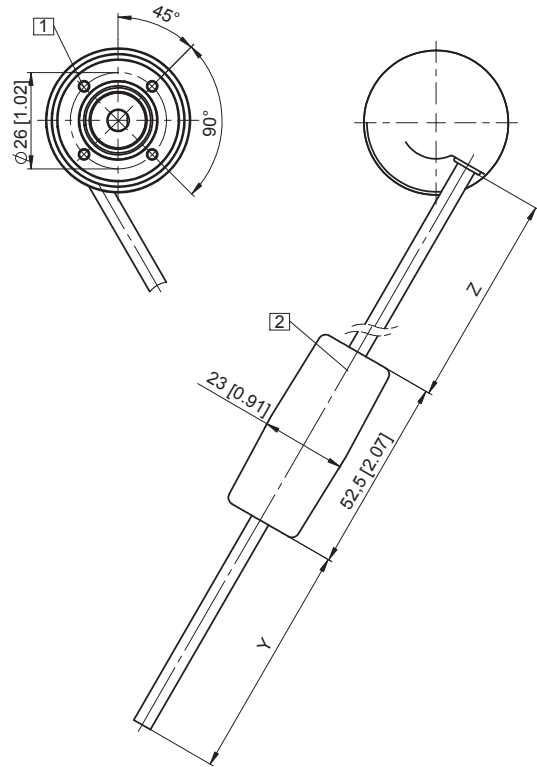
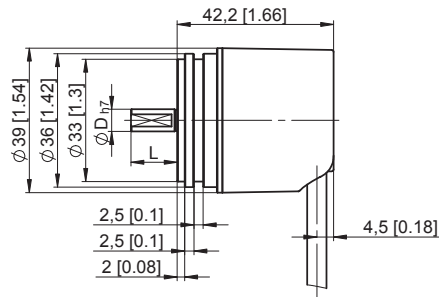
SSI / BiSS-C

Dimensions shaft version

Dimensions in mm [inch]

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

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

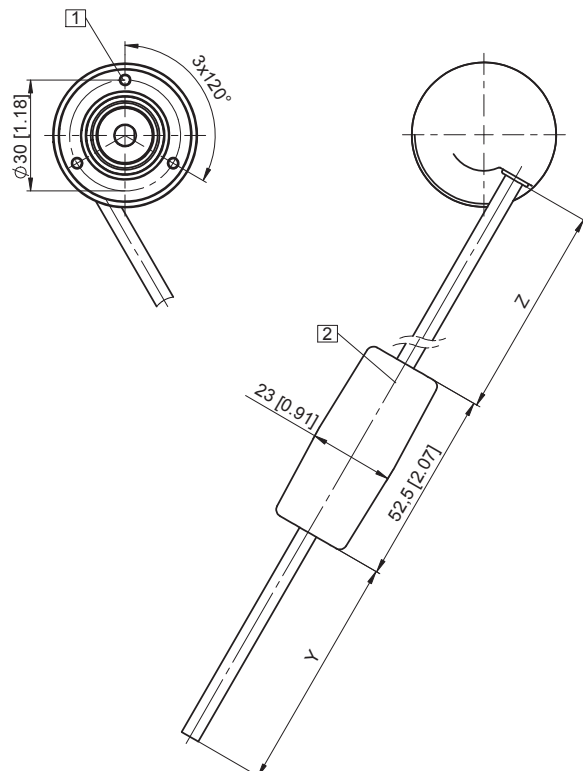
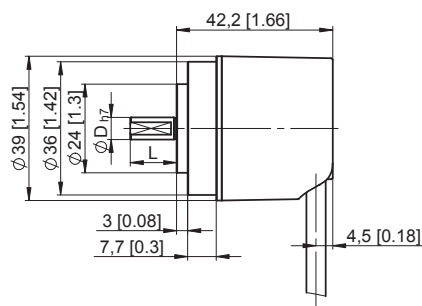


D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

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

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

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



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

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

Absolute Encoders – Multiturn

Compact electronic Multiturn, optical	Sendix F3663 / F3683 (Shaft / Hollow shaft)	SSI / BiSS-C
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Dimensions hollow shaft version

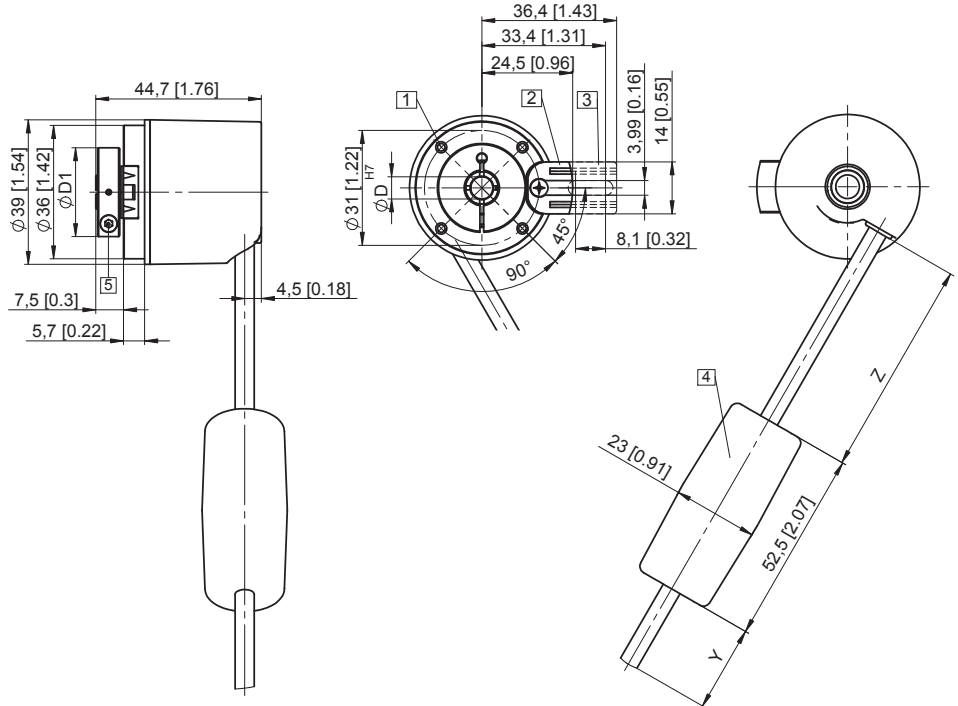
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

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

- 1 M2.5, 5 [0.20] deep
- 2 Spring element short
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Spring element long
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 4 Battery (in the cable)
- 5 Recommended torque for the clamping ring 0.6 Nm



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

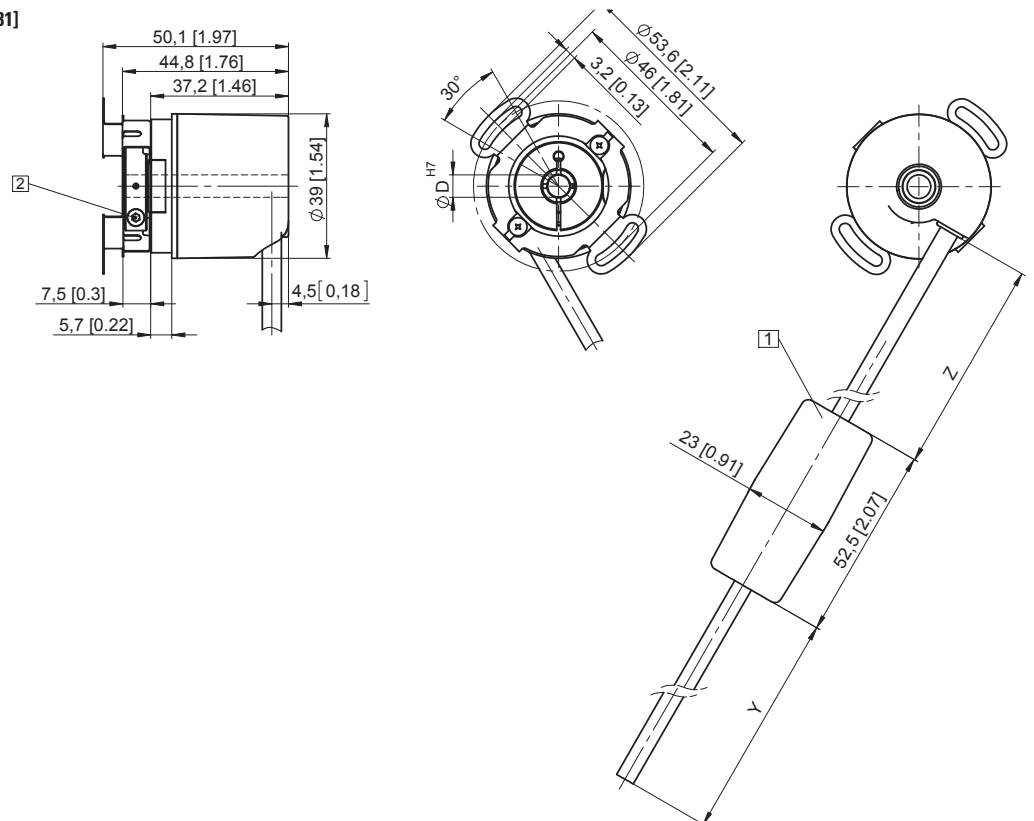
Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, \varnothing 46 [1.81]

Flange type 2

- 1 Battery (in the cable)
- 2 Recommended torque for the clamping ring 0.6 Nm



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

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

Insertion depth for blind hollow shaft 14.5 [0.57]

Absolute Encoders – Multiturn

Compact electronic Multiturn, optical

Sendix F3668 / F3688 (Shaft / Hollow shaft)

CANopen



The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields. With a size of just 36 x 42 mm it offers a shaft or a blind hollow shaft of up to 10 mm.



Reliable and magnetically insensitive

- Sturdy bearing construction in Safety Lock™ Design for resistance against vibration and installation errors
- Reduced number of components ensures magnetic insensitivity
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40°C up to +85°C [-40°F ... +185°F]
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoAsic) - offering highest reliability, a high resolution up to 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

Order code

8.F3668 . **X****X****2****X** . **21** **22**

Shaft version

Type

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



a Flange

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

b Shaft (\varnothing x L), with flat

- 1 = \varnothing 6 x 12.5 mm [0.24 x 0.49"]
- 3 = \varnothing 8 x 15 mm [0.32 x 0.49"]
- 5 = \varnothing 10 x 20 mm [0.39 x 0.79"]
- 2 = \varnothing 1/4" x 12.5 mm [0.49"]
- 4 = \varnothing 3/8" x 5/8"

c Interface / Power supply

- 2 = CANopen DS301 V4.02 / 10 ... 30 V DC

optional on request

- Ex 2/22
- seawater-resistant
- special cable length

d Type of connection

- 1 = cable, tangential, 1 m [3.28'] PUR
- 3 = cable, tangential, 5 m [16.40'] PUR

e Fieldbus profile

- 21 = CANopen Encoderprofil DS406 V3.2

Order code

8.F3688 . **X****X****2****X** . **21** **22**

Hollow shaft

Type

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



a Flange

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

b Blind hollow shaft

- 5 = \varnothing 6 mm [0.24"]
- 7 = \varnothing 8 mm [0.32"]
- 4 = \varnothing 10 mm [0.39"]
- 6 = \varnothing 1/4"

c Interface / Power supply

- 2 = CANopen DS301 V4.02 / 10 ... 30 V DC

optional on request

- Ex 2/22
- seawater-resistant
- special cable length

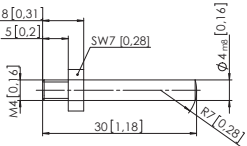
d Type of connection

- 1 = cable, tangential, 1 m [3.28'] PUR
- 3 = cable, tangential, 5 m [16.40'] PUR

e Fieldbus profile

- 21 = CANopen Encoderprofil DS406 V3.2

Absolute Encoders – Multiturn

Compact electronic Multiturn, optical		Sendix F3668 / F3688 (Shaft / Hollow shaft)	CANopen
Mounting accessory for shaft encoders			Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1101.0808
Mounting accessory for hollow shaft encoders			
Cylindrical pin, long for torque stops		With fixing thread	8.0010.4700.0000
Connection technology			
Connector, self-assembly (straight)	M12 female connector with coupling nut		8.0000.5111.0000
Programming set			
Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB		8.0010.9000.0015

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

Absolute Encoders
Multiturn

Technical data

Mechanical characteristics		
Maximum speed	Shaft- or blind hollow shaft version	12 000 min ⁻¹
	without shaft seal (IP65)	10 000 min ⁻¹ (continuous)
	Shaft version (IP67) or hollow shaft version	10 000 min ⁻¹
	(IP65) with shaft seal	8 000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	without shaft seal	< 0.007 Nm
	with shaft seal (IP67)	< 0.01 Nm
Load capacity of shaft	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)
EX approval for hazardous areas	optional Zone 2 and 22	
Working temperature range	-40°C ... +85°C [-40°F ... +185°F]	
Material	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast
	cable	PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms	
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz	
Electrical characteristics		
Power supply	10 ... 30 V DC	
Current consumption (no load)	max. 80 mA	
Reverse polarity protection of the power supply (+V)	yes	
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Interface characteristics CANopen	
Resolution Singleturn	1 ... 65536 (16 bit) scaleable
Default value Singleturn	8192 (13 bit)
Resolution 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

Diagnostic LED (two-colour, red/green)	
LED ON or blinking	red Error display green Status display

Absolute Encoders – Multiturn

**Compact
electronic Multiturn, optical**

Sendix F3668 / F3688 (Shaft / Hollow shaft)

CANopen

General information about CANopen

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

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

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

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

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

The two-colour LED located on the back indicates the operating or fault status of the CAN-bus, as well as the status of the internal diagnostics.

CANbus Connection

The CANopen encoders are equipped with a Bus trunk line in various lengths and can be terminated in the device.

The devices do not have an integrated T-coupler nor they are looped internally and must therefore only be used as end devices.

If possible, drop lines should be avoided, as in principle they lead to signal reflections. As a rule the reflections caused by the drop lines are not critical, if they have completely decayed before the point in time when the scanning occurs.

The sum of all the drop lines should not, for a particular baud rate, exceed the maximum length L_u .

$L_u < 5$ m [16.40'] cable length for 125 Kbit

$L_u < 2$ m [6.56'] cable length for 250 Kbit

$L_u < 1$ m [3.28'] cable length for 1 Mbit

When used as a drop line, the termination resistor should not be activated.

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

Universal Scaling Function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The Universal Scaling Function remedies this problem.

LSS Layer Setting Services DS305 V2.0

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

CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated. (Class C2 functionality):

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

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

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

Terminal assignment

Interface	Type of connection	Cable (Isolate unused wires individually before initial start-up)					
		Signal:	+V	0 V	CAN_GND	CAN_H	CAN_L
2	1, 3	Cable colour:	BN	WH	GY	GN	YE

Absolute Encoders – Multiturn

**Compact
electronic Multiturn, optical**

Sendix F3668 / F3688 (Shaft / Hollow shaft)

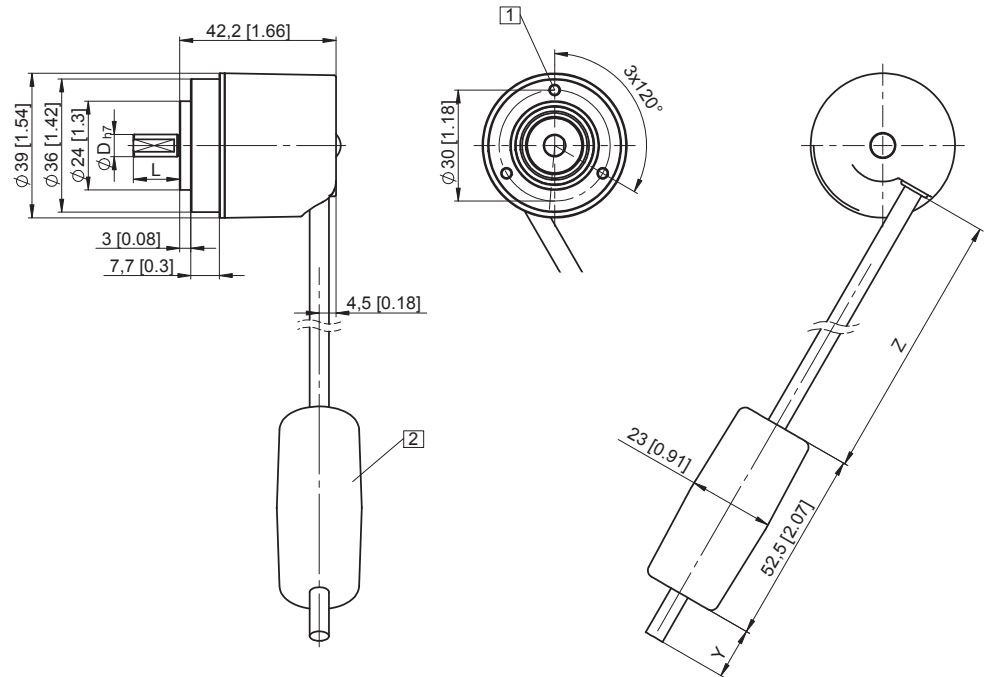
CANopen

Dimensions shaft version

Dimensions in mm [inch]

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

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



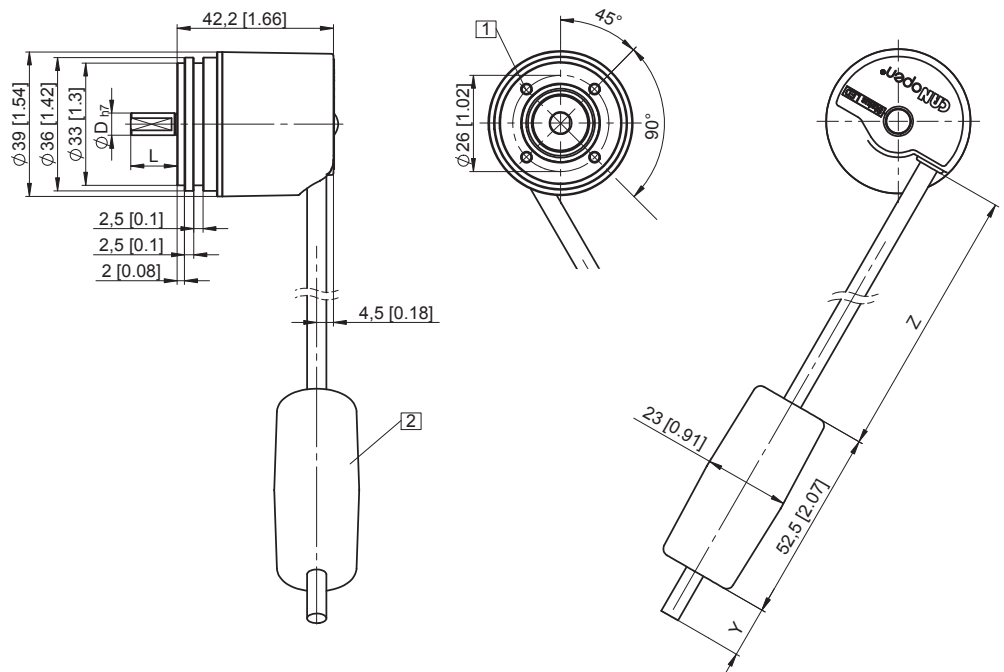
D	L	Fit
6 [0.24]	12.5 [0.49]	h7
8 [0.32]	15 [0.59]	h7
10 [0.39]	20 [0.79]	h7
1/4"	12.5 [0.49]	h7
3/8"	5/8"	h7

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

Synchro flange, \varnothing 36 [1.42]

**Flange type 2 and 4
Drawing with cable**

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



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

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

Absolute Encoders – Multiturn

Compact electronic Multiturn, optical

Sendix F3668 / F3688 (Shaft / Hollow shaft)

CANopen

Dimensions hollow shaft version

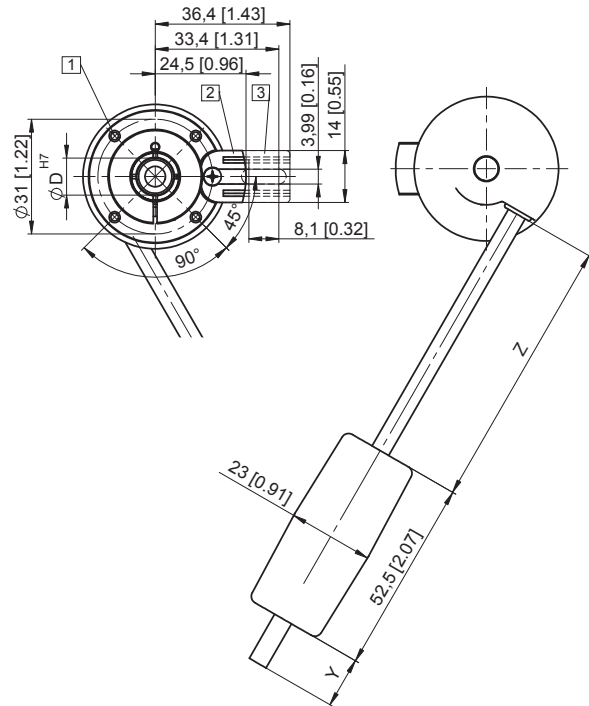
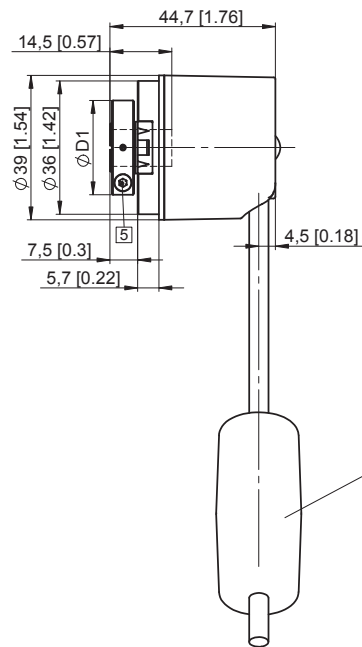
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

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

- 1 M2.5, 5 [0.20] deep
- 2 Spring element short
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Spring element long
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 4 Battery (in the cable)
- 5 Recommended torque for the clamping ring 0.6 Nm



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

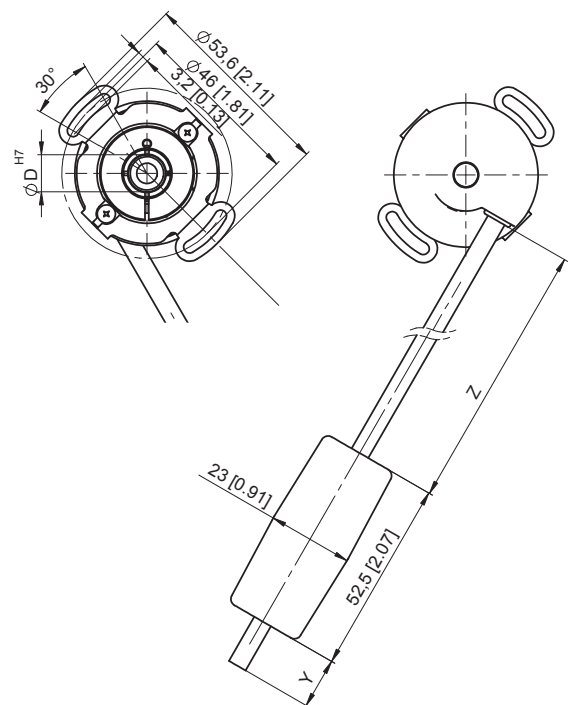
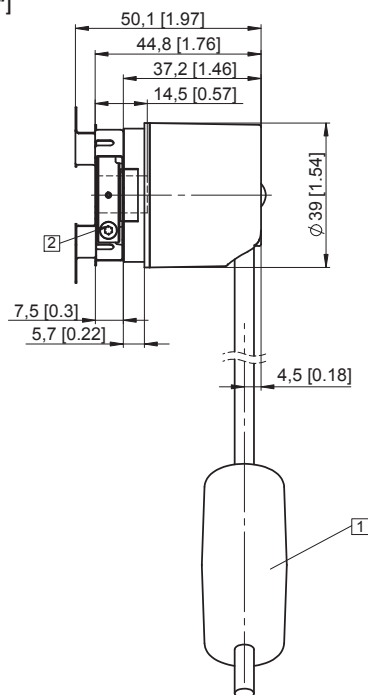
Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Insertion depth for blind hollow shaft 14.5 [0.57]

Flange with stator coupling, \varnothing 46 [1.81"]

Flange type 2

- 1 Battery (in the cable)
- 2 Recommended torque for the clamping ring 0.6 Nm



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

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

Insertion depth for blind hollow shaft 14.5 [0.57]

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5863 / 5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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The Sendix 5863 and 5883 multiturn encoders with SSI or BiSS-C 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.



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	Seawater-resistant version on request

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 every-day use
- -40°C... +90°C: use in wide temperature range and protection IP67

Versatile

- Available with SSI or BiSS-C interface and combined with SinCos incremental signals
- The right fixing solution or type of connection available for every application
- SET button and LED for simple start-up

Absolute Encoders
Multiturn

Order code

Shaft version

8.5863
Type

. X X X X . X X 2 X
a b c d e f g h

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



a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 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, IP65 □ 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 or BiSS-C / 5 V DC
- 2 = SSI or BiSS-C / 10 ... 30 V DC**
- 3 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC
- 4 = SSI or BiSS-C, 2048 ppr SinCos / 10 ... 30 V DC
- 5 = SSI or BiSS-C / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 7 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC
- 8 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 10 ... 30 V DC
- 9 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC, with sensor output for monitoring the voltage on the encoder

d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- 2 = radial cable, 1 m [3.28'] PVC**
- 3 = M23 connector, 12-pin, axial
- 4 = M23 connector, 12-pin, radial**
- 5 = M12 connector, 8-pin, axial⁴⁾
- 6 = M12 connector, 8-pin, radial⁴⁾

e Code

- B = SSI, Binary
- C = BiSS-C, 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 Inputs / Outputs⁵⁾

- 2 = SET, DIR input**
additional status output

h Options (Service)

- 1 = no option
- 2 = Status LED
- 3 = SET button and Status LED**

optional on request

- Ex 2/22
- seawater-resistant
- special cable length

1) US-Version

2) Preferred type only in conjunction with flange type 2

3) Preferred type only in conjunction with flange type 1

4) Can be combined only with interface 1 and 2

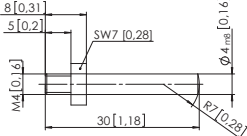
5) Resolution, preset value and counting direction factory-programmable

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5863 / 5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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Order code Hollow shaft	8.5883 Type	.XXXX.XX2X a b c d e f g h	If for each parameter of an encoder the <u>underlined preferred option</u> is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.	10 by 10
a Flange 1 = with spring element long, IP65 2 = with spring element long, IP67 3 = with stator coupling, IP65 ø 65 mm [2.56"] 4 = with stator coupling, IP67 ø 65 mm [2.56"] 5 = with stator coupling, IP65 ø 63 mm [2.48"] 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] – blind hollow shaft 8 = 3/8" 9 = 1/2"	c Interface / Power supply 1 = SSI or BiSS-C / 5 V DC 2 = SSI or BiSS-C / 10 ... 30 V DC 3 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC 4 = SSI or BiSS-C, 2048 ppr SinCos / 10 ... 30 V DC 5 = SSI or BiSS-C / 5 V DC, with sensor output for monitoring the voltage on the encoder 6 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC, with sensor output for monitoring the voltage on the encoder 7 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC 8 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 10 ... 30 V DC 9 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC, with sensor output for monitoring the voltage on the encoder	d Type of connection 2 = axial cable, 1 m [3.28'] PVC 4 = M23 connector, 12-pin, radial 6 = M12 connector, 8-pin, radial ²⁾ E = tangential cable, 1 m [3.28'] PVC	e Code B = SSI, Binary C = BiSS-C, Binary G = SSI, Gray
				f Resolution ¹⁾ A = 10 bit ST + 12 bit MT 1 = 11 bit ST + 12 bit MT 2 = 12 bit ST + 12 bit MT 3 = 13 bit ST + 12 bit MT 4 = 14 bit ST + 12 bit MT 7 = 17 bit ST + 12 bit MT
				g Inputs / Outputs ¹⁾ 2 = SET, DIR input additional status output
				h Options (Service) 1 = no option 2 = Status LED 3 = SET button and Status LED
				<i>optional on request</i> - Ex 2/22 - seawater-resistant - special cable length

Mounting accessory for shaft encoders	Order No.
Coupling Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010

Mounting accessory for hollow shaft encoders	Order No.
Cylindrical pin, long for torque stops 	8.0010.4700.0000

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

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

1) Resolution, preset value and counting direction factory-programmable
2) Only in conjunction with flange type 1 and 2

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5863 / 5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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Technical data

Mechanical characteristics		
Max. speed, shaft version	IP65 up to 70°C [158°F]	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	11 000 min ⁻¹ , 9 000 min ⁻¹ (continuous)
Max. speed, hollow shaft version	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
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
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +90°C ¹⁾ [-40°F ... +194°F] ¹⁾
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	cable	PVC
Shock resistance acc. EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics		
Power supply		5 V DC + 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 80 mA
	10 ... 30 V DC	max. 50 mA
Reverse polarity protection of the power supply (+V)		yes (at 10 ... 30 V DC)
Short circuit proof outputs		yes ²⁾
UL approval		File 224618
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC

SSI interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. 20 mA
Signal level	HIGH	typ. 3.8 V
	LOW at I _{Load} = 20 mA	typ. 1.3 V
Singleturn resolution		10 ... 14 bit and 17 bit ³⁾
Number of revolutions		4096 (12 bit)
Code		Binary or Gray
SSI clock rate	ST resolution ≤ 14 bit	50 kHz ... 2 MHz
	ST resolution ≥ 15 bit	50 kHz ... 125 kHz
Monoflop time		≤ 15 μs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.		
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 μs
	ST resolution ≥ 15 bit	4 μs
Status and parity bit		on request

BiSS-C Interface		
Singleturn resolution		10 ... 14 bit and 17 bit ³⁾
Number of revolutions		4096 (12 bit)
Code		Binary
Clock rate		up to 10 MHz
Max. update rate		< 10 μs, depends on the clock rate and the data length
Data refresh rate		≤ 1 μs
Note:		<ul style="list-style-type: none"> - Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings - CRC data verification

SET input or SET button		
Input		active HIGH
Input type		comparator
Signal level	HIGH	min: 60 % of +V (power supply) max: +V
	LOW	max: 25 % of +V (power supply)
Input current		< 0.5 mA
Min. pulse duration (SET)		10 ms
Timeout after SET signal		14 ms
Response time (DIR input)		1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the status output is at LOW.

Option incremental outputs (A/B), 2048 ppr		
	SinCos	RS422 TTL-compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 V _{pp} (± 20%)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes	yes

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
 3) Other options on request

Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5863 / 5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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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 22k).	
An active status output (LOW) displays: <ul style="list-style-type: none"> – Sensor error, singleturn or multiturn (soiling, glass breakage etc.) – LED fault (failure or ageing) – over- or under-temperature 	
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.	

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

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

Terminal assignment

Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
1, 2	1, 2, E	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - - - shield
1, 2	3, 4	SET, DIR, Status	M23 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
5	1, 2, E	SET, DIR, Status sensor output	Cable (Isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
5	3, 4	SET, DIR, Status sensor output	M23 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
3, 4, 7, 8	1, 2, E	SET, DIR, SinCos or incr. RS422	Cable (Isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
3, 4, 7, 8	3, 4	SET, DIR, SinCos or incr. RS422	M23 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
6, 9	1, 2, E	SinCos o. incr. RS422 sensor output	Cable (Isolate unused wires individually before initial start-up)
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
6, 9	3, 4	SinCos o. incr. RS422 sensor output	M23 connector
			Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
1, 2	5, 6	SET, DIR	M12 connector
			Signal: 0 V +V C+ C- D+ D- SET DIR \perp
			Pin: 1 2 3 4 5 6 7 8 PH

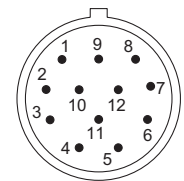
- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A, \bar{A} : Incremental output channel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

- SET: SET input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- Stat: Status output
- PH \perp : Plug connector housing (Shield)

Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5863 / 5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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Dimensions shaft version

Dimensions in mm [inch]

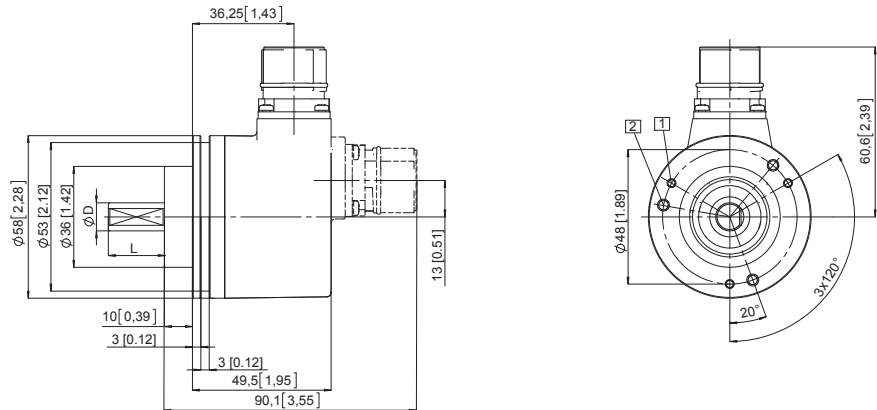
Clamping flange, \varnothing 58 [2.28]

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



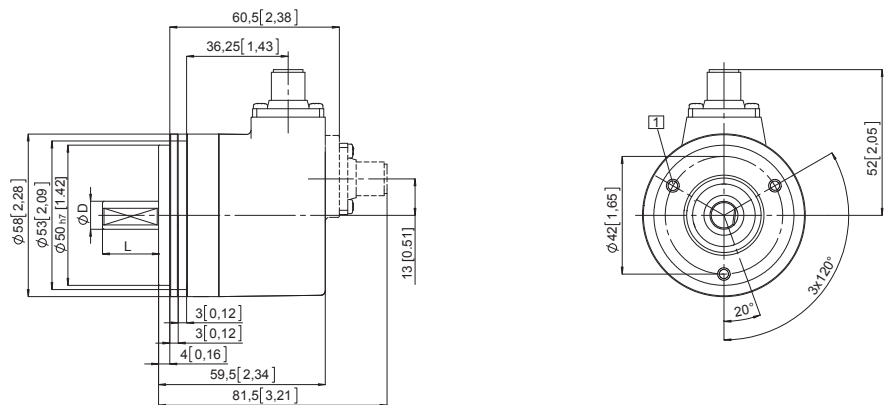
Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(Drawing with M12 connector)

- 1 M4, 6 [0.24] deep

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

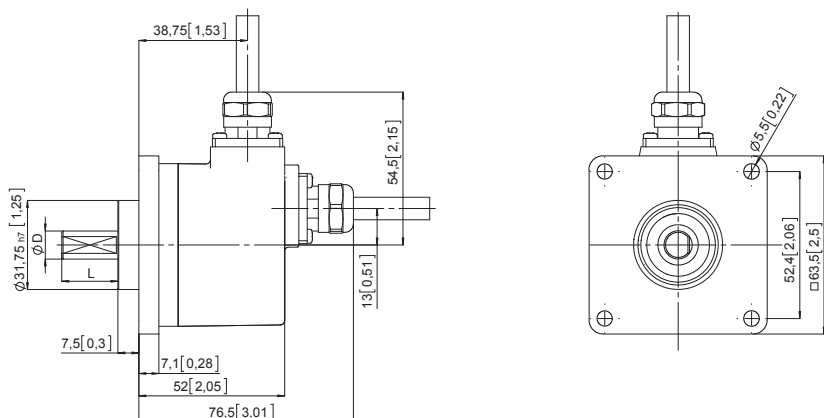


Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(Drawing with cable)

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



Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

**Standard
mechanical Multiturn, optical**

Sendix 5863 / 5883 (Shaft / Hollow shaft)

SSI / BiSS-C

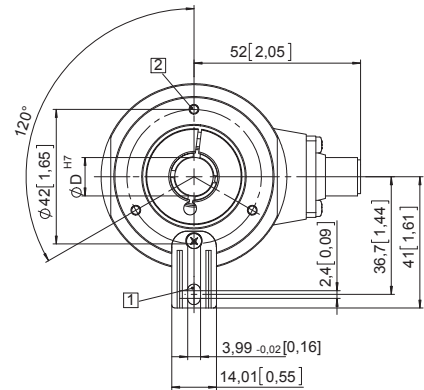
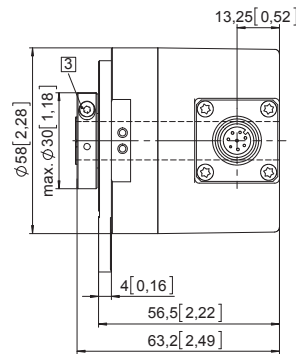
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element long Flange type 1 and 2

(drawing with M12 connector)

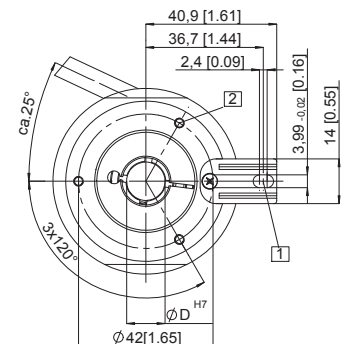
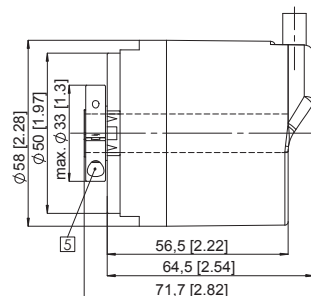
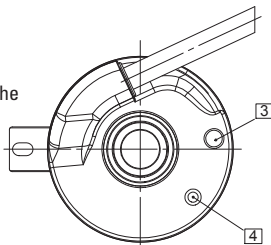
- 1 Torque stop slot,
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 M3, 6 [0.24] deep
- 3 Recommended torque for the
clamping ring 0.6 Nm



Flange with spring element long Flange type 1 and 2

(drawing with tangential cable)

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



Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5863 / 5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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Dimensions hollow shaft version

Dimensions in mm [inch]

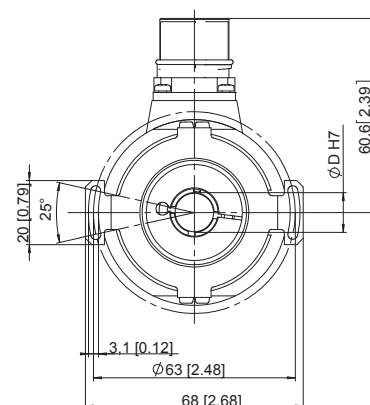
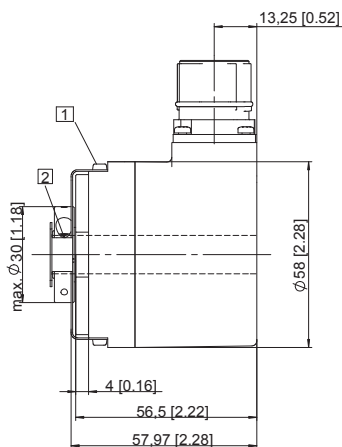
Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(Drawing with M23 connector)

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



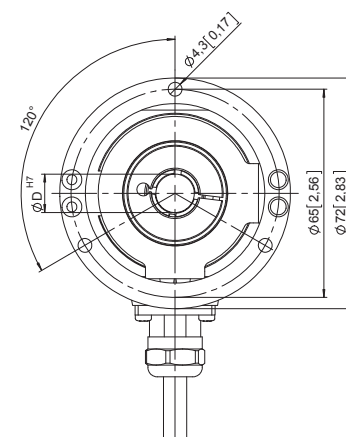
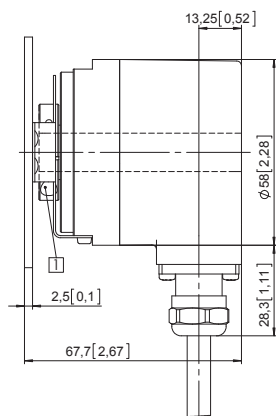
Flange with stator coupling, \varnothing 65 [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(Drawing with cable)

- 1 Recommended torque for the
clamping ring 0.6 Nm



Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

Standard
SIL2/PLd, mech. Multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (Shaft / Hollow shaft) SSI/BiSS-C + SinCos



The absolute multiturn encoders 5863FS2 and 5883FS2 of the Sendix SIL family are suited for use in safety-related applications up to SIL2 according to EN 61800-5-2 or PLd to EN ISO 13849-1.

The extra strong Safety-Lock™ Design interlocked bearings, the high integration density of the components based on OptoASIC technology and the rugged die-cast housing make these devices ideal also for demanding applications outdoors up to IP67.



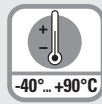
Mechanical drive



Safety-Lock™



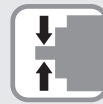
High rotational speed



Temperature range



High protection level



High shaft load capacity



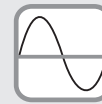
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Optical sensor

Functional Safety

- Encoder with individual certificate from IFA / TÜV
- Suitable for applications up to SIL2 acc. to EN 61800-5-2
- Suitable for applications up to PLd acc. to EN ISO 13849-1
- SSI or BiSS-C 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
Type a b c d e f g h

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.



Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

a Flange

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

b Shaft (ø x L)

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

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

c Interface / Power supply

3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC

4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

d Type of connection

1 = axial cable, 1 m [3.28"] PVC

2 = radial cable, 1 m [3.28"] PVC

3 = M23 connector, 12 pin, axial

4 = M23 connector, 12 pin, radial

e Code

B = SSI, Binary

C = BiSS-C, Binary

G = SSI, Gray

f Resolution ¹⁾

A = 10 bit ST + 12 bit MT

1 = 11 bit ST + 12 bit MT

2 = 12 bit ST + 12 bit MT

3 = 13 bit ST + 12 bit MT

4 = 14 bit ST + 12 bit MT

7 = 17 bit ST + 12 bit MT

g Inputs / outputs ¹⁾

2 = SET, DIR inputs

h Options (Service)

1 = no option

2 = Status LED

3 = SET button and Status LED

optional on request

- special cable length

- Ex 2/22

Order code

8.5883FS2 . X X X X . X X 2 X
Type a b c d e f g h

If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.



Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.

a Flange

A = with torque stop set, IP65

B = with stator coupling, IP65, ø 63 mm [2.48"]

b Hollow shaft

3 = ø 10 mm [0.39"]

4 = ø 12 mm [0.47"]

5 = ø 14 mm [0.55"]

K = ø 10 mm [0.39"], tapered shaft

c Interface / Power supply

3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC

4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

d Type of connection

2 = radial cable, 1 m [3.28"] PVC

E = tangential cable, 1 m [3.28"] PVC

4 = M23 connector, 12 pin, radial

e Code

B = SSI, Binary

C = BiSS-C, Binary

G = SSI, Gray

f Resolution ¹⁾

A = 10 bit ST + 12 bit MT

1 = 11 bit ST + 12 bit MT

2 = 12 bit ST + 12 bit MT

3 = 13 bit ST + 12 bit MT

4 = 14 bit ST + 12 bit MT

7 = 17 bit ST + 12 bit MT

g Inputs / outputs ¹⁾

2 = SET, DIR inputs

h Options (Service)

1 = no option

2 = Status LED

3 = SET button and Status LED

optional on request

- special cable length

- Ex 2/22

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

Absolute Encoders – Multiturn

Standard SIL2/PLd, mech. Multiturn, optical	Sendix SIL 5863FS2 / 5883FS2 (Shaft / Hollow shaft)	SSI/BiSS-C + SinCos
Accessory safety technology		Order No.
Safety-M, basic modules	speed / position monitoring for 1 axis	8.MSP1.000
	speed / position monitoring for 2 axes (analogue inputs optional)	8.MSP2.XXX
Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling	8.0000.5012.0000
	M23 female connector with coupling, Ex zone 2/22	8.0000.5012.0000.Ex
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [2.19'] PVC cable	8.0000.6901.0002.0031

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for functional safety under www.kuebler.com/safety

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed, shaft version	up to 70°C [158°F] 12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous) up to T _{max} 8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
Max. speed, hollow shaft version	up to 70°C [158°F] 9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous) up to T _{max} 6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	shaft version < 0.01 Nm hollow shaft version < 0.03 Nm
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
Hazardous area approval	optional zone 2 and 22
Working temperature range	-40°C ... +90°C ²⁾ [-40°F ... +194°F] ²⁾
Material	shaft / hollow shaft stainless steel flange aluminium housing zinc die-cast housing cable PVC
Shock resistance acc. EN 60068-2-27	500 m/s ² , 11 ms
Vibration resistance acc. EN 60068-2-6	200 m/s ² , 10 ... 150 Hz

Electrical characteristics	
Power supply	5 V DC ± 5% or 10 ... 30 V DC
Current consumption	5 V DC max. 80 mA (no output load) 10 ... 30 V DC max. 50 mA
Reverse polarity protection of the power supply (+V)	yes
Short circuit proof outputs	yes ³⁾
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

Absolute Encoders
Multiturn

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

Absolute Encoders – Multiturn

Standard
SIL2/PLd, mech. Multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (Shaft / Hollow shaft) SSI/BiSS-C + SinCos

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. ±20 mA
Signal level	HIGH typ 3.8 V LOW at $I_{Load} = 20$ mA typ 1.3 V
Singleturn resolution	10 ... 14 bit and 17 bit ¹⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	resolution ST ≤ 14 bit 50 kHz ... 2 MHz resolution ST ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 µs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	
Data refresh rate	resolution ST ≤ 14 bit ≤ 1 µs resolution ST ≥ 15 bit 4 µs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ¹⁾
Number of revolutions	4096 (12 bit)
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs
Note:	<ul style="list-style-type: none"> – Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

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

SET input or SET button	
Input	active HIGH
Input type	comparator
Signal level	HIGH min: 60 % of +V, max: +V LOW max: 25 % of +V (power supply)
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Reaction time (DIR input)	1 ms
The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.	

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

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

LED	
The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.	
If the LED is ON (status output LOW) this indicates: <ul style="list-style-type: none"> - Sensor error, singleturn or multiturn (soiling, glass breakage etc.) - LED error, failure or ageing - Over- or under-temperature 	
In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.	

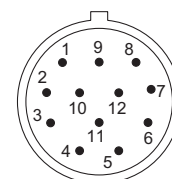
Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)													
3, 4	1, 2, E	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield

Interface	Type of connection	M23 connector, 12-pin													
3, 4	3, 4	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp
		Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- A, \bar{A} : cosine signal
- B, \bar{B} : sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

1) Other options on request

Absolute Encoders – Multiturn

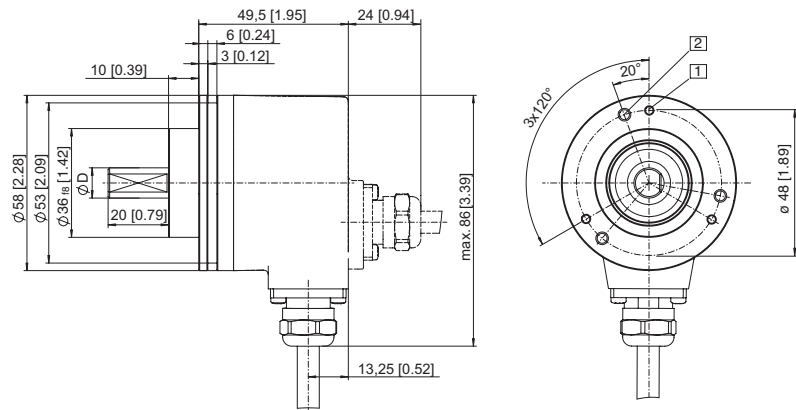
Standard
SIL2/PLd, mech. Multiturn, optical **Sendix SIL 5863FS2 / 5883FS2 (Shaft / Hollow shaft) SSI/BiSS-C + SinCos**

Dimensions shaft version

Dimensions in mm [inch]

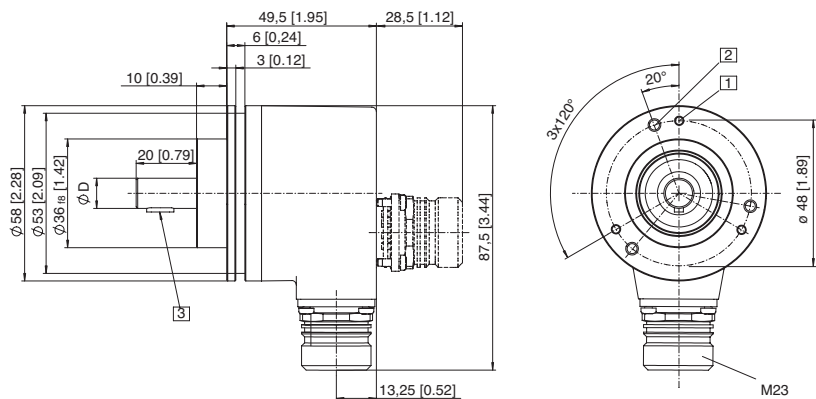
Clamping flange, ø 58 [2.28]
Flange type 1 with shaft type 2
 (Drawing with cable)

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



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

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



Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

Standard
SIL2/PLd, mech. Multiturn, optical

Sendix SIL 5863FS2 / 5883FS2 (Shaft / Hollow shaft) SSI/BiSS-C + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

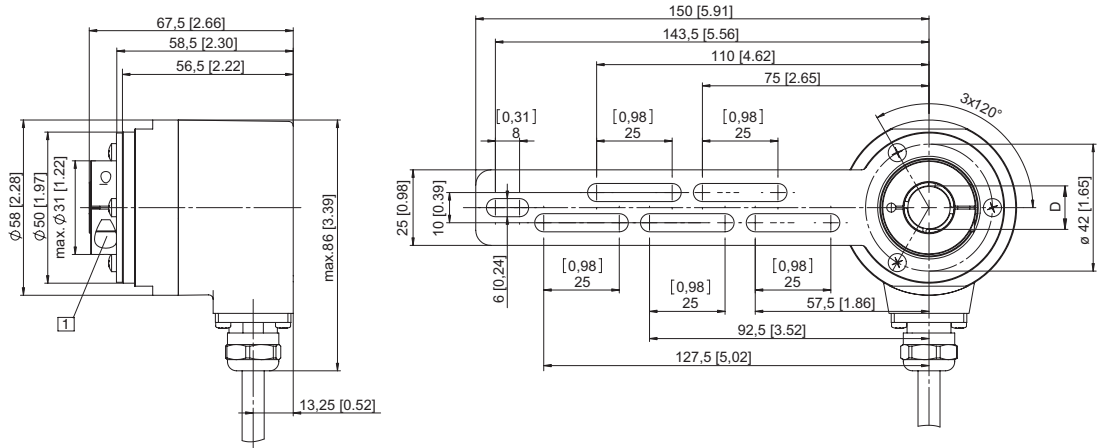
Flange with torque stop set

Flange type A

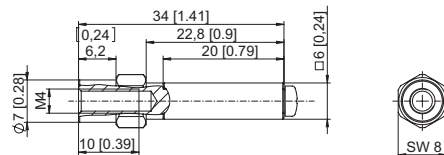
(Drawing with cable)

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

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



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



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

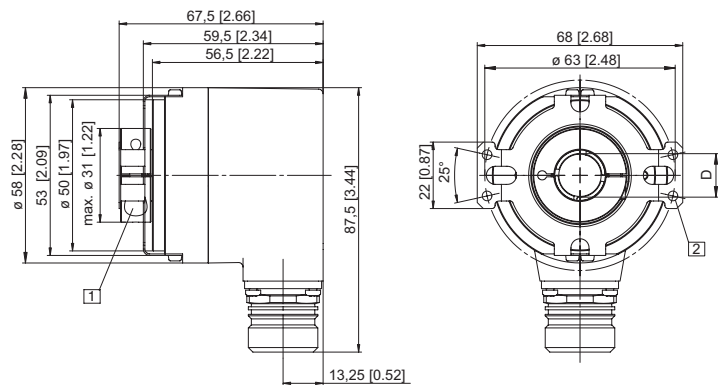
Flange type B

(Drawing with M23 connector)

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

- 2 for (4x) M3 screw

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



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

Flange type B

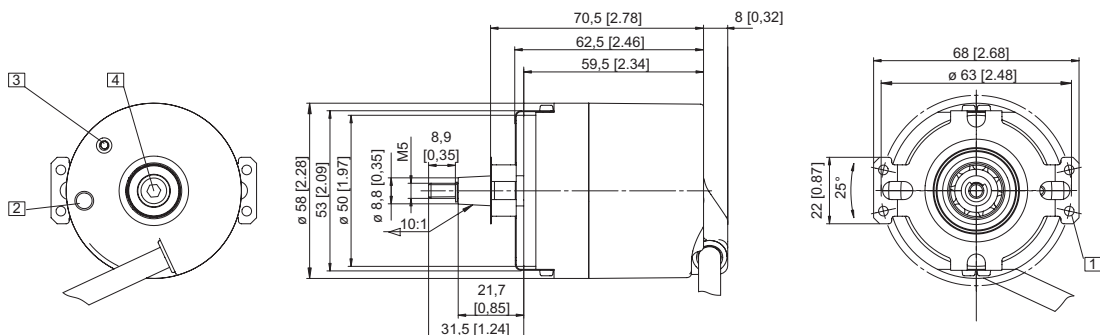
(Drawing with tangential cable outlet)

- 1 for (4x) M3 screw

- 2 Status LED

- 3 SET button

- 4 SW 4



Absolute Encoders – Multiturn

Standard
SIL3/PLe, mech. Multiturn, optical **Sendix SIL 5863FS3 / 5883FS3 (Shaft / Hollow shaft) SSI/BiSS-C + 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 IP67.



Mechanical drive



Safety-Lock™



High rotational speed



Temperature range



High protection level



High shaft load capacity



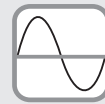
Shock / vibration resistant



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-C 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

8.5863FS3

Type

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

a b c d e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.

Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange

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

b Shaft (ø x L)

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

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

c Interface / Power supply

3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC

4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

d Type of connection

1 = axial cable, 1 m [3.28'] PVC

2 = radial cable, 1 m [3.28'] PVC

3 = M23 connector, 12 pin, axial

4 = M23 connector, 12 pin, radial

e Code

B = SSI, Binary

C = BiSS-C, Binary

G = SSI, Gray

f Resolution ¹⁾

A = 10 bit ST + 12 bit MT

1 = 11 bit ST + 12 bit MT

2 = 12 bit ST + 12 bit MT

3 = 13 bit ST + 12 bit MT

4 = 14 bit ST + 12 bit MT

7 = 17 bit ST + 12 bit MT

g Inputs / outputs ¹⁾

2 = SET, DIR inputs

h Options (Service)

1 = no option

2 = Status LED

3 = SET button and Status LED

optional on request

- special cable length

- Ex 2/22

Order code

8.5883FS3

Type

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

a b c d e f g h

If for each parameter of an encoder the **underlined preferred option** is selected, then the delivery time will be 10 working days for a maximum of 10 pieces.

Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.



a Flange

A = with torque stop set, IP65

B = with stator coupling, IP65, ø 63 mm [2.48"]

b Hollow shaft

3 = ø 10 mm [0.39"]

4 = ø 12 mm [0.47"]

5 = ø 14 mm [0.55"]

K = ø 10 mm [0.39"], tapered shaft

c Interface / Power supply

3 = SSI or BiSS-C + 2048 ppr SinCos / 5 V DC

4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC

d Type of connection

2 = radial cable, 1 m [3.28'] PVC

E = tangential cable, 1 m [3.28'] PVC

4 = M23 connector, 12 pin, radial

e Code

B = SSI, Binary

C = BiSS-C, Binary

G = SSI, Gray

f Resolution ¹⁾

A = 10 bit ST + 12 bit MT

1 = 11 bit ST + 12 bit MT

2 = 12 bit ST + 12 bit MT

3 = 13 bit ST + 12 bit MT

4 = 14 bit ST + 12 bit MT

7 = 17 bit ST + 12 bit MT

g Inputs / outputs ¹⁾

2 = SET, DIR inputs

h Options (Service)

1 = no option

2 = Status LED

3 = SET button and Status LED

optional on request

- special cable length

- Ex 2/22

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

Absolute Encoders – Multiturn

Standard SIL3/PLe, mech. Multiturn, optical	Sendix SIL 5863FS3 / 5883FS3 (Shaft / Hollow shaft)	SSI/BiSS-C + SinCos
Accessory safety technology		Order No.
Safety-M, basic modules	speed / position monitoring for 1 axis	8.MSP1.000
	speed / position monitoring for 2 axes (analogue inputs optional)	8.MSP2.XXX
Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling nut	8.0000.5012.0000
	M23 female connector with coupling nut, Ex zone 2/22	8.0000.5012.0000.Ex
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [2.19'] PVC cable	8.0000.6901.0002.0031

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for functional safety under www.kuebler.com/safety

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics		
Max. speed, shaft version		
up to 70°C [158°F]	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)	
up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)	
Max. speed, hollow shaft version		
up to 70°C [158°F]	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)	
up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)	
Starting torque - at 20°C [68°F]		
shaft version	< 0.01 Nm	
hollow shaft version	< 0.03 Nm	
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	
Hazardous area approval		
optional zone 2 and 22		
Working temperature range		
-40°C ... +90°C ²⁾ [-40°F ... +194°F] ²⁾		
Material		
shaft / hollow shaft	stainless steel	
flange	aluminium	
housing	zinc die-cast housing	
cable	PVC	
Shock resistance acc. EN 60068-2-27		
500 m/s ² , 11 ms		
Vibration resistance acc. EN 60068-2-6		
200 m/s ² , 10 ... 150 Hz		

Electrical characteristics		
Power supply	5 V DC ± 5% or 10 ... 30 V DC	
Current consumption (no load)	5 V DC	max. 80 mA
	10 ... 30 V DC	max. 50 mA
Reverse polarity protection of the power supply (+V)	yes	
Short circuit proof outputs	yes ³⁾	
UL approval	File 224618	
CE compliant acc. to	EMC guideline 2004/108/EC Machinery directive 2006/42/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

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

Absolute Encoders – Multiturn

Standard SIL3/PLe, mech. Multiturn, optical	Sendix SIL 5863FS3 / 5883FS3 (Shaft / Hollow shaft)	SSI/BiSS-C + 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
Singleturn resolution	10 ... 14 bit and 17 bit ¹⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	resolution ST ≤ 14 bit 50 kHz ... 2 MHz resolution ST ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 µs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.	
Data refresh rate	resolution ST ≤ 14 bit ≤ 1 µs resolution ST ≥ 15 bit 4 µs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ¹⁾
Number of revolutions	4096 (12 bit)
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs
Note:	<ul style="list-style-type: none"> – Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

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

SET input or SET button	
Input	active HIGH
Input type	comparator
Signal level	HIGH min: 60 % of +V, max: +V LOW max: 25 % of +V (power supply)
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Reaction time (DIR input)	1 ms
The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.	

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

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

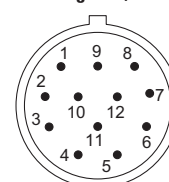
LED	
The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF.	
If the LED is ON this indicates:	
<ul style="list-style-type: none"> - Sensor error, singleturn or multiturn (soiling, glass breakage etc.) - LED error, failure or ageing - Over- or under-temperature 	
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.	

Terminal assignment

Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)
3, 4	1, 2, E	Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
		Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
Interface	Type of connection	M23 connector, 12-pin
3, 4	3, 4	Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
		Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- A, \bar{A} : cosine signal
- B, \bar{B} : sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

1) Other options on request

Absolute Encoders – Multiturn

Standard
SIL3/PLe, mech. Multiturn, optical

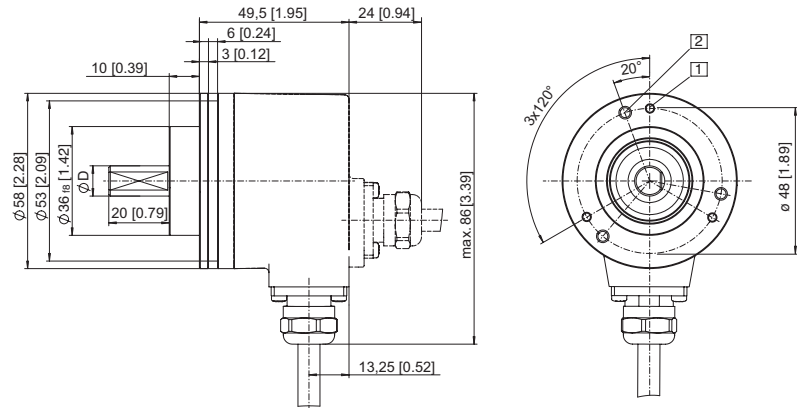
Sendix SIL 5863FS3 / 5883FS3 (Shaft / Hollow shaft) SSI/BiSS-C + SinCos

Dimensions shaft version

Dimensions in mm [inch]

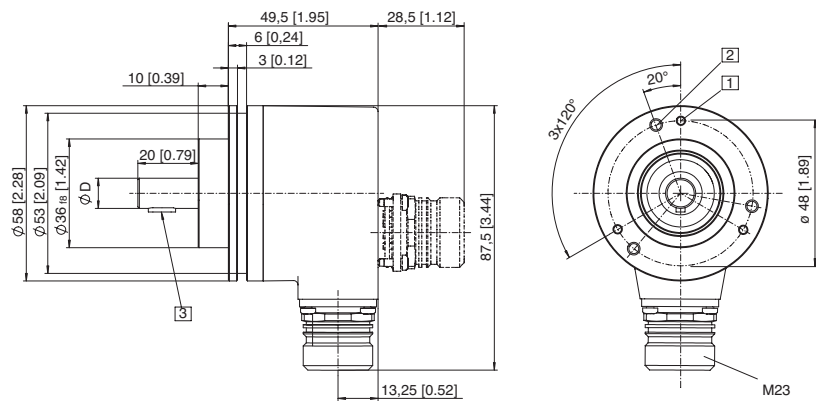
Clamping flange, \varnothing 58 [2.28]
Flange type 1 with shaft type 2
 (Drawing with cable)

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



Clamping flange, \varnothing 58 [2.28]
Flange type 1 with shaft type A
 (Drawing with M23 connector)

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



Absolute Encoders – Multiturn

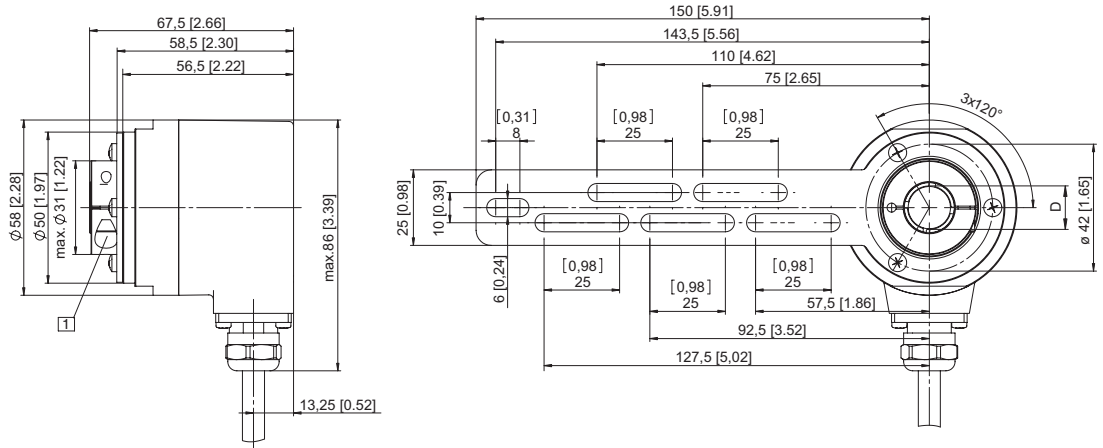
Standard
SIL3/PLe, mech. Multiturn, optical **Sendix SIL 5863FS3 / 5883FS3 (Shaft / Hollow shaft)** **SSI/BiSS-C + SinCos**

Dimensions hollow shaft version

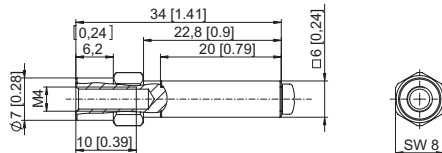
Dimensions in mm [inch]

Flange with torque stop set Flange type A (Drawing with cable)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- D = $\varnothing 10^{H7}$ [0.39]
 $\varnothing 12^{H7}$ [0.47]
 $\varnothing 14^{H7}$ [0.55]

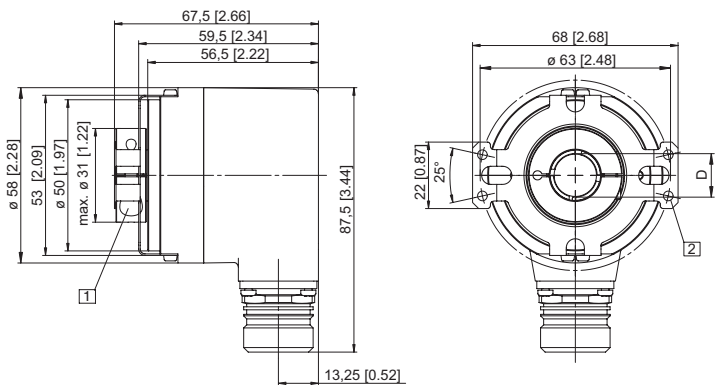


Torque pin with rectangular sleeve with M4 thread, 10 [0.39] deep



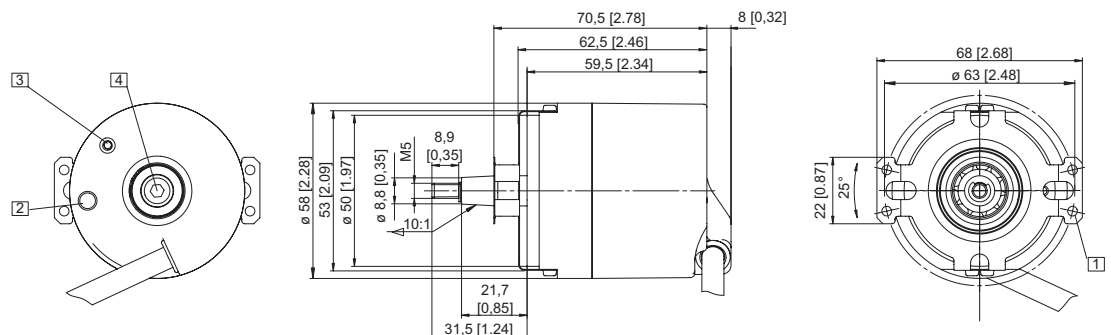
Flange with stator coupling, $\varnothing 63$ [2.48] and hollow shaft Flange type B (Drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm
- 2 for (4x) M3 screw
- D = $\varnothing 10^{H7}$ [0.39]
 $\varnothing 12^{H7}$ [0.47]
 $\varnothing 14^{H7}$ [0.55]



Flange with stator coupling, $\varnothing 63$ [2.48] and tapered shaft Flange type B (Drawing with tangential cable outlet)

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



Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

Standard electronic Multiturn, optical

Sendix F5863 / F5883 (Shaft / Hollow shaft)

SSI / BiSS-C



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.



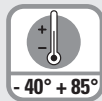
24 bit MT
Multiturn Resolution



Safety-Lock™



High rotational speed



Temperature range
-40° +85°



High protection level
IP



High shaft load capacity



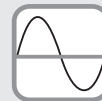
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Seawater-resistant version on request

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-C 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-C up to 10 MHz

Order code Shaft version

8.F5863

Type

. X X X X . X X X X

a b c d e f g h

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



a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]**
- 3 = clamping flange, IP67 ø 58 mm [2.28"]
- 2 = synchro flange, IP65 ø 58 mm [2.28"]**
- 4 = synchro flange, IP67 ø 58 mm [2.28"]

b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]**¹⁾
- 2 = 10 x 20 mm [0.39 x 0.79"]**²⁾
- 3 = 1/4" x 7/8"
- 4 = 3/8" x 7/8"

c Interface / Power supply

- 1 = SSI or BiSS-C / 5 V DC
- 2 = SSI or BiSS-C / 10 ... 30 V DC**
- 3 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC
- 4 = SSI or BiSS-C, 2048 ppr SinCos / 10 ... 30 V DC
- 5 = SSI or BiSS-C / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 6 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC, with sensor output for monitoring the voltage on the encoder
- 7 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC
- 8 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 10 ... 30 V DC
- 9 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC, with sensor output for monitoring the voltage on the encoder

d Type of connection

- 1 = axial cable, 1 m [3.28'] PVC
- 2 = radial cable, 1 m [3.28'] PVC**
- 3 = M23 connector, 12-pin, axial
- 4 = M23 connector, 12-pin, radial**
- 5 = M12 connector, 8-pin, axial³⁾
- 6 = M12 connector, 8-pin, radial³⁾

e Code

- B = SSI, Binary
- C = BiSS-C, Binary
- G = SSI, Gray**

f Resolution (Singleturn)¹⁾

- A = 10 bit
- 1 = 11 bit
- 2 = 12 bit
- 3 = 13 bit**
- 4 = 14 bit
- 7 = 17 bit

g Resolution (Multiturn)

- 2 = 12 bit MT**
- 6 = 16 bit MT
- 4 = 24 bit MT

h Options (Service)

- 1 = no option
 - 2 = Status LED
 - 3 = SET button and Status LED**
- optional on request*
- Ex 2/22
- seawater-resistant
- special cable length

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

3) Can be combined only with interface 1 and 2
4) Resolution, preset value and counting direction factory-programmable

Absolute Encoders – Multiturn

Standard electronic Multiturn, optical	Sendix F5863 / F5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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Order code Hollow shaft	8.F5883 Type	.XXXX.XXXX a b c d e f g h	If for each parameter of an encoder the underlined preferred option is selected, then the delivery time will be 10 working days for a maximum of 10 pieces. Qts. up to 50 pcs. of these types generally have a delivery time of 15 working days.	10 by 10			
a Flange 1 = with spring element long, IP65 2 = with spring element long, IP67 3 = with stator coupling, IP65 ø 65 mm [2.56"] 4 = with stator coupling, IP67 ø 65 mm [2.56"] 5 = with stator coupling, IP65 ø 63 mm [2.48"] 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] – blind hollow shaft 8 = ø 3/8" 9 = ø 1/2"	c Interface / Power supply 1 = SSI or BiSS-C / 5 V DC 2 = SSI or BiSS-C / 10 ... 30 V DC 3 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC 4 = SSI or BiSS-C, 2048 ppr SinCos / 10 ... 30 V DC 5 = SSI or BiSS-C / 5 V DC, with sensor output for monitoring the voltage on the encoder 6 = SSI or BiSS-C, 2048 ppr SinCos / 5 V DC, with sensor output for monitoring the voltage on the encoder 7 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC 8 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 10 ... 30 V DC 9 = SSI or BiSS-C and 2048 ppr incremental signals RS422 (TTL-comp.) / 5 V DC, with sensor output for monitoring the voltage on the encoder	d Type of connection 2 = radial cable, 1 m [3.28'] PVC 4 = M23 connector, 12-pin, radial 6 = M12 connector, 8-pin, radial ²⁾ E = tangential cable, 1 m [3.28'] PVC	e Code B = SSI, Binary C = BiSS-C, Binary G = SSI, Gray	f Resolution (Singleturn) ¹⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit	g Resolution (Multiturn) 2 = 12 bit MT 6 = 16 bit MT 4 = 24 bit MT	h Options (Service) 1 = no option 2 = Status LED 3 = SET button and Status LED <i>optional on request</i> - Ex 2/22 - seawater-resistant - special cable length

Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	<p>With fixing thread</p>	8.0010.4700.0000
Connection technology		
Connector, self-assembly (straight)	M12 female connector with coupling nut	05.CMB 8181-0
	M23 female connector with coupling nut	8.0000.5012.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6041.8211.002M
	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	8.0000.6901.0002.0031

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

1) Resolution, preset value and counting direction factory-programmable
2) Can be combined only with Interface 1 and 2

Absolute Encoders – Multiturn

Standard electronic Multiturn, optical	Sendix F5863 / F5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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Technical data

Mechanical characteristics		
Max. speed, shaft version	IP65 up to 70°C [158°F]	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	11 000 min ⁻¹ , 9 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
Max. speed, hollow shaft version	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	4 000 min ⁻¹ , 2 000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 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	housing side	IP67
	shaft side	IP65, opt. IP67
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +85°C [-40°F ... +185°F] ¹⁾
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	cable	PVC
Shock resistance acc. EN 60068-2-27		2500 m/s ² , 6 ms
Vibration resistance acc. EN 60068-2-6		100 m/s ² , 55 ... 2000 Hz

Electrical characteristics		
Power supply		5 V DC + 5% or 10 ... 30 V DC
Current consumption (no load)	5 V DC	max. 60 mA
	10 ... 30 V DC	max. 30 mA
Reverse polarity protection of the power supply (+V)		yes (at 10 ... 30 V DC)
Short circuit proof outputs		yes ²⁾
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC

SSI interface		
Output driver		RS485 transceiver type
Permissible load / channel		max. ± 30 mA
Signal level	HIGH	typ 3.8 V
	LOW at I _{Load} = 20 mA	typ 1.3 V
Short circuit proof outputs		yes ²⁾
Singleturn resolution		10 ... 17 bit
Number of revolutions		max. 24 bit
Code		Binary or Gray
SSI clock rate	ST resolution ≤ 14 bit	50 kHz ... 2 MHz
	ST resolution ≥ 15 bit	50 kHz ... 125 kHz
Monoflop time		≤ 15 µs
Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time.		
Data refresh rate	ST resolution ≤ 14 bit	≤ 1 µs
	ST resolution ≥ 15 bit	4 µs
Status and parity bit		on request

BiSS-C interface	
Singleturn resolution	10 ... 17 bit
Number of revolutions	max. 24 bit
Code	Binary
BiSS-C clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs
Note:	<ul style="list-style-type: none"> – Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

SET input		
Input	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-C. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off. The SET function should be carried out whilst the encoder is at rest.

Option incremental outputs (A/B), 2048 ppr		
	SinCos	RS422 TTL-compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 V _{pp} (± 20%)	HIGH: min. 2.5 V
		LOW: max. 0.5 V
Short circuit proof	yes ²⁾	yes ²⁾

Status output and LED	
Output driver	Open Collector, internal pull up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH: +V / LOW: < 1 V
Active	LOW
The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (Open Collector with int. pull-up 22k).	
An active status output (LOW) displays: <ul style="list-style-type: none"> – Sensor error, singleturn or multiturn (soiling, glass breakage etc.) – LED fault (failure or ageing) – over- or under-temperature 	
In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.	

1) Cable version: -30°C ... +75°C [-22°F ... +167°F]
2) Short circuit to 0 V or to output; if power supply correctly applied

Absolute Encoders – Multiturn

Standard electronic Multiturn, optical	Sendix F5863 / F5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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DIR input	
A HIGH signal switches the direction of rotation from the default CW to CCW. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The status output will switch to LOW.	
Response time (DIR input)	1 ms

Power-ON delay	
After Power-ON the device requires a time of approx. 150 ms before valid data can be read. Hot plugging of the encoder should be avoided.	

Terminal assignment

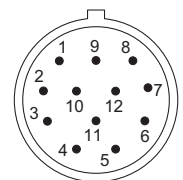
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
1, 2	1, 2, E	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - - - shield
Interface	Type of connection	Features	M23 connector
1, 2	3, 4	SET, DIR, Status	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C N/C N/C \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
5	1, 2, E	SET, DIR, Status sensor output	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
			Cable colour: WH BN GN YE GY PK BU RD BK - GY-PK RD-BU shield
Interface	Type of connection	Features	M23 connector
5	3, 4	SET, DIR, Status sensor output	Signal: 0 V +V C+ C- D+ D- SET DIR Stat N/C 0Vsens +Vsens \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
3, 4, 7, 8	1, 2, E	SET, DIR, SinCos or incr. RS422	Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
			Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
Interface	Type of connection	Features	M23 connector
3, 4, 7, 8	3, 4	SET, DIR, SinCos or incr. RS422	Signal: 0 V +V C+ C- D+ D- SET DIR A \bar{A} B \bar{B} \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	Cable (Isolate unused wires individually before initial start-up)
6, 9	1, 2, E	SinCos o. incr. RS422 sensor output	Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			Cable colour: WH BN GN YE GY PK BU RD BK VT GY-PK RD-BU shield
Interface	Type of connection	Features	M23 connector
6, 9	3, 4	SinCos o. incr. RS422 sensor output	Signal: 0 V +V C+ C- D+ D- A \bar{A} B \bar{B} 0Vsens +Vsens \perp
			Pin: 1 2 3 4 5 6 7 8 9 10 11 12 PH
Interface	Type of connection	Features	M12 connector
1, 2	5, 6	SET, DIR	Signal: 0 V +V C+ C- D+ D- SET DIR \perp
			Pin: 1 2 3 4 5 6 7 8 PH

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
- C+, C-: Clock signal
- D+, D-: Data signal
- A, \bar{A} : Incremental output channel A
- B, \bar{B} : Incremental output channel B
- SET: Set input. The current position becomes defined as position zero.
- DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
- Stat: Status output
- PH \perp : Plug connector housing (Shield)

Top view of mating side, male contact base



M12 connector, 8-pin



M23 connector, 12-pin

Absolute Encoders – Multiturn

**Standard
electronic Multiturn, optical**

Sendix F5863 / F5883 (Shaft / Hollow shaft)

SSI / BiSS-C

Dimensions shaft version

Dimensions in mm [inch]

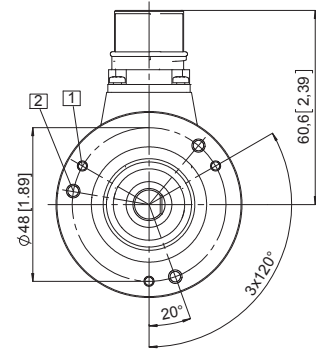
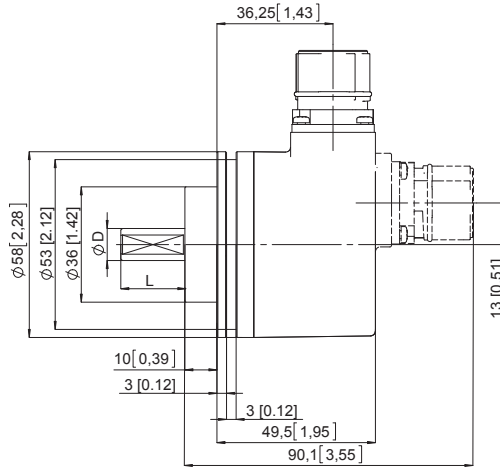
Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

(Drawing with M23 connector)

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

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



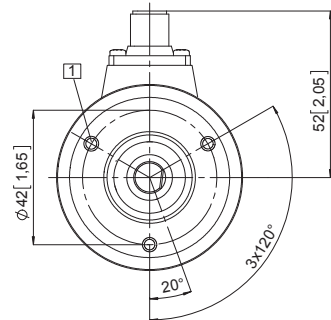
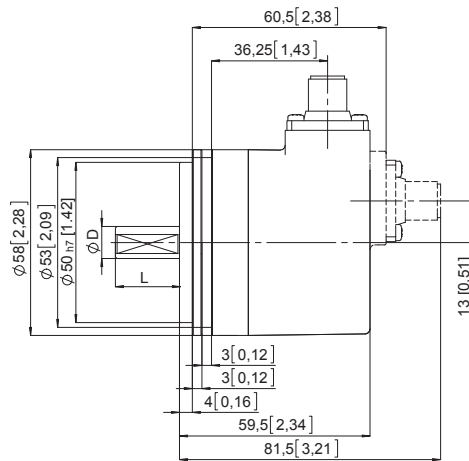
Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(Drawing with M12 connector)

- 1 M4, 6 [0.24] deep

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



Absolute Encoders – Multiturn

Standard electronic Multiturn, optical	Sendix F5863 / F5883 (Shaft / Hollow shaft)	SSI / BiSS-C
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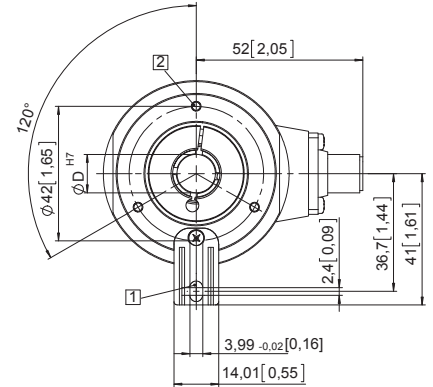
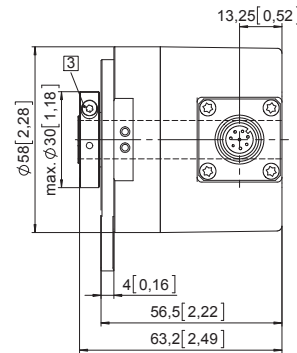
Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with spring element long Flange type 1 and 2

(drawing with M12 connector)

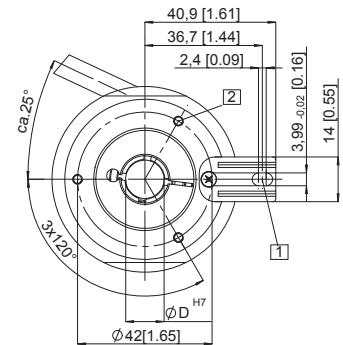
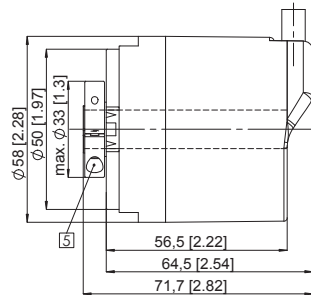
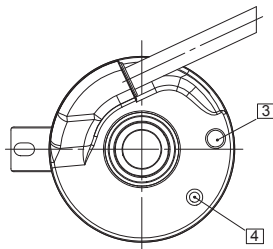
- 1 Torque stop slot,
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 M3, 6 [0.24] deep
- 3 Recommended torque for the
clamping ring 0.6 Nm



Flange with spring element long Flange type 1 and 2

(drawing with tangential cable)

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



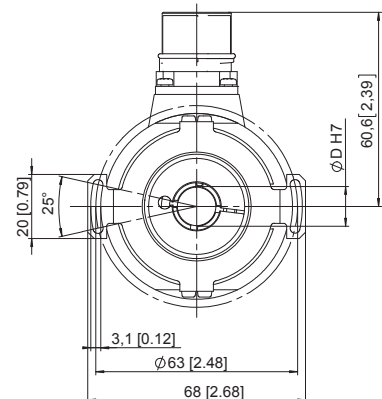
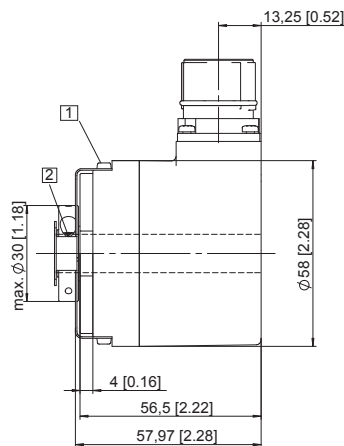
Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6

Pitch circle diameter for fixing screws 63 mm [2.48]

(Drawing with M23 connector)

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



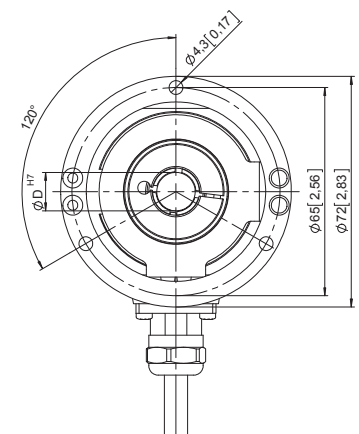
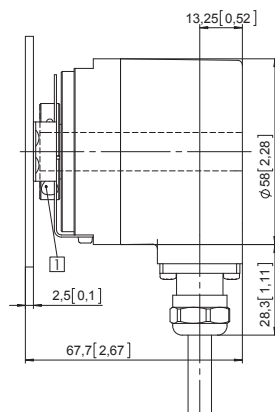
Flange with stator coupling, \varnothing 65 [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(Drawing with cable)

- 1 Recommended torque for the
clamping ring 0.6 Nm



Absolute Encoders – Multiturn

**Standard
programmable, optical / magnetic**

5862 / 5882 (Shaft / Hollow shaft)

SSI



The multiturn encoders 5862 and 5882, with SSI interface and combined optical and magnetic sensor technology, offer a maximum resolution of 25 bits.

These encoders are programmable via the Ezturn software.

The hollow shaft version boasts a minimal installation depth, facilitating use where space is tight.



High rotational speed



Temperature range
-20°...+85°C



High protection level
IP



High shaft load capacity



Shock / vibration resistant



Short circuit proof



Reverse polarity protection

Compact

- Hollow shaft version with just 43 mm installation depth
- Hollow shaft version up to 12 mm diameter

Flexible

- With SSI interface
- Programmable via Ezturn
- Numerous connection options due to wide range of connection types

Order code

Shaft version

8.5862 . XXXXX . XXXX
Type a b c d e

a Flange

1 = clamping flange, ø 58 mm [2.28"]

b Shaft (ø x L), with flat

2 = ø 10 x 20 mm [0.39 x 0.79"]

c Interface / Power supply

2 = SSI / 5...30 V DC, with 4 status outputs

d Type of connection

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

i SSI interface¹⁾

2004 = 8192 x 4096 (25 bit), Gray

Order code

Hollow shaft

8.5882 . XXXXX . XXXX
Type a b c d e

a Flange

1 = through hollow shaft with spring element short

3 = through hollow shaft with stator coupling, ø 63 mm [2.48"]

b Hollow shaft

8 = ø 12 mm [0.47"]

c Interface / Power supply

2 = SSI / 5...30 V DC, with 4 status outputs

d Type of connection

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

i SSI interface¹⁾

2004 = 8192 x 4096 (25 bit), Gray

1) This factory set (default) resolution (25 bit, Gray, cw) can be changed by using the Ezturn programming software.

Absolute Encoders – Multiturn

Standard programmable, optical / magnetic	5862 / 5882 (Shaft / Hollow shaft)	SSI
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops	<p>With fixing thread</p>	8.0010.4700.0000
Connection technology		
Connector, self-assembly (straight)	M23 female connector with coupling nut, 17-pin	8.0000.5012.0000
Cordset, pre-assembled	M23 female connector with coupling nut, 2 m [6.56'] PVC cable	8.0000.6901.0002.0031
Programming set		
Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum System Requirements Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0004

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

Absolute Encoders
Multiturn

Technical data		
Mechanical characteristics		
Speed		max. 6.000 min ⁻¹ 1)
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 2)	80 N
	axial 2)	40 N
Weight		approx. 0.4 kg [14.11 oz]
Protection acc. to EN 60529		IP65
Temperature range		-20°C ... +85°C [-4°F ... +185°F]
Material	shaft / hollow shaft	stainless steel h8
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		
Power supply (+V)		5.0 ... 30 V DC 5)
Power consumption (no load)	typ.	89 mA
	max.	138 mA
Short circuit proof outputs 3)		yes 4)
Reverse polarity protection of the power supply (+V)		yes
UL approval		File 224618
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC
SSI Interface		
Output driver		RS485
Permissible load / channel		max. +/- 20 mA
Update rate for position data		approx. 1600/s
SSI clock rate		100 kHz / 500 kHz
Signal level	HIGH	typ. 3.8 V
	LOW (I _{Load} = 20 mA)	typ. 1.3 V
Singleturn resolution		13 bit programmable 1 ... 8192
Number of revolutions		12 bit programmable 1 ... 4096
Rising edge time t_r (without cable)		max. 100 ns
Falling edge time t_f (without cable)		max. 100 ns

1) Hollow shaft version: For continuous operation max. 3000 min⁻¹
 2) At shaft end
 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 ≥ 5 V DC short circuit to channel or 0 V is permitted.
 5) The power supply at the encoder input must not be less than 4.75 V (5 V - 5%)

Absolute Encoders – Multiturn

Standard programmable, optical / magnetic	5862 / 5882 (Shaft / Hollow shaft)	SSI
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Control inputs (V/R, SET)	
Voltage	5 ... 30 V DC = +V
Response time	10 ms
Switching level	LOW max. 25% +V HIGH min. 60% +V, max. +V
Max. input current	≤ 0.5 mA

Control outputs	
Output driver	Push-Pull
Max. Output current	± 9.0 mA
Signal level	HIGH min. +V - 3.0 V LOW max. 1.5 V
Rising edge time t_r	max. 240 µs
Falling edge time t_f	max. 300 µs

Control inputs

Up/Down input to switch the counting direction

The encoder can output increasing code values when the shaft is rotated either clockwise or counter-clockwise (when looking from the shaft side).

There are two methods for selecting the appropriate option:

1. Via a hardware configuration of the V/R input BEFORE powering up the encoder
2. By programming the device using the Kübler „Ezturn®“ programming tool.

The following table shows the choice of functions determined by the hardware and software settings:

Hardware configuration of the V/R input	Programmed selection using the EzTurn® programming tool	Function: increasing code value when the shaft is in the following direction:
„LOW“ (0V) on the V/R-input (=cw)	cw	cw
„HIGH“ (+V) on the V/R-input (= ccw)	cw	ccw
„LOW“ (0V) on the V/R-input (=cw)	ccw	ccw
„HIGH“ (+V) on the V/R-input (= ccw)	ccw	ccw

SET input

This input is used for a one-time alignment (zeroing) of the encoder immediately after installation. A high control pulse (+V) applied to this input for a minimum of 10 ms will reset the current encoder position to the pre-programmed setpoint value.

The programming of the setpoint can be carried out with Kübler's Ezturn® programming software or can, on request, be done in advance at the factory. The default value is zero. However anyvalue within the encoder's measuring range can be defined.

Outputs ¹⁾

Output	Default-function ²⁾
A1	battery control
A2	not activated
A3	not activated ³⁾
A4	not activated ³⁾

Notes:

- Any hardware configuration of the V/R input must take place BEFORE powering up the encoder!
- If the V/R input is not configured, then a 0 V configuration will apply (default condition)!
- If the direction of rotation is changed due to the V/R configuration, without activating the SET function again, and if the encoder is also then powered up again, a new position value may be outputted, even if the physical shaft position of the encoder has not moved! This is due to internal conversion processes.
- The start-up procedure for the encoder should therefore follow this sequence:
 1. Determine the count direction of the encoder either via the V/R input or via programming
 2. Apply power to the encoder
 3. Activate the SET function, if desired (see SET input below)
- If using a cable wire to configure the V/R input, then for EMC reasons the wire should not remain open but should be tied either to 0 V or +V!
- The response time of the V/R input with +V = 5 ... 30 V DC power supply is 10 ms.

Notes:

- The SET function should only be implemented when the encoder shaft is at rest.
- For the duration of the SET pulse the SSI interface does not function and therefore does not output any valid position values! In order to avoid malfunctions, no SSI clock pulse should occur during the SET pulse.
- If a cable wire is used to configure the SET input, then for EMC reasons the wire should not remain open but should if at all possible be tied to 0 V, provided no SET pulse is triggered!
- The response time of the SET input with +V = 5 ... 30 V DC power supply is 10 ms.

The outputs are not activated in the factory setting (default). They can be activated and defined with the optional Ezturn® programming software e.g. limit switch, overspeed and temperature control etc.

1) Not available for versions with incremental track

2) Programmable with optional programming software Ezturn®

3) With the order code Interface 9 assigned to the sense outputs.

Absolute Encoders – Multiturn

Standard programmable, optical / magnetic	5862 / 5882 (Shaft / Hollow shaft)	SSI
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Functionality of the Ezturn® software

- Configuration function
- Setting of the communication parameters
- Setting of a drive factor by means of the modification of the resolution per revolution, the number of revolutions and the total resolution
- Programming of the direction of rotation and code type
- Setting of a preset/electronic zero point
- Setting of diagnostic functions
- Setting of the outputs A1 ... A4
 - Limit switch values, max. 2
 - Alarm and status information
 - Battery monitoring
- Limiting max. number of bit to interface with PLCs
- Diagnostics and information for the set-up operation
- Data transmission from the PC to the encoder and inversely, also during operation
- Print-out of the current data and set parameters
- Convenient position output with the current set data
- Terminal operation for direct instructions via the keyboard
- Diagnostics of the encoder connected

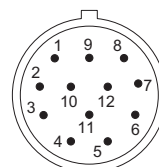
Terminal assignment

Synchronous serial interface

Interface	Type of connection	Feature	M23 connector													
			Signal:	0 V	+V	C+	C-	D+	D-	ST	VR	A1	A2	A3 ¹⁾ 0 V sens	A4 ¹⁾ +V sens	⊥
2	5862: 4	SET	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
	5882: 2															

- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- ST: Set input. The current position becomes defined as position zero.
- VR: Up/down input. As long as this input is active, decreasing code values are transmitted when shaft turning clockwise.
- A1, A2, A3, A4: Outputs, can be modified using Ezturn®
- PH ⊥: Plug connector housing (Shield)

Top view of mating side, male contact base



M23 connector, 12-pin

1) With the order code interface 9 these outputs are assigned to the sense outputs. The sensor circuits are internally tied to the power supply. Special power supply units control the voltage drop in long cable runs via the voltage feedback. If the circuits are not being used, then they should be individually isolated and not connected.

Absolute Encoders – Multiturn

Standard
programmable, optical / magnetic

5862 / 5882 (Shaft / Hollow shaft)

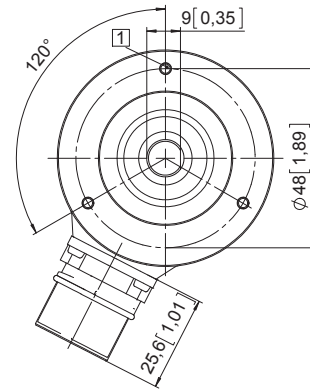
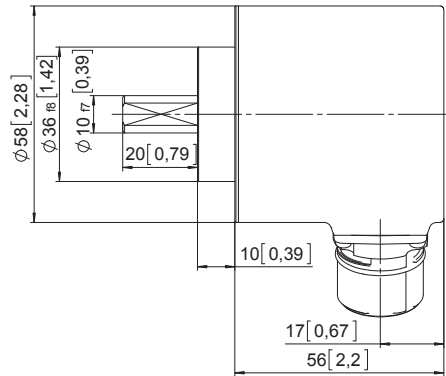
SSI

Dimensions shaft version

Dimensions in mm [inch]

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

- 1 M3, 5 [0.20] deep

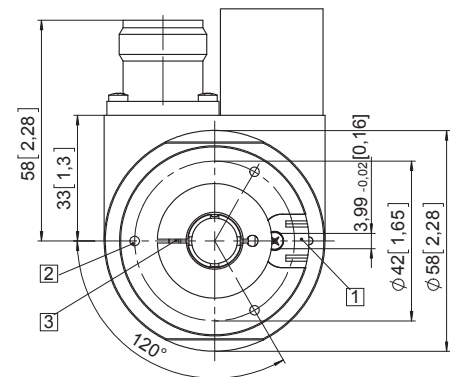
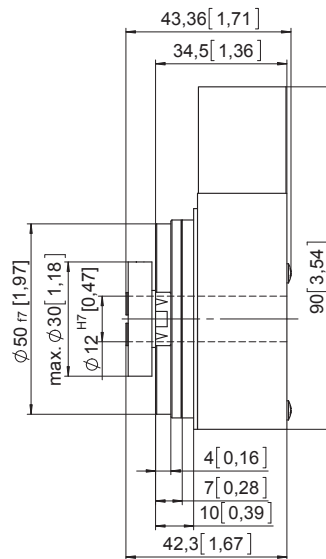


Dimensions hollow shaft version

Dimensions in mm [inch]

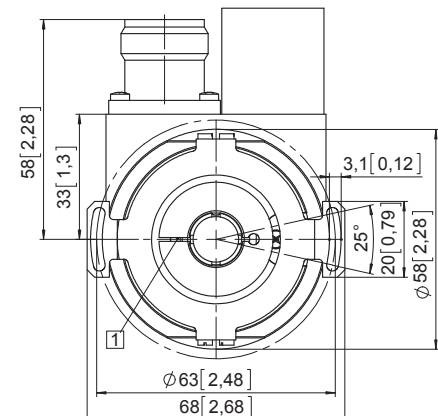
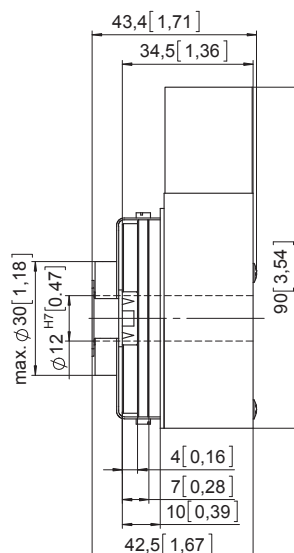
Through hollow shaft
with spring element short
Flange type 1

- 1 Torque stop slot,
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 2 M3, 5 [0.20] deep
- 5 Recommended torque for the
clamping ring 0.6 Nm



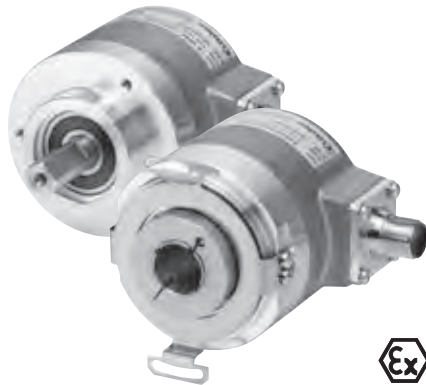
Through hollow shaft
with stator coupling, \varnothing 63 [2.48]
Flange type 3

- 1 Recommended torque for the
clamping ring 0.6 Nm



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	SinCos	Seawater-resistant version on request
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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)

 Absolute Encoders
Multiturn

Order code Shaft version	8.F5868 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.	
a Flange	b Shaft (ø x L), with flat	d Type of connection	f Options (Service)		
<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"]	<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"	A = 1 x cable PVC, radial, length 2 m [6.56"] <u>E = 1 x M12 connector, radial, 5-pin</u> F = 2 x M12 connector, radial, 5-pin	<u>2 = no option</u> <u>3 = SET button</u> optional on request - Ex 2/22 - seawater-resistant - special cable length		
c Interface / Power supply		e Fieldbus profile ⁵⁾			
<u>2 = CANopen DS301 V4.02 /</u> <u>10 ... 30 V DC</u>		<u>21 = CANopen Encoder-Profile DS406 V3.2</u>			

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.	
a Flange	b Hollow shaft	d Type of connection	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"]	3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> B = ø 12 mm, blind hollow shaft ³⁾ 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"]	<u>E = 1 x M12 connector, radial, 5-pin</u> F = 2 x M12 connector, radial, 5-pin ⁴⁾ L = 1 x cable PVC, tangential, length 2 m [6.56"]	<u>2 = no option</u> <u>3 = SET button</u> optional on request - Ex 2/22 - seawater-resistant - special cable length		
c Interface / Power supply		e Fieldbus profile ⁵⁾			
<u>2 = CANopen DS301 V4.02 /</u> <u>10 ... 30 V DC</u>		<u>21 = CANopen Encoder-Profile DS406 V3.2</u>			

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 type of connection F
 4) Can be combined only with blind hollow shaft ø12 mm [0.47"]
 5) CAN parameters can also be factory pre-set

Absolute Encoders – Multiturn

Standard electronic Multiturn, optical	Sendix F5868 / F5888 (Shaft / Hollow shaft)	CANopen
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops		With fixing thread 8.0010.4700.0000
Connection technology		
Connector, self-assembly (straight)	Coupling M12 for Bus in	8.0000.5116.0000
	Connector M12 for Bus out	8.0000.5111.0000
Cordset, pre-assembled	M12, for Bus in, 2 m [6.56'] PVC cable	05.00.6091.A211.002M
	M12, for Bus out, 2 m [6.56'] PVC cable	05.00.6091.A411.002M
Programming set		
Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0015

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional 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	12 000 min ⁻¹ , 10 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
	IP67 up to 70°C	11 000 min ⁻¹ , 9 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	8 000 min ⁻¹ , 5 000 min ⁻¹ (continuous)
Max. speed hollow shaft version	IP65 up to 70°C	9 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
	IP67 up to 70°C	8 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	4 000 min ⁻¹ , 2 000 min ⁻¹ (continuous)
Starting torque at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 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	housing side	IP67
	shaft side	IP65, opt. IP67
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +80°C ¹⁾ [-40°F ... +176°F] ¹⁾
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	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		10 ... 30 V DC
Power consumption (no load)		max. 80 mA
Reverse polarity protection of the power supply (+V)		yes
UL approval		File 224618
CE compliant acc. to		EMC guideline 2004/108/EC
RoHS compliant acc. to		guideline 2002/95/EC
Diagnostic LED (two-colour, red/green)		
LED ON or blinking	red	Error display
	green	Status display
	combination red / green	Error code

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
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Interface characteristics CANopen	
Singleturn resolution	1 ... 65536 (16 bit), scalable
Default value Singleturn	8192 (13 bit)
Multiturn resolution	max. 65536 (16 bit) scalable only via the total resolution
Total resolution	1 ... 4.294.967.296 (32 bit) Default: 25 bit
Code	Binary
Interface	CAN High-Speed acc. to ISO 11898, Basic- and Full-CAN, CAN Specification 2.0 B
Protocol	CANopen Profile DS406 V3.2 with manufacturer-specific add-ons, LSS-Service DS305 V2.0
Baud rate	10 ... 1000 kbit/s (software configurable)
Node address	1 ... 127 (software configurable)
Termination switchable	software configurable
LSS Protocol	CIA LSS protocol DS305, Global command support for node address and baud rate. Selective commands via attributes of the identity object

General information about CANopen

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

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

When switching the device on, all parameters, which have been saved on an EEPROM to protect them against power failure, are loaded again.

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

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

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

The two-colour LED located on the back indicates the operating or fault status of the CAN bus, as well as the status of the internal diagnostics.

Universal Scaling Function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The Universal Scaling Function remedies this problem.

CANopen Communication Profile DS301 V4.2

Among others, the following functionality is integrated. Class C2 functionality:

- NMT Slave
- Identity Object
- Error Behaviour Object
- Variable PDO Mapping self-start programmable (Power on to operational), 4 Sending PDO's
- Node address, baud rate and CANbus / Programmable termination
- Producer / Consumer Heartbeat

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode
- 2 working areas with 2 upper and lower limits and the corresponding output states
- Variable PDO mapping for position, speed, work area status, error message, raw data
- Extended failure management for position sensing
- User interface with visual display of bus and failure status
- Customer-specific memory 16 Byte
- Customer-specific protocol
- Universal Scaling Function (USF)
- "Watchdog controlled" device
- Extended diagnostic modes

LSS Layer Setting Services DS305 V2.0

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

Absolute Encoders – Multiturn

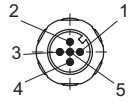
**Standard
electronic Multiturn, optical**

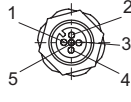
Sendix F5868 / F5888 (Shaft / Hollow shaft)

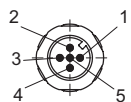
CANopen

Terminal assignment

Interface	Type of connection	Function	Cable (Bus terminal cover with terminal box)					
2	A, L	Bus IN	Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
			Abbreviation:	0 V	+V	CL	CH	CG
			Cable colour:	WH	BN	YE	GN	GY

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

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

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

Dimensions shaft version

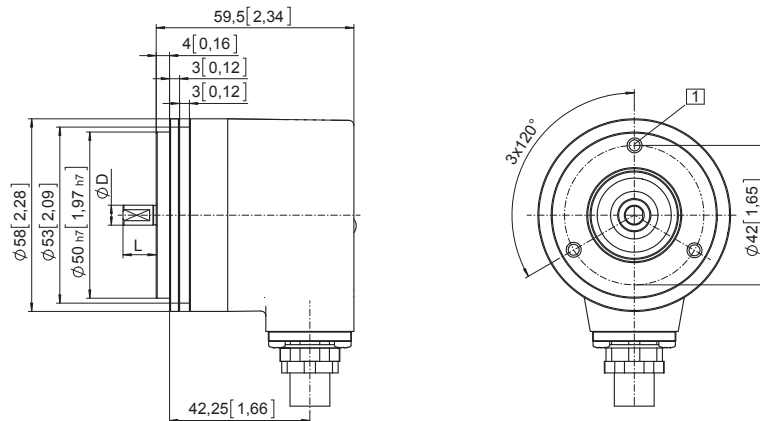
Dimensions in mm [inch]

Synchro flange, ø 58 [2.28]

Flange type 2 and 4

(Drawing with 12 connector)

1 M4, 6 [0.24] deep



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

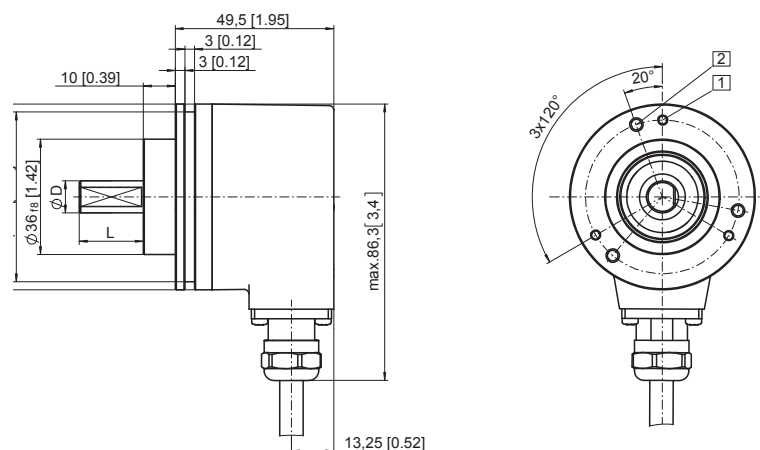
Clamping flange, ø 58 [2.28]

Flange type 1 and 3

(Drawing with cable)

1 3 x M3, 6 [0.24] deep

2 3 x M4, 8 [0.32] deep



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

Absolute Encoders – Multiturn

Standard electronic Multiturn, optical	Sendix F5868 / F5888 (Shaft / Hollow shaft)	CANopen
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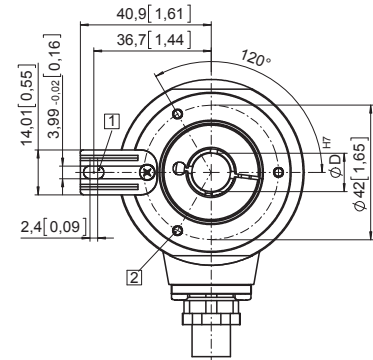
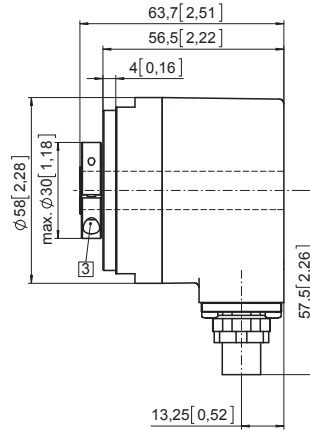
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element long

Flange type 1 and 2
(drawing with cable)

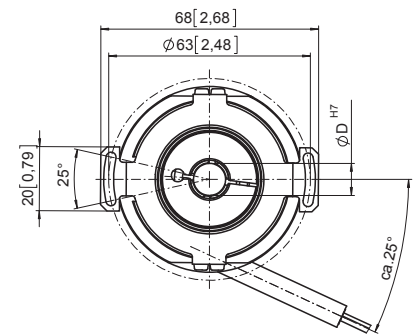
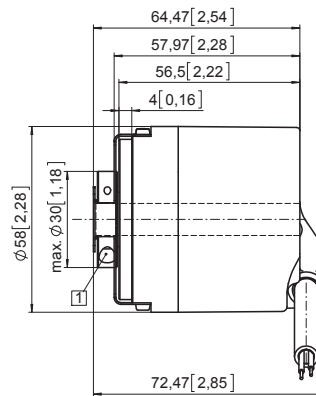
- 1 M3, 6 [0.24] deep
- 2 Torque stop slot,
Recommendation:
Cylindrical pin DIN 7, \varnothing 4 [0.16]
- 3 Recommended torque for the
clamping ring 0.6 Nm



Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(Drawing with tangential cable)

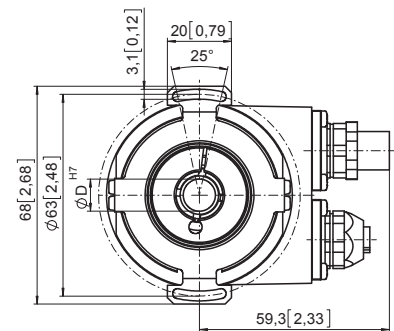
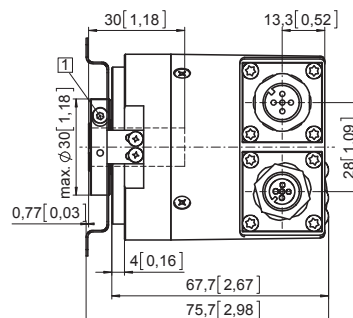
- 1 Fixing screws DIN7985 M2.5x6
- 2 Recommended torque for the
clamping ring 0.6 Nm



Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6
Pitch circle diameter for fixing screws 63 [2.48]
(Drawing with 2 x M12 connector)

- 1 Recommended torque for the
clamping ring 0.6 Nm



Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical

Sendix 5868 / 5888 (Shaft / Hollow shaft)

PROFIBUS DP



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

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



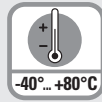
Mechanical drive



Safety-Lock™



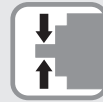
High rotational speed



Temperature range
-40... +80°C



High protection level
IP



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor



Seawater-resistant version on request

Reliable

- Tried-and-tested in applications with the highest demands, such as in wind energy or mobile automation
- Absolutely reliable operation in areas with strong magnetic fields, thanks to mechanical gear with optical sensor technology

Flexible

- Fast, simple, error-free connection using versions with M12 connector
- Wide-ranging programming options thanks to latest encoder profile

Order code Shaft version

8.5868
Type

. X X 3 X . 31 1 X
a b c d e f

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



a Flange

- 1 = clamping flange, IP65 ø 58 mm [2.28"]**
3 = clamping flange, IP67 ø 58 mm [2.28"]
2 = synchro flange, IP65 ø 58 mm [2.28"]
4 = synchro flange, IP67 ø 58 mm [2.28"]
5 = square flange, IP65 □ 63.5 mm [2.5"]
7 = square flange, IP65 □ 63.5 mm [2.5"]

b Shaft (ø x L), with flat

- 1 = 6 x 10 mm [0.24 x 0.39"]¹⁾**
2 = 10 x 20 mm [0.39 x 0.79"]²⁾
3 = 1/4" x 7/8"
4 = 3/8" x 7/8"

c Interface / Power supply

- 3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC**

d Type of connection

- 1 = removable bus terminal cover, with cable gland fitting, radial
2 = removable bus terminal cover, with 3 x M12 connectors, radial, 5-pin

e Fieldbus profile

- 31 = PROFIBUS DP V0 encoder profile Class 2**

f Options (Service)

- 2 = no option
3 = SET button
optional on request
- Ex 2/22
- seawater-resistant

Order code Hollow shaft

8.5888
Type

. X X 3 X . 31 1 X
a b c d e f

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



a Flange with torque stop

- 1 = with spring element long, IP65
2 = with spring element long, IP67
3 = with stator coupling, IP65 ø 65 mm [2.56"]
4 = with stator coupling, IP67 ø 65 mm [2.56"]
5 = with stator coupling, IP65 ø 63 mm [2.48"]
6 = with stator coupling, IP67 ø 63 mm [2.48"]

b Blind hollow shaft

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

c Interface / Power supply

- 3 = PROFIBUS DP V0 encoder profile V 1.1, 10 ... 30 V DC**

d Type of connection

- 1 = removable bus terminal cover, with cable gland fitting, radial
2 = removable bus terminal cover, with 3 x M12 connectors, radial, 5-pin

e Fieldbus profile

- 31 = PROFIBUS DP V0 encoder profile Class 2**

f Options (Service)

- 2 = no option
3 = SET button
optional on request
- Ex 2/22
- seawater-resistant

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

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical		Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFIBUS DP
Mounting accessory for shaft encoders			Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]		8.0000.1101.1010
Mounting accessory for hollow shaft encoders			
Cylindrical pin, long for torque stops		With fixing thread	8.0010.4700.0000
Connection technology			
Connector, self-assembly (straight)	Coupling M12 for Bus in		05.BMWS 8151-8.5
	Connector M12 for Bus out		05.BMSWS 8151-8.5
	Connector M12 for power supply		05.B8141-0
Cordset, pre-assembled	M12 cordset for Bus in , 6 m [19.68'] PUR cable		05.00.6011.3211.006M
	M12 cordset for Bus out, 6 m [19.68'] PUR cable		05.00.6011.3411.006M
	M12 cordset for power supply, 2 m [6.56'] PUR cable		05.00.6061.6211.002M

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

Technical data

Mechanical characteristics		
Max. speed	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
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 [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
EX approval for hazardous areas		optional zone 2 and 22
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Materials	shaft / hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	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	10 ... 30 V DC
Power consumption (no load)	max. 120 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

SET button (zero or defined value, option)
Protection against accidental activation. Button can only be operated with a ball-pen or pencil.

Diagnostic LED (yellow)
LED is ON with following errors Sensor error (Profibus error)

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFIBUS DP
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Interface characteristics PROFIBUS-DP	
Singleturn resolution	1 ... 65536 (16 bit), scaleable
Default value	8192 (13 bit)
Total resolution	28 bit (scaleable 1 ... 2 ²⁸ steps)
Number of revolutions	4096 (12 bit), scaleable: 1 ... 4096
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	Signal:	BUS IN				BUS OUT				The shield of the connection cable must be connected over a large area via the cable gland.
			B	A	0 V	+ V	0 V	+ V	B	A	
3	1 (terminal box)	Terminal:	1	2	3	4	5	6	7	8	
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 – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFIBUS DP
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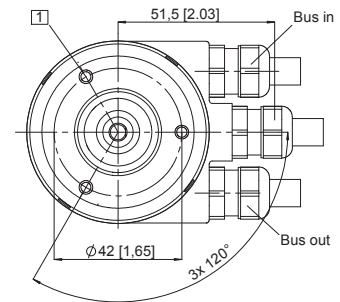
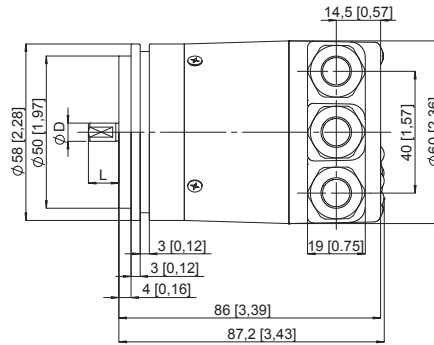
Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4
(Drawing with cable)

1 M4, 6 [0.24] deep



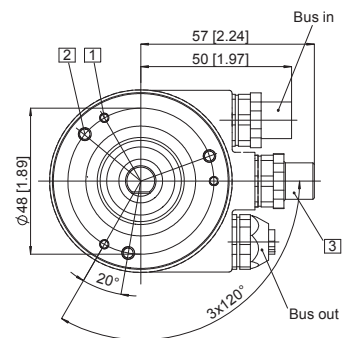
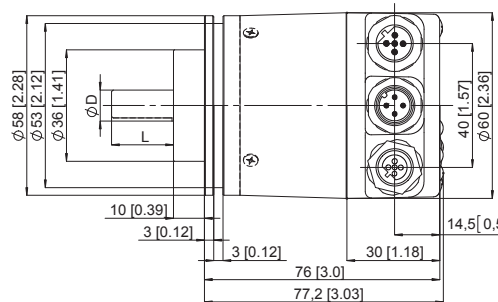
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3
(Drawing with 2 x M12 connector)

1 3 x M3, 6 [0.24] deep

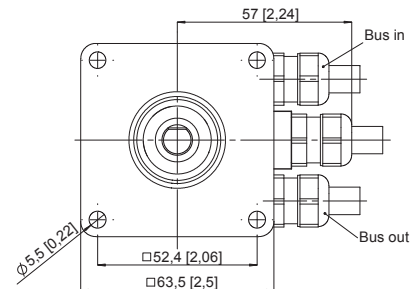
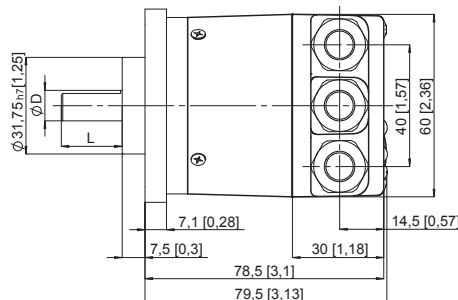
2 3 x M4, 8 [0.32] deep



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

Square flange, \square 63.5 [2.5]

Flange type 5 and 7
(Drawing with cable)



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

Absolute Encoders – Multiturn

**Standard
mechanical Multiturn, optical**

Sendix 5868 / 5888 (Shaft / Hollow shaft)

Profibus-DP

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

Dimensions in mm [inch]

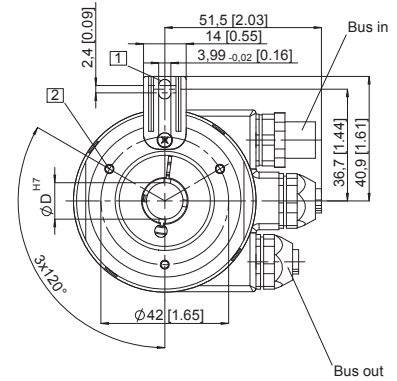
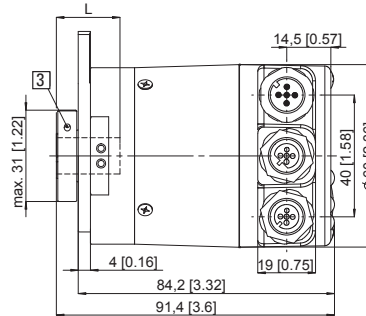
Flange with spring element long

Flange type 1 and 2

(drawing with 3 x M12 connector)

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

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



Flange with stator coupling, \varnothing 63 [2.48]

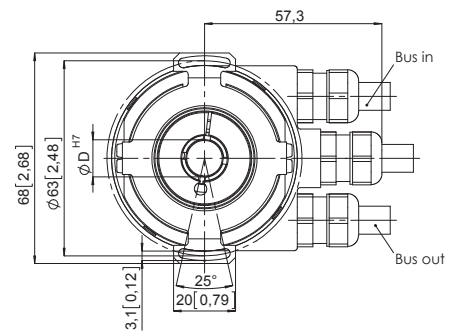
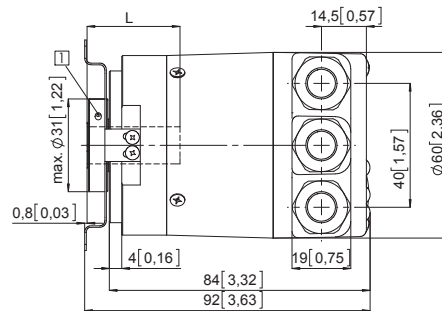
Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(Drawing with cable)

- 1 Recommended torque for the
clamping ring 0.6 Nm

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



Flange with stator coupling, \varnothing 65 [2.56]

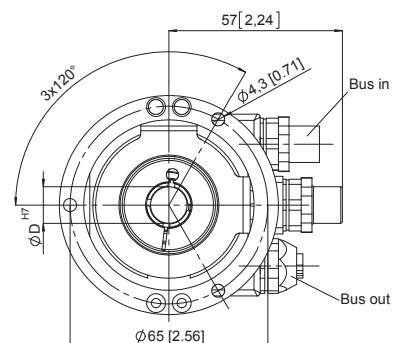
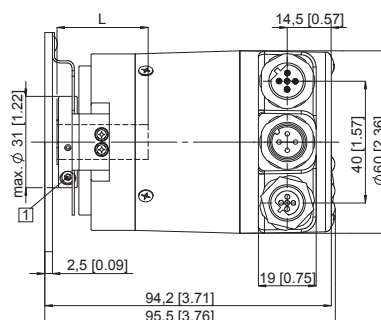
Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(drawing with 3 x M12 connector)

- 1 Recommended torque for the
clamping ring 0.6 Nm

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



Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	CANopen/CANopenLift
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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.



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	Seawater-resistant version on request

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

Absolute Encoders
Multiturn

Order code	8.5868	. X X X X . X X 2 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.					
Shaft version	Type	<table border="1"> <tr> <td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td> </tr> </table>			a	b	c	d
a	b	c	d	e	f			
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, IP65 □ 63.5 mm [2.5"]	<u>2 = CANopen DS301 V4.02, 10 ... 30 V DC</u> <u>5 = CANopen DS301 V4.02, 10 ... 30 V DC</u> mit 2048 ppr incremental track (TTL-compatible) ³⁾	<u>21 = CANopen Encoder-Profile DS406 V3.2</u> 22 = CANlift DS417 V1.01					
b Shaft (ø x L), with flat	<u>1 = 6 x 10 mm [0.24 x 0.39"]¹⁾</u> <u>2 = 10 x 20 mm [0.39 x 0.79"]²⁾</u> 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"	<u>2 = 2 x M12 connector</u> Fixed connection without bus terminal cover A = cable, radial, length 2 m [6.56'] PVC E = 1 x M12 connector, 5-pin, radial F = 2 x M12 connector, 5-pin, radial I = 1 x M23 connector, 12-pin, radial J = 2 x M23 connector, 12-pin, radial K = 1 x D-Sub connector, 9-pin	<u>3 = SET button</u> optional on request - Ex 2/22 - seawater-resistant - special cable length					
c Interface / Power supply			<u>2 = CANopen DS301 V4.02, 10 ... 30 V DC</u> <u>5 = CANopen DS301 V4.02, 10 ... 30 V DC</u> mit 2048 ppr incremental track (TTL-compatible) ³⁾					
d Type of connection			removable bus terminal cover 1 = cable gland radial <u>2 = 2 x M12 connector</u> Fixed connection without bus terminal cover A = cable, radial, length 2 m [6.56'] PVC E = 1 x M12 connector, 5-pin, radial F = 2 x M12 connector, 5-pin, radial I = 1 x M23 connector, 12-pin, radial J = 2 x M23 connector, 12-pin, radial K = 1 x D-Sub connector, 9-pin					
e Fieldbus profile⁴⁾			<u>21 = CANopen Encoder-Profile DS406 V3.2</u> 22 = CANlift DS417 V1.01					
f Options (Service)			2 = no options <u>3 = SET button</u>					

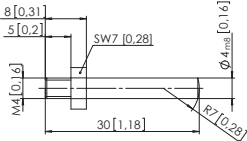
1) Preferred type only in conjunction with flange type 2
 2) Preferred type only in conjunction with flange type 1
 3) Only in conjunction with connection type 2
 4) CAN parameters can also be factory pre-set

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	.XXXX.XX2X 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 with torque stop 1 = with spring element long, IP65 2 = with spring element long, IP67 3 = with stator coupling, IP65 ø 65 mm [2.56"] 4 = with stator coupling, IP67 ø 65 mm [2.56"] <u>5 = with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	b Blind hollow shaft 3 = ø 10 mm [0.39"] <u>4 = ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	c Interface / Power supply <u>2 = CANopen DS301 V4.02, 10 ... 30 V DC</u> <u>5 = CANopen DS301 V4.02, 10 ... 30 V DC</u> mit 2048 ppr incremental track (TTL-compatible) ¹⁾	d Type of connection removable bus terminal cover 1 = cable gland radial <u>2 = 2 x M12 connector</u> Fixed connection without bus terminal cover A = cable, radial, length 2 m [6.56'] PVC E = 1 x M12 connector, 5-pin, radial F = 2 x M12 connector, 5-pin, radial I = 1 x M23 connector, 12-pin, radial J = 2 x M23 connector, 12-pin, radial K = 1 x D-Sub connector, 9-pin	e Fieldbus profile ²⁾ <u>21 = CANopen Encoder-Profile DS406 V3.2</u> 22 = CANlift DS417 V1.01	f Options (Service) 2 = no options <u>3 = SET button</u> optional on request - Ex 2/22 - seawater-resistant - special cable length

Mounting accessory for shaft encoders	Order No.
Coupling Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010

Mounting accessory for hollow shaft encoders	Order No.
Cylindrical pin, long for torque stops 	8.0010.4700.0000

Connection technology	Order No.
Connector, self-assembly (straight) Coupling M12 for Bus in Connector M12 for Bus out	8.0000.5116.0000 8.0000.5111.0000
Cordset, pre-assembled M12, for Bus in, 6 m [19.68'] PVC cable M12, for Bus out, 6 m [19.68'] PVC cable	05.00.6091.A211.006M 05.00.6091.A411.006M
Programming set Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB 8.0010.9000.0015

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

1) Only in conjunction with connection type 2
2) CAN parameters can also be factory pre-set

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	CANopen/CANopenLift
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Technical data

Mechanical characteristics		
Max. speed	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
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
EX approval for hazardous areas	optional Zone 2 and 22	
Working temperature range	-40°C ... +80°C ¹⁾ [-40°F ... +176°F] ¹⁾	
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
	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	10 ... 30 V DC
Power consumption (no load)	max. 100 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics CANopen/CANopenLift	
Singleturn resolution	1 ... 65536 (16 bit), scalable
Default value	8192 (13 bit)
Multiturn resolution	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268 435 456 (28 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 or CANlift Profile DS417 V1.1
Baud rate	10 ... 1000 kbit/s (can be set via DIP switches / software configurable)
Node address	1 ... 127 (can be set via rotary switches / software configurable)
Termination switchable	can be set via DIP switches, software configurable

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

SET button (zero or defined value, option)
Protection against accidental activation.
Button can only be operated with a ball-pen or pencil.

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

Absolute Encoders
Multiturn

1) Cable version: -30°C ... +75°C [-22°F ... +167°F]
2) Short circuit to 0 V or to output, only one channel at a time, power supply correctly applied

Standard mechanical Multiturn, optical

Sendix 5868 / 5888 (Shaft / Hollow shaft)

CANopen/CANopenLift

General information about CANopen / CANopenLift

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02. In addition, device specific profiles such as encoder profile DS406 V3.2 and DS417 V1.1 (for lift applications) are available

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CAN bus.

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

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

As competitively priced alternatives, encoders are also available with a connector or a cable connection, where the device address and baud rate can be changed and configured by means of the software. The models with bus terminal cover and integrated T-coupler allow for extremely simple installation: the bus and power supply can be easily connected via M12 connectors. The device address can be set via 2 rotary hex switches. Furthermore, another DIP switch allows for the setting of the baud rate and switching on a termination resistor. Three LEDs located on the back indicate the operating or fault status of the CAN bus, as well as the status of an internal diagnostic.

Universal Scaling Function

At the end of the physical resolution of an encoder, **when scaling is active**, an error appears if the division of the physical limit (GP_U) by the programmed total resolution (TMR) does not produce an integer.

The Universal Scaling Function remedies this problem.

CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated.

- Class C2 functionality
- NMT Slave
- Heartbeat Protocol
- High Resolution Sync Protocol
- Identity Object
- Error Behaviour Object
- Variable PDO Mapping
- Self-start programmable (Power on to operational)
- 3 Sending PDO's
- Node address, baud rate and CANbus
- Programmable termination

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode
- Units for speed selectable (steps/sec or RPM)
- Factor for speed calculation (e.g. circumference of measuring wheel)
- Integration time for the speed value from 1 ... 32
- 2 working areas with 2 upper and lower limits and the corresponding output states
- Variable PDO mapping for position, speed, work area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status - 3 LED's
- Optional - 32 CAMs programmable
- Customer-specific memory - 16 Bytes

CANopen Lift Profile DS417 V1.1

Among others, the following functionality is integrated:

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

All profiles stated here: Key-features

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

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	CANopen/CANopenLift
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Terminal assignment

Interface	Type of connection	Cable gland (Bus terminal cover with terminal box)										
2,5	1	Bus OUT					Bus IN					
		Signal:	CAN_GND	CAN_L	CAN_H	0 V power supply	+V power supply	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND
		Abbreviation:	CG	CL	CH	0 V	+V	0 V	+V	CL	CH	CG
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)										
2,5	A	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H	CAN_GND					
		Cable colour:	WH	BN	YE	GN	GY					
Interface	Type of connection	2 x M12 connector										
2,5	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
Interface	Type of connection	1 x M12 connector										
2,5	E	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	3	2	5	4						1
Interface	Type of connection	2 x M23 connector										
2,5	J	Bus OUT										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	10	12	2	7						3
		Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	10	12	2	7						3
Interface	Type of connection	1 x M23 connector										
2,5	I	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	10	12	2	7						3
Interface	Type of connection	D-Sub connector										
2,5	K	Bus IN										
		Signal:	0 V power supply	+V power supply	CAN_L	CAN_H						CAN_GND
		Pin:	6	9	2	7						3

Absolute Encoders – Multiturn

**Standard
mechanical Multiturn, optical**

Sendix 5868 / 5888 (Shaft / Hollow shaft)

CANopen/CANopenLift

Dimensions shaft version, with removable bus terminal cover

Dimensions in mm [inch]

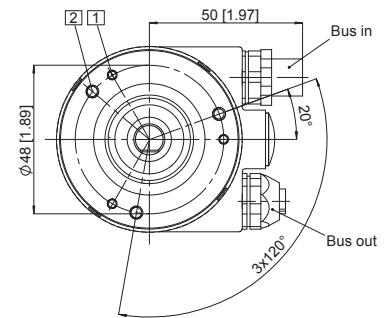
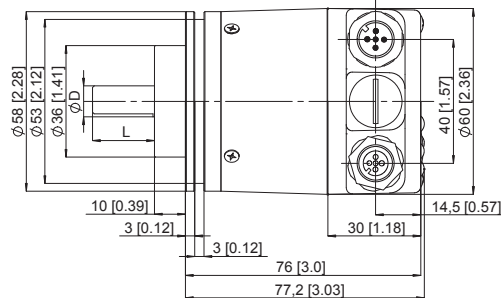
Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

(Drawing with 2 x M12 connector)

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

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



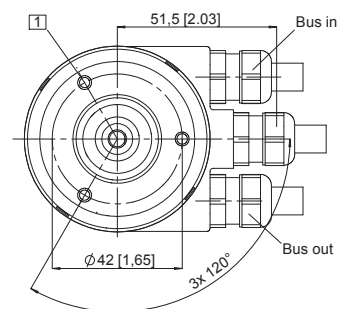
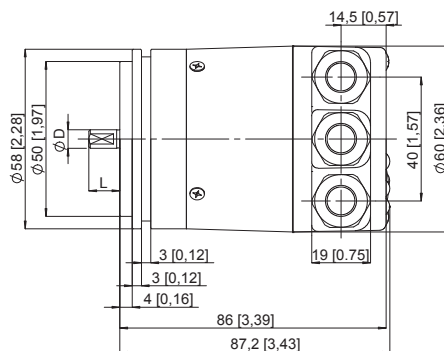
Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(Drawing with cable)

- 1 M4, 6 [0.24] deep

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

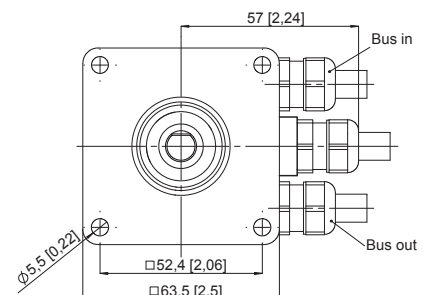
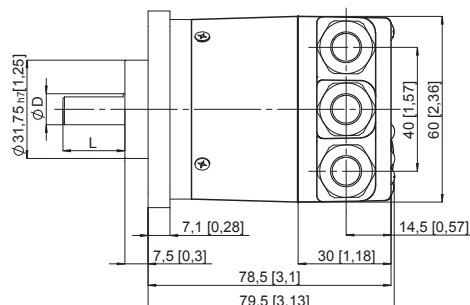


Square flange, \square 63.5 [2.5]

Flange type 5 and 7

(Drawing with cable)

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



Absolute Encoders – Multiturn

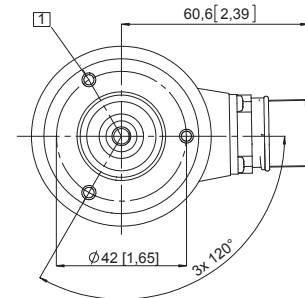
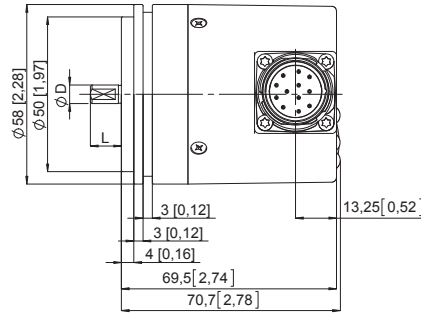
Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	CANopen/CANopenLift
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Dimensions shaft version, with fixed connection

Dimensions in mm [inch]

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

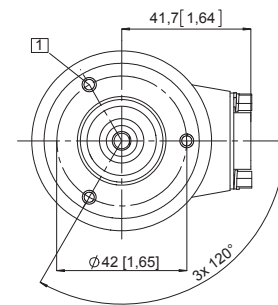
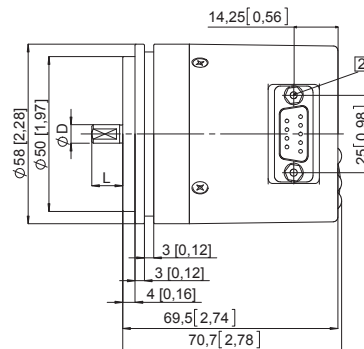
1 M4, 6 [0.24] deep



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

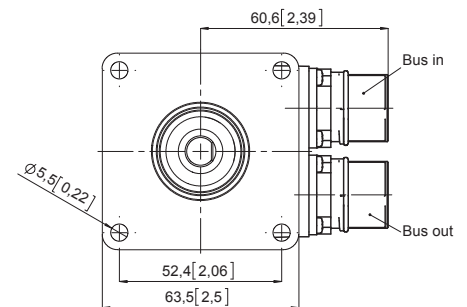
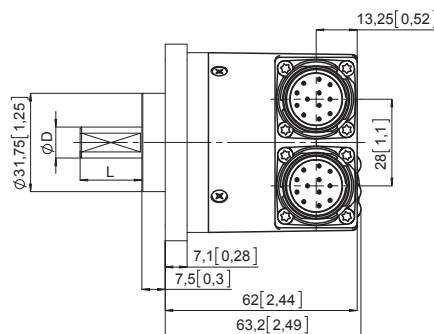
Synchro flange, ø 58 [2.28] Flange type 2 and 4 (Drawing with D-Sub connector)

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



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

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



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

Absolute Encoders – Multiturn

**Standard
mechanical Multiturn, optical**

Sendix 5868 / 5888 (Shaft / Hollow shaft)

CANopen/CANopenLift

Dimensions shaft version, with fixed connection

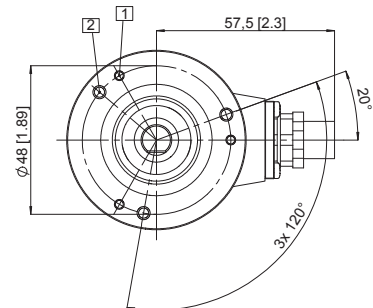
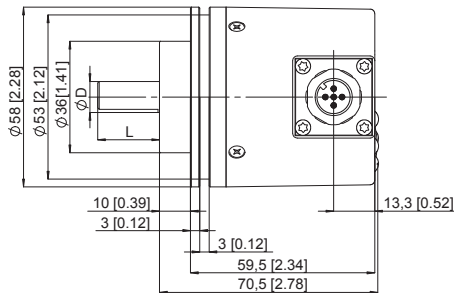
Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

(Drawing with 1 x M12 connector)

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



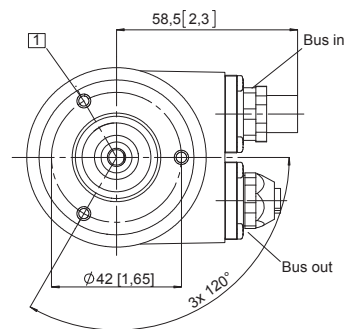
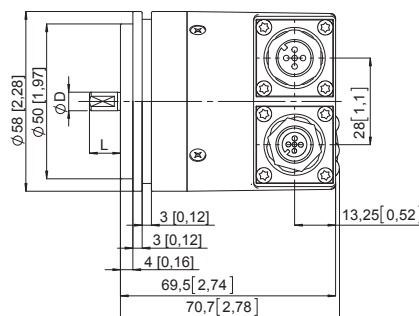
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Synchro flange, \varnothing 58 [2.28]

Flange type 2 and 4

(Drawing with M12 connector)

- 1 M4, 8 [0.32] deep



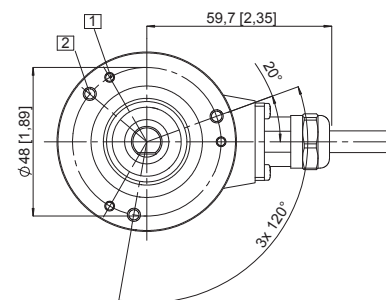
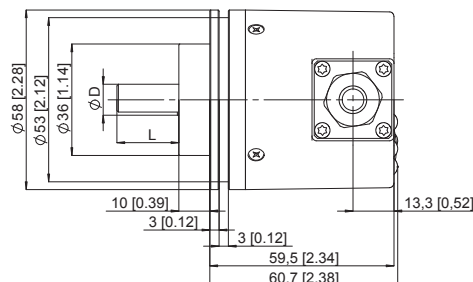
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7

Clamping flange, \varnothing 58 [2.28]

Flange type 1 and 3

(Drawing cable)

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



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

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	CANopen/CANopenLift
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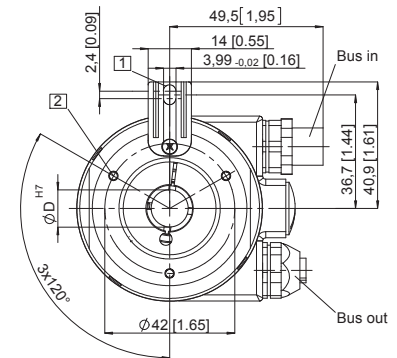
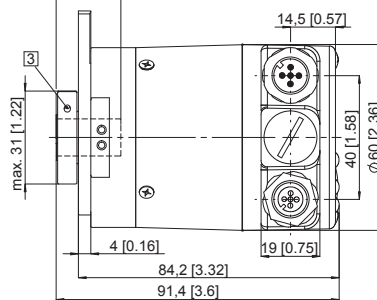
Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

Flange with spring element long Flange type 1 and 2

(drawing with 2 x M12 connector)

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

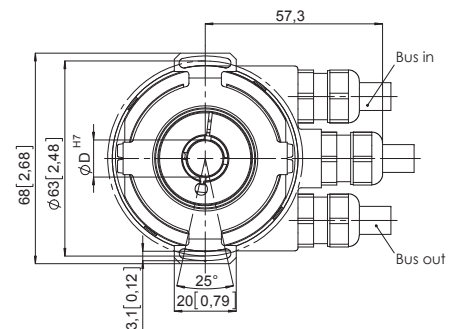
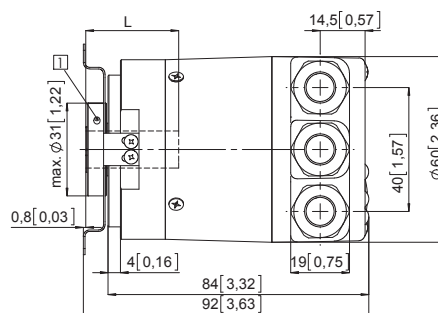


Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6

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

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

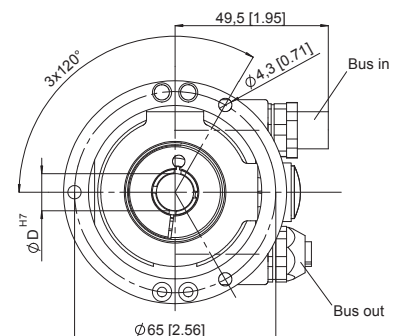
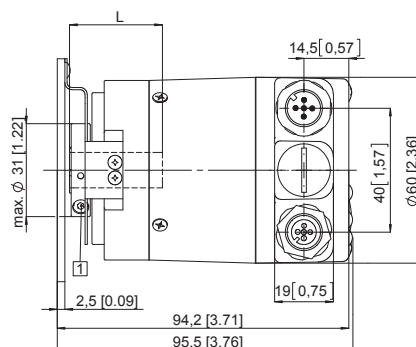


Flange with stator coupling, \varnothing 65 [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]
(Drawing with 2x M12 connector)

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



Absolute Encoders – Multiturn

**Standard
mechanical Multiturn, optical**

Sendix 5868 / 5888 (Shaft / Hollow shaft)

CANopen/CANopenLift

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

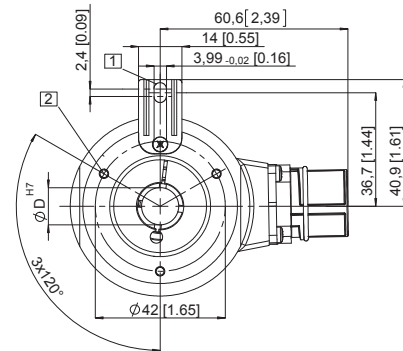
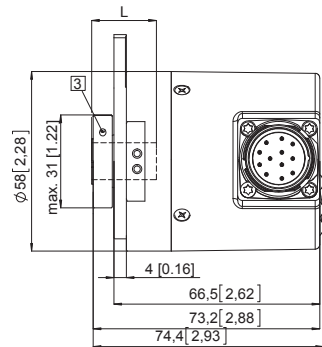
Dimensions in mm [inch]

Flange with spring element long

Flange type 1 and 2

(drawing with M23 connector)

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

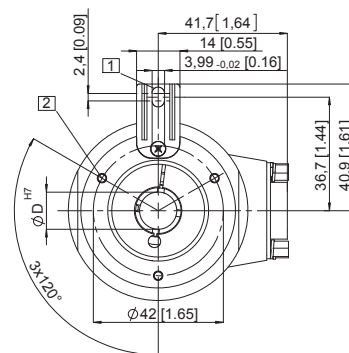
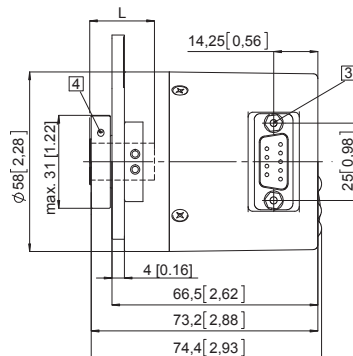


Flange with spring element long

Flange type 1 and 2

(drawing with D-Sub connector)

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



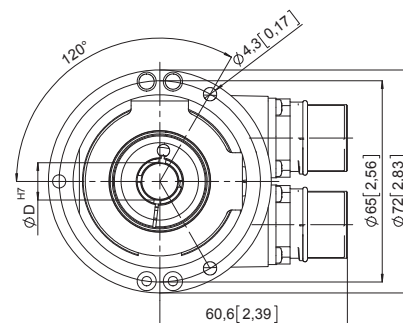
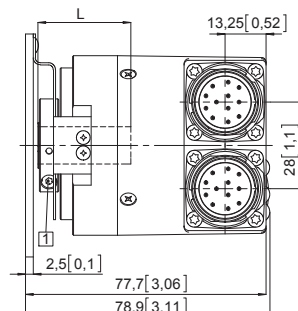
Flange with stator coupling, $\varnothing 65$ [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(drawing with 2 x M23 connector)

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



Absolute Encoders – Multiturn

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]

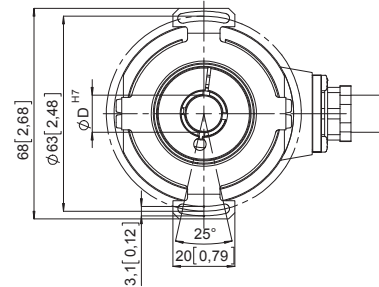
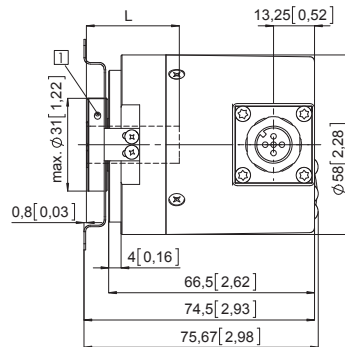
Flange with stator coupling, \varnothing 63 [2.48]

Flange type 5 and 6

Pitch circle diameter for fixing screws 63 [2.48]

(drawing with M12 connector)

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

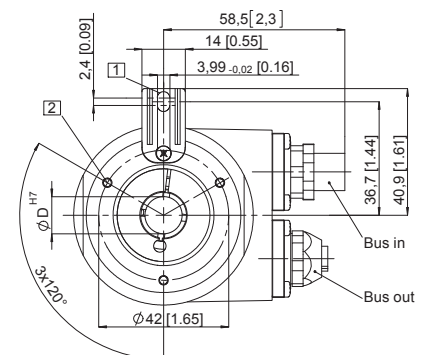
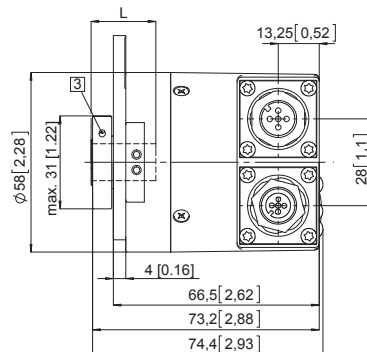


Flange with spring element long

Flange type 1 and 2

(drawing with 2 x M12 connector)

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



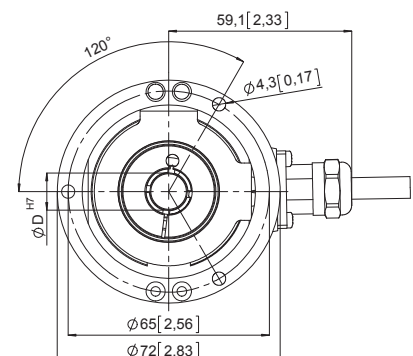
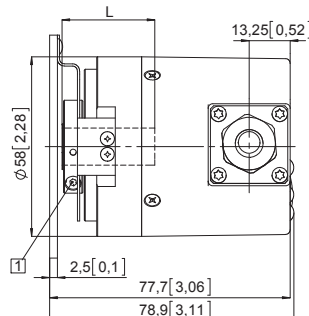
Flange with stator coupling, \varnothing 65 [2.56]

Flange type 3 and 4

Pitch circle diameter for fixing screws 65 [2.56]

(Drawing with cable)

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



Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical

Sendix 5868 / 5888 (Shaft / Hollow shaft)

EtherCAT



The multiturn encoders Sendix 5868 and 5888 with second-generation EtherCAT interface and optical sensor technology are ideal for use in all applications with an EtherCAT interface.

The data communication is based on CAN over EtherNet and ideally suited for use in real time applications.

These encoders are available with a solid shaft up to a maximum of 10 mm or a blind hollow shaft up to 15 mm.



EtherCAT
Conformance tested



Mechanical drive



Safety-Lock™



High rotational speed



Temperature range
-40...+80°C



High protection level
IP67



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



Optical sensor



Seawater-resistant version on request

Reliable

- EtherCAT conformance tested
- Integration of the latest Slave – EtherCAT stack from Beckhoff, Version 5.01
- Ideally suited for use in harsh outdoor environments, thanks to IP67 protection and rugged housing construction

Flexible

- Use of CoE (CAN over EtherNet)
- Genuine new position information as a result of minimal cycle time of 62.5 µs in the DC mode
- Faster, easier error-free connection thanks to M12 connectors

Order code Shaft version

8.5868 . **XXB2** . **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, IP65 □ 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

e Fieldbus profile

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

d Type of connection

- 2** = 3 x M12 connector, 4-pin

optional on request
- Ex 2/22
- seawater-resistant

Order code Hollow shaft

8.5888 . **XXB2** . **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 Hollow shaft

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

c Interface / Power supply

- B** = EtherCAT / 10 ... 30 V DC

e Fieldbus profile

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

d Type of connection

- 2** = 3 x M12 connector, 4-pin

optional on request
- Ex 2/22
- seawater-resistant

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

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical		Sendix 5868 / 5888 (Shaft / Hollow shaft)	EtherCAT
Mounting accessory for shaft encoders			Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]		8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]		8.0000.1101.1010
Mounting accessory for hollow shaft encoders			
Cylindrical pin, long for torque stops		With fixing thread	8.0010.4700.0000
Connection technology			
Connector, self-assembly (straight)	Coupling M12 for Port IN and Port OUT		05.WASCSY4S
	Connector M12 for power supply		05.B8141-0
Cordset, pre-assembled	M12 for Port IN and Port OUT, 2 m [6.56'] PUR cable		05.00.6031.4411.002M
	M12 for power supply, 2 m [6.56'] PUR cable		05.00.6061.6211.002M

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

Technical data

Mechanical characteristics		
Max. speed	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
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
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +80°C [-40°F ... +176°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
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

Device characteristics	
Singleturn resolution	1 ... 65535 (16 bit), scaleable
Default value	8192 (13 bit)
Multiturn resolution	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scaleable
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	

Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	max. 120 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Modes	
Freerun, Distributed Clock	

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical

Sendix 5868 / 5888 (Shaft / Hollow shaft)

EtherCAT

General information about CoE (CAN over EtherNet)

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

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

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

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

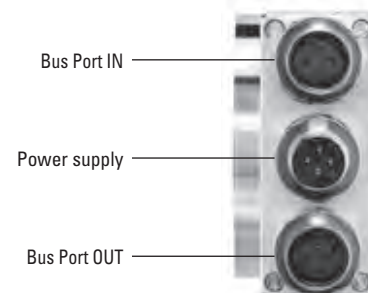
CANopen encoder profile 3.2.10 CoE (CAN over EtherNet)

The following parameters are programmable:

- Position update time of 62.5 µs
- EtherCAT certificate of conformity
- Speed with sign
- Four units for speed calculation: Steps/sec, Steps/100 ms, Steps/10 ms, RPM
- Time stamp as system time at the point in time when the position is read out
- Two working area state registers
- Along with the scaled position, the raw data – position as process value – is also mappable
- Dynamic Mapping
- Gating Time: setting of the time interval, via which the speed value can be interpolated
- Sensor temperature in degrees Celsius
- Comprehensive plausibility test when downloading parameters to the encoder
- Alarm and warning messages
- User interface with visual display of bus and fault status – 4 LEDs
- Extended error management for position sensing with integrated temperature control
- Implementation of the latest CANopen profile 3.2.10 from the 18th February 2011

Terminal assignment bus

Interface	Type of connection	Function	M12 connector					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
B	2 (3 x M12 connector)	Bus Port IN	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	–	Voltage –	–	
			Abbreviation:	+ V	–	0 V	–	
			Pin:	1	2	3	4	
		Bus Port OUT	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	EtherCAT
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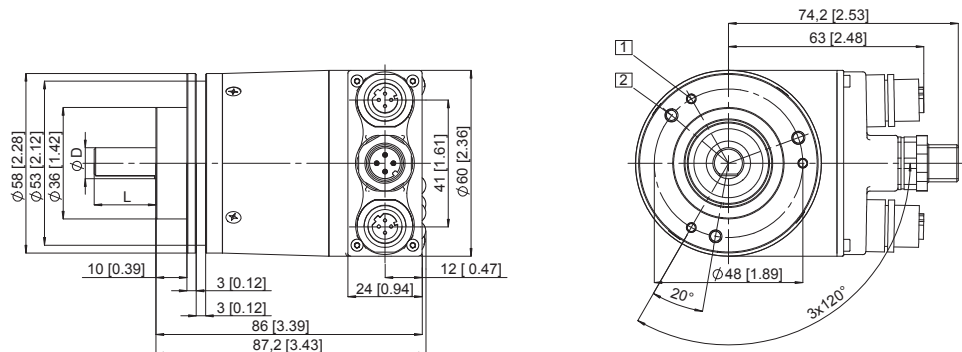
Dimensions shaft version, with removable bus terminal cover

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

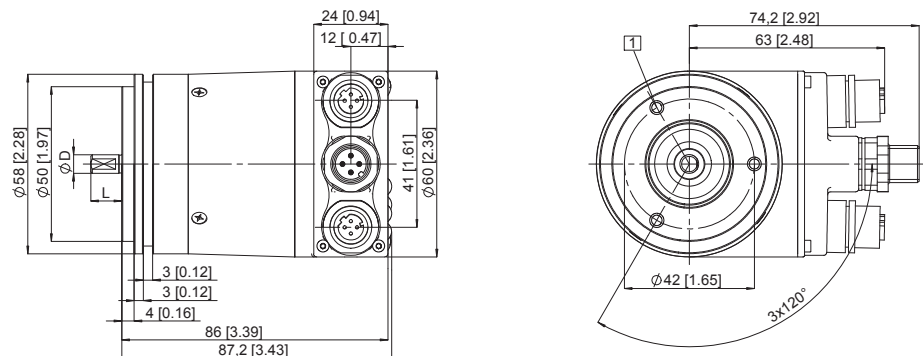
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



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

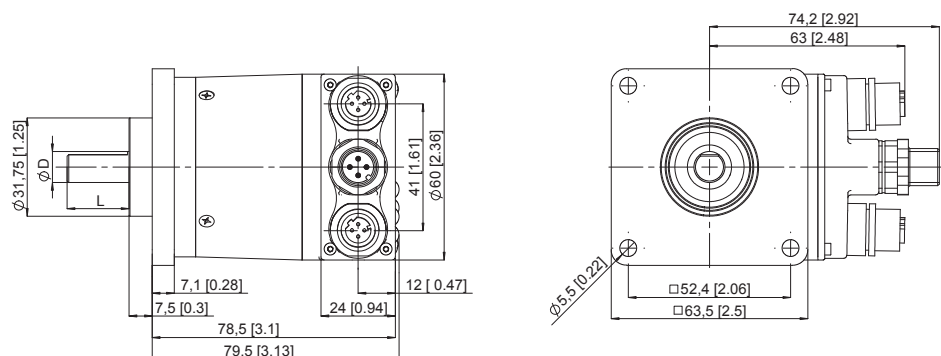
- 1 M4, 6.0 [0.24] deep

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



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

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



Absolute Encoders – Multiturn

**Standard
mechanical Multiturn, optical**

Sendix 5868 / 5888 (Shaft / Hollow shaft)

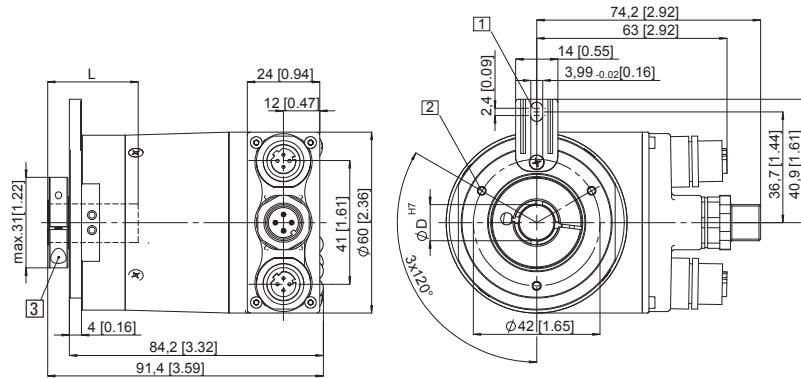
EtherCAT

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

Dimensions in mm [inch]

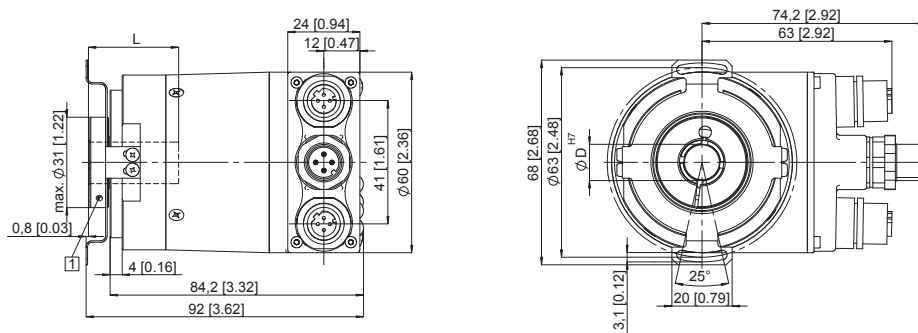
Flange with spring element long Flange type 1 and 2

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



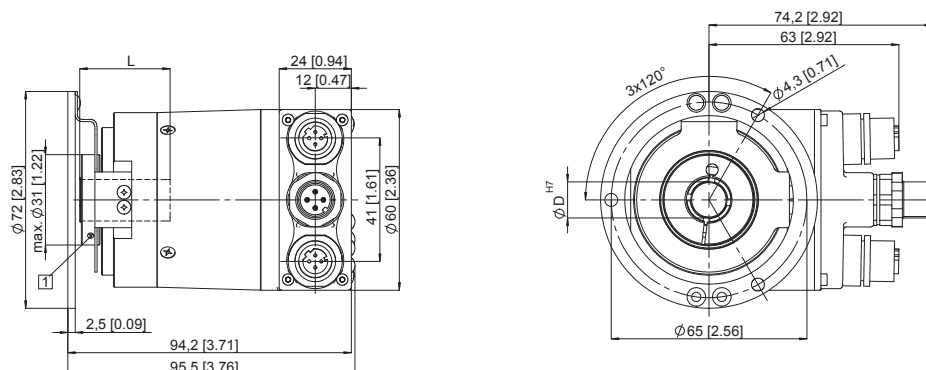
Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

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



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

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



Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFINET IO
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The multiturn encoders Sendix 5868 and 5888 with PROFINET interface and optical sensor technology are ideal for use in all applications with a PROFINET interface.

The encoder supports the isochronous (IRT) mode and is therefore ideal for real-time applications.

Easy start-up thanks to the "Ezturn for PROFINET" software supplied with the encoder.



Mechanical drive	Safety-Lock™	High rotational speed	Temperature range	High protection level	High shaft load capacity	Shock / vibration resistant	Magnetic field proof	Reverse polarity protection	Optical sensor	Seawater-resistant version on request

Reliable

- Ideally suited for all PROFINET applications thanks to the use of encoder profile 4.1
- Perfect for use in harsh outdoor environments, as a result of IP67 protection and rugged housing construction

Flexible

- IRT-Mode
- Cycle time ≤ 1 ms
- Firmware updater allows for easy expansion of characteristics without having to disassemble the encoder.
- Faster, easier error-free connection thanks to M12 connectors

 Absolute Encoders
Multiturn

Order code Shaft version	8.5868 Type	. X X C 2 . C 2 12	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 Shaft (ø x L), with flat	c Interface / Power supply	e Field bus profile	
1 = <u>clamping flange, IP65 ø 58 mm [2.28"]</u> 3 = clamping flange, IP67 ø 58 mm [2.28"] 2 = <u>synchro flange, IP65 ø 58 mm [2.28"]</u> 4 = synchro flange, IP67 ø 58 mm [2.28"] 5 = square flange, IP65 □ 63.5 mm [2.5"] 7 = square flange, IP65 □ 63.5 mm [2.5"]	1 = 6 x 10 mm [0.24 x 0.39"] ¹⁾ 2 = <u>10 x 20 mm [0.39 x 0.79"]</u> ²⁾ 3 = 1/4" x 7/8" 4 = 3/8" x 7/8"	C = <u>PROFINET IO / 10 ... 30 V DC</u>	C2 = <u>PROFINET IO</u>	
		d Type of connection	optional on request	
		removable bus terminal cover	- Ex 2/22	
		<u>2 = 3 x M12 connector, 4-pin</u>	- seawater-resistant	

Order code Hollow shaft	8.5888 Type	. X X C 2 . C 2 12	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	e Field bus 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"] 5 = <u>with stator coupling, IP65 ø 63 mm [2.48"]</u> 6 = with stator coupling, IP67 ø 63 mm [2.48"]	3 = ø 10 mm [0.39"] 4 = <u>ø 12 mm [0.47"]</u> 5 = ø 14 mm [0.55"] 6 = ø 15 mm [0.59"] 8 = ø 3/8" 9 = ø 1/2"	C = <u>PROFINET IO / 10 ... 30 V DC</u>	C2 = <u>PROFINET IO</u>	
		d Type of connection	optional on request	
		removable bus terminal cover	- Ex 2/22	
		<u>2 = 3 x M12 connector, 4-pin</u>	- seawater-resistant	

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

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFINET IO
Mounting accessory for shaft encoders		Order No.
Coupling	Bellows coupling ø 19 mm [0.75"] for shaft 6 mm [0.24"]	8.0000.1101.0606
	Bellows coupling ø 19 mm [0.75"] for shaft 10 mm [0.39"]	8.0000.1101.1010
Mounting accessory for hollow shaft encoders		
Cylindrical pin, long for torque stops		With fixing thread 8.0010.4700.0000
Connection technology		
Connector, self-assembly (straight)	Coupling M12 for Port 1 and Port 2 Connector M12 for power supply	05.WASCSY4S 05.B8141-0
Cordset, pre-assembled	M12 for Port 1 and Port 2, 2 m [6.56'] PUR cable M12 for power supply, 2 m [6.56'] PUR cable	05.00.6031.4411.002M 05.00.6061.6211.002M

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

Technical data

Mechanical characteristics		
Max. speed	IP65 up to 70°C [158°F]	9 000 min ⁻¹ , 7 000 min ⁻¹ (continuous)
	IP65 up to T _{max}	7 000 min ⁻¹ , 4 000 min ⁻¹ (continuous)
	IP67 up to 70°C [158°F]	8 000 min ⁻¹ , 6 000 min ⁻¹ (continuous)
	IP67 up to T _{max}	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Starting torque - at 20°C [68°F]	IP65	< 0.01 Nm
	IP67	< 0.05 Nm
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
EX approval for hazardous areas		optional Zone 2 and 22
Working temperature range		-40°C ... +85°C [-40°F ... +185°F]
Material	shaft/hollow shaft	stainless steel
	flange	aluminium
	housing	zinc die-cast housing
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. 200 mA
Reverse polarity protection of the power supply (+V)	yes
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Device characteristics	
Singleturn resolution	1 ... 65535 (16 bit), scaleable
Default value	8192 (13 bit)
Multiturn resolution	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scaleable
Code	binary
Protocol	PROFINET IO

Link 1 and 2, LED (green / yellow)		
two coloured	green	active link
	yellow	data transfer

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

Ezturn software for PROFINET (supplied with the encoder)
<ul style="list-style-type: none"> Monitoring of cyclic data (e.g. position, speed) Monitoring of acyclic data (e.g. IMO, electronic name plate, encoder parameters, warnings and error messages, preset) Setting of preset values Firmware updates via the bus

Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (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.

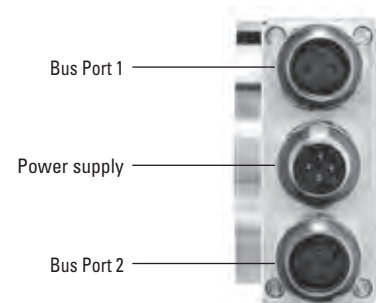
PROFINET IO

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**rotokoll is implemented here. Basically, the advantage of MRP is that the functionality of the components, which are wired in a ring structure, is maintained in case of a failure or of a breakage of the wires in any location.

Terminal assignment

Interface	Type of connection	Function	M12 connector					Diagram
			Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
C	2 (3 x M12 connector)	Bus Port 1	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	
		Power supply	Signal:	Voltage +	-	Voltage -	-	
			Abbreviation:	+ V	-	0 V	-	
			Pin:	1	2	3	4	
		Bus Port 2	Signal:	Transmit data+	Receive data+	Transmit data -	Receive data -	
			Abbreviation:	TxD+	RxD+	TxD-	RxD-	
			Pin:	1	2	3	4	



Absolute Encoders – Multiturn

Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFINET IO
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Dimensions shaft version, with removable bus terminal cover

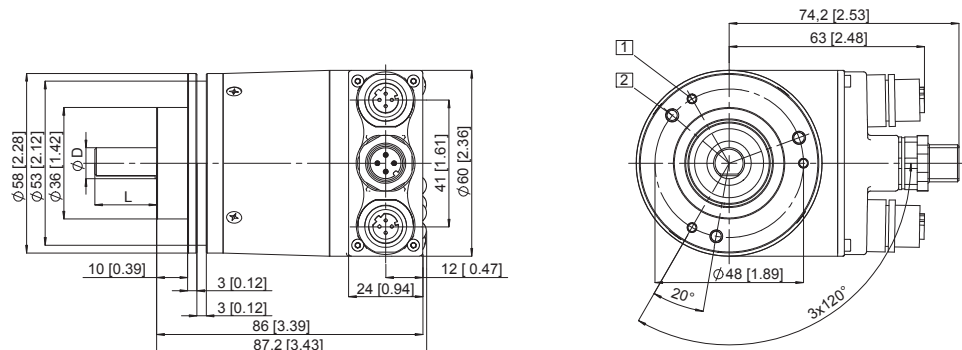
Dimensions in mm [inch]

Clamping flange, ø 58 [2.28]

Flange type 1 and 3

- 1 3 x M3, 6.0 [0.24] deep
- 2 3 x M4, 8.0 [0.31] deep

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

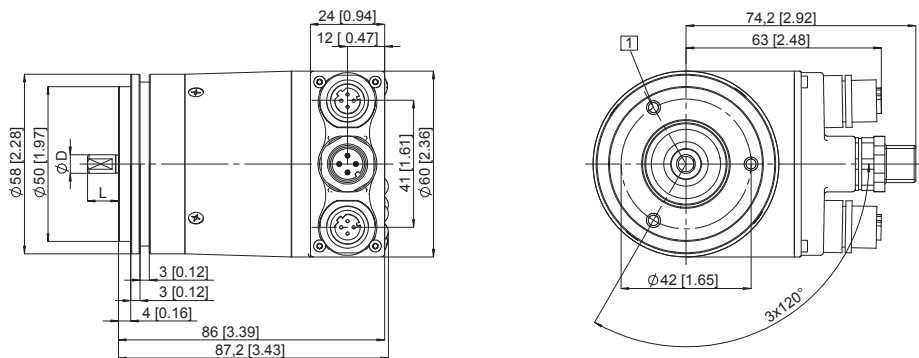


Synchro flange, ø 58 [2.28]

Flange type 2 and 4

- 1 M4, 6.0 [0.24] deep

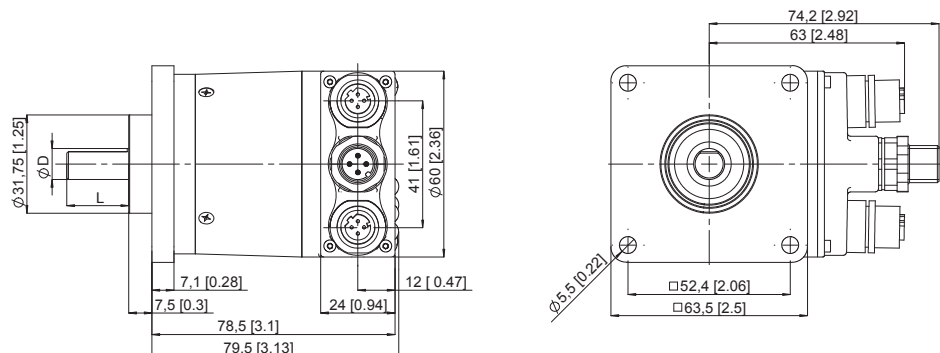
D	L	Fit
6 [0.24]	10 [0.39]	h7
10 [0.39]	20 [0.79]	f7
1/4"	7/8"	h7
3/8"	7/8"	h7



Square flange, □ 63.5 [2.5]

Flange type 5 and 7

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



Absolute Encoders – Multiturn

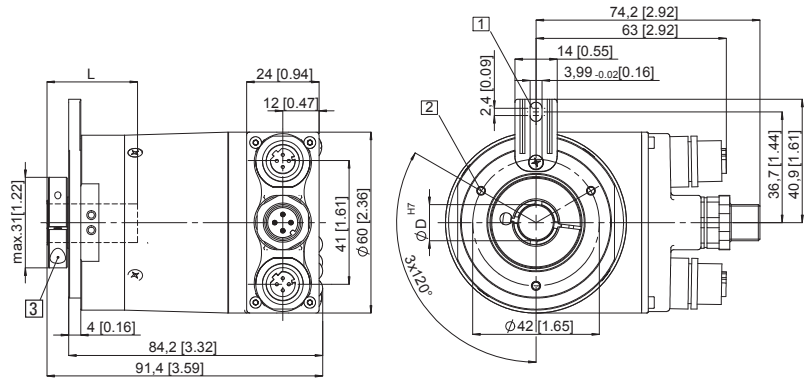
Standard mechanical Multiturn, optical	Sendix 5868 / 5888 (Shaft / Hollow shaft)	PROFINET IO
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Dimensions hollow shaft version (blind hollow shaft), with removable bus terminal cover

Dimensions in mm [inch]

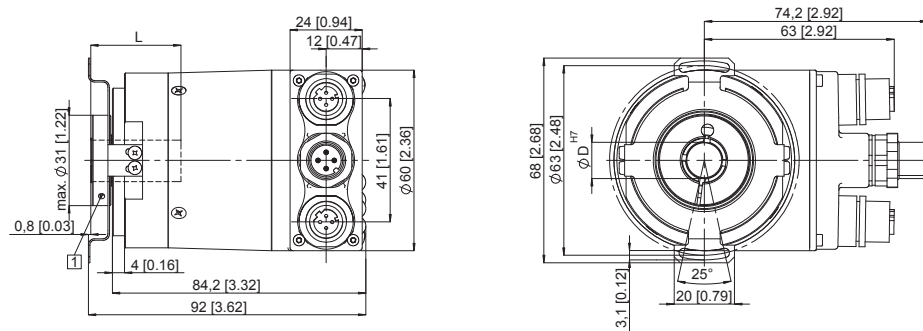
Flange with spring element long Flange type 1 and 2

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



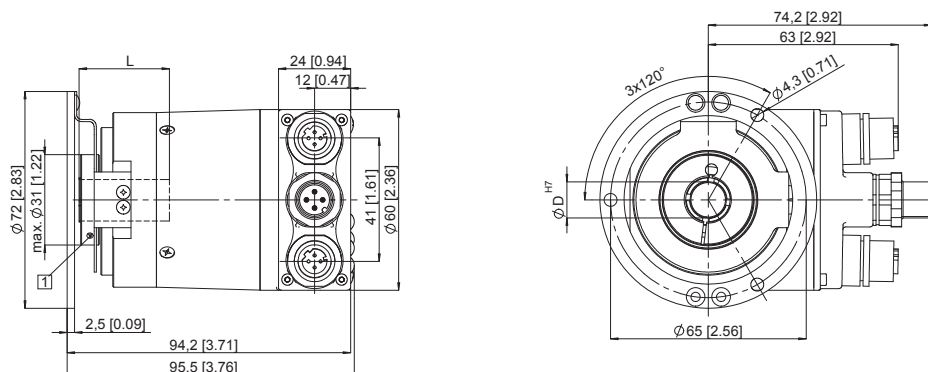
Flange with stator coupling, $\varnothing 63$ [2.48] Flange type 5 and 6

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



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

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



Absolute Encoders – Multiturn

Standard

ATEX, mechanical Multiturn, optical

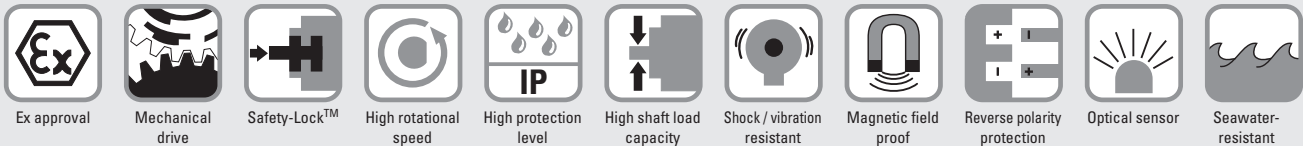
Sendix 7063 (Shaft)

SSI / BiSS-C



The Sendix 7063 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater resistant housing, with an SSI or BiSS-C 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-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection)

Explosion protection

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

Order code

8.7063 . 1 X 2 X . X X 2 1 . XXXX
Type a b c d e f g h i ¹⁾

a Flange

1 = clamping-synchronous flange, IP67, \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 = SSI or BiSS-C / 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-C, 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

Mounting accessory for shaft encoders

Order No.

Coupling

Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]

8.0000.1101.1010

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

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

1) Not applicable with connection types 1 and 2

1) Resolution, preset value and counting direction factory-programmable

Absolute Encoders – Multiturn

Standard ATEX, mechanical Multiturn, optical	Sendix 7063 (Shaft)	SSI / BiSS-C
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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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Materials	shaft stainless steel flange / housing seawater-resistant Al, type AISiMgMn (EN AW-6082) cable stainless steel on request PUR
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
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
Short-circuit proof outputs	yes ¹⁾
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC
RoHS compliant acc. to	guideline 2002/95/EC

DIR input	
A HIGH signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed.	
If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.	

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

SSI interface	
Output driver	RS485 transceiver type
Permissible load/channel	max. 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Singleturn resolution	10 ... 14 bit and 17 bit ²⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	ST resolution ≤ 14 bit 50 kHz ... 2 MHz ST resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	< 15 μs ²⁾
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	
Data refresh rate	ST resolution ≤ 14 bit < 1 μ ST resolution ≥ 15 bit < 4 μs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ²⁾
Number of revolutions	4096 (12 bit)
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

SET input	
Input	HIGH active
Input type	Comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response time (DIR input)	1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read.

Status output	
Output driver	Open Collector, internal pull-up resistor 22 kOhm
Permissible load	max. 20 mA
Signal level	HIGH +V LOW < 1 V
Active at	LOW

The status output serves to display various alarm or error messages. The status output is HIGH (Open Collector with internal pull-up 22k) in normal operation.

1) Short-circuit with 0 V or output, only one channel at a time, power supply correctly applied
2) Other options on request

Absolute Encoders – Multiturn

Standard

ATEX, mechanical Multiturn, optical

Sendix 7063 (Shaft)

SSI / BiSS-C

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)											
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥	⊥
2	1, 2, A, B	SET, DIR	Cable Marking:	1	2	3	4	5	6	7	8	9	YE/GN	shield

+V: Encoder power supply +V DC

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

C+, C-: Clock signal

D+, D-: Data signal

SET: Set input. The current position becomes defined as position zero.

DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.

Stat: Status output

⊥: Protective earth

Dimensions

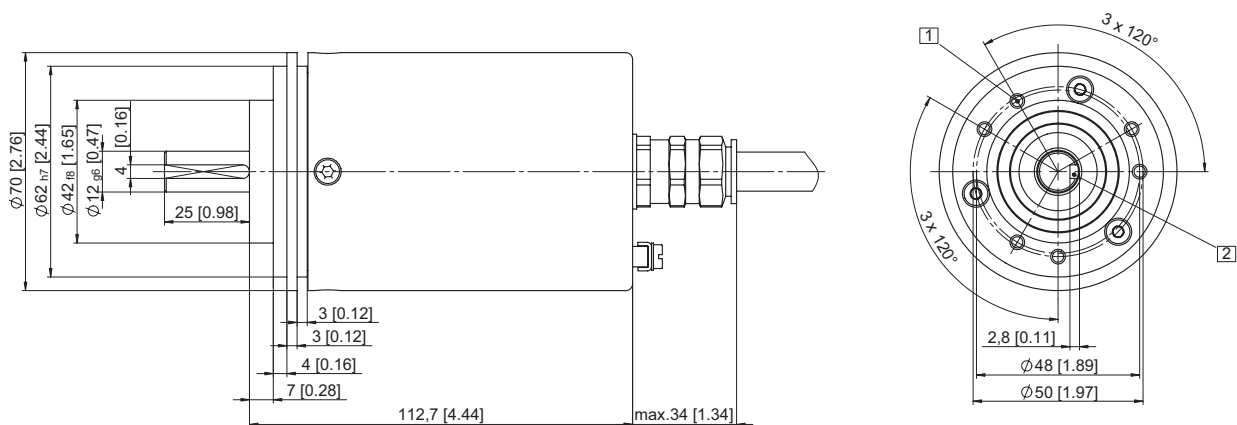
Dimensions in mm [inch]

Clamping-synchronous flange, ø 70 [2.76]

Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep

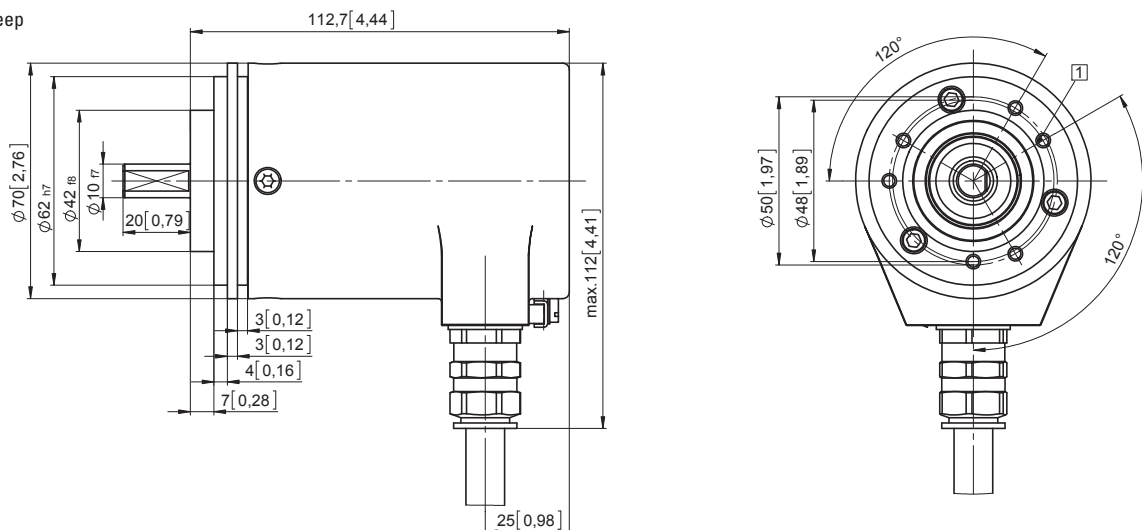
2 Keyway for DIN 6885-A-4x4x25 key



Clamping-synchronous flange, ø 70 [2.76]

Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Absolute Encoders – Multiturn

Standard ATEX, SIL2/PLd, mechanical Multiturn, optical	Sendix SIL 7063FS2 (Shaft)	SSI / BiSS-C + SinCos
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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-resistant aluminium.



Ex approval



Safety-Lock™



High rotational speed



High protection level



High shaft load capacity



Shock / vibration resistant



Magnetic field proof



Short-circuit proof



Reverse polarity protection



Optical sensor



Seawater-resistant

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-C 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 8.7063FS2 . 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 or BiSS-C + 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-C, Binary
 G = SSI, Gray

f Resolution ¹⁾

A = 10 bit ST + 12 bit MT
 1 = 11 bit ST + 12 bit MT
 2 = 12 bit ST + 12 bit MT
 3 = 13 bit ST + 12 bit MT
 4 = 14 bit ST + 12 bit MT
 7 = 17 bit ST + 12 bit MT

g Inputs / Outputs ²⁾

2 = SET, DIR 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*

Accessories – Safety control

Accessories – Safety control	Order No.
Safety-M, basic modules	
Speed and position monitoring for 1 axis	8.MSP1.000
Speed and position monitoring for 2 axes (analogue inputs optional)	8.MSP2.XXX

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

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

Absolute Encoders – Multiturn

Standard ATEX, SIL2/PLd, mechanical Multiturn, optical	Sendix SIL 7063FS2 (Shaft)	SSI/BiSS-C + 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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLd / SIL2
System structure	2 channel (Cat. 3 / HFT = 1)
PFH_d value¹⁾	2.16 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Materials	shaft stainless steel flange / housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) stainless steel on req. 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

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 45 mA
Reverse polarity protection for power supply (+V)	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Singleturn resolution	10...14 bit and 17 bit ³⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	ST resolution ≤ 14 bit 50 kHz ... 2 MHz ST resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 µs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 µs ST resolution ≥ 15 bit 4 µs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ³⁾
Number of revolutions	4096 (12 bit)
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 µs, depends on the clock rate and the data length
Data refresh rate	≤ 1 µs
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

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

SET input	
Input	high active
Input type	Comparator
Signal level (+V = Power supply)	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response time (DIR input)	1 ms

The encoder can be set to zero at any position by means of a High signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read.

- 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) Other options on request

Absolute Encoders – Multiturn

Standard ATEX, SIL2/PLd, mechanical Multiturn, optical	Sendix SIL 7063FS2 (Shaft)	SSI / BiSS-C + SinCos
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DIR input
A HIGH signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed.
If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)														
4	1, 2, A, B	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp	\perp
			Cable marking:	6	1	2	3	4	5	11	12	7	8	9	10	YE/GN	shield

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
SET: SET input. The current position becomes defined as position zero.

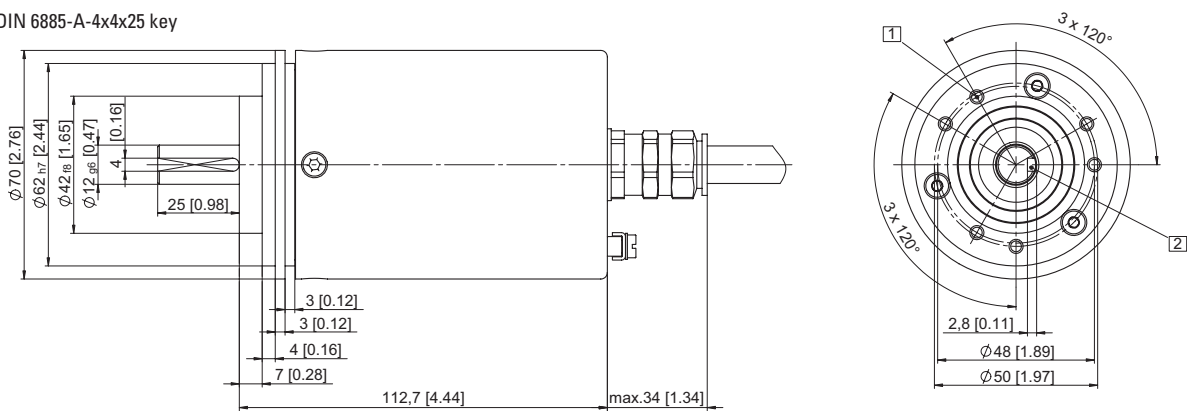
DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.
A, \bar{A} : Cosine signal
B, \bar{B} : Sine signal
 \perp : Protective earth

Dimensions

Dimensions in mm [inch]

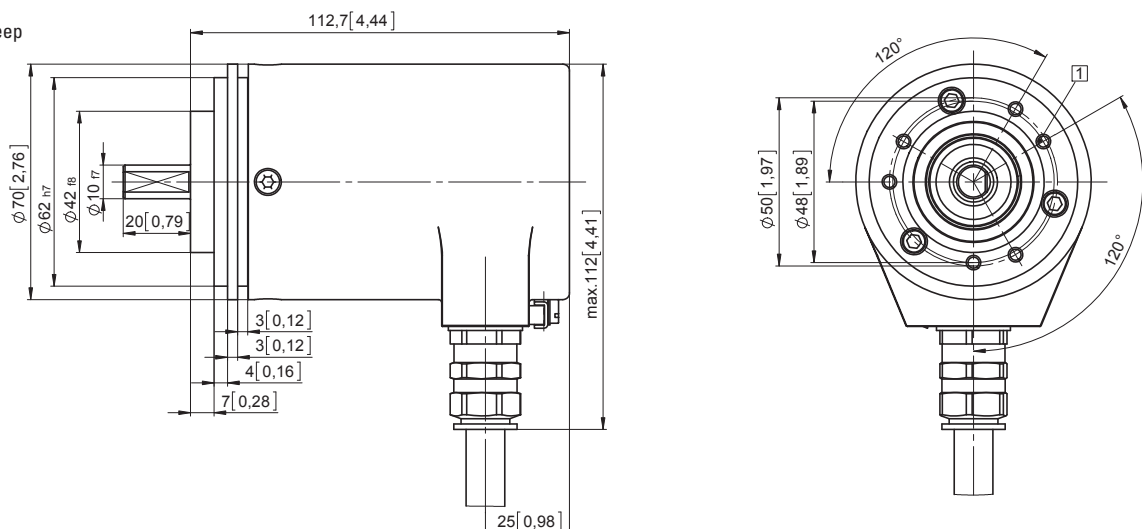
Clamping-synchronous flange, $\varnothing 70$ [2.76] Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Absolute Encoders – Multiturn

Standard

ATEX, SIL3/PLe, mechanical Multiturn, optical

Sendix SIL 7063FS3 (Shaft)

SSI/BiSS-C + SinCos



Ex protection and Functional Safety in one device.

The absolute multiturn encoders 7063FS3 of the Sendix SIL family are suited for use in safety-related applications up to SIL3 acc. to EN 61800-5-2 or PLe to EN ISO 13849-1.

In addition, these devices ensure Ex protection in a compact 70 mm housing out of seawater-resistant aluminium.



Functional Safety

- Encoder with individual certificate from IFA / TÜV
- Suitable for applications up to SIL3 acc. to EN 61800-5-2
- Suitable for applications up to PLe acc. to EN ISO 13849-1
- SSI or BiSS-C 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

- | | | |
|---|--|--|
| <p>a Flange
1 = clamping-synchronous flange, IP67, ø 70 mm [2.76"]</p> <p>b Shaft (ø x L)
2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key</p> <p>c Interface / Power supply
4 = SSI or BiSS-C + 2048 ppr SinCos / 10 ... 30 V DC</p> <p>d Type of connection
1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see i, e. g.: 0100 = 10 m [32.81']</p> | <p>e Code
B = SSI, Binary
C = BiSS-C, Binary
G = SSI, Gray</p> <p>f Resolution ²⁾
A = 10 bit ST + 12 bit MT
1 = 11 bit ST + 12 bit MT
2 = 12 bit ST + 12 bit MT
3 = 13 bit ST + 12 bit MT
4 = 14 bit ST + 12 bit MT
7 = 17 bit ST + 12 bit MT</p> | <p>g Inputs / Outputs ²⁾
2 = SET, DIR input</p> <p>h Options
1 = no option</p> <p>i Cable length in dm ¹⁾
0050 = 5 m [16.40']
0100 = 10 m [32.81']
0150 = 15 m [49.21']</p> <p style="text-align: right;"><i>optional on request
- special cable length</i></p> |
|---|--|--|

Accessories – Safety control

Accessories – Safety control	Order No.
Safety-M, basic modules	
Speed and position monitoring for 1 axis	8.MSP1.000
Speed and position monitoring for 2 axes (analogue inputs optional)	8.MSP2.XXX

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety in the safety technology section or under www.kuebler.com/safety

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

Absolute Encoders – Multiturn

Standard ATEX, SIL3/PLe, mechanical Multiturn, optical	Sendix SIL 7063FS3 (Shaft)	SSI / BiSS-C + 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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

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	
Relevant standards	EN ISO 13849-1 / EN 61800-5-2, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value ¹⁾	1.09 x 10 ⁻⁸ h ⁻¹
Proof-test interval	20 years

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Material	shaft stainless steel flange / housing seawater-resistant Al, type AISiMgMn (EN AW-6082) stainless steel on req. 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

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 50 mA
Reverse polarity protection for power supply (+V)	yes
Short circuit proof outputs	yes ²⁾
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC Machinery directive 2006/42/EC
RoHS compliant acc. to	guideline 2002/95/EC

SSI interface	
Output driver	RS485 transceiver type
Permissible load / channel	max. 20 mA
Signal level	HIGH typ 3.8 V LOW at I _{Load} = 20 mA typ 1.3 V
Singleturn resolution	10 ... 14 bit and 17 bit ³⁾
Number of revolutions	4096 (12 bit)
Code	Binary or Gray
SSI clock rate	ST resolution ≤ 14 bit 50 kHz ... 2 MHz ST resolution ≥ 15 bit 50 kHz ... 125 kHz
Monoflop time	≤ 15 μs
Note: if clock starts cycling within monoflop time a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. The update rate depends on clock speed, data length and monoflop time.	
Data refresh rate	ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs
Status and parity bit	on request

BiSS-C interface	
Singleturn resolution	10 ... 14 bit and 17 bit ³⁾
Number of revolutions	4096 (12 bit)
Code	Binary
Clock rate	up to 10 MHz
Max. update rate	< 10 μs, depends on the clock rate and the data length
Data refresh rate	≤ 1 μs
Note:	– Bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification

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

SET input	
Input	high active
Input type	Comparator
Signal level	HIGH min. 60 % of +V max. +V LOW max. 25 % of +V
Input current	< 0.5 mA
Min. pulse duration (SET)	10 ms
Timeout after SET signal	14 ms
Response time (DIR input)	1 ms

The encoder can be set to zero at any position by means of a High signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read.

- 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.
- Short circuit to 0 V or to output, one channel at a time, power supply correctly applied
- Other options on request

Absolute Encoders – Multiturn

Standard
ATEX, SIL3/PLe, mechanical Multiturn, optical

Sendix SIL 7063FS3 (Shaft)

SSI/BiSS-C + SinCos

DIR input

A HIGH signal switches the direction of rotation from the default CW to CCW. The reverse function can also be factory-programmed.

If DIR is reversed when the device is already switched on, this will be interpreted as an error. The status output switches to LOW.

Power-ON delay

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

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)														
			Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	\bar{A}	B	\bar{B}	\perp	\perp
4	1, 2, A, B	SET, DIR	Cable marking:	6	1	2	3	4	5	11	12	7	8	9	10	YE/GN	shield

+V: Encoder power supply +V DC

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

C+, C-: Clock signal

D+, D-: Data signal

SET: SET input. The current position becomes defined as position zero.

DIR: Direction input: If this input is active, output values are counted backwards (decrease) when the shaft is turning clockwise.

A, \bar{A} : Cosine signal

B, \bar{B} : Sine signal

\perp : Protective earth

Dimensions

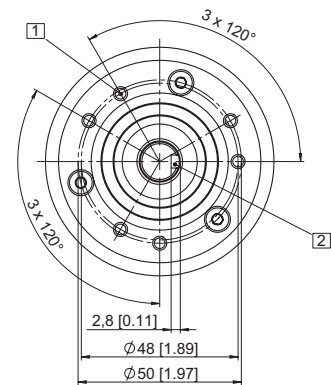
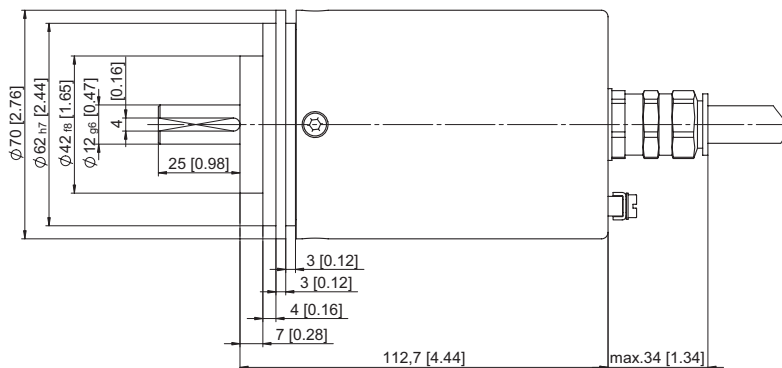
Dimensions in mm [inch]

Clamping-synchronous flange, \varnothing 70 [2.76]

Shaft type 1 with axial cable outlet

1 6 x M4, 10 [0.39] deep

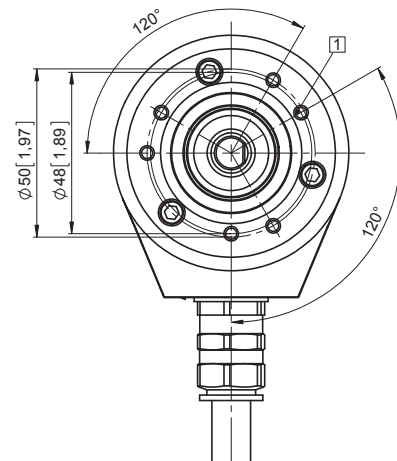
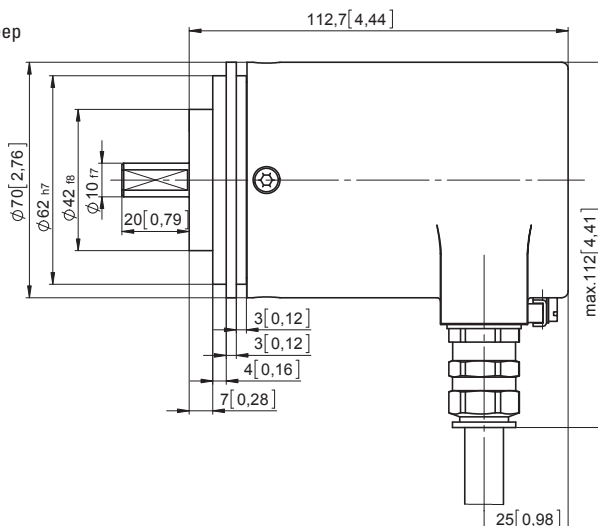
2 Keyway for DIN 6885-A-4x4x25 key



Clamping-synchronous flange, \varnothing 70 [2.76]

Shaft type 2 with radial cable outlet

1 6 x M4, 10 [0.39] deep



Absolute Encoders – Multiturn

Standard ATEX, mechanical Multiturn, optical	Sendix 7068 (Shaft)	PROFIBUS DP
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The Sendix 7068 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater resistant 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-resistant

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-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection)

Explosion protection

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

Absolute Encoders
Multiturn

Order code	8.7068	.1	X	3	X	.31	11	.XXXX	
Shaft version	Type	a	b	c	d	e	f	1)	
a Flange	1 = clamping-synchronous flange, IP67, ø 70 mm [2.76"]	d Type of connection					f Cable length in dm¹⁾		
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	1 = axial cable, 2 m [6.56'] PUR 2 = radial cable, 2 m [6.56'] PUR A = axial cable, length > 2 m [6.56'] B = radial cable, length > 2 m [6.56'] preferred length see f , e. g.: 0100 = 10 m [32.81']					0050 = 5 m [16.40'] 0100 = 10 m [32.81'] 0150 = 15 m [49.21']		
c Interface / Power supply	3 = PROFIBUS DP V0 / 10 ... 30 V DC	e Fieldbus profile					optional on request - special cable length		
		31 = PROFIBUS DP V0 encoder profile Class 2							

Mounting accessory for shaft encoders	Order No.
Coupling	8.0000.1101.1010
	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

1) Not applicable with connection types 1 and 2

Absolute Encoders – Multiturn

Standard ATEX, mechanical Multiturn, optical	Sendix 7068 (Shaft)	PROFIBUS DP
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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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Materials	shaft stainless steel flange / housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) (stainless steel on request) cable PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 120 mA
Reverse polarity protection for power supply (+V)	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics PROFIBUS DP	
Resolution Singleturn	1 ... 65536 (16 bit), scaleable Default value 8192 (13 bit)
Total resolution	1 ... 268.435.456 (28 bit), skalierbar, Default: 25 bit
Number of revolutions	4096 (12 bit), skalierbar 1 ... 4096
Code	Binary
Interface	Specification according to PROFIBUS DP 2.0 / Standard (DIN 19245 Part 3) / RS485 galvanically isolated
Protocol	Profibus Encoder Profile V1.1 Class 1 and Class 2 with manufacturer-specific add-ons
Baud rate	maximum 12 Mbit/s
Device address	software controlled setting of the device address via the SSA-service with a CLASS 2-Master. Default address: 125
Termination	active termination can only be switched on externally

Profibus Encoder Profile V1.1

The PROFIBUS DP device profile describes the functionality of the communication and the manufacturer-specific component within the PROFIBUS Fieldbus system. The Encoder Profile applies to encoders and defines the individual objects independently of the manufacturer. In addition, the profile makes provision for additional extended functions specific to the manufacturer. The use of PROFIBUS compatible devices ensures that the systems of today are ready to meet the demands of the future.

The following parameters can be programmed

- Direction of rotation
- Scaling – number of steps per revolution
- Preset value
- Diagnostics mode

The following functionality is integrated

- Galvanic isolation of the Bus stage with DC/DC converter
- Line Driver acc. to RS485 max. 12 MB
- Full Class 1 and Class 2 functionality
- Speed value

Absolute Encoders – Multiturn

Standard	Sendix 7068 (Shaft)	PROFIBUS DP
ATEX, mechanical Multiturn, optical		

Terminal assignment

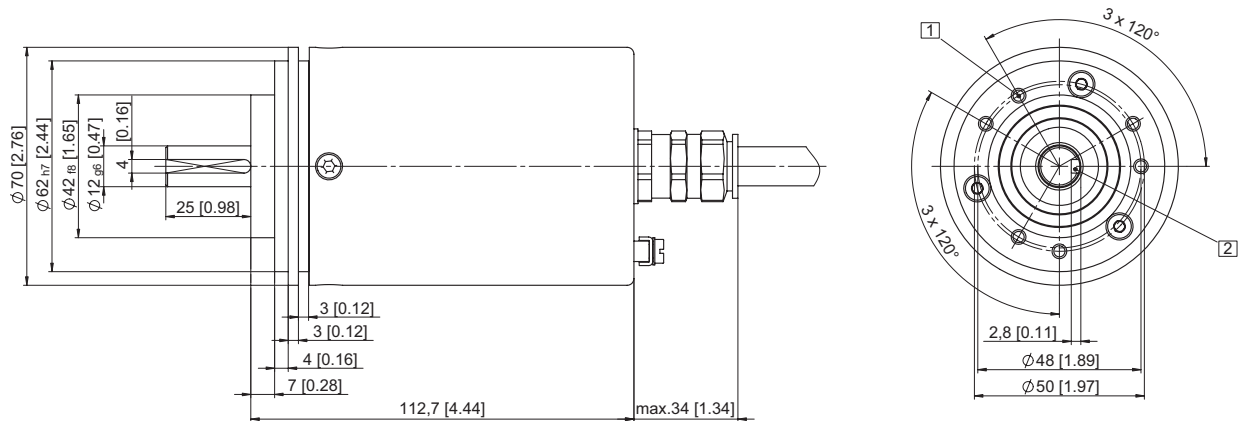
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
		Signal:	0 V	+V	PB_A IN	PB_B IN	BUS_GND	BUS_VDC	PB_A OUT	PB_B OUT
3	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

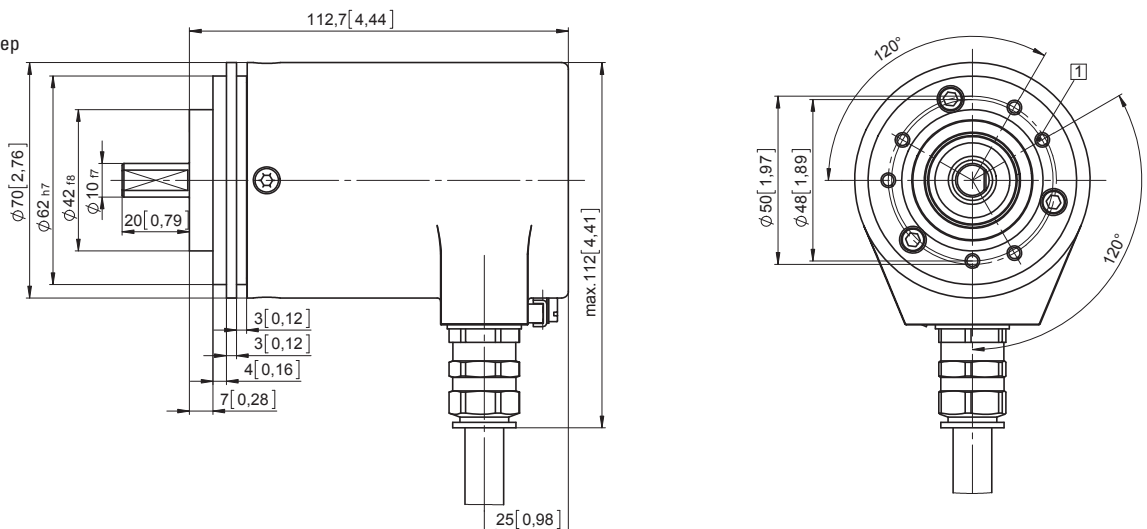
Clamping-synchronous flange, \varnothing 70 [2.76] Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

Standard

ATEX, mechanical Multiturn, optical

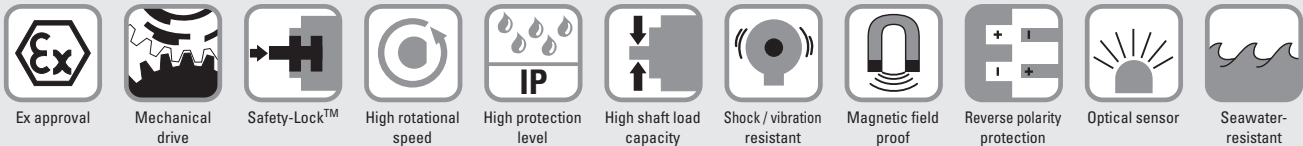
Sendix 7068 (Shaft)

CANopen



The Sendix 7068 absolute multiturn encoders offer Ex protection in a compact 70 mm seawater resistant 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-resistant aluminium
- Remains sealed even in harsh everyday use and ensures highest safety against field breakdowns (IP67 protection)

Explosion protection

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

Order code

8.7068 . 1 X 2 X . 21 11 . XXXX

Shaft version

Type a b c d e f 1)

a Flange

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

b Shaft ($\varnothing \times L$)

2 = 10 x 20 mm [0.39 x 0.79"], with flat
1 = 12 x 25 mm [0.47 x 0.98"], with keyway for 4 x 4 mm [0.16 x 0.16"] key

c Interface / Power supply

2 = CANopen DS301 V4.02 / 10 ... 30 V DC

d Type of connection

1 = axial cable, 2 m [6.56'] PUR
2 = radial cable, 2 m [6.56'] PUR
A = axial cable, length > 2 m [6.56']
B = radial cable, length > 2 m [6.56']
preferred length see f, e. g.: 0100 = 10 m [32.81']

e Fieldbus profile

21 = CANopen encoder profile DS406 V3.2

f Cable length in dm ¹⁾

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

optional on request
- special cable length

Mounting accessory for shaft encoders

Order No.

Coupling

Bellows coupling \varnothing 19 mm [0.75"] for shaft 10 mm [0.39"]

8.0000.1101.1010

Programming set

Including:

- Interface converter USB-CAN
- Connection cable from interface converter to encoder
- Power supply 90 ... 250 V AC
- DVD with Ezturn® software

Minimum system requirements:

Operating system: WinXP SP3 or higher
Processor: 1 GHz
RAM: 512 MB
Required disk space: 500 MB

8.0010.9000.0015

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

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

1) Not applicable with connection types 1 and 2

Absolute Encoders – Multiturn

Standard ATEX, mechanical Multiturn, optical	Sendix 7068 (Shaft)	CANopen
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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 IP6x
Directive 94/9/EC	EN 60079-0: 2009; EN 60079-1: 2007; EN 60079-31: 2009

Explosion protection IECEx	
Certificate of Conformity (CoC)	IECEx PTB 13.0026 X
Category (gas)	Ex d IIC T4 - T6 Gb
Category (dust)	Ex tb IIIC T135°C - T85°C Db IP6x
IECEx	IEC 60079-0:2007; IEC 60079-1:2007; IEC 60079-31:2008

Mechanical characteristics	
Max. speed	continuous 6 000 min ⁻¹
Starting torque – at 20°C [68°F]	< 0.05 Nm
Moment of inertia	4.0 x 10 ⁻⁶ kgm ²
Load capacity of shaft	radial 80 N axial 40 N
Weight	approx. 1.3 kg [45.86 oz]
Protection acc. to EN 60529	IP67
Working temperature range	-40°C ... +60°C [-40 ... +140°F]
Material	shaft stainless steel flange / housing seawater-resistant Al, type AlSiMgMn (EN AW-6082) stainless steel on req. cable PUR
Shock resistance acc. to EN 60068-2-27	2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s ² , 55 ... 2000 Hz

Electrical characteristics	
Power supply	10 ... 30 V DC
Current consumption (no load)	max. 100 mA
Reverse polarity protection for power supply (+V)	yes
CE compliant acc. to	EMC guideline 2004/108/EC ATEX guideline 94/9/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics CANopen	
Resolution Singleturn	1 ... 65535 (16 bit), scalable
Resolution Multiturn	max. 4096 (12 bit) scalable only via the total resolution
Total resolution	1 ... 268.435.456 (28 bit), scalable 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
Baud rate	10 ... 1000 kbit/s (Software configurable)
Node address	1 ... 127 (Software configurable)
Switchable termination	Software configurable

 Absolute Encoders
Multiturn

General information about CANopen

The CANopen encoders support the latest CANopen communication profile according to DS301 V4.02 .

In addition, device-specific profiles like the encoder profile DS406 V3.2 are available.

The following operating modes may be selected: Polled Mode, Cyclic Mode, Sync Mode and a High Resolution Sync Protocol. Moreover, scale factors, preset values, limit switch values and many other additional parameters can be programmed via the CANbus. When switching the device on, all parameters are loaded from an EEPROM, where they were saved previously to protect them against power-failure.

As output values **position, speed, acceleration** as well as the **working area status** may be combined freely as PDO (PDO mapping)

CANopen Communication Profile DS301 V4.02

Among others, the following functionality is integrated:

Class C2 functionality

- NMT Slave
- Heartbeat Protocol
- High Resolution Sync Protocol
- Identity Object
- Error Behaviour Object
- Variable PDO Mapping self-start programmable (Power on to operational), 3 Sending PDO's
- Node address, baud rate and CANbus Programmable termination

CANopen Encoder Profile DS406 V3.2

The following parameters can be programmed:

- Event mode
- Units for speed selectable (Steps/Sec or RPM)
- Factor for speed calculation (e.g. measuring wheel circumference)
Integration time for speed value of 1...32
- 2 work areas with 2 upper and lower limits and the corresponding output states
- Variable PDO mapping of position, speed, acceleration, working area status
- Extended failure management for position sensing with integrated temperature control
- User interface with visual display of bus and failure status - 3 LED's
- Optional - 32 CAMs programmable
- Customer-specific memory - 16 Bytes

Absolute Encoders – Multiturn

Standard	Sendix 7068 (Shaft)	CANopen
ATEX, mechanical Multiturn, optical		

Terminal assignment

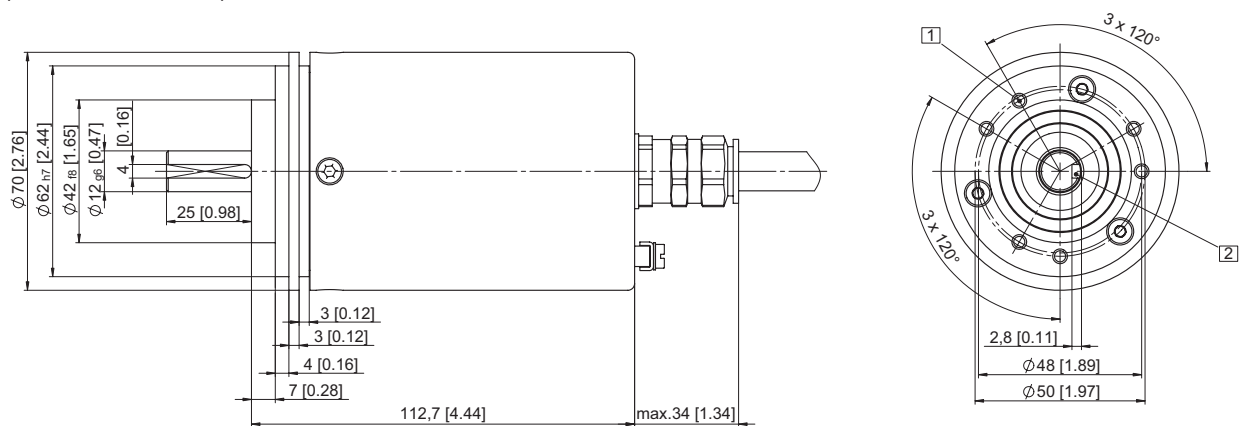
Interface	Type of connection	Cable (isolate unused wires individually before initial start-up)								
		Signal:	0 V	+V	CAN_H	CAN_L	CAN_GND	CAN_H	CAN_L	CAN_GND
2	1, 2, A, B	Cable marking:	1	2	4	5	6	7	8	9

Dimensions

Dimensions in mm [inch]

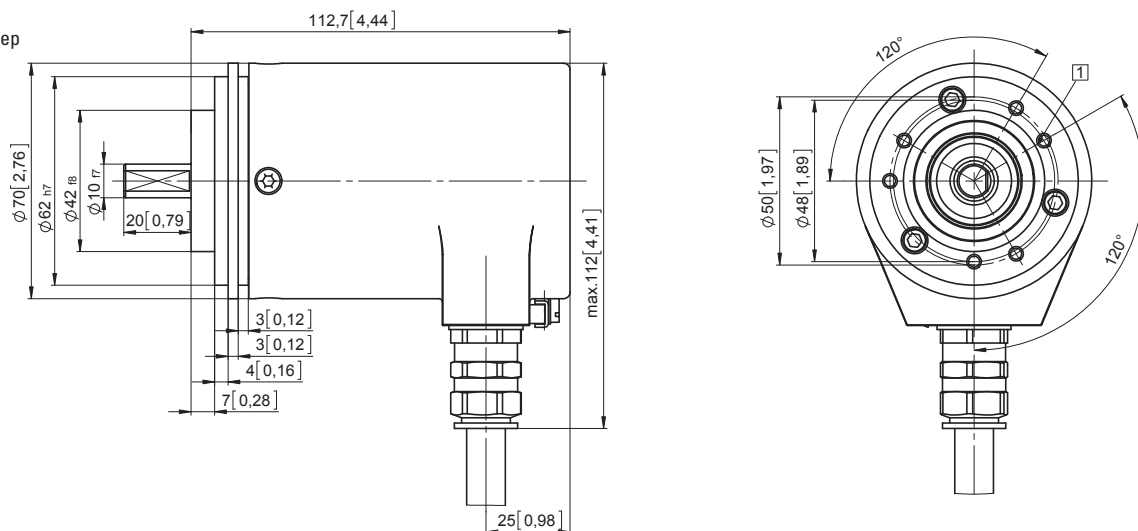
Clamping-synchronous flange, \varnothing 70 [2.76] Shaft type 1 with axial cable outlet

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



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

- 1 6 x M4, 10 [0.39] deep



Absolute Encoders – Multiturn

Large hollow shaft optical / magnetic	9080 (Hollow shaft)	PROFIBUS DP
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The multiturn encoder 9080 with Profibus interface and combined optical / mechanical sensor technology is perfect for Profibus applications, where a large hollow shaft is required.

This through hollow shaft is available with a diameter up to 28 mm. The maximum resolution of the 9080 is 25 bits.



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

Adaptable <ul style="list-style-type: none"> With cable gland or M12 connector Hollow shaft of 12 up to 28 mm Programmable over the bus 	User-friendly <ul style="list-style-type: none"> All relevant parameters programmable Wide selection of shafts and fixing options
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Order code	Hollow shaft	8.9080	.XX3X.	3001
		Type	a b c d	e
a Flange	b Hollow shaft	c Interface / Power supply	e Fieldbus profile	
1 = without mounting aid	1 = \varnothing 12 mm [0.47"]	3 = PROFIBUS DP / 10 ... 30 V DC	3001 = Profibus Class 2	
2 = with spring element short	2 = \varnothing 15 mm [0.59"]	d Type of connection	1 = removable bus terminal cover, with cable gland M16	
3 = with spring element long	9 = \varnothing 16 mm [0.63"]	1 = removable bus terminal cover, with cable gland M16	2 = removable bus terminal cover, with 3 x M12 connector, 5-pin	
4 = with mounting flange	3 = \varnothing 20 mm [0.79"]			
5 = with tether arm long	4 = \varnothing 24 mm [0.94"]			
	C = \varnothing 25 mm [0.98"]			
	5 = \varnothing 28 mm [1.10"]			
	6 = \varnothing 5/8"			
	7 = \varnothing 1"			

Mounting accessory for hollow shaft encoders		Order No.
Cylindrical pin, long for torque stops		With fixing thread 8.0010.4700.0003

Connection technology		
Connector, self-assembly (straight)	Coupling M12 for Bus in Connector M12 for Bus out Connector M12 for power supply	05.BMWS 8151-8.5 05.BMSWS 8151-8.5 05.B8141-0
Cordset, pre-assembled	M12 cordset for Bus in , 6 m [19.68'] PUR cable M12 cordset for Bus out, 6 m [19.68'] PUR cable M12 cordset for power supply, 2 m [6.56'] PUR cable	05.00.6011.3211.006M 05.00.6011.3411.006M 05.00.6061.6211.002M

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

Absolute Encoders – Multiturn

**Large hollow shaft
optical / magnetic**

9080 (Hollow shaft)

PROFIBUS DP

Technical data

Mechanical characteristics

Max. speed	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Moment of inertia	approx. 72 x 10 ⁻⁶ kgm ²
Starting torque	< 0.2 Nm
Weight	approx. 0.9 kg [31.74 oz]
Protection EN 60529	IP65
EX approval for hazardous areas	optional Zone 2 and 22
Working temperature range	-10°C ... +70°C [+14°F ... +158°F]
Material	hollow shaft stainless steel H7
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

Power supply (+V)	10 ... 30 V DC
Power consumption	290 mA
Recommended fuse	T 0.315 A
Performance against magnetic influence acc. to	EN 61000-4-8, Severity level 5
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics PROFIBUS DP

Resolution Singleturn	1 ... 8192 (13 bit) scalable
Number of revolutions	max. 4096 scalable 1 ... 4096 (12 bit)
Code	Binary
Interface	RS485
Protocol	PROFIBUS DP, encoder profile class 2
Baud rate	max. 12 Mbit/s
Device address	adjustable with DIP-switches

Profibus Encoder-Profile V1.1

Profibus Encoder-Profile V1.1 The PROFIBUS-DP device profile describes the functionality of the communication and the user-specific component within the PROFIBUS field bus system. For encoders, the encoder profile is definitive. Here the individual objects are defined independent of the manufacturer.

Furthermore, the profiles offer space for additional manufacturer-specific functions; this means that PROFIBUS-compliant device systems can be used now with the guarantee that they are ready for the future too.

The following parameters can be programmed:

- Direction of rotation
- Scaling factor
 - number of pulse/rotation
 - total resolution
- Preset value
- Diagnostics mode

The following functionality is integrated:

- Galvanic isolation of the Fieldbus stage with DC/DC converter
- Line driver according to RS485 max. 12 MB
- Addressing by means of rotary switches
- Diagnostics LED
- Full Class 1 and Class 2 functionality

Terminal assignment terminal box

Interface	Type of connection	Terminal box												
		Signal:		ENC.			BUS IN			BUS OUT			ENC.	
3	1	+V DC	0 V	0 V	B	A	A	B	0 V	0 V	+V DC	⊥	⊥	
		Terminal:	1	2	3	4	5	6	7	8	9	10	11	12

Terminal assignment M12 connector

Interface	Type of connection	Function	M12 connector						Diagram
			Signal:	–	PB_A	–	PB_B	–	
3	2	Bus in	Signal:	–	PB_A	–	PB_B	–	
			Pin:	1	2	3	4	5	
		Power supply	Signal:	+V	–	0 V	–		
			Pin:	1	2	3	4		
		Bus out	Signal:	BUS_VDC	PB_A	PB_GND	PB_B	⊥	
			Pin:	1	2	3	4	5	

Absolute Encoders – Multiturn

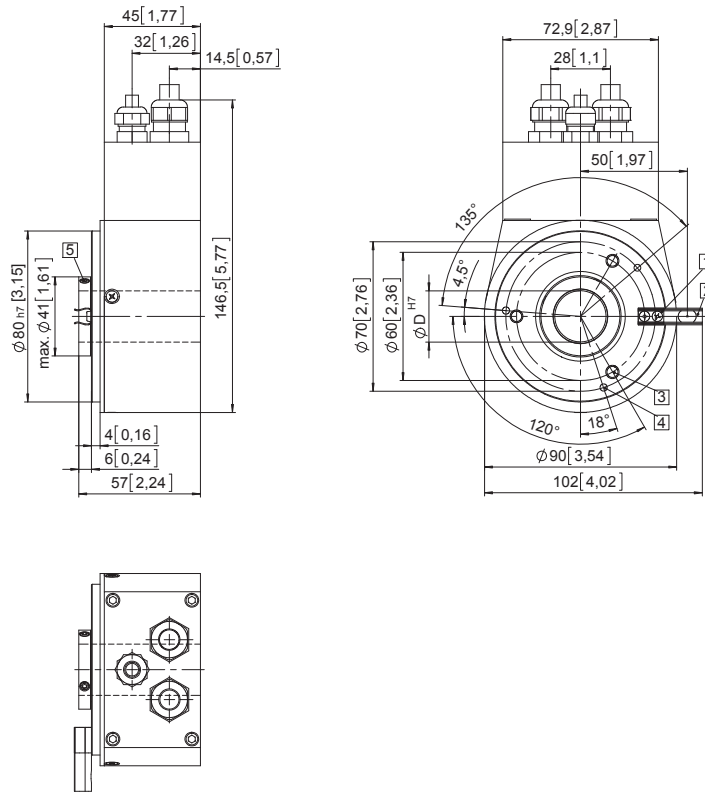
Large hollow shaft optical / magnetic	9080 (Hollow shaft)	PROFIBUS DP
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Dimensions

Dimensions in mm [inch]

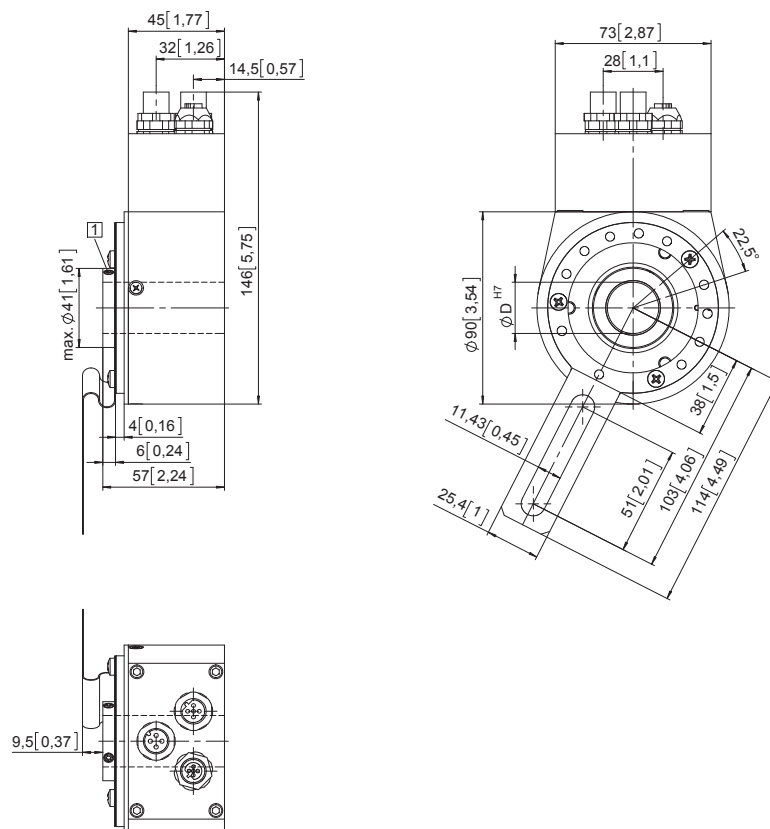
Flange with spring element

- 1 Spring element short (flange No. 2)
Cylindrical pin DIN 6325, \varnothing 6 [0.24]
- 2 Spring element long (flange No. 3)
Cylindrical pin DIN 6325, \varnothing 6 [0.24]
- 3 3 x M6, 10 [0.39] deep
- 4 3 x M4, 7 [0.28] deep
- 5 Recommended torque for the
clamping ring 1.0 Nm



Flange with tether arm long

- 1 Recommended torque for the
clamping ring 1.0 Nm



Absolute Encoders – Multiturn

**Large hollow shaft
optical / magnetic**

9080 (Hollow shaft)

CANopen / DeviceNet



The multiturn encoder 9080 with CANopen interface and combined optical / mechanical sensor technology is perfect for CANopen applications, where a large hollow shaft is required.

This through hollow shaft is available with a diameter up to 28 mm. The maximum resolution of the 9080 is 25 bits.



DeviceNet

CANopen®



High rotational speed



Temperature range
-10°...+70°C



High protection level
IP65



High shaft load capacity



Shock / vibration resistant



Short circuit proof



Reverse polarity protection

Adaptable

- With cable gland or M12 connector
- Hollow shaft of 12 up to 28 mm
- Programmable over the bus

User-friendly

- All relevant parameters programmable
- Wide selection of shafts and fixing options

Order code Hollow shaft

8.9080 . XXXX . XXXX
Type a b c d e

a Flange

- 1 = without mounting aid
- 2 = with spring element short
- 3 = with spring element long
- 4 = with mounting flange
- 5 = with tether arm long

b Hollow shaft

- 1 = ø 12 mm [0.47"]
- 2 = ø 15 mm [0.59"]
- 9 = ø 16 mm [0.63"]
- 3 = ø 20 mm [0.79"]
- 4 = ø 24 mm [0.94"]
- C = ø 25 mm [0.98"]
- 5 = ø 28 mm [1.10"]
- 6 = ø 5/8"
- 7 = ø 1"

c Interface / Power supply

- 1 = DeviceNet / 10 ... 30 V DC
- 2 = CANopen / 10 ... 30 V DC

e Fieldbus profile

- 1001 = DeviceNet
- 2001 = CANopen
Encoder Profile DSP 406

d Type of connection

- 1 = removable bus terminal cover, with cable gland M16 ¹⁾
- 2 = removable bus terminal cover, with 3 x M12 connector, 5-pin

Includes EDS-file and documentation on CD
Use **couplings** for the **BUS-IN** connection and **connectors** for the **BUS-OUT** connection.

1) Only in conjunction with CANopen

Absolute Encoders – Multiturn

Large hollow shaft optical / magnetic	9080 (Hollow shaft)	CANopen / DeviceNet
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Mounting accessory for hollow shaft encoders	Order No.
--	-----------

Cylindrical pin, long		8.0010.4700.0003
for torque stops		

Connection technology		
-----------------------	--	--

Connector, self-assembly (straight)	M12 female connector with coupling for Bus in	8.0000.5116.0000
	M12 male connector with external thread for Bus out	8.0000.5111.0000

Vorkonfektionierter Kabelsatz	CANopen, Bus in, 6 m [19.68'] PVC cable	05.00.6021.2211.006M
	CANopen, Bus out, 6 m [19.68'] PVC cable	05.00.6021.2411.006M
	DeviceNet, Bus in, 6 m [19.68'] PVC cable	05.00.6091.A211.006M
	DeviceNet, Bus out, 6 m [19.68'] PVC cable	05.00.6091.A411.006M

Programming set		
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Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0015
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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	
Max. speed	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Moment of inertia	approx. 72 x 10 ⁻⁶ kgm ²
Starting torque - at 20°C [68°F]	< 0.2 Nm
Weight	approx. 0.9 kg [31.74 oz]
Protection acc. to EN 60529	IP65
Working temperature range	-10°C ... +70°C [+14°F ... + 158°F]
Material	hollow shaft stainless steel H7
Shock resistance acc. 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 (+V)	10 ... 30 V DC
Power consumption	290 mA
Recommended fuse	T 0.315 A
Performance against magnetic influence acc. to	EN 61000-4-8, Severity level 5
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics CANopen / DeviceNET	
Singleturn resolution	1 ... 8192 (13 bit) scaleable
Number of revolutions	max. 4096 scalable only via the total resolution
Multiturn resolution	1 ... 4096 (12 bit)
Total resolution	25 bit
Code	Binary
Interface	CAN HIGH-Speed acc. to ISO/DIS 11898, Basic and Full-CAN; CAN specification 2.0 B (11 and 29 bit Identifier)
Protocol	CANopen according to profile DSP 406 with additional functions. DeviceNet Profile for Encoder Release V 2.0
Baud rate	programmable via DIP switches 10 ... 1000 Kbit/s
Basic identifier/node	programmable via DIP switches

 Absolute Encoders
Multiturn

Absolute Encoders – Multiturn

**Large hollow shaft
optical / magnetic**

9080 (Hollow shaft)

CANopen / DeviceNet

CANopen - Device Profile

General description

The CANopen Device Profiles describe the functionality of the communication and of that part of the CANopen fieldbus system specific to the manufacturer. Device Profile 406 applies to encoders and defines the individual objects independently of the manufacturer. In addition the profile makes provision for additional extended functions specific to the manufacturer; using devices that interface with CANopen offers the advantage of acquiring systems today that are prepared for the needs of the future.

The following functionality is integrated:

- Class C2 functionality
- NMT Slave
- Diagnostics (internal) 2 bit
- CAN LED for Bus status
- CAN LED for operating mode

The following parameters can be programmed::

- Polling mode or auto mode with adjustable time
- Code sequence (Direction)
- Number of pulses/rotation 1 ... 8192
- Number of revolutions 1 ... 4096
- Total resolution
- Preset
- Offset
- Number of revolutions

DeviceNet Encoder profile

General description

The DeviceNet Device Profile describes the functionality of the communication and of that part of the DeviceNet fieldbus system specific to the manufacturer. The Encoder Profile applies to encoders and defines the individual objects independently of the manufacturer. In addition the profile makes provision for additional extended functions specific to the manufacturer.

The following parameters can be programmed:

- Direction of rotation
- Scaling factor
 - Number of pulses/rotation
 - Total resolution
- Number of revolutions
- Preset value
- Diagnostics mode
- Resolution

The following functionality is integrated:

- Galvanic isolation of the Fieldbus stage with DC/DC converter
- Addressing via DIP switches or software
- Diagnostic LED for network and mode
- Baud rate 125, 250 and 500 kbit/s programmable via DIP switches
- Node address 0 ... 63 and baud rate programmable via DIP switches
- Polled mode
- Cyclic mode
- Change of state mode (COS)
- Combination of Polled mode and Cyclic mode
- Combination of Polled mode and COS mode
- Offline connection set
- Device heartbeat
- "Out of box" Configuration
- MAC ID and Baud rate preset value, MAC ID = 63
- Baud rate = 125 kbit/s
- 2 I/O Assembly: Position value / Position value and status

Fieldbus encoders can be used in following applications:

CANopen

- Elevators
- Construction plant
- Cranes
- Agricultural vehicles
- Mobile plant
- Special purposes vehicles

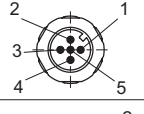

DeviceNet

Especially suitable for applications in the USA.

Terminal assignment terminal box

Interface	Type of connection	Terminal box											
		Signal:		ENC.		BUS IN		BUS OUT		ENC.		shield	
1, 2	1	+V DC	0 V	0 V	B	A	A	B	0 V	0 V	+V DC	⊥	
		Terminal:	1	2	3	4	5	6	7	8	9	10	11

Terminal assignment M12 connector version

Interface	Type of connection	Function	M12 connector						Diagram
			Signal:	DRAIN	+ V DC	- V DC	CAN_H	CAN_L	
1, 2	2	Bus in	Pin:	1	2	3	4	5	
			Colour:	GY	RD	BK	WH	BU	
			Signal:	DRAIN	+ V DC	- V DC	CAN_H	CAN_L	
		Bus out	Pin:	1	2	3	4	5	
			Colour:	GY	RD	BK	WH	BU	
			Signal:	DRAIN	+ V DC	- V DC	CAN_H	CAN_L	

Absolute Encoders – Multiturn

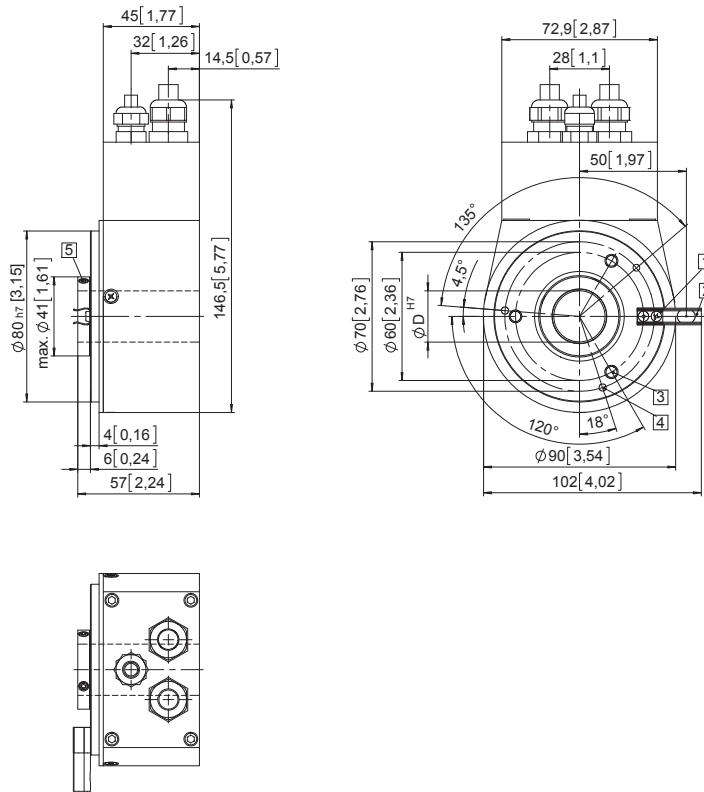
Large hollow shaft optical / magnetic	9080 (Hollow shaft)	CANopen / DeviceNet
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Dimensions

Dimensions in mm [inch]

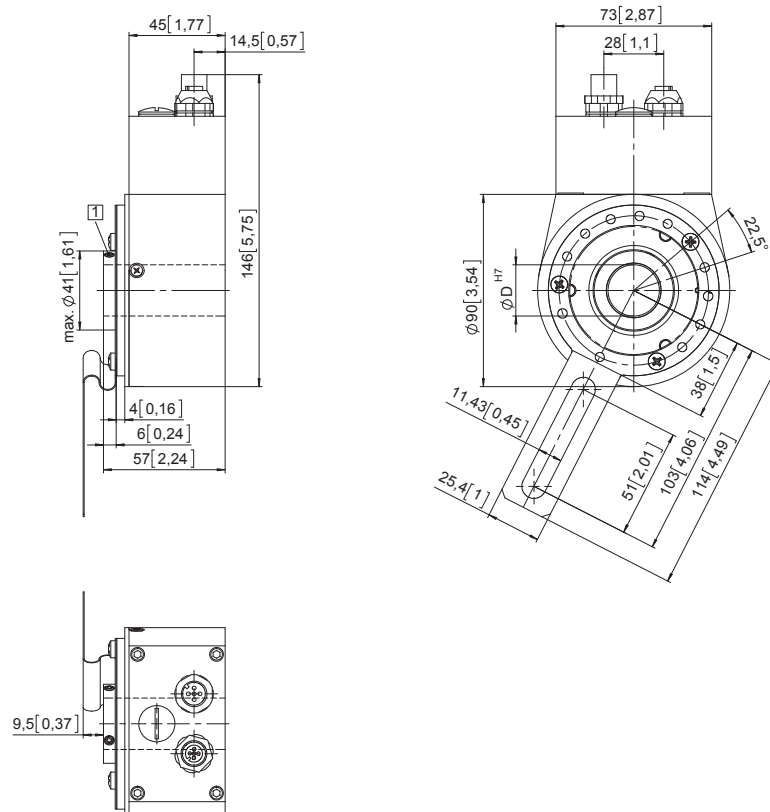
Flange with spring element

- 1 Spring element short (flange No. 2)
Cylindrical pin DIN 6325, \varnothing 6 [0.24]
- 2 Spring element long (flange No. 3)
Cylindrical pin DIN 6325, \varnothing 6 [0.24]
- 3 3 x M6, 10 [0.39] deep
- 4 3 x M4, 7 [0.28] deep
- 5 Recommended torque for the
clamping ring 1.0 Nm



Flange with tether arm long

- 1 Recommended torque for the
clamping ring 1.0 Nm



Absolute Encoders – Multiturn

**Large hollow shaft
programmable, optical / magnetic**

9081 (Hollow shaft)

SSI / RS485



The multiturn encoder 9081, with SSI interface and combined optical / mechanical sensor technology, is also available with additional incremental track RS422 or RS485 interface.

This encoder has a through hollow shaft with a diameter up to 28 mm and offers resolutions up to 25 bits.



Optimised dimensions

- Hollow shaft up to max. 28 mm with an installation depth of just 47 mm
- Outer diameter 90 mm

Flexible

- Various torque stops available
- Large selection of hollow shafts, interfaces and resolutions

Order code Hollow shaft

8.9081 . XXXX 2 . XXXX
Type a b c d e

a Flange

- 1 = without mounting aid
- 2 = with spring element short
- 3 = with spring element long
- 4 = with mounting flange
- 5 = with tether arm long

b Hollow shaft

- 1 = \varnothing 12 mm [0.47"]
- 2 = \varnothing 15 mm [0.59"]
- 3 = \varnothing 20 mm [0.79"]
- 4 = \varnothing 24 mm [0.94"]
- 5 = \varnothing 28 mm [1.10"]
- 6 = \varnothing 5/8"
- 7 = \varnothing 1"

Further hollow shafts on request

c Interface / Power supply

- 2 = SSI with 4 status outputs / 5 ... 30 V DC
- 5 = SSI with incremental tracks A, B, \bar{A} , \bar{B} 2048 PPR/ 5 ... 30 V DC
- 9 = SSI with 2 status outputs and 2 sensor outputs for monitoring the power supply on the encoder/ 4.75 ... 30 V DC
- 3 = RS485, half-duplex, internal termination / 5 ... 30 V DC
- 7 = RS485, half-duplex, external termination / 5 ... 30 V DC

d Type of connection

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

e SSI interface ¹⁾

- 2001 = 4096 x 4096 (24 bit), Binary
- 2002 = 8192 x 4096 (25 bit), Binary
- 2003 = 4096 x 4096 (24 bit), Gray
- 2004 = 8192 x 4096 (25 bit), Gray

RS485-Interface, half-duplex mode
3001 = ESC-protocol max. 38400 baud

1) This factory set (default) resolution can be re-programmed by using the Ezturn® software.

Absolute Encoders – Multiturn

Large hollow shaft programmable, optical / magnetic	9081 (Hollow shaft)	SSI / RS485
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Mounting accessory for hollow shaft encoders

Cylindrical pin, long for torque stops		With fixing thread	Order No. 8.0010.4700.0003
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Connection technology

Connector, self-assembly (straight)	M23 female connector with coupling nut	8.0000.5012.0000
Cordset, pre-assembled	M23 female connector with coupling nut, 6 m [19.68'] PVC cable	05.00.6091.A411.006M

Programming set

Including: - Interface converter USB-CAN - Connection cable from interface converter to encoder - Power supply 90 ... 250 V AC - DVD with Ezturn® software	Minimum system requirements: Operating system: WinXP SP3 or higher Processor: 1 GHz RAM: 512 MB Required disk space: 500 MB	8.0010.9000.0004
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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	
Max. speed	6 000 min ⁻¹ , 3 000 min ⁻¹ (continuous)
Moment of inertia	approx. 65 x 10 ⁻⁶ kgm ²
Starting torque - at 20°C [68°F]	< 0.2 Nm
Weight	approx. 0.7 kg
Protection acc. to EN 60529	IP65
Working temperature range	-20°C ... +70°C [-4°F ... +158°F]
Materials	hollow shaft stainless steel H7
Shock resistance acc. 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 (+V)	5.0 ... 30 V DC ⁴⁾
Power consumption (no load)	typ 89 mA max 138 mA
Short circuit proof outputs ²⁾	yes ³⁾
Reverse polarity protection of the power supply +V	yes
Performance against magnetic influence acc. to	EN 61000-4-8, Severity level 5
UL approval	File 224618
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Control inputs (V/R, SET)	
Voltage	5 ... 30 V DC = +V
Response time	10 ms
Switching level	LOW max. 25% +V HIGH min. 60% +V, max. +V
Max. current load	≤ 0.5 mA

SSI interface	
Output driver	RS485
Permissible load/channel	max. +/- 20 mA
Update rate for position data	approx. 1600/s
SSI clock rate	min. / max. 100 kHz / 500 kHz
Signal level	HIGH typ. 3.8 V LOW (I _{Load} = 20 mA) typ. 1.3 V
Resolution Singleturn	13 bit programmable 1 ... 8192
Number of revolutions	12 bit programmable 1 ... 4096
Falling edge time t_f (without cable)	max. 100 ns
Rising edge time t_r (without cable)	max. 100 ns

Control outputs	
Output driver	Push-Pull
max. current output	± 10.0 mA
Signal level	HIGH min. +V - 2.8 V LOW max. 1.8 V
Falling edge time t_f (without cable)	max. 1 µs
Rising edge time t_r (without cable)	max. 1 µs

Incremental outputs (A/B)	
Output driver	RS422-compatible
SSI clock rate min. / max. / Pulse frequency	200 kHz
Signal level	HIGH 4.5 V LOW (I _{Load} = 20 mA) 0.5 V
Falling edge time t_f (without cable)	max. 200 ns
Rising edge time t_r (without cable)	max. 200 ns

- 1) For shaft version only (at shaft end)
- 2) If power supply +V correctly applied
- 3) Only one channel allowed to be shorted-out:
at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.
at +V ≥ 5 ... 30 V DC short circuit to channel or 0 V is permitted.
- 4) The power supply at the encoder input must not be less than 4.75 V (5 V - 5%)

Absolute Encoders – Multiturn

**Large hollow shaft
programmable, optical / magnetic**

9081 (Hollow shaft)

SSI / RS485

Control inputs

V/R input for change of direction

The encoder can output increasing code values when the shaft is rotated either clockwise or counter-clockwise (when looking from the shaft side).

There are two methods for selecting the appropriate option:

1. Via a hardware configuration of the V/R input BEFORE powering up the encoder
2. By programming the device using the Kübler „EzTurn®“ programming tool.

The following table shows the function selection dependent on hardware and software settings:

Hardware configuration of the V/R input:	Programmed selection using the „EzTurn“ programming tool	Function: increasing code value when the shaft is in the following direction
„LOW“ (0V) on the V/R input (=cw)	cw	cw
„HIGH“ (+V) on the V/R input (= ccw)	cw	ccw
„LOW“ (0V) on the V/R input (=cw)	ccw	ccw
„HIGH“ (+V) on the V/R input (= ccw)	ccw	ccw

SET input

This input is used for a one-time alignment (zeroing) of the encoder immediately after installation. A high control pulse (+V) applied to this input for a minimum of 10 ms will reset the current encoder position to the pre-programmed setpoint value.

The programming of the setpoint can be carried out with Kübler's EzTurn® programming software or can, on request, be done in advance at the factory. The default value is zero. However any value within the encoder's measuring range can be defined.

Note:

- Any hardware configuration of the V/R input must take place BEFORE powering up the encoder!
- If the V/R input is not configured, then a 0 V configuration will apply (default condition)!
- If the direction of rotation is changed due to the V/R configuration, without activating the SET function again, and if the encoder is also then powered up again, a new position value may be outputted, even if the physical shaft position of the encoder has not moved! This is due to internal conversion processes.
- The start-up procedure for the encoder should therefore follow this sequence:
 1. Determine the count direction of the encoder either via the V/R input or via programming
 2. Apply power to the encoder
 3. Activate the SET function, if desired (see SET input below)
- If using a cable wire to configure the V/R input, then for EMC reasons the wire should not remain open but should be tied either to 0 V or +V!
- The response time of the V/R input with +V = 5 ... 30 V DC power supply is 10 ms.

Notes:

- The SET function should only be implemented when the encoder shaft is at rest.
- For the duration of the SET pulse the SSI interface does not function and therefore does not output any valid position values! In order to avoid malfunctions, no SSI clock pulse should occur during the SET pulse.
- If a cable wire is used to configure the SET input, then for EMC reasons the wire should not remain open but should if at all possible be tied to 0 V, provided no SET pulse is triggered!
- The response time of the SET input with +V = 5 ... 30 V DC power supply is 10 ms.

Outputs ¹⁾

Output	Default-function ²⁾
A1	battery control
A2	not activated
A3	not activated ³⁾
A4	not activated ³⁾

The outputs are not activated in the factory setting (default). They can be activated and defined with the optional EzTurn® programming software e.g. limit switch, overspeed and temperature control etc.

Functionality of the EzTurn® software

- Setting of the communication parameters
- Configuration function
- Setting of a drive factor by means of the modification of the resolution per revolution, the number of revolutions and the total resolution
- Programming of the direction of rotation and code type
- Setting of a preset/electronic zero point
- Setting of diagnostic functions
- Setting of the outputs A1 ... A4
 - Limit switch values, max. 2
 - Alarm and status information
 - Battery monitoring
- Limiting max. number of bit to interface with PLCs
- Diagnostics and information for the set-up operation
- Data transmission from the PC to the encoder and inversely, also during operation
- Print-out of the current data and set parameters
- Convenient position output with the current set data
- Terminal operation for direct instructions via the keyboard
- Diagnostics of the encoder connected

1) Not available for versions with incremental track

2) Programmable with the optional programming software EzTurn®

3) With the order code Interface 9 assigned to the sense outputs.

Absolute Encoders – Multiturn

**Large hollow shaft
programmable, optical / magnetic**

9081 (Hollow shaft)

SSI / RS485

Terminal assignment (SSI Synchronous Serial Interface with 12 pin connector)

Interface	Type of connection	Features	M23 connector													
			Signal:	0 V	+V	C+	C-	D+	D-	ST	VR	A1	A2	A3 ¹⁾ 0 V sens	A4 ¹⁾ +V sens	⊥
2, 9	2	SET Up/down input	Pin:	1	2	3	4	5	6	7	8	9	10	11	12	PH
			Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	

Terminal assignment (RS485 interface with 12 pin connector)

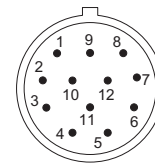
Interface	Type of connection	Features	M23 connector													
			Signal:	0 V	+V	T/R-	T/R+	Term ²⁾	Term ²⁾		VR				⊥	
3, 7	2	Up/down input	Pin:	1	2	3	4	5	6	7 ²⁾	8	9	10	11	12	PH
			Cable colour:	WH	BN	GN	YE				RD					

Terminal assignment (SSI interface with incremental track (A/B))

Interface	Type of connection	Features	M23 connector													
			Signal:	0 V	+V	C+	C-	D+	D-	ST	VR	B̄	B	Ā	A	⊥
5	2	SET Up/down input	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
- A, Ā: Incremental output channel A
- B, B̄: Incremental output channel B
- ST: Set input. The current position becomes defined as position zero.
- VR: Up/down input. As long as this input (High-Level = +V) is active, decreasing code values are transmitted when shaft turning clockwise.
- R: Receive channel
- T: Transmit channel
- A1, A2, A3, A4: Outputs, can be modified using Ezturn
- PH ⊥: Plug connector housing (Shield)

Top view of mating side, male contact base

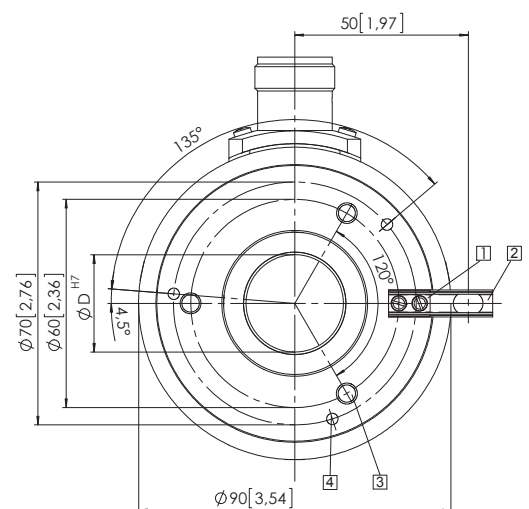
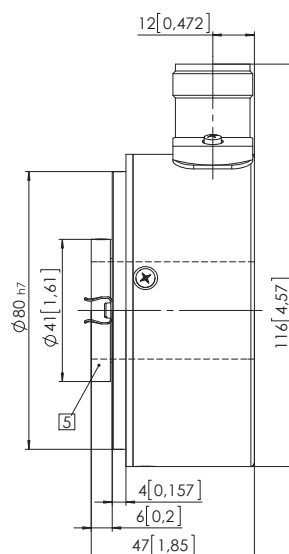


M23 connector, 12 pin

Dimensions

Dimensions in mm [inch]

- 1 Spring element short (flange No. 2)
Cylindrical pin DIN 6325, ø 6 [0.24]
- 2 Spring element long (flange No. 3)
Cylindrical pin DIN 6325, ø 6 [0.24]
- 3 3 x M6, 10 [0.39] deep
- 4 3 x M4, 7 [0.28] deep
- 5 Recommended torque for the
clamping ring 1.0 Nm



- 1) With the order code Interface 9 these outputs are assigned to the sense outputs. The sensor circuits are internally tied to the power supply. Special power supply units control the voltage drop in long cable runs via the voltage feedback. If the circuits are not being used, then they should be individually isolated and not connected.
- 2) For the version with external termination: if the termination is desired (terminating resistor 120 Ohm), then both connections are to be tied together by means of a jumper (0 Ohm).



www.kuebler.com
Type: 8.LI50.1121.2250
S-Nr:
4,8-30 VDC 60 mA
Lit. No. 1121
Feb. 09

0V	WH	B	CR	CE
+V	BN	B	PK	
A	GN	F	BL	
AI	YE	D	RD	

Shield =
▲

Linear Measuring Technology

		Type	Description	Page
Incremental magnetic measurement system	Sensor head, magnetic band	Limes LI20 / B1	Resolution min. 10 µm	312
		Limes LI50 / B2	Resolution min. 5 µm	315
Draw wire mechanics	With encoder or analogue sensor	Draw wire encoder A50	Measuring length max. 1.25 m	318
		Draw wire encoder B80	Measuring length max. 3 m	321
		Draw wire encoder C120	Measuring length max. 6 m	324
		Draw wire encoder D135	Measuring length max. 42.5 m	327
	With analogue sensor	Draw wire encoder A40 / A41	Measuring length max. 2 m	332
	With incremental encoder	Draw wire encoder A40	Measuring length max. 2 m	334
	With encoder	Draw wire encoder C105	Measuring length max. 6 m	336
Elevator measuring system	For shaft-copying	Encoder mounting fixture, guided-belt, LM3	Max. height 53 m	338
Length measuring kit	With encoder	Mini measuring wheel system	Incremental	340
	With encoder / preset counter	Rack system with pinion	Incremental / absolute	341
	With encoder / preset counter	Measuring wheelsystem	Incremental / absolute	342
	Flexible fastening	Spring encoder arm		343
	Measuring wheels	Different wheel coatings		344

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 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.

NEW: Version for outdoor use with extremely sturdy aluminium housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



Temperature range



High protection level



Shock / vibration resistant



Reverse polarity protection

Robust

- Sturdy housing with IP67 protection.
Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78)
- Non-contact measuring system – free from wear
- Masking tape protecting the magnetic band

Easy installation

- Simple glued assembly of the magnetic band
- Large mounting tolerances
- Requires very little installation space
- Warning signals via LED if the magnetic field is too weak

Order code Magnetic sensor 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 PUR, 2 m [6.56'] length

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.LI20.1121.2005
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 Other lengths up to 50 m on request

Stock types

8.B1.10.010.0010
8.B1.10.010.0020
8.B1.10.010.0050
8.B1.10.010.0100

¹⁾ With quadruple evaluation (only connected with magnetic band Limes B2)

Linear Measuring Technology

Incremental magnetic measurement system Sensor head, magnetic band	Limes LI20 / B1	Resolution min. 10 µm
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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, serial interface and scalable analogue output 6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface 6.572.0118.D05
	with 4 fast switch outputs, serial interface and scalable analogue output 6.572.0118.D95

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

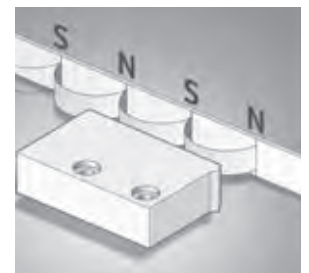
Technical data

Magnetic sensor Limes LI20	
Output circuit	Push-Pull RS422
Power supply	4.8 ... 30 V DC 4.8 ... 26 V DC
Permissible load / channel	±20 mA 120 Ω
Max. cable length	max. 30 m [98.43'] RS422 Standard
Power consumption (no load)	typ. 25 mA, max. 60 mA
Short circuit proof ¹⁾	yes yes ²⁾
Min. pulse edge interval	1 µs (corresponds to 4 µs/cycle see signal figures below)
Output signal	A, \bar{A} , B, \bar{B} , 0, $\bar{0}$
Reference signal	index periodical
Accuracy	
System Accuracy:	typ. +200 µm, max. ± (0.04 + 0.04 x L) mm, L in [m], up to L = 50 m, at T = 20°C [+68°F]
Repeat accuracy	±1 increment
Resolution and speed ³⁾	100 µm (quadruple), max. 25 m/s 25 µm (quadruple), max. 4 m/s 10 µm (quadruple), max. 6.5 m/s
Permissible alignment tolerance (see draft „Mounting tolerances“)	
Gap sensor / magnetic band	0.1 ... 1.0 mm, recommended 0.4 mm
Offset	max. ±1 mm
Tilting	max. 3°
Torsion	max. 3°
General data	
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Shock resistance	500 g/1 ms
Vibration strength	30 g/10 ... 2000 Hz
Protection	Model 1 IP67 acc. to DIN 60529 Model 2 IP68 / IP69k acc. to DIN 60529 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Housing	Aluminium
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG25] shielded, may be used in trailing cable installations
Status LED	Green pulse-index Red Error; Speed too high or magnetic fields too weak (8.LI20.XXXX.X020 and 8.LI20.XXXX.X050)
CE compliant acc. to	EMC guideline 2004/108/EC
RoHS compliant acc. to	guideline 2002/95/EC

Magnetic band Limes B1	
Pole gap	2 mm from pole to pole
Dimensions	width 10 mm thickness 1.97 mm incl. masking tape
Temperature coefficient	16 x 10 ⁻⁶ /K
Working temperature	-20°C ... +80°C [-4°F ... +176°F] -20°C ... +65°C [-4°F ... +144°F] (when mounted solely with adhesive tape)
Storage temperature	-20°C ... +80°C [-4°F ... +176°F]
Mounting	adhesive joint
Measuring	0.1 m (to receive an optimal result of measurement, the magnetic band should be ca. 0.1 m longer than the desired measuring length)
Bending radius	≥ 150 mm (when mounted solely with adhesive tape)

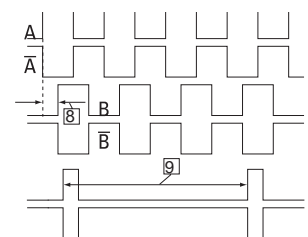
Linear Measuring Technology

Function principle



Signal figures

- 8) Pulse edge interval:
Pay attention to the instructions in the technical data
- 9) Periodic index signal every 2 mm [0.08"]; the logical assignment A, B and 0-Signal can change



- 1) If power supply correctly applied
- 2) Only one channel allowed to be shorted-out
If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted
If +V = 5 ... 30 V, short-circuit to channel or 0 V is permitted
- 3) At the listed rotational speed the min. pulse edge interval is 1 µs, this corresponds to 250 kHz.
For the max. rotational speed range a counter with a count input frequency of not less than 250 kHz should be provided.

Linear Measuring Technology

Incremental magnetic measurement system Sensor head, magnetic band

Limes LI20 / B1

Resolution min. 10 µm

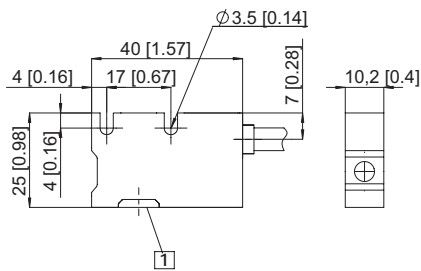
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

Dimensions

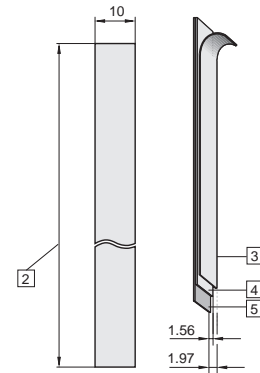
Dimensions in mm [inch]

Magnetic sensor Limes LI20



1 active measuring area

Magnetic band Limes B1



2 length L, max. 50 m

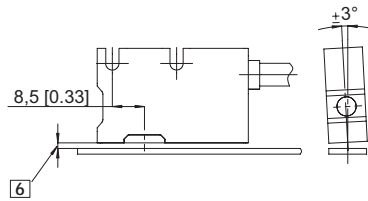
3 masking tape

4 magnetic band

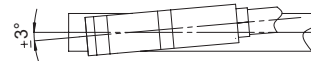
5 carrier band

Permissible mounting tolerances

Tilting



Torsion



Offset



6 distance sensor / magnetic band:
0.1 ... 1.0 mm (recommended 0.4 mm)

1) Shield is attached to connector housing

Linear Measuring Technology

Incremental magnetic measurement system Sensor head, magnetic band	Limes LI50 / B2	Resolution min. 5 µm
---	------------------------	-----------------------------



The non-contact incremental magnetic linear measurement system 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.

NEW: Version for outdoor use with extremely sturdy aluminium housing and stainless-steel cover, wide temperature range as well as a UV-resistant cable. IP68 / IP69k protection, special encapsulation technology and tested resistance to cyclic humidity and damp heat offer the highest levels of reliability, even in exposed outdoor use.



Temperature range



High protection level



Shock / vibration resistant



Reverse polarity protection

Robust

- Sturdy housing with IP67 protection.
Option: special housing for maximum resistance against condensation (IP68 / IP69k, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78)
- Non-contact measuring system – free from wear
- Masking tape protecting the magnetic band

Easy installation

- Simple glued assembly of the magnetic tape
- Large mounting tolerances
- Requires very little installation space
- Warning signals via Status LED if the magnetic field is too weak

Order code Magnetic sensor Limes LI50

8.LI50.X1X1.2XXX
Type a b c d e f

a Model

- 1 = IP67, standard
- 2 = IP68 / IP69k and humidity tested acc. to EN 60068-3-38, EN 60068-3-78

b Pulse edge interval

- 1 = standard

c Output circuit / Power supply

- 1 = RS422 / 4.8 ... 26 V DC
- 2 = Push-Pull / 4.8 ... 30 V DC

d Type of connection

- 1 = cable PUR, 2 m [6.56'] length

e Reference signal

- 2 = index periodic

f Code (resolution)¹⁾

- 050 = 25 µm
- 250 = 5 µm

Stock types

- 8.LI50.1111.2050
- 8.LI50.1111.2250
- 8.LI50.1121.2050
- 8.LI50.1121.2250

Order code Magnetic band Limes B2

8.B2.10.010.XXXX
Type a b

a Width

- 10 = 10 mm

b Length

- 0010 = 1 m
- 0020 = 2 m
- 0040 = 4 m
- 0050 = 5 m
- 0060 = 6 m
- 0100 = 10 m
- 0200 = 20 m
- Other lengths up to 50 m on request

Stock types

- 8.B2.10.010.0010
- 8.B2.10.010.0020
- 8.B2.10.010.0050
- 8.B2.10.010.0100

¹⁾ With quadruple evaluation (only connected with magnetic band Limes B2)

Linear Measuring Technology

Incremental magnetic measurement system Sensor head, magnetic band	Limes LI50 / B2	Resolution min. 5 µm
---	------------------------	-----------------------------

Accessories / Display Type 572	Order No.
Position display, 6-digit	with 4 fast switch outputs and serial interface 6.572.0116.D05
	with 4 fast switch outputs, serial interface and scalable analogue output 6.572.0116.D95
Position display, 8-digit	with 4 fast switch outputs and serial interface 6.572.0118.D05
	with 4 fast switch outputs, serial interface and scalable analogue output 6.572.0118.D95

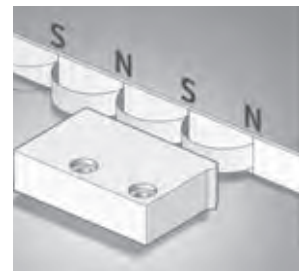
Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Technical data

Magnetic sensor Limes LI50		
Output circuit	Push-Pull	RS422
Power supply	4.8 ... 30 V DC	4.8 ... 26 V DC
Permissible load / channel	±20 mA	120 Ω
Max. cable length	max. 30 m	RS422 Standard
Power consumption (no load)	typ. 25 mA, max. 60 mA	
Short circuit proof ¹⁾	yes	yes ²⁾
Min. pulse edge interval	1 µs (corresponds to 4 µs/cycle see signal figures below)	
Output signal	A, \bar{A} , B, \bar{B} , 0, $\bar{0}$	
Reference signal	index periodical	
Accuracy		
System Accuracy	typ. +200 µm, max. ± (0.06 + 0.04 x L) mm, L in [m], up to L = 50 m, at T = 20°C [+68°F]	
Repeat accuracy	±1 increment	
Resolution and speed ³⁾	25 µm (quadruple), max. 16.25 m/s 5 µm (quadruple), max. 3.25 m/s	
Permissible alignment tolerance (see draft „Mounting tolerances“)		
Gap sensor / magnetic band	0.1 ... 2.0 mm, 1.0 mm recommended	
Offset	max. ±1 mm [0.4"]	
Tilting	max. 3°	
Torsion	max. 3°	
General data		
Working temperature	-20°C ... +80°C [-4°F ... +176°F]	
Shock resistance	500 g/1 ms	
Vibration strength	30 g/10 ... 2000 Hz	
Protection	Model 1	IP67 acc. to DIN 60529
	Model 2	IP68 / IP69k acc. to DIN 60529 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Housing	Aluminium	
Cable	2 m [6.56'] long, PUR 8 x 0.14 mm ² [AWG 25] shielded, may be used in trailing cable installations	
Status-LED:	green	pulse-index
	red	Error; Speed too high or magnetic fields too weak (8.LI50.XXXX.X050 and 8.LI50.XXXX.X250)
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

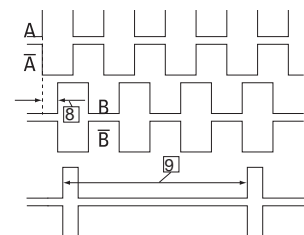
Magnetic band Limes B2	
Pole gap	5 mm from pole to pole
Dimensions	width 10 mm thickness 1.97 mm incl. masking tape
Temperature coefficient	16 x 10 ⁻⁶ /K
Working temperature	-20°C ... +80°C [-4°F ... +176°F] -20°C ... +65°C [-4°F ... +144°F] (when mounted solely with adhesive tape)
Storage temperature	-20°C ... +80°C [-4°F ... +176°F]
Mounting	adhesive joint
Measuring	0.1 m (to receive an optimal result of measurement, the magnetic band should be ca. 0.1 m longer than the desired measuring length)
Bending radius	≥ 150 mm (when mounted solely with adhesive tape)

Function principle



Signal figures

- 8 Pulse edge interval:
Pay attention to the instructions in the technical data
- 9 Periodic index signal every 2 mm [0.08"]; the logical assignment A, B and 0-Signal can change



- 1) If power supply correctly applied
- 2) Only one channel allowed to be shorted-out
If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted
If +V = 5 ... 30 V, short-circuit to channel or 0 V is permitted
- 3) At the listed rotational speed the min. pulse edge interval is 1 µs, this corresponds to 250 kHz.
For the max. rotational speed range a counter with a count input frequency of not less than 250 kHz should be provided.

Linear Measuring Technology

Incremental magnetic measurement system	Limes LI50 / B2	Resolution min. 5 µm
Sensor head, magnetic band		

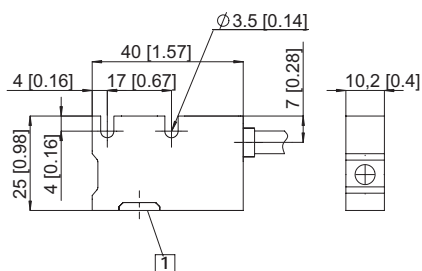
Terminal assignment

Output circuit	Type of connection	Cable									
1, 2	1	Signal:	0 V	+V	A	\bar{A}	B	\bar{B}	0	$\bar{0}$	\perp
		Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	shield ¹⁾

Dimensions

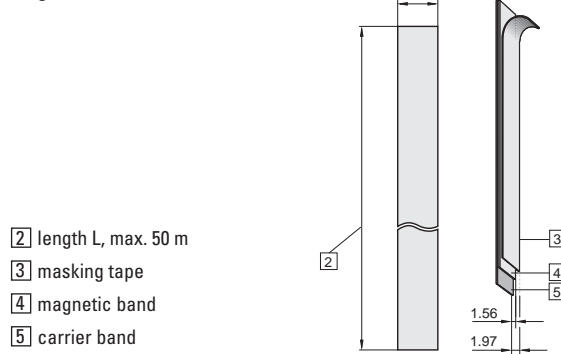
Dimensions in mm [inch]

Magnetic sensor Limes LI50



1 active measuring area

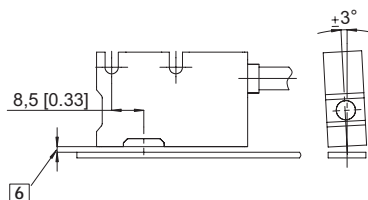
Magnetic band Limes B2



- 2 length L, max. 50 m
- 3 masking tape
- 4 magnetic band
- 5 carrier band

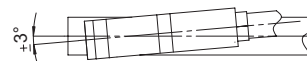
Permissible mounting tolerances

Tilting



6 distance sensor / magnetic band:
0.1 ... 2.0 mm (recommended 1 mm)

Torsion



Offset



1) PH = Shield is attached to connector housing

Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor

Draw wire encoder A50

**Measuring length max. 1.25 m
Traverse speed max. 10 m/s**

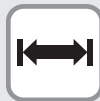


The draw wire mechanics A50 boast both a compact design and high dynamics.

The draw wire mechanics may be equipped with encoders with an analogue, incremental or absolute output. The maximum measuring length is 1.25 m.



Max. acceleration
300 m/s²



Long service life



Wide temperature range



High protection level
IP



Reverse polarity protection

Robust

- The titanium-anodised aluminium housing and the stainless steel wires allow for using the mechanics even in harsh conditions
- Wear-free wire exit thanks to special plain bearing guide

Versatile

- High traverse speed, up to 10 m/s
- High acceleration, up to 300 m/s²
- Quick fastening by means of 2 screws
- Various connection possibilities available

Order code with encoder

D8.6A1 . XXXX . XX XX . XXXX
Type a b c d e

a Measuring range
0025 = 250 mm
0050 = 500 mm
0125 = 1250 mm
other measuring ranges on request

b Encoder used
36 = Sendix incremental 3610
F3 = Sendix absolute F3663, SSI
F8 = Sendix absolute F3668, CANopen

c Output circuit
depends on the encoder used

e Resolution / Protocol / Options
depends on the encoder used

d Type of connection
depends on the encoder used

Standard resolutions for draw wire with incremental encoder Sendix 3610, drum circumference 125 mm

	125	1250	2500
Pulses / revolution	125	1250	2500
Pulses / mm	1	10	20
Resolution (mm)	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix F3663 or F3668 CANopen, drum circumference 125 mm

Absolute encoder	F3663	F3668 CANopen
Pulses / revolution	4096 / 12 bit	4096, programmable via the bus / 12 bit
Pulses / mm	32.8	32.8
Resolution (mm)	~ 0.03	~ 0.03

Recommended standard devices

Order No. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol
D8.6A1.XXXX.3642.1250	3610 (8.3610.2342.1250)	PushPull with inv. signal	8...30 V DC	cable radial 2 m [6.56"]	1250 ppr
D8.6A1.XXXX.F321.G222	Sendix F3663 (8.F3663.4121.G222)	SSI	10...30 V DC	cable tangential 1 m [3.28"]	4096 ppr / SSI-Gray code
D8.6A1.XXXX.F821.2112	Sendix F3668 (8.F3663.4121.2112)	CANopen	10...30 V DC	cable tangential 1 m [3.28"]	CANopen encoder profile V3.2

Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor	Draw wire encoder A50	Measuring length max. 1.25 m Traverse speed max. 10 m/s
--	------------------------------	--

Order code with analogue sensor	D8.3A1 . XXXX . XXX X . 0000
Type	<div style="display: flex; justify-content: space-around;"> a b c </div>

a <i>Measuring range</i>	b <i>Analogue sensor output / Power supply</i>	c <i>Type of connection</i>
0025 = 250 mm 0050 = 500 mm 0125 = 1250 mm other measuring ranges on request	A11 = 4 ... 20 mA / 12 ... 30 V DC A22 = 0 ... 10 V / 12 ... 30 V DC A33 = Potentiometer 1 kΩ / max. 30 V DC	1 = cable axial, 2 m [6.56'] PVC cable 3 = M12 connector, 4-pin, axial

Guide pulley for draw wire encoder	Order No.
	8.0000.7000.0045 Order code for the set: - Guide pulley (anodised aluminium) - 2 x countersunk screws for lateral fixing - 2 x hexagonal screws for fixing on a flat surface

Connection technology for analogue sensor		
Connector, self-assembly (straight)	M12 female connector with coupling nut	8.0000.5116.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6081.2211.002M

Technical data

Mechanical characteristics (draw wire mechanics)				
Measuring range		250 mm	500 mm	1250 mm
Extension force	F_{min}	6.8 N	3.4 N	4.1 N
	F_{max}	7.9 N	4.0 N	5.4 N
Max. speed		8 m/s	8 m/s	10 m/s
Max. acceleration		200 m/s ²	200 m/s ²	300 m/s ²
Linearity (of the measuring range)	analogue output	±0.15 %	±0.1 %	±0.1 %
	with encoder	±0.05 %	±0.05 %	±0.05 %
Weight		approx. 330 g [11.64 oz] (depending on the sensor / encoder used)		
Material	housing	titanium-anodised aluminium		
	wire	stainless steel ø 0.5 mm		
Protection (sensor)		IP65 (IP67 on request for encoders)		

Electrical characteristics (digital output)
The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders

Operating principle

Construction
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.

Electrical characteristics (analogue output)			
Analogue output	0 ... 10 V	4 ... 20 mA	Potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]
Connection diagrams			
CE-compliant acc. to	EMC guideline 2004/108/EC		
RoHS-compliant acc. to	guideline 2002/95/EC		

Linear Measuring Technology

**Draw wire mechanics
with encoder or analogue sensor**

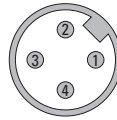
Draw wire encoder A50

**Measuring length max. 1.25 m
Traverse speed max. 10 m/s**

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 k Ω	+V	Slider	0 V	n. c.

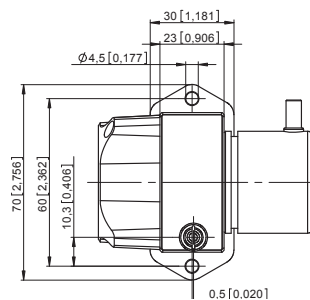
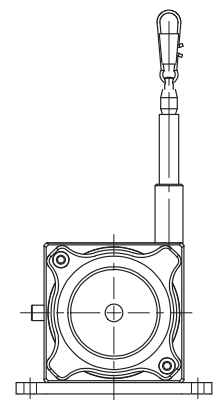
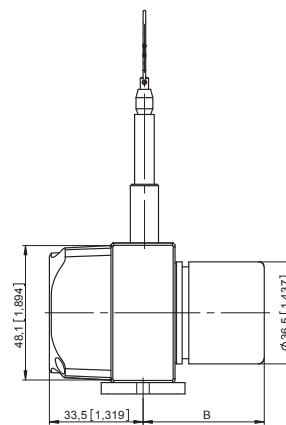
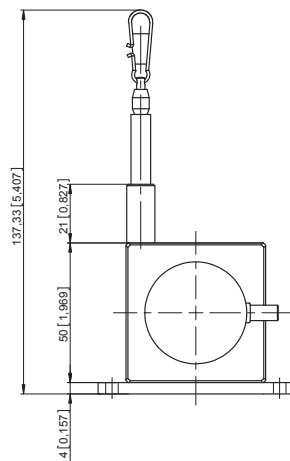
Connector (analogue output)



Dimensions

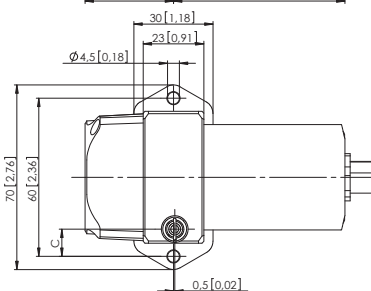
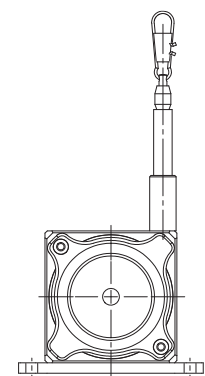
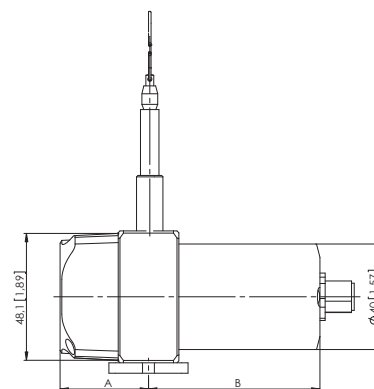
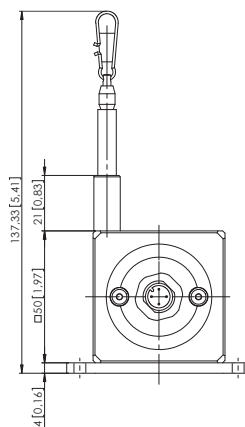
Dimensions in mm [inch]

Draw wire mechanics with encoder



Encoder type	Measuring length	B
Incremental	250 ... 1250 mm	43.0 [1.69]
Absolute	250 ... 1250 mm	53.7 [2.11]

Draw wire mechanics with analogue sensor



Sensor type	Measuring length	A	B	C
Potentiometer	250 mm	26.5 [1.04]	65 [2.56]	21.3 [0.84]
	500 mm	26.5 [1.04]	65 [2.56]	21.3 [0.84]
	1250 mm	33.5 [1.32]	65 [2.56]	10.3 [0.41]
4 ... 20 mA	250 mm	26.5 [1.04]	78.5 [3.09]	21.3 [0.84]
	500 mm	26.5 [1.04]	78.5 [3.09]	21.3 [0.84]
	1250 mm	33.5 [1.32]	78.5 [3.09]	10.3 [0.41]

Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor

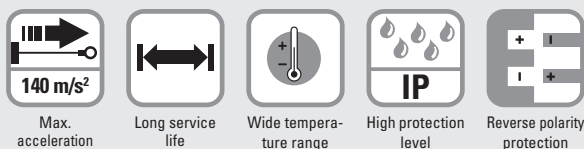
Draw wire encoder B80

**Measuring length max. 3 m
Traverse speed max. 10 m/s**



The draw wire mechanics B80 can be used up to a measuring length of 3 metres.

These draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analogue sensors.



Robust

- The titanium-anodised aluminium housing and the stainless steel wires allow for using the mechanics even in harsh conditions
- Wear-free wire exit thanks to special plain bearing guide

Versatile

- High traverse speed, up to 10 m/s
- High acceleration, up to 140 m/s²
- Quick fastening by means of 2 screws
- Various connection possibilities available

Linear Measuring Technology

Order code with encoder

D8.4B1	.XXXX	.XX	XX	.XXXX
Type	a	b	c d	e

a Measuring range

0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm
other measuring ranges on request

b Encoder used

00 = Sendix incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868

c Output circuit

depends on the encoder used

d Type of connection

depends on the encoder used

e Resolution / Protocol / Options

depends on the encoder used

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 200 mm

	200	2000	4000
Pulses / revolution	200	2000	4000
Pulses / mm	1	10	20
Resolution (mm)	1	0.1	0.05

Standard resolutions for draw wire with absolute encoder Sendix F5863 / F5868 or 5863 / 5868, drum circumference 200 mm

	F5863 / 5863	F5868 / 5868
Absolute encoder	F5863 / 5863	F5868 / 5868
Pulses / revolution	2048 / 11 bit	4096, programmable via the bus / 12 bit
Pulses / mm	10.24	20.48
Resolution (mm)	-0.1	~ 0.05

Recommended standard devices

Order No. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Options
D8.4B1.XXXX.0054.2000	Sendix 5000 (8.5000.8354.2000)	PushPull mit with inv. signal	10...30 V DC	1 x M12 connector radial	2000 ppr	no option
D8.4B1.XXXX.F324.G123	Sendix F5863 (8.F5863.1224.G123)	SSI	10...30 V DC	1 x M23 connector radial	SSI-Gray-Code	Set button + Status LED
D8.4B1.XXXX.6324.G123	Sendix 5863 (8.5863.1224.G123)	SSI	10...30 V DC	1 x M23 connector radial	SSI-Gray-Code	Set button + Status LED
D8.4B1.XXXX.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10...30 V DC	1 x M23 connector radial	CANopen encoder profile DS406 V3.2	Set button
D8.4B1.XXXX.6822.2113	Sendix 5868 (8.5868.1222.2113)	CANopen	10...30 V DC	3 x M23 connector radial	CANopen encoder profile DS406 V3.2	Set button
D8.4B1.XXXX.6832.3113	Sendix 5868 (8.5868.1232.3113)	Profibus	10...30 V DC	3 x M23 connector radial	PROFIBUS DP V0 encoder profile Class 2	Set button
D8.4B1.XXXX.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10...30 V DC	3 x M23 connector radial	CANopen encoder profile 3.2.10 CoE	no option
D8.4B1.XXXX.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	Profinet	10...30 V DC	3 x M23 connector radial	PROFINET encoder profile version 4.1	no option

Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor

Draw wire encoder B80

**Measuring length max. 3 m
Traverse speed max. 10 m/s**

Order code with analogue sensor

D8.3B1 . XXXX . XXX X . 0000
Type a b c

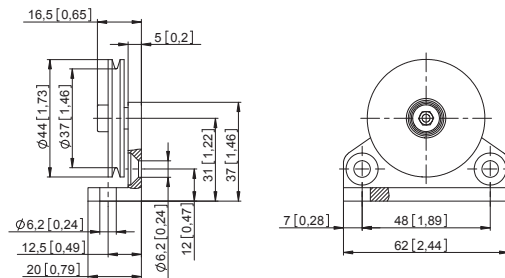
a Measuring range
0100 = 1000 mm
0200 = 2000 mm
0300 = 3000 mm
other measuring ranges on request

b Analogue sensor output / Power supply
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = Potentiometer 1 kΩ / max. 30 V DC

c Type of connection
1 = cable axial, 2 m [6.56'] PVC cable
3 = M12 connector, 4-pin

Guide pulley for draw wire encoder

Order No.



Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analogue sensor

Connector, self-assembly (straight)

M12 female connector with coupling nut

8.0000.5116.0000

Cordset, pre-assembled

M12 female connector with coupling nut, 2 m [6.56'] PVC cable

05.00.6081.2211.002M

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range	1000 mm	2000 mm	3000 mm
Extension force	F _{min} 6.9 N	6.4 N	6.9 N
	F _{max} 8.3 N	7.8 N	9.8 N
Max. speed	10 m/s	10 m/s	10 m/s
Max. acceleration	140 m/s ²	140 m/s ²	140 m/s ²
Linearity (of the measuring range)	analogue output ±0.15 %	±0.1 %	±0.1 %
	with encoder ±0.05 %	±0.05 %	±0.05 %
Weight	approx. 750 g [26.45 oz] (depending on the sensor/encoder used)		
Material	housing	titanium-anodised aluminium	
	wire	stainless steel ø 0.5 mm (ø 1 mm can be supplied as a special up to measuring range 1500 mm)	
Protection (sensor)	IP65 (IP67 on request for encoders)		

Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

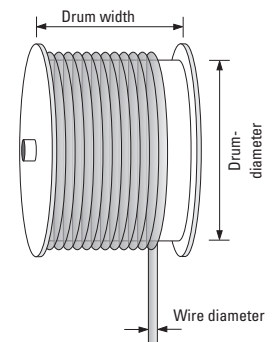
Operating principle

Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note

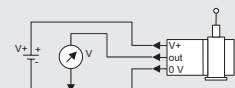
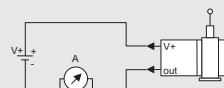
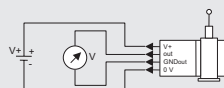
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Electrical characteristics (analogue output)

Analogue output	0 ... 10 V	4 ... 20 mA	Potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]

Connection diagrams



CE compliant acc. to

EMC guideline 2004/108/EC

RoHS compliant acc. to

guideline 2002/95/EC

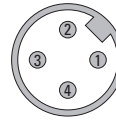
Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor	Draw wire encoder B80	Measuring length max. 3 m Traverse speed max. 10 m/s
--	------------------------------	---

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

Connector (analogue output)

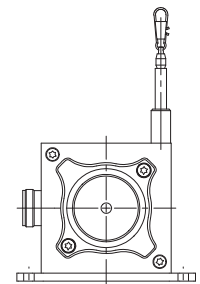
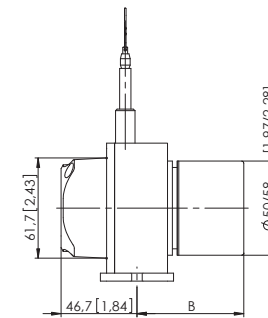
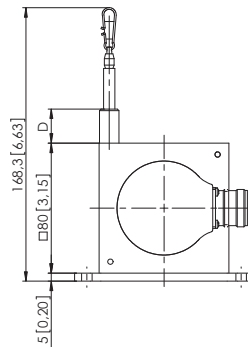


Dimensions

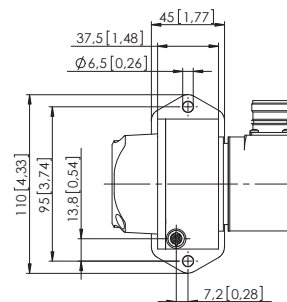
Dimensions in mm [inch]

Draw wire mechanics with encoder

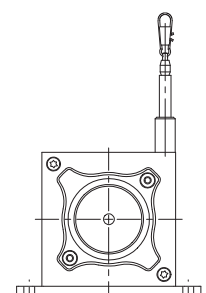
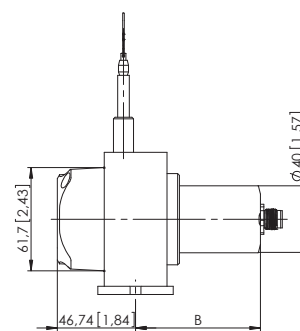
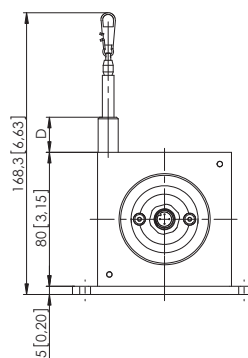
Measuring range	D
1000 mm	21 [0.83]
2000 mm	35 [1.38]
3000 mm	35 [1.38]



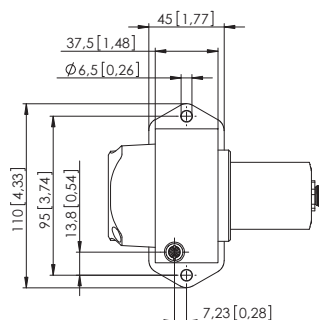
Dimension B depends on the encoder used	
Encoder	B
Sendix incremental (5000) D8.4B1.XXXX.00XX.XXXX	54.25 [2.12]
Sendix absolute (5863) D8.4B1.XXXX.63XX.XXXX	66.75 [2.63]
Sendix absolute (5868) D8.4B1.XXXX.68XX.XXXX	93.25 [3.67]



Draw wire mechanics with analogue sensor



Sensor type	Measuring length	B	D
Potentiometer	1000 mm	74 [2.91]	21 [0.83]
	2000 mm	74 [2.91]	21 [0.83]
	3000 mm	102.5 [4.04]	65 [2.56]
4 ... 20 mA	1000 mm	87.5 [3.44]	21 [0.83]
	2000 mm	87.5 [3.44]	21 [0.83]
	3000 mm	102.3 [4.03]	78.5 [3.09]



Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor

Draw wire encoder C120

**Measuring length max. 6 m
Traverse speed max. 10 m/s**

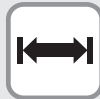


These draw wire mechanics C120 can be used up to a measuring length of 6 metres.

This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analogue sensors.



Max. acceleration



Long service life



Wide temperature range



High protection level



Reverse polarity protection

Robust

- The titanium-anodised aluminium housing and the stainless steel wires allow for using the mechanics even in harsh conditions
- Wear-free wire exit thanks to special plain bearing guide

Versatile

- High traverse speed, up to 10 m/s
- High acceleration, up to 140 m/s²
- Quick fastening by means of 2 screws
- Various connection possibilities available

Order code with encoder

D8.4C1 . 0600 . XX XX . XXXX
Type a b c d e

a *Measuring range*
0600 = 6000 mm
other measuring ranges on request

b *Encoder used*
00 = Sendix incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868

c *Output circuit*
depends on the encoder used

e *Resolution / Protocol / Options*
depends on the encoder used

d *Type of connection*
depends on the encoder used

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 317.68 mm

Pulses / revolution	500	2000
Pulses / mm	1.6	6.3
Resolution (mm)	~ 0.63	~ 0.16

Standard resolutions for draw wire with absolute encoder Sendix F5863 or F5868 / 5863 or 5868, drum circumference 317.68 mm

Absolute encoder	F5863 / 5863	F5868 / 5868
Pulses / revolution	2048 / 11 bit	4096, programmable via the bus / 12 bit
Pulses / mm	6.4	12.9
Resolution (mm)	~ 0.16	~ 0.08

Recommended standard devices


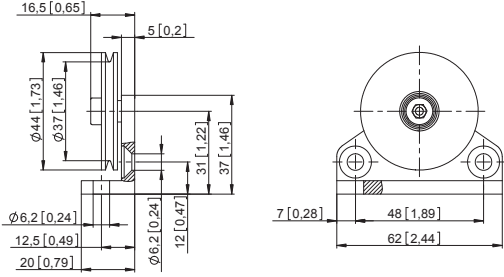
Order No. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Options
D8.4C1.XXXX.0054.2000	Sendix 5000 (8.5000.8354.2000)	PushPull mit with inv. signal	10...30 V DC	1 x M12 connector radial	2000 ppr	no option
D8.4C1.XXXX.F324.G123	Sendix F5863 (8.F5863.1224.G123)	SSI	10...30 V DC	1 x M23 connector radial	SSI-Gray-Code	Set button + Status LED
D8.4C1.XXXX.6324.G123	Sendix 5863 (8.5863.1224.G123)	SSI	10...30 V DC	1 x M23 connector radial	SSI-Gray-Code	Set button + Status LED
D8.4C1.XXXX.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10...30 V DC	1 x M23 connector radial	CANopen encoder profile DS406 V3.2	Set button
D8.4C1.XXXX.6822.2113	Sendix 5868 (8.5868.1222.2113)	CANopen	10...30 V DC	3 x M23 connector radial	CANopen encoder profile DS406 V3.2	Set button
D8.4C1.XXXX.6832.3113	Sendix 5868 (8.5868.1232.3113)	Profibus	10...30 V DC	3 x M23 connector radial	PROFIBUS DP V0 encoder profile Class 2	Set button
D8.4C1.XXXX.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10...30 V DC	3 x M23 connector radial	CANopen encoder profile 3.2.10 CoE	no option
D8.4C1.XXXX.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	Profinet	10...30 V DC	3 x M23 connector radial	PROFINET encoder profile version 4.1	no option

Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor	Draw wire encoder C120	Measuring length max. 6 m Traverse speed max. 10 m/s
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Order code with analogue sensor	D8.3C1 . 0600 . XXX X . 0000
Type	a b c

- | | | |
|---|---|---|
| <p>a <i>Measuring range</i>
0600 = 6000 mm
other measuring ranges on request</p> | <p>b <i>Analogue 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 = cable axial, 2 m [6.56'] PVC cable
3 = M12 connector, 4-pin</p> |
|---|---|---|

Guide pulley for draw wire encoder	Order No.		
		<p>Order code for the set: - Guide pulley (anodised aluminium) - 2 x countersunk screws for lateral fixing - 2 x hexagonal screws for fixing on a flat surface</p>	<p>8.0000.7000.0045</p>

Connection technology for analogue sensor		
Connector, self-assembly (straight)	M12 female connector with coupling nut	8.0000.5116.0000
Cordset, pre-assembled	M12 female connector with coupling nut, 2 m [6.56'] PVC cable	05.00.6081.2211.002M

Technical data

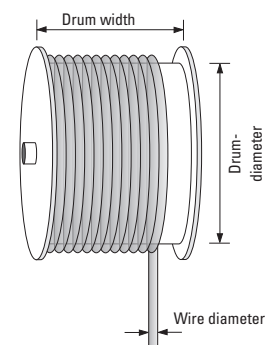
Mechanical characteristics (draw wire mechanics)	
Measuring range	6000 mm
Extension force	F_{min} 8.8 N F_{max} 12.3 N
Max. speed.	10 m/s
Max. acceleration	140 m/s ²
Linearity	analogue output ±0.1 % (of the measuring range) with encoder ±0.05 % (of the measuring range)
Weight	approx. 1600 g [56.44 oz] (depending on the sensor/encoder used)
Material	housing titanium-anodised aluminium wire stainless steel ø 0.5 mm (ø 1 mm can be supplied as a special up to measuring range 1500 mm)
Protection (sensor)	IP65 (IP67 on request for encoders)

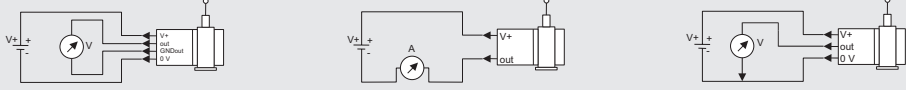
Electrical characteristics (digital output)
The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders

Operating principle

Construction
The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note
Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Electrical characteristics (analogue output)			
Analogue output	0 ... 10 V	4 ... 20 mA	Potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]
Connection diagrams			
CE compliant acc. to	EMC guideline 2004/108/EC		
RoHS compliant acc. to	guideline 2002/95/EC		

Linear Measuring Technology

**Draw wire mechanics
with encoder or analogue sensor**

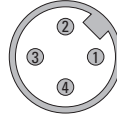
Draw wire encoder C120

**Measuring length max. 6 m
Traverse speed max. 10 m/s**

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

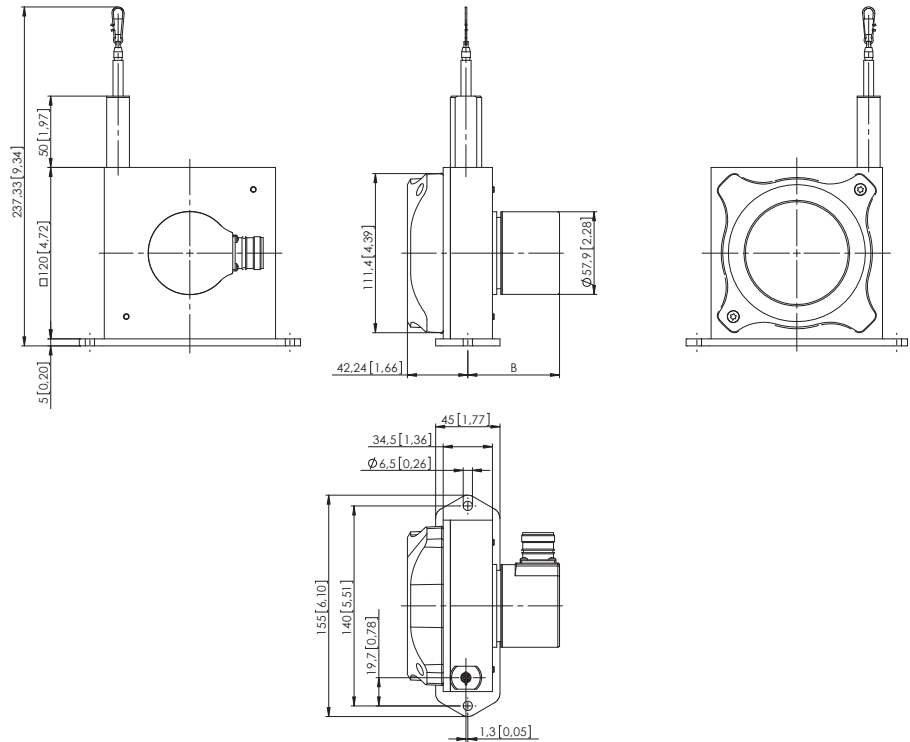
Connector (analogue output)



Dimensions

Dimensions in mm [inch]

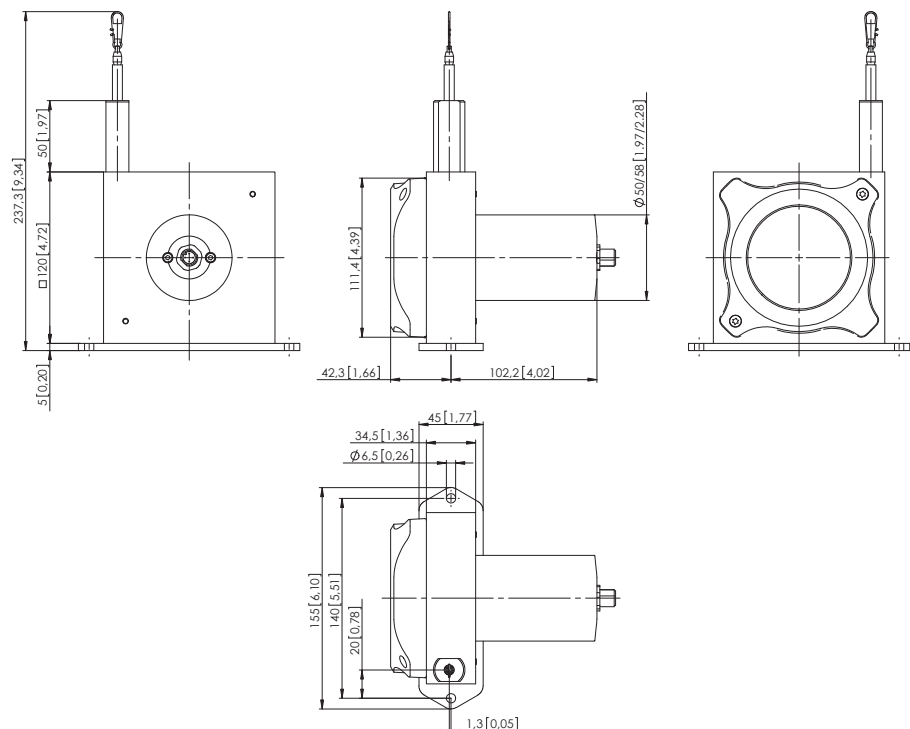
Draw wire mechanics with encoder



Dimension **B** depends on the encoder used

Encoder	B
Sendix incremental (5000) D8.4C1.XXXX.00XX.XXXX	54.25 [2.12]
Sendix absolute (5863) D8.4C1.XXXX.63XX.XXXX	66.75 [2.63]
Sendix absolute (5868) D8.4C1.XXXX.68XX.XXXX	93.25 [3.67]

Draw wire mechanics with analogue sensor



Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor **Draw wire encoder D135** **Measuring length max. 42.5 m**
Traverse speed max. 5 m/s



These draw wire mechanics D135 can be used up to a measuring length of 42.5 metres.

This draw wire mechanics may be combined with the proven Kübler Sendix encoders with incremental or absolute interface, as well as with analogue sensors.

With its compact construction, the D135 suits perfectly all measuring tasks from 8 up to 42.5 metres.



Max. acceleration 140 m/s ²	Long service life	Temperature -20°C...+90°C	High protection level IP	Reverse polarity protection

Robust

- The titanium-anodised aluminium housing and the stainless steel wires allow for using the mechanics even in harsh conditions
- Wear-free wire exit thanks to special plain bearing guide

Versatile

- High traverse speed and high acceleration
- Flexible mounting thanks to fastening tabs or fastening grooves
- Various connection possibilities available

Linear Measuring Technology

Order code with encoder **D8.4D1 . XXXX . XXXX . XXXX**

Type a b c d e

a Measuring range

0800 = 8 000 mm	3000 = 30 000 mm
1000 = 10 000 mm	3500 = 35 000 mm
1200 = 12 000 mm	4000 = 40 000 mm
1500 = 15 000 mm	4250 = 42 500 mm
2000 = 20 000 mm	other measuring ranges on request
2500 = 25 000 mm	

b Encoder used

00 = Sendix incremental 5000
F3 = Sendix absolute F5863
63 = Sendix absolute 5863
F8 = Sendix absolute F5868
68 = Sendix absolute 5868

c Output circuit depends on the encoder used

d Type of connection depends on the encoder used

e Resolution / Protocol / Options depends on the encoder used

Standard resolutions for draw wire with incremental encoder Sendix 5000, drum circumference 333.33 mm (357.14 mm for the 8 000 mm measuring range)		
Pulses / revolution	500	2000
Pulses / mm	1.5 (1.4)	6 (5.6)
Resolution (mm)	~ 0.66 (0.71)	~ 0.17 (0.18)

Standard res. for draw wire with absolute encoder Sendix F5863 or F5868 – 5863 or 5868, drum circumference 333.33 mm (357.14 mm for the 8 000 mm measuring range)		
Absolute encoder	F5863 / 5863	F5868 / 5868
Pulses / revolution	2048 / 11 bit	4096, programmable via the bus / 12 bit
Pulses / mm	6.14 (5.73)	12.28 (11.47)
Resolution (mm)	~ 0.16 (0.17)	~ 0.08 (0.09)

Recommended standard devices

Order No. draw wire encoder	Mounted encoder	Interface	Power supply	Type of connection	Resolution / Protocol	Options
D8.4D1.XXXX.0054.2000	Sendix 5000 (8.5000.8354.2000)	PushPull mit with inv. signal	10...30 V DC	1 x M12 connector radial	2000 ppr	no option
D8.4D1.XXXX.F324.G123	Sendix F5863 (8.F5863.1224.G123)	SSI	10...30 V DC	1 x M23 connector radial	SSI-Gray-Code	Set button + Status LED
D8.4D1.XXXX.6324.G123	Sendix 5863 (8.5863.1224.G123)	SSI	10...30 V DC	1 x M23 connector radial	SSI-Gray-Code	Set button + Status LED
D8.4D1.XXXX.F82E.2123	Sendix F5868 (8.F5868.122E.2123)	CANopen	10...30 V DC	1 x M23 connector radial	CANopen encoder profile DS406 V3.2	Set button
D8.4D1.XXXX.6822.2113	Sendix 5868 (8.5868.1222.2113)	CANopen	10...30 V DC	3 x M23 connector radial	CANopen encoder profile DS406 V3.2	Set button
D8.4D1.XXXX.6832.3113	Sendix 5868 (8.5868.1232.3113)	Profibus	10...30 V DC	3 x M23 connector radial	PROFIBUS DP V0 encoder profile Class 2	Set button
D8.4D1.XXXX.68B2.B212	Sendix 5868 (8.5868.12B2.B212)	EtherCAT	10...30 V DC	3 x M23 connector radial	CANopen encoder profile 3.2.10 CoE	no option
D8.4D1.XXXX.68C2.C212	Sendix 5868 (8.5868.12C2.C212)	Profinet	10...30 V DC	3 x M23 connector radial	PROFINET encoder profile version 4.1	no option

Linear Measuring Technology

**Draw wire mechanics
with encoder or analogue sensor**

Draw wire encoder D135

**Measuring length max. 42.5 m
Traverse speed max. 5 m/s**

**Order code
with analogue sensor**

D8.3D1 . XXXX . XXX X . 0000
Type a b c

a Measuring range

0800 = 8 000 mm 3000 = 30 000 mm
1000 = 10 000 mm 3500 = 35 000 mm
1500 = 15 000 mm 4000 = 40 000 mm
2000 = 20 000 mm other measuring ranges
2500 = 25 000 mm on request

b Analogue sensor output / Power supply

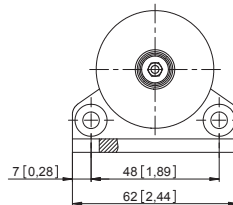
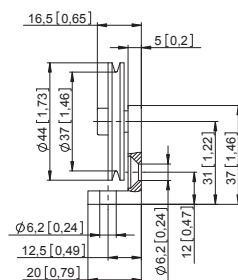
A11 = 4 ... 20 mA / 12 ... 30 V DC
A22 = 0 ... 10 V / 12 ... 30 V DC
A33 = Potentiometer 1 kΩ / max. 30 V DC

c Type of connection

1 = cable axial, 2 m [6.56'] PVC cable
3 = M12 connector, 4-pin

Guide pulley for draw wire encoder

Order No.



Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Connection technology for analogue sensor

Connector, self-assembly (straight)

M12 female connector with coupling nut

8.0000.5116.0000

Cordset, pre-assembled

M12 female connector with coupling nut, 2 m [6.56'] PVC cable

05.00.6081.2211.002M

Technical data

Mechanical characteristics (draw wire mechanics)

Measuring range	8000 mm	10000 mm 12000 mm 15000 mm	20000 mm	25000 mm 30000 mm	35000 mm 40000 mm 42500 mm
Extension force	F_{min}	7.2 N	8.7 N	7.0 N	7.3 N
	F_{max}	16.0 N	16.9 N	12.4 N	15.7 N
Max. speed	10 m/s	6 m/s	5 m/s	5 m/s	5 m/s
Max. acceleration	140 m/s ²	80 m/s ²	60 m/s ²	60 m/s ²	60 m/s ²
Linearity	analogue output	± 0.1 % (of the measuring range)			
	encoder	± 0.05 % (of the measuring range)			
Weight	depending on the measuring and the sensor/encoder used				
Material	housing	titanium-anodised aluminium			
	wire	stainless steel ϕ 0.5 mm (ϕ 1 mm can be supplied as a special up to measuring range 1500 mm)			
Protection (sensor)	IP65 (IP67 on request for encoders)				

Electrical characteristics (digital output)

The electrical characteristics of the draw wire mechanics with digital output can be found in the data sheets of the encoders.

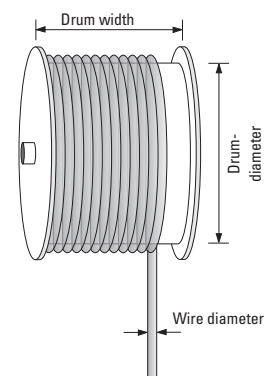
Operating principle

Construction

The core of a draw wire device is a drum mounted on bearings, onto which a wire is wound. Winding takes place via a spring-loaded device.

Note

Exceeding the maximum extension length of the draw wire will lead to damage to the wire and the mechanics.



Linear Measuring Technology

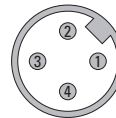
Draw wire mechanics with encoder or analogue sensor **Draw wire encoder D135** **Measuring length max. 42.5 m**
Traverse speed max. 5 m/s

Electrical characteristics (analogue output)			
Analogue output	0 ... 10 V	4 ... 20 mA	Potentiometer
Output	0 ... 10 V / galv. isolated, 4 conductors	4 ... 20 mA / 2 conductors	1 kΩ
Power supply	12 ... 30 V DC	12 ... 30 V DC	max. 30 V DC
Recommended slider current	–	–	< 1 μA
Max. current consumption	22.5 mA (no load)	50 mA	–
Reverse polarity protection	yes	yes	–
Working temperature	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +60°C [-4°F ... +140°F]	-20°C ... +85°C [-4°F ... +185°F]
Connection diagrams			
CE compliant acc. to	EMC guideline 2004/108/EC		
RoHS compliant acc. to	guideline 2002/95/EC		

Terminal assignment (analogue output)

Pin	1	2	3	4
Cable colour	BN	WH	BU	BK
0 ... 10 V	+V	Signal	0 V	0 V Sig.
4 ... 20 mA	+V	n. c.	Signal	n. c.
1 kΩ	+V	Slider	0 V	n. c.

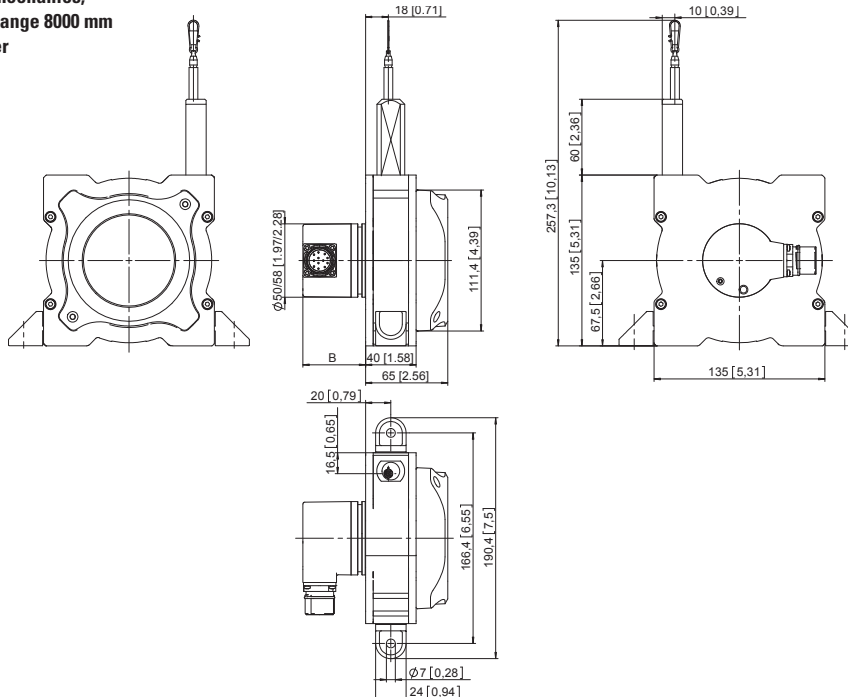
Connector (analogue output)



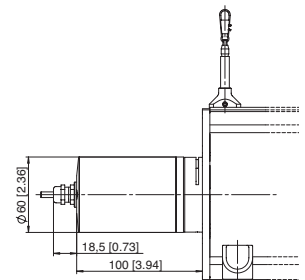
Dimensions

Dimensions in mm [inch]

Draw wire mechanics, Measuring range 8000 mm with encoder



with analogue output



Dimension B depends on the encoder used	
Encoder	B
Sendix incremental (5000) D8.4D1.XXXX.00XX.XXXX	37.00 [1.46]
Sendix absolute (5863) D8.4D1.XXXX.63XX.XXXX	49.50 [1.95]
Sendix absolute (5868) D8.4D1.XXXX.68XX.XXXX	76.00 [2.99]

Linear Measuring Technology

**Draw wire mechanics
with encoder or analogue sensor**

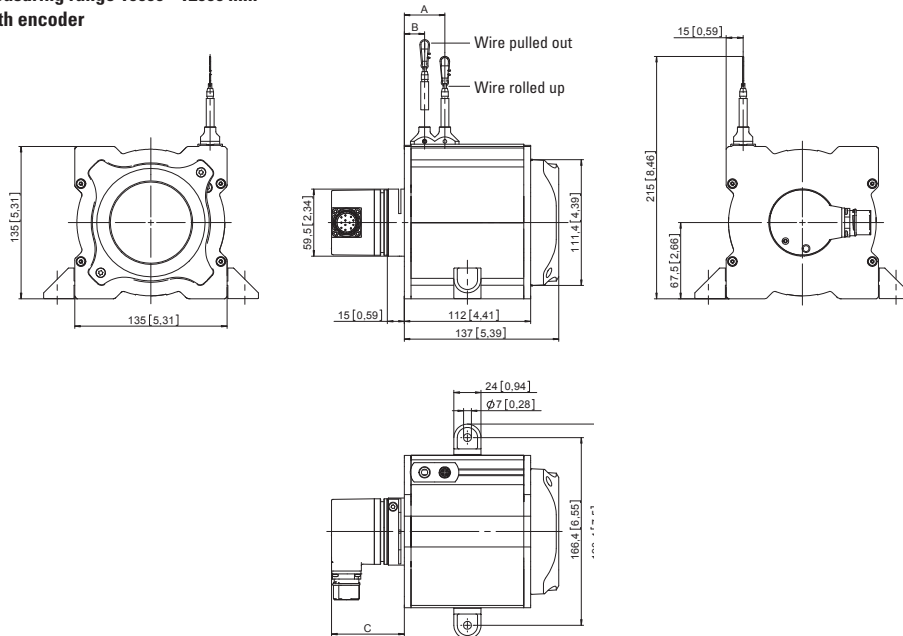
Draw wire encoder D135

**Measuring length max. 42.5 m
Traverse speed max. 5 m/s**

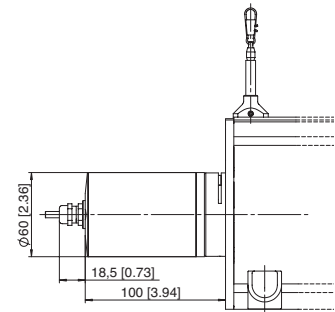
Dimensions

Dimensions in mm [inch]

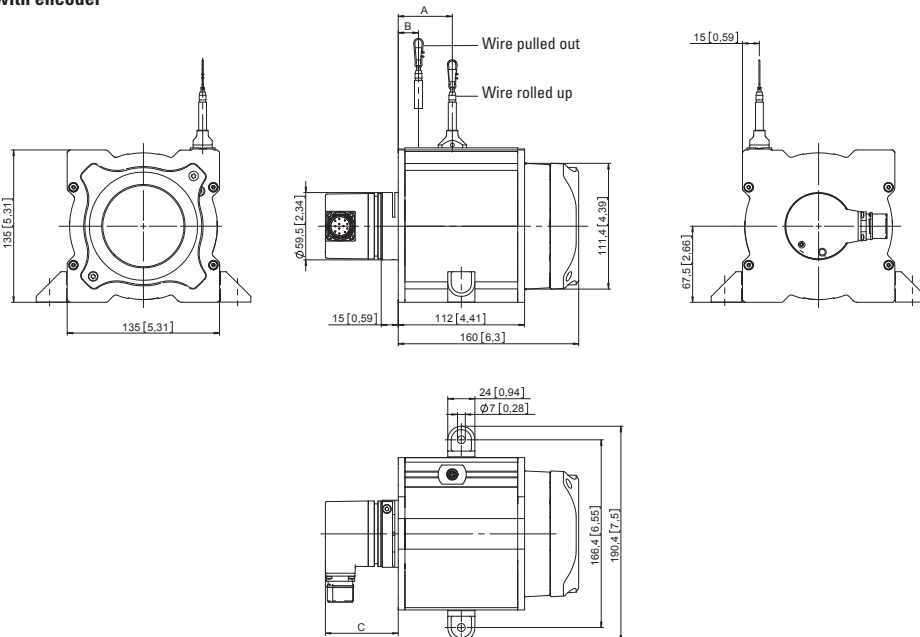
**Draw wire mechanics,
Measuring range 10000 - 12000 mm
with encoder**



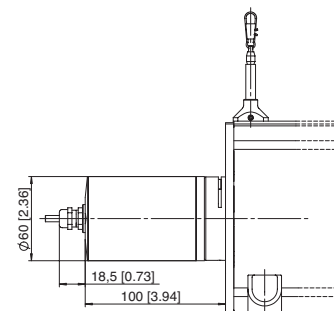
with analogue output



**Draw wire mechanics,
Measuring range 15000 - 20000 mm
with encoder**



with analogue output



Dimension C depends on the encoder used	
Encoder	C
Sendix incremental (5000) D8.4D1.XXXX.00XX.XXXX	37.00 [1.46]
Sendix absolute (5863) D8.4D1.XXXX.63XX.XXXX	49.50 [1.95]
Sendix absolute (5868) D8.4D1.XXXX.68XX.XXXX	76.00 [2.99]

Measuring range	A - Wire rolled up	B - Wire pulled out
10000 mm	33 [1.30]	18 [0.71]
12000 mm	36 [1.42]	18 [0.71]
15000 mm	41 [1.61]	18 [0.71]
20000 mm	48 [1.89]	18 [0.71]

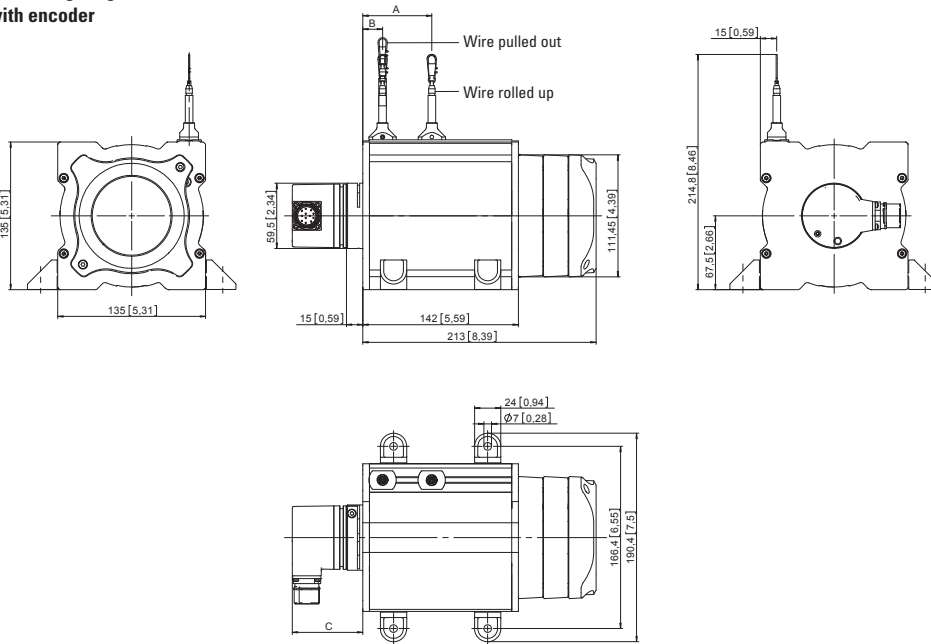
Linear Measuring Technology

Draw wire mechanics with encoder or analogue sensor	Draw wire encoder D135	Measuring length max. 42.5 m Traverse speed max. 5 m/s
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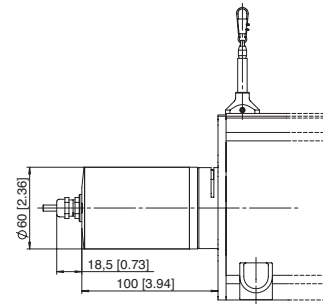
Dimensions

Dimensions in mm [inch]

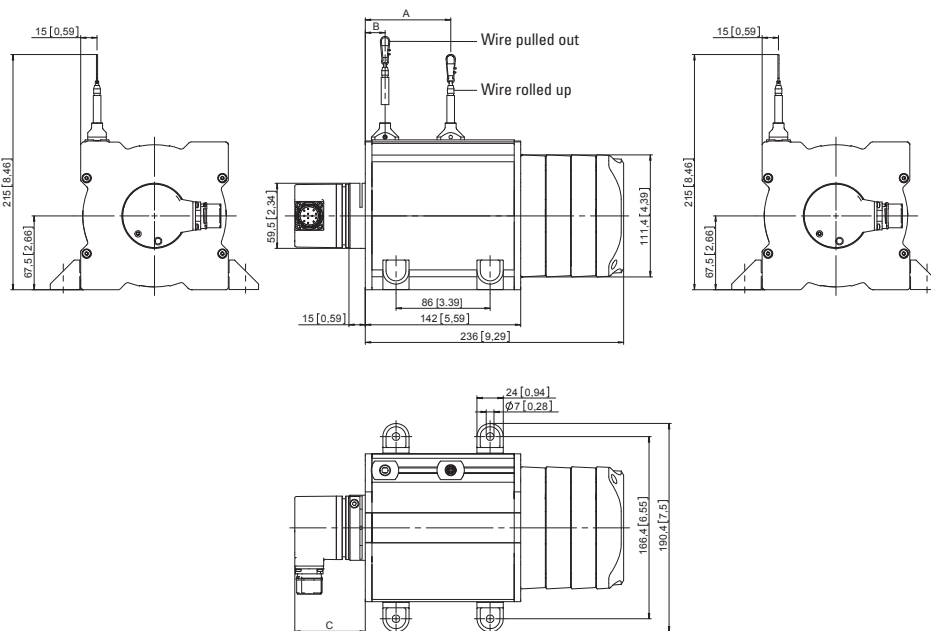
**Draw wire mechanics,
Measuring range 25000 - 30000 mm
with encoder**



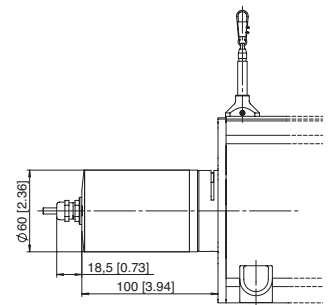
with analogue output



**Draw wire mechanics,
Measuring range 35000 - 42500 mm
with encoder**



with analogue output



Dimension C depends on the encoder used	
Encoder	C
Sendix incremental (5000) D8.4D1.XXXX.00XX.XXXX	37.00 [1.46]
Sendix absolute (5863) D8.4D1.XXXX.63XX.XXXX	49.50 [1.95]
Sendix absolute (5868) D8.4D1.XXXX.68XX.XXXX	76.00 [2.99]

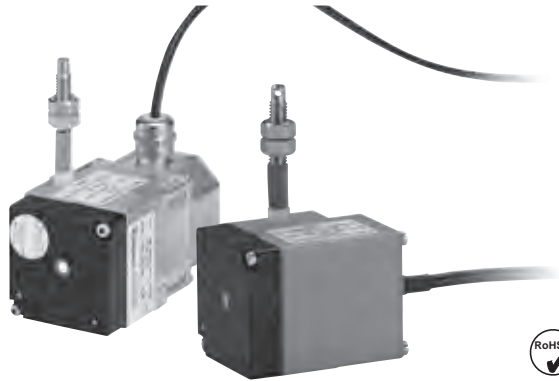
Measuring range	A - Wire rolled up	B - Wire pulled out
25000 mm	56 [2.20]	18 [0.71]
30000 mm	63 [2.48]	18 [0.71]
35000 mm	71 [2.80]	18 [0.71]
40000 mm	78 [3.07]	18 [0.71]
42500 mm	82 [3.23]	18 [0.71]

Linear Measuring Technology

Draw wire mechanics with analogue sensor

**Draw wire encoder A40, 1 m
Draw wire encoder A41, 2 m**

**Measuring length max. 2 m
Traverse speed max. 1 m/s**



The draw wire encoders A40 and A41 with analogue output is characterised by its compact design. They are available with a potentiometer, voltage or current output.



Compact and simple

- Measuring length up to 2000 mm
- For applications with a low traversing speed
- Easy to install

Order code **D5.350 X . AXX X . 0000**
draw wire encoder

Type **a** **b** **c**

a Measuring range

- 1 = 1000 mm
- 2 = 2000 mm

b Output circuit

- 11 = analogue output 4 ... 20 mA
- 22 = analogue output 0 ... 10 V DC power supply 15 ... 28 V DC
- 33 = potentiometer output 10 kΩ

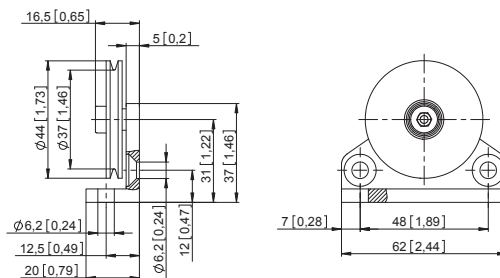
c Type of connection

- 1 = cable 2 m [6.56'] for measuring range 1000 mm: axial for measuring range 2000 mm: radial
- 2 = M12 connector, 4-pin, radial (only available for measuring range 2000 mm)

Accessories for draw wire encoder

Order No.

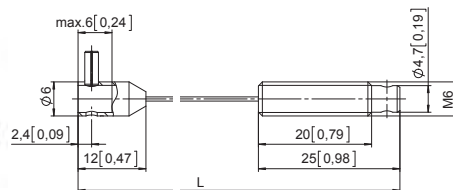
Guide pulley



- Order code for the set:
- Guide pulley (anodised aluminium)
 - 2 x countersunk screws for lateral fixing
 - 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



- Steel wire 2 m [6.56']
- Steel wire 5 m [16.40']
- Steel wire 10 m [32.81']
- Paraleine 2 m [6.56']

8.0000.7000.0033
8.0000.7000.0034
8.0000.7000.0035
8.0000.7000.0032

Linear Measuring Technology

Draw wire mechanics with analogue sensor	Draw wire encoder A40, 1 m	Measuring length max. 2 m
	Draw wire encoder A41, 2 m	Traverse speed max. 1 m/s

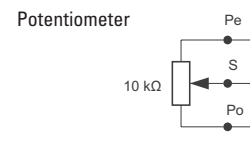
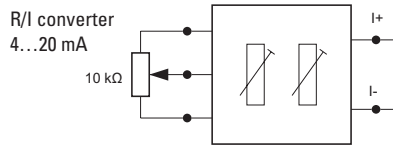
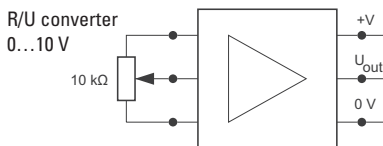
Technical data

Mechanical characteristics (draw wire mechanics)		
Measuring range	1000 mm (A40)	2000 mm (A41)
Speed max.	0.8 m/s	1 m/s
Working temperature	0°C ... 50°C [+32°F ... +122°F]	-10°C ... +80°C [+14°F ... +176°F]
Protection	IP50	IP65
Weight	approx. 200 g [7.06 oz]	approx. 320 g [11.29 oz]
Extension force F_{min}	2 N	
Repeat accuracy	± 0.15 mm	
Linearity	± 0.35 %	
Material	housing plastic / zinc die cast	wire stainless-steel \varnothing 0.45 mm plastic-coated

Electrical characteristics			
Analogue output	0 ... 10 V	4 ... 20 mA	Potentiometer 10 k Ω
Power supply	15 ... 28 V DC	–	–
Operating range	–	15 ... 28 V DC	max. 48 V DC
Temperature range	0°C ... 50°C [+32°F ... +122°F]	0°C ... 50°C [+32°F ... +122°F]	0°C ... 50°C [+32°F ... +122°F]
Load	max 500 Ω	max 500 Ω	–
CE compliant acc. to	EMC guideline 2004/108/EC		
RoHS guideline acc. to	guideline 2002/95/EC		

Terminal assignment

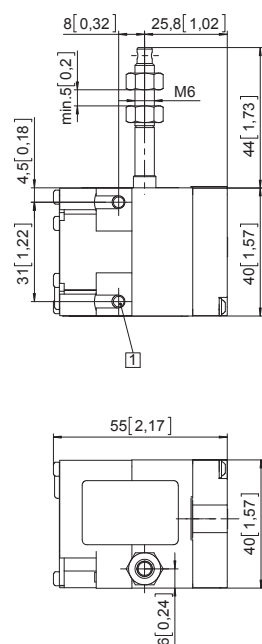
Colour	BN	WH	GN	
Pin M12	1	2	3	4
0 ... 10 V	+ 24 V DC	0 V	U_{out}	n.c.
0 ... 20 mA	I+	I-	n.c.	n.c.
Potentiometer	Po	Pe	S	n.c.



Dimensions

Dimensions in mm [inch]

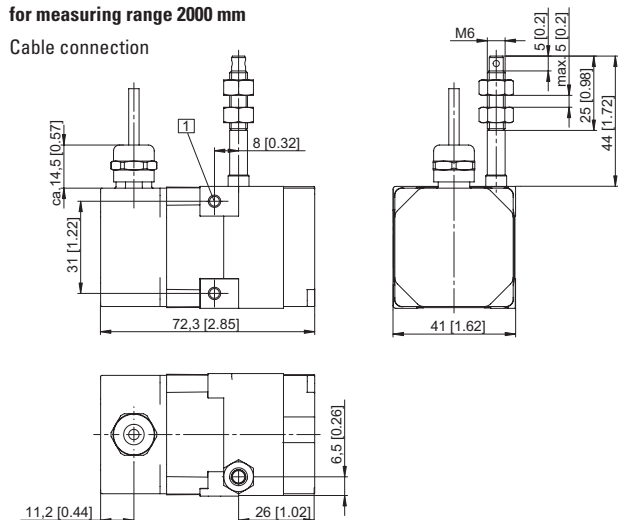
for measuring range 1000 mm



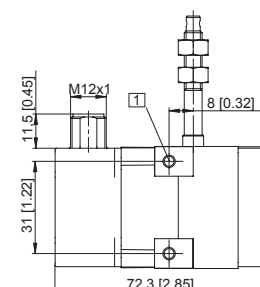
1 2 x M4, max. screw-in depth 8 mm [0.32"]

for measuring range 2000 mm

Cable connection



M12 connector



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**



The draw wire system A40 with incremental encoder excels with its compact construction.



Compact and simple

- Measuring length up to 2000 mm
- For applications with low traverse speeds
- Easy mounting

Order code **D 5.2 XXX . 24 XX . 1000**
draw wire encoder Type **a** **b**

a Steel wire, length
 501 = 1000 mm
 102 = 2000 mm

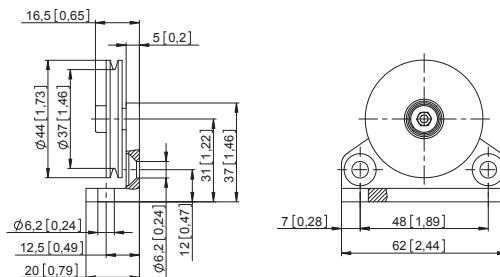
b Output circuit / Power supply
 21 = Push-Pull with inverted signal / 5 ... 24 V DC
 41 = Push-Pull with inverted signal / 8 ... 30 V DC

Stock types
 D5.2102.2421.1000 D5.2501.2421.1000
 D5.2102.2441.1000 D5.2501.2441.1000

Accessories for draw wire encoder

Order No.

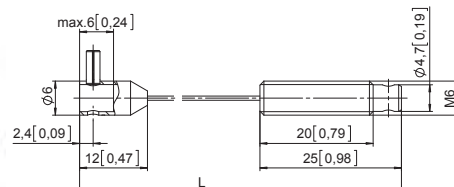
Guide pulley



Order code for the set:
 - Guide pulley (anodised aluminium)
 - 2 x countersunk screws for lateral fixing
 - 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



Steel wire 2 m [6.56']
 Steel wire 5 m [16.40']
 Steel wire 10 m [32.81']
 Paraleine 2 m [6.56']

8.0000.7000.0033
8.0000.7000.0034
8.0000.7000.0035
8.0000.7000.0032

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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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 σ 0.45 mm
Weight	approx. 210 g [7.41 oz]

Electrical characteristics (encoder)		
Output circuits	Push-pull	Push-pull
Power supply	5 ... 24 V DC	8 ... 30 V DC
Current consumption (no load)	max. 50 mA	max. 50 mA
Permissible load / channel	max. 50 mA	max. 50 mA
Pulse rate	max. 160 kHz	max. 160 kHz
Switching level	HIGH min. +V - 2.5 V LOW max. 0.5 V	min. +V - 3 V max. 2.5 V
Rising edge time t_r	max. 1 μ s	max. 1 μ s
Falling edge time t_f	max. 1 μ s	max. 1 μ s
Short-circuit protected outputs	yes	yes
CE compliant acc. to	EMC guideline 2004/108/EC	
RoHS compliant acc. to	guideline 2002/95/EC	

Mechanical characteristics (encoder)	
Protection acc. to EN 60529	IP54
Working temperature	-20°C ... +85°C [-4°F ... +185°F]
Shock resistance acc. to EN60068-2-27	1000 m/s ² , 6 ms
Vibration resistance acc. to EN60068-2-6	100 m/s ² , 55 ... 2000 Hz

Description of the incremental encoder (connected on load side)

- Compensation for temperature and ageing
- Short-circuit protected outputs
- Reverse polarity protected power supply input
- Push-pull output

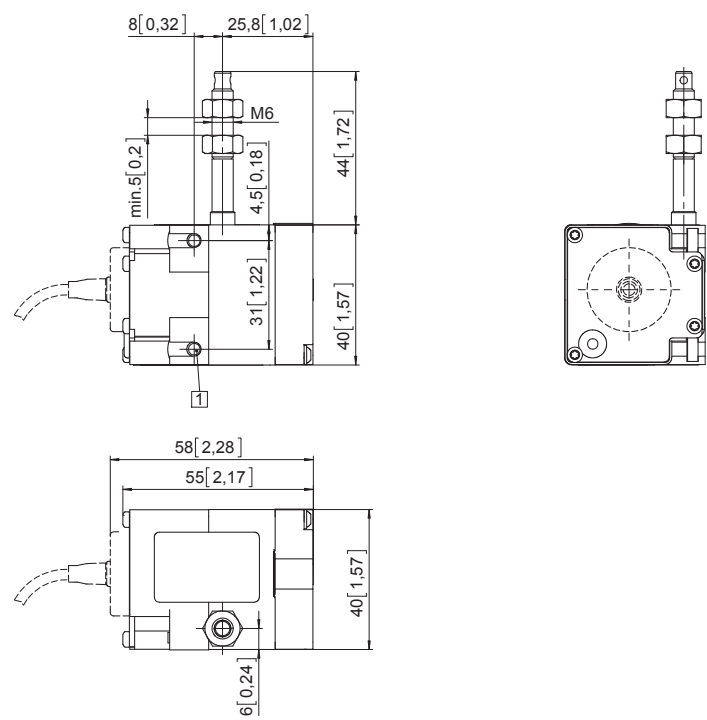
Terminal assignment of the encoder

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

Isolate unused outputs before initial start-up.

Dimensions

Dimensions in mm [inch]



Linear Measuring Technology

Draw wire mechanics with encoder

Draw wire encoder C105

**Measuring length max. 6 m
Traverse speed max. 3 m/s**



These draw wire mechanics can be combined with all encoders having a size 58 synchro flange and 6 mm shaft.



Flexible and simple

- Possibility for user to exchange encoder
- Measuring lengths 2800 mm or 6000 mm
- Simple installation

Order code with encoder

D8.1 **XXX** . **XX****XX** . **XXXX**
Type **a** **b** **c** **d** **e**

a Measuring range
106 = 6000 mm
2A1 = 2800 mm

b Mounted encoder
05 = 5805 62 = 5862
2Z = 5000 60 = 5860
04 = 5804 63 = 5863
 68 = 5868

c Output circuit ¹⁾

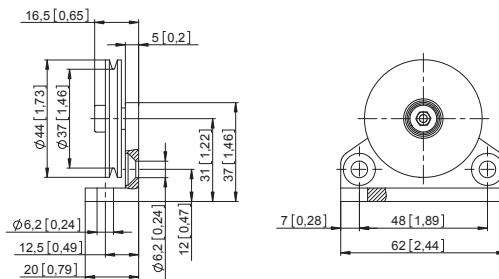
d Type of connection ¹⁾

e Resolution / pulses / protocol ¹⁾

Accessories for draw wire encoder

Order No.

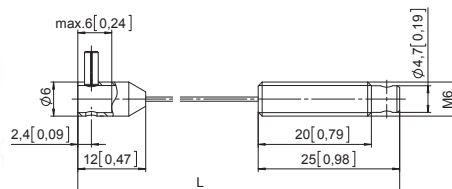
Guide pulley



Order code for the set:
- Guide pulley (anodised aluminium)
- 2 x countersunk screws for lateral fixing
- 2 x hexagonal screws for fixing on a flat surface

8.0000.7000.0045

Extension cable



Steel wire 2 m [6.56']
Steel wire 5 m [16.40']
Steel wire 10 m [32.81']
Paraleine 2 m [6.56']

8.0000.7000.0033

8.0000.7000.0034

8.0000.7000.0035

8.0000.7000.0032

1) These data depend on the chosen encoder

Linear Measuring Technology

Draw wire mechanics with encoder	Draw wire encoder C105	Measuring length max. 6 m Traverse speed max. 3 m/s
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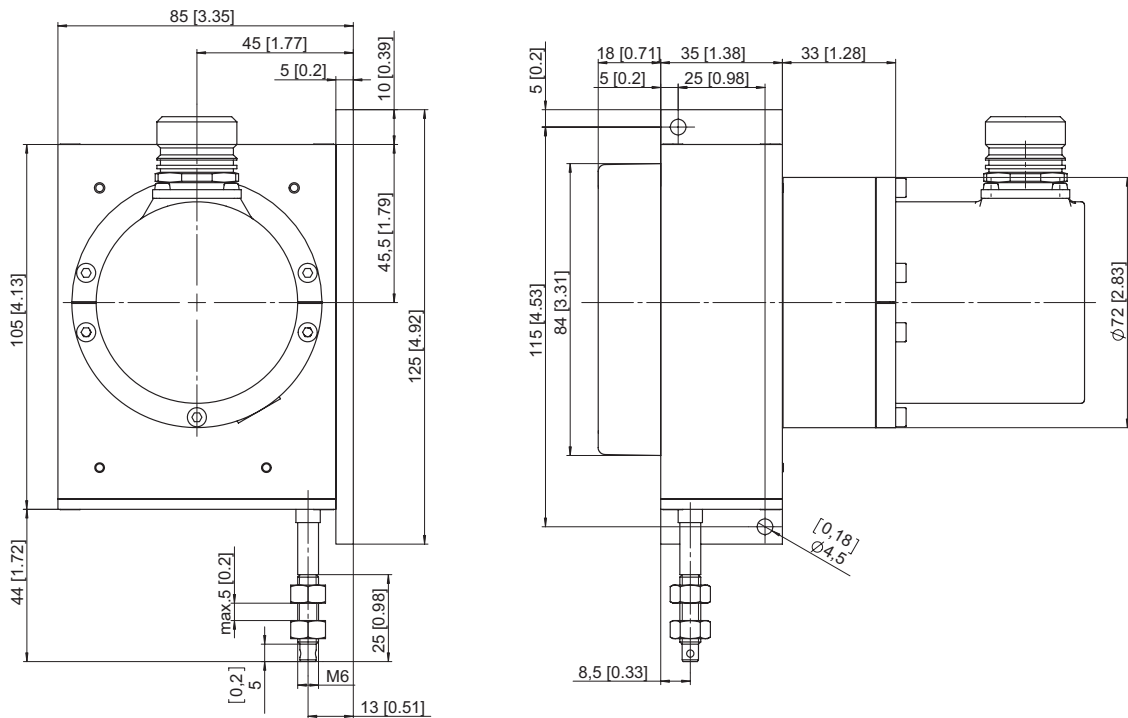
Technical data

Mechanical characteristics	
Measuring range	2800 mm / 6000 mm
Traversing speed	max. 3000 mm/s
Extension force F_{min}	8 N
Repeat accuracy	± 0.15 mm
Working temperature	-20°C ... +80°C [-4°F ... +176°F]
Weight	approx. 700 g [24.69 oz]
Drum circumference	200 mm
Wire	2800 mm paraleine- with \varnothing 1.05 mm 6000 mm steel wire - with \varnothing 0.54 mm

For the electrical characteristics as well as for the terminal assignment, please refer to the data sheet of the encoder used.

Dimensions

Dimensions in mm [inch]



Linear Measuring Technology

Elevator 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 elevator car.



Ideal for use in passenger elevators, freight elevators, automatic storage systems.

Complete system

- Rugged construction
- 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 elevator car

consists of:

- Encoder mounting fixture
- Mounted measuring wheel
- Belt guide
- Belt fixing and tensioning set
- Screws and other small components

suitable encoders:

- Incremental encoder: 8.5000.83XX.XXXX

Calculation of pulse rate PPR =

$$\frac{300 \text{ mm}}{\text{Resolution, e.g. 0.5 mm}} = 600$$

- Absolute encoders:

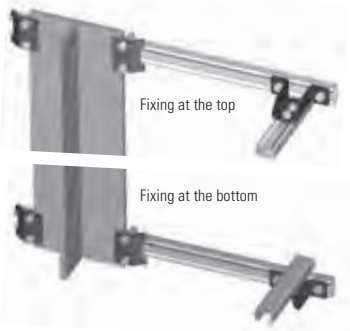

SSI: 8.5863.12XX.XXXX

CANopen / CANopenLift: 8.5868.12XX.XXXX



Linear Measuring Technology

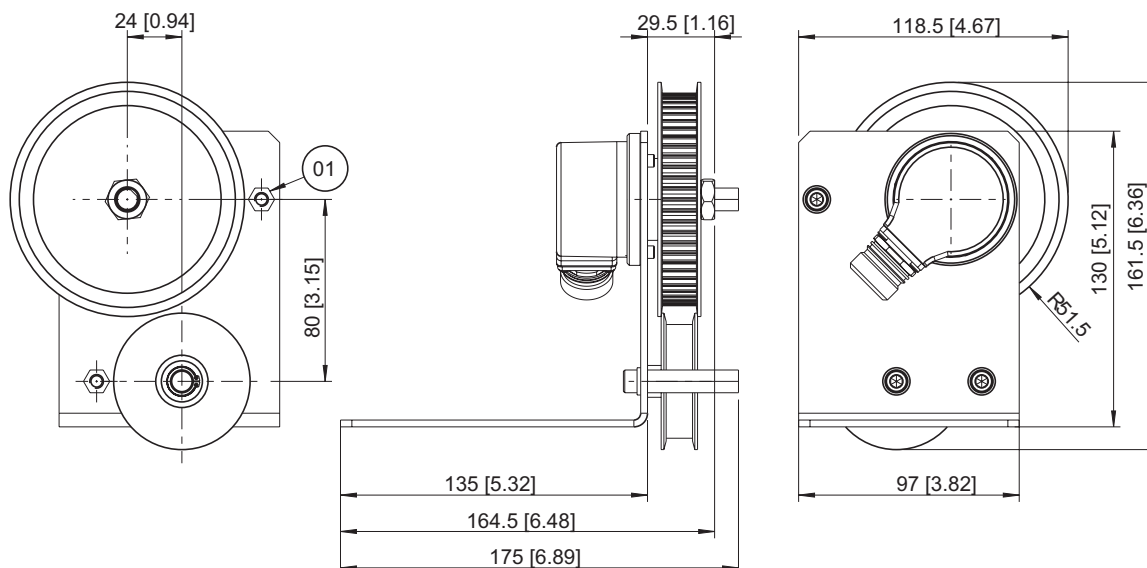
Elevator measuring system for shaft-copying	Encoder mounting fixture, guided-belt, LM3	max. height 53 m
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Accessories for encoder mounting fixture LM3	Order No.
<p>Fixing kit</p>  <p>Complete kit consists of:</p> <ul style="list-style-type: none"> - 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 metres Standard delivery lengths: 20 m, 25 m, 30 m, 35 m, 40 m, 45 m, 50 m, 55 m, 60 m, 70 m, 80 m, 90 m, 100 m, 120 m, 250 m, 300 m Other lengths on request</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 elevator	53 m
Effective circumference of belt pulley	300 mm

Dimensions

Dimensions in mm [inch]



Linear Measuring Technology

**Length measuring kit
Mini measurement system**

Measuring wheel system, incl. encoder

Incremental



Very compact mini measurement system with incremental interface.

Easy to install

- 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 mm x 50 mm x 52 mm
- Measuring wheel circumference 100 mm

Order code

05.2400.0040.1000.50 XX
a

Resolution
0.1 mm

Cable outlet
radial, 2 m [6.56'] PVC cable

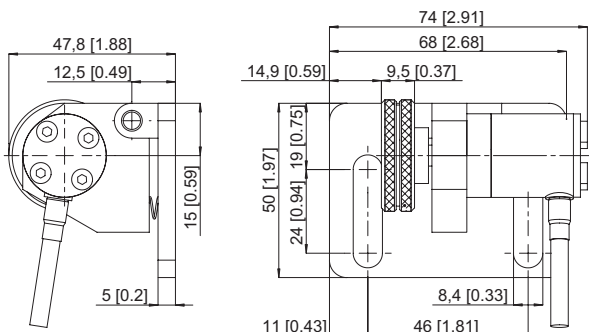
a *Measuring wheel*
45 = Knurled aluminium
49 = Rubber, Shore hardness 60

Technical Data

Speed max.	2000/min.
Protection	IP64
Output circuit	Push-pull with inversion
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.

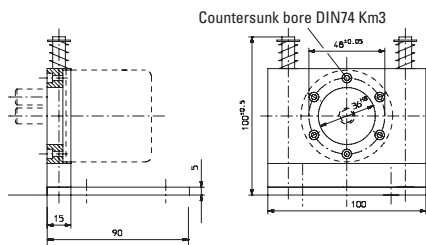
Typical areas of application are:

- Wood working industry
- Textile industry
- Handling and automation technology
- Mechanical engineering / Special machines

Single components

Order No.

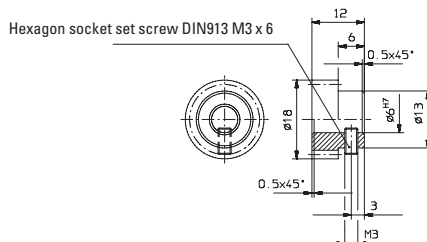
Flexible holding device for encoders



Guide rods stainless steel
Flange Al

8.0010.7000.0004

Pinion for displacement measuring device

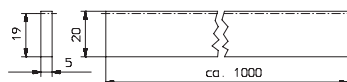


Material free-cutting steel
Surface burnished
Module pitch approx. 1
No of teeth 16

with bore diameter \varnothing 6 mm [0.24"]
with bore diameter \varnothing 10 mm [0.39"]

8.0010.7000.0002
8.0010.7000.0006

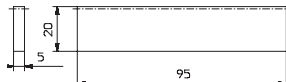
Rack



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

716 LED preset counter, 90 ... 260 V AC, 1 preset
923 LCD preset counter 90 ... 260 V AC, 1 preset

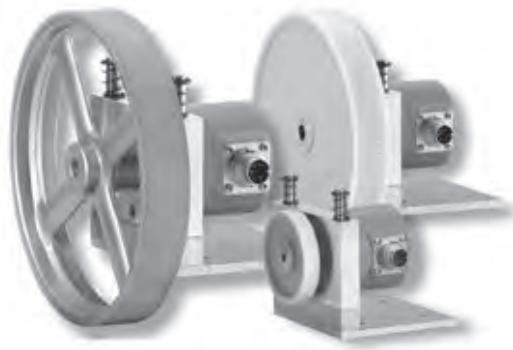
6.716.010.000
6.923.0100.000

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.

Flexible

- Various measuring wheels for various applications:
 - Hytrel for the textile industry
 - Vulkollan for the wood, paper, metal and plastics industry
- Resolution 1 mm

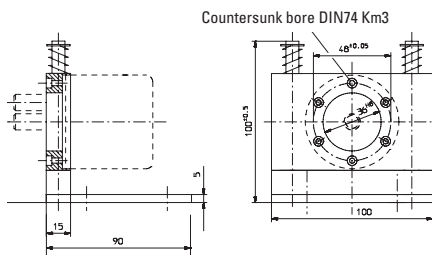
Easy operation

- The encoder support ensures an optimal load on the encoder shaft
- No additional power supply is required for the encoder, since it can be powered directly by the preset counter

Single components

Order No.

Flexible holding device for encoders



**Guide rods
Flange**

stainless steel
Al

8.0010.7000.0004

Spring encoder arm

8.0000.7000.010

Measuring wheels

0.2 m measuring wheel, plastic corrugated

8.0000.3297.0010

0.5 m measuring wheel, plastic smooth

8.0000.3547.0010

0.5 m measuring wheel, plastic corrugated

8.0000.3557.0010

Encoder

Sendix 5000 for 0.2 m measuring wheel, 1 mm resolution

8.5000.8354.0200

Sendix 5000 for 0.5 m measuring wheel, 1 mm resolution

8.5000.8354.0500

Standard cordset

with 2 m [6.56'] PVC cable, M12

05.00.6041.8211.002M

Preset counter

716 LED preset counter, 90 - 260 V AC, 1 preset

6.716.010.000

Linear Measuring Technology

Length measuring kits	Spring encoder arm
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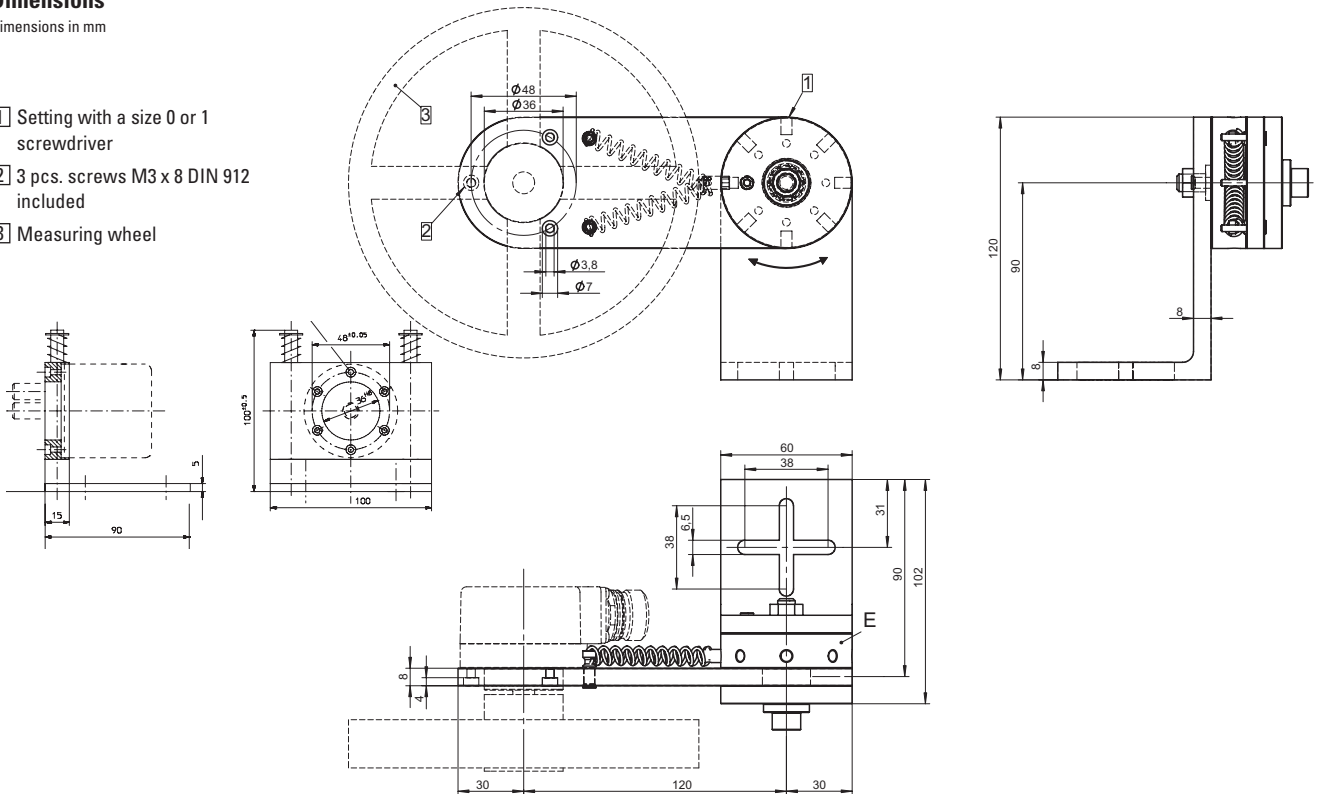


<p>Robust and reliable</p> <ul style="list-style-type: none"> • Max. 40 N, adjustable spring pressure available in any position • Pressure for each notch appr. 20 N (first notch between 0 and appr. 20 N) • Wide temperature range -40°C ... +120°C 	<p>Versatile</p> <ul style="list-style-type: none"> • Can be installed in any mounting position 9 setting positions in 40° steps • Base plate – variable in 4 directions
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Order code	8.0010.7000.0010
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Dimensions
Dimensions in mm

- 1 Setting with a size 0 or 1 screwdriver
- 2 3 pcs. screws M3 x 8 DIN 912 included
- 3 Measuring wheel

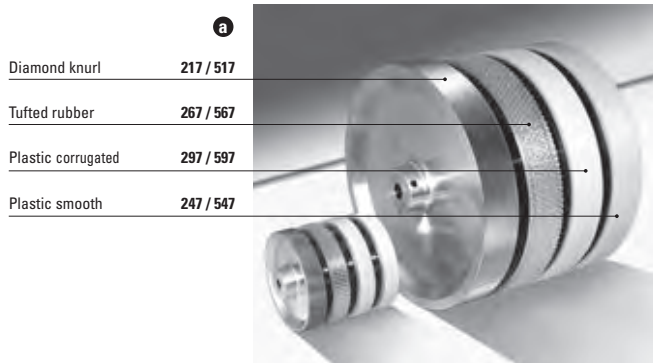


Linear Measuring Technology

Linear Measuring Technology

Length measuring kits Measuring wheels

Various wheel coatings



Diamond knurl	217 / 517
Tufted rubber	267 / 567
Plastic corrugated	297 / 597
Plastic smooth	247 / 547

Measuring wheels for measuring the length of products in movement, e.g. in the paper, metal, textile, wood or plastic industry.

Various tyres to meet the requirements of the various surfaces of the product to be measured – various diameters, designed for use with Kübler encoders, available for metric and imperial systems.

Selection of the measuring wheel profile according to the surface of the measured material

Surface of the measured material	Recommended profile no.
Cardboard	1, 2, 3, 4, 5
Wood	1, 2, 3, 4, 5
Textile	1, 2, 3, 4
Plastic (e.g. PVC, PE, ...)	2, 3, 4, 5
Paper	2, 3, 4, 5
Wire, greased metals, steel profiles, leather	2
Carpet, cables, nonwoven	3
Greased metals, glass, floor coverings	4
Painted surfaces	2, 4
Rubber, soft plastic	1

Please note:

If a measuring wheel is mounted directly on the shaft of a rotary encoder, the pressure force between the measuring wheel and measured material should not exceed the radial shaft load listed in the data sheet of the encoder.

In addition, the measuring wheels can only be used for in-house purposes which are not subject to the stipulations of the German calibration code.

Order code Measuring wheels

8.0000 . 3 XXX . 00 XX
a b

Measuring wheel Circumference / ϕ / width	Profile measuring wheels (s.o.)	Coating	Wheel No. <small>a</small>	Weight	Standard bore <small>b</small> ¹⁾	Material of wheel body	Working temperature
0.2 m / ϕ 63.7 mm / 12 mm [7.87" / ϕ 2.51" / 0.47"]	1	diamond knurl (aluminium)	217	60 g [2.12 oz]	06 = 6 mm [0.24"] 10 = 10 mm [0.39"]	aluminium	-30°C ... +80°C [-22°F ... +176°F]
	2	plastic (polyurethane) smooth	247	60 g [2.12 oz]			
	3	tufted rubber (polyurethane)	267	60 g [2.12 oz]			
	4	plastic (polyurethane) corrugated	297	60 g [2.12 oz]			
0.5 m / ϕ 159.2 mm / 25 mm [19.69" / ϕ 6.27 / 0.98"]	1	diamond knurl (aluminium)	517	775 g [27,34 oz]	10 = 10 mm [0.39"]	aluminium	-30°C ... +80°C [-22°F ... +176°F]
	2	plastic (polyurethane) smooth	547	700 g [24,69 oz]			
	3	tufted rubber (polyurethane)	567	700 g [24,69 oz]			
	4	plastic (polyurethane) corrugated	597	700 g [24,69 oz]			
12" / ϕ 3.82" / 0.38"	5	natural rubber (NR) smooth	751	100 g [3,53 oz]	10 = 10 mm [0.39"]	aluminium	-30°C ... +80°C [-22°F ... +176°F]

1) Other bore diameters on request

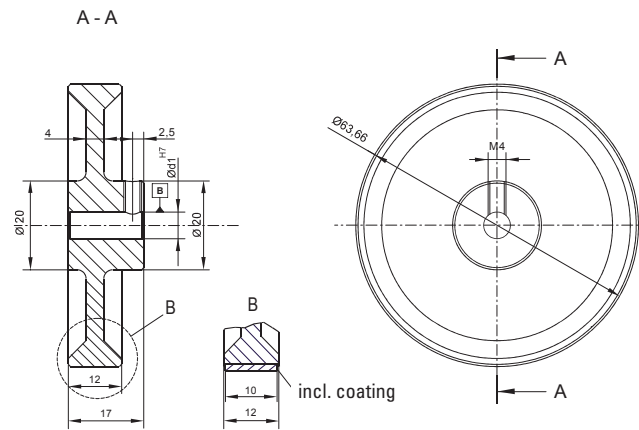
Linear Measuring Technology

Length measuring kits
Measuring wheels **Various wheel coatings**

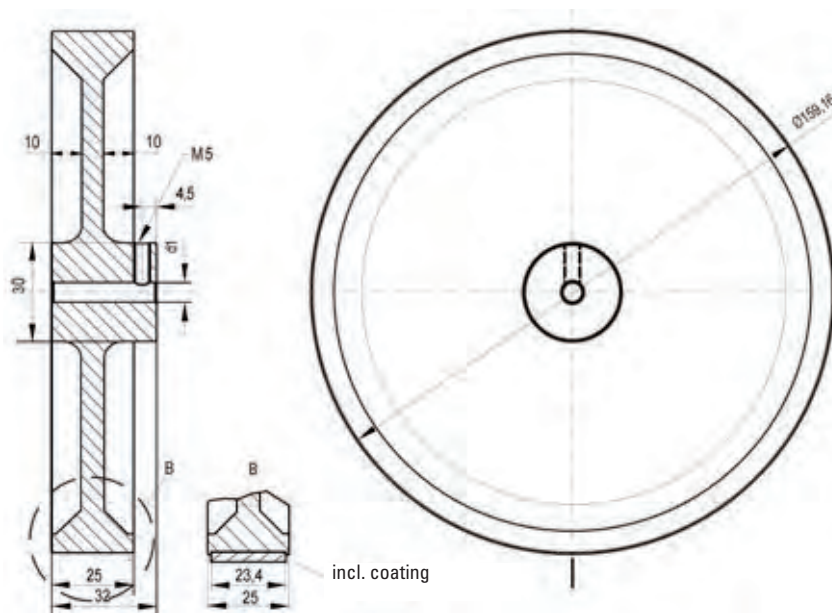
Dimensions

Dimensions in mm [inch]

Measuring wheel No. 2XX



Measuring wheel No. 5XX



KUEBLER
www.kuebler.com
SIS40

Inclinometers

	Type	Interface	Page
Inclinometers	IS40, 2-dimensional	Analogue	348
MEMS, capacitive	IS60, 2-dimensional	CANopen	350

Inclinometers

**Inclinometer
MEMS / capacitive**

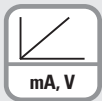
IS40, 2-dimensional

Analogue



The inclinometer IS40 permits 2-dimensional inclinations to be measured.

Versions are available for the measuring ranges $\pm 10^\circ$, $\pm 45^\circ$ or $\pm 60^\circ$. The compact robust construction makes this sensor the ideal device for measuring angles in harsh environments.



Output



High protection level



Shock / vibration resistant



Reverse polarity protection

Innovative

- Rugged construction
- High resolution and accuracy
- Current or voltage interface
- High shock resistance
- Zero point adjustment

Compact / Many applications

- Small design – minimal space requirement
- For use in vehicle technology, solar installations, commercial vehicles, cranes and hoists

**Order code
Inclinometer IS40**

8.IS40 . 2XXX1
Type

a Measuring direction 2 = 2-dimensional x/y	b Measuring range 1 = $\pm 10^\circ$ 2 = $\pm 45^\circ$ 3 = $\pm 60^\circ$	c Interface 1 = 4 ... 20 mA ¹⁾ 3 = 0.1 ... 4.9 V DC ¹⁾ 4 = ratiometric 2% ... 98% ²⁾	d Power supply 1 = 5 V DC 2 = 10 ... 30 V DC	e Type of connection 1 = M12 connector
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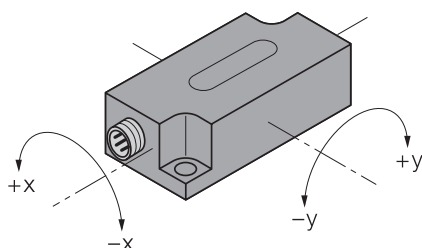
Connection technology

Order No.

Connector, self-assembly (straight)	M12 female connector with coupling	8.0000.5116.0000
Cordset, pre-assembled	M12 female connector with coupling, 2 m [6.56'] PVC cable	05.00.6081.2211.002M

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

Direction of inclination



1) Availably only in combination with power supply 10 ... 30 V DC
2) In relation to the power supply 5 V DC (Availably only in combination with power supply 5 V DC)

Inclinometers

Inclinometer MEMS / capacitive	IS40, 2-dimensional	Analogue
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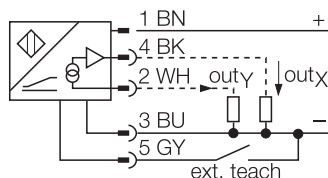
Technical data

Mechanical characteristics	
Connection	M12 connector
Weight	50 g [1.76 oz]
Protection acc. to EN 60529	IP68
Working temperature range	-30°C ... +70°C [-22°F ... +158°F]
Material	plastic PBT-GF20-V0
Shock resistance	30 g, 11 ms
Vibration resistance	55 Hz, 1 mm [0.04]
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

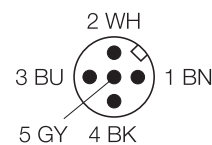
Electrical characteristics	
Power supply	5 V DC +/-0.25 V or 10 ... 30 V DC (depending on version)
Power consumption (no load)	≤ 20 mA
Reverse polarity protection (+V)	yes
Measuring axes	2 (x/y)
Measuring range	±10°, ±45°, ±60°
Resolution	for version ±10° ≤ 0.05° for version ±45° ≤ 0.1° for version ±60° ≤ 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	EN 61362-2-3 EMC requirements for transducers

Connections



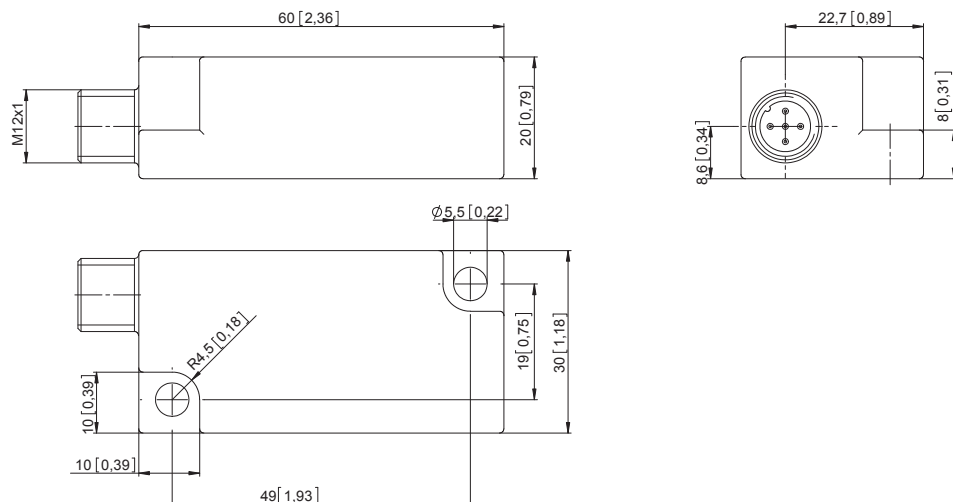
ext. teach: if this input is connected to 0 V, then the output of the inclinometer is reset to 0°.

Terminal assignment



Dimensions

Dimensions in mm [inch]



Inclinometers

**Inclinometer
MEMS / capacitive**

IS60, 2-dimensional

CANopen



The inclinometer IS60 permits 2-dimensional inclinations to be measured. Versions are available for the measuring ranges $\pm 10^\circ$, $\pm 45^\circ$ or $\pm 60^\circ$.

The sensor has a standardised CANopen interface, which enables easy configuration and start-up. All the parameters are stored in the internal permanent memory.

Can be supplied with customer-specific parameterising.



CANopen



High protection level



Shock / vibration resistant



Reverse polarity protection

Robust and reliable

- Protection rating IP68
- Robust plastic housing
- High shock resistance

User-friendly and accurate

- High resolution and accuracy
- Programmable vibration suppression
- High sampling rate and bandwidth

Order code Inclinometer IS60

8.IS60 . 2X523
Type

a Measuring direction
2 = 2-dimensional x/y

b Measuring range
1 = $\pm 10^\circ$
2 = $\pm 45^\circ$
3 = $\pm 60^\circ$

c Interface
5 = CANopen

d Power supply
2 = 10 ... 30 V DC

e Type of connection
3 = 2 x M12 connector

Connection technology

Order No.

Connector, self-assembly (straight)

M12 female connector with coupling, Bus in
M12 male connector with external thread, Bus out

05.B-8151-0/9

05.BS-8151-0/9

Cordset, pre-assembled

M12 female connector with coupling, 6 m [19.69'] PVC cable, Bus in
M12 male connector with external thread, 6 m [19.69'] PVC cable, Bus out

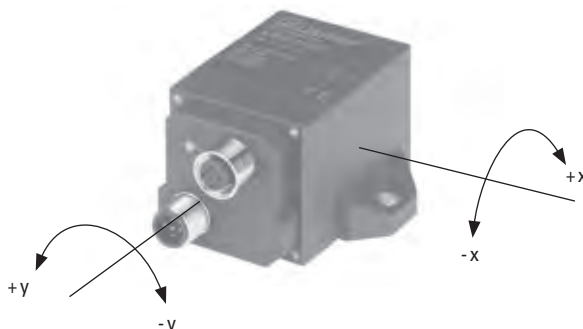
05.00.6021.2211.006M

05.00.6021.2411.006M

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

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

Direction of inclination



Inclinometers

Inclinometer MEMS / capacitive	IS60, 2-dimensional	CANopen
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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
Working temperature range	-40°C ... +80°C [-40°F ... +176°F]
Material	plastic PA12-GF30
Shock resistance	30 g, 11 ms
Vibration resistance	55 Hz, 1 mm [0.04]
Dimensions	68 x 42.5 x 42.5 mm [2.68 x 1.67 x 1.67"]

Electrical characteristics	
Power supply	10 ... 30 V DC
Power consumption (no load)	40 ... 105 mA
Reverse polarity protection (+V)	yes
Measuring axes	2 (x/y)
Measuring range	± 10°, ± 45°, ± 60°
Resolution	≤ 0.01°
Absolute accuracy	± 0.05°
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	EN 61326-2-3 EMC requirements for transducers
RoHS compliant acc. to	guideline 2002/95/EC

Interface characteristics CANopen	
Interface	CANopen according to CiA DS-301, Profile to CiA DSP-410
Data rates	10 kbit/s, 20 kbit/s, 50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s, 1 Mbit/s
Functions	TPDO (RTR, cyclic, event-driven, synchronized), parameterization per SDO and object register, digital filter (Butterworth Low pass, 8th order), SYNC Consumer, EMCY Producer, output and control of internal device temperature (±2.0 K accuracy), failure control with the help of Heartbeat or Nodeguarding / Lifeguarding
Note ID	1...127

A full description of the technical data can be found in the relevant product manual at www.kuebler.com.

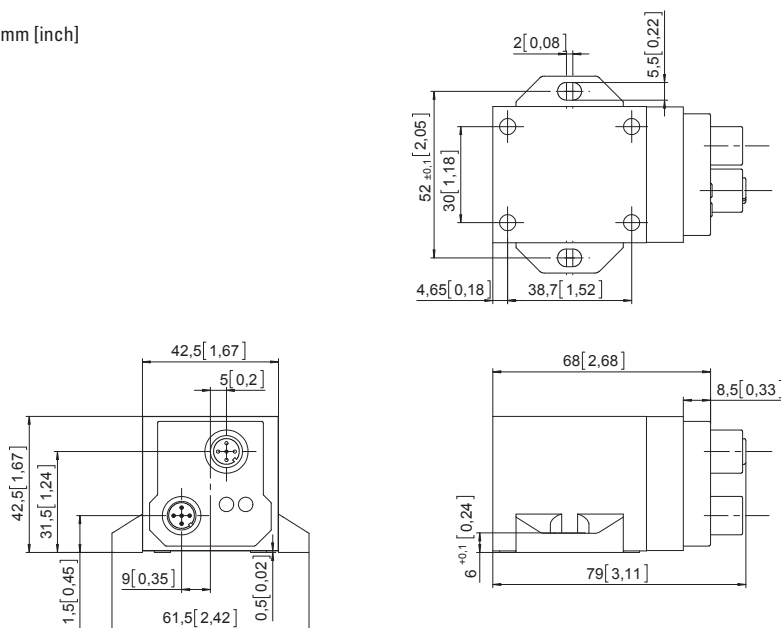
Terminal assignment

PIN	Signal	Assignment
1	CAN_SHLD	Shield
2	CAN V+	Power supply (+24 V DC)
3	CAN_GND	0 V
4	CAN_H	CAN_H Bus cable
5	CAN_L	CAN_L Bus cable



Dimensions

Dimensions in mm [inch]





Safety modules		Type	Page
Basic module new	Speed monitoring	1 axis	Safety-M MS1 354
	Speed / position monitoring	1 axis	Safety-M MSP1 357
	Speed monitoring	2 axes	Safety-M MS2 361
	Speed / position monitoring	2 axes	Safety-M MSP2 364
Expansion module new	I/O expansion	Digital	Safety-M EM3 368
	I/O expansion	Relay	Safety-M EM4 370
Communication module new	Communication module	DeviceNet	Safety-M BM11 372
		CANopen	Safety-M BM21 374
		PROFIBUS DP	Safety-M BM31 376
		EtherCAT	Safety-M BMB1 378
		PROFINET IO	Safety-M BMC1 380

Functional Safety

Safety module Basic module	Safety-M MS1 – Speed monitoring	1 axis
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MS1 is a compact and modular safety control of the Safety-M family with integrated drive monitoring for one axis. This device is freely programmable for the safe processing of drive-related safety functions as well as of EMERGENCY STOP switches, two-hand operator controls, light barriers, operating mode selectors, etc.

The basic version allows 1 safe encoder connection to be implemented. 14 safe inputs and 3 safe shut-off channels are available.



1-encoder solutions (TTL/HTL, SinCos, proximity switch) and to a limited extent also 2-encoder solutions (a combination of any encoder technologies) are supported for the safe speed and/or position detection.

- Extensive library of pre-configured safe sensors and command devices
- Complete range of speed- and position-related safe drive monitoring functions as per DIN EN 61800 already integrated (e.g. SS1, SS2, SOS, SLS, SDI, SLA, SSM, SCA, SBC, EDM)
- Parameterizable encoder interface for TTL / SinCos / SSI on the front and proximity switch / HTL via terminal connection
- Graphical programming interface by SafePLC-SW

- Basic unit comes with 14 safe input lines and 3 safe shut-off channels, comprising 1 safe relay output and 2 messaging outputs
- Cross-short-cut monitoring functionality
- Output contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts
- Extensive diagnostic functionality integrated in FW
- Status monitoring by coded 7-segment-display and status LED's
- Quit- / Start- / Reset button on the front display
- Extendable up to max. 65 safe I/O lines by means of an integrated backplane bus (connector for top hat rail mount)
- Optional field bus interface (bus modules for PROFIBUS DP, PROFINET IO, CANopen, EtherCAT, DeviceNet)

Order No.

The programming software SafePLC and the programming cable are required for programming. T-BUS connectors are required for connecting a BUS module or an expansion module.

MS1	Speed monitoring for 1 axis	8.MS1.000
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Accessory

Order No.

T-bus connector		05.TBMS.000
Programming cable		8.0010.9000.0020
Licence key SafePLC		05.SPLC.001
Connection technology		
Cordset, pre-assembled, 1 m [3.28']	for SinCos signals	cable with 1 x M23 / 1 x D-Sub, 9-pin
	for SSI signals, X31/X32	cable with 1 x M23 / 1 x D-Sub, 9-pin
		8.0000.6900.0001.0069
		8.0000.6900.0001.0068

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

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

You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety

Modular construction

Basic module

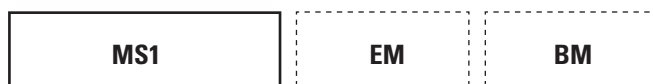
Modular safety control system

Expansion modules

For additional inputs and outputs

Field bus modules

For standard field bus interface



Overview inputs / outputs

14 x	safe digital inputs
2 x	relays outputs (safe due to redundant operation)
2 x	digital outputs LOSIDE / HISIDE (safe due to redundant operation)
2 x	messaging outputs

Functional Safety

Safety module Basic module	Safety-M MS1 – Speed monitoring	1 axis
---------------------------------------	--	---------------

Technical data

General data	
Max. number of expansion modules	2 x EM, 1 x BM
Interface for expansion modules	T-bus connector for top hat rail mount
Safe digital input lines	14 incl. 8 OSSD
Safe digital output lines	2
Safe relay outputs	1
Messaging outputs	2
Pulse output lines	2
Type of connection	pluggable terminals, coded
Max. terminal cross section	1.5 mm ² [AWG 15]
Drive monitoring - number of axis	1 axis

Electrical characteristics	
Power supply	24 V DC / 2 A
Tolerance	-15%, +20%
Power consumption	2.4 W
Fuse on power supply	max. 2 A
Rated data digital inputs	24 V DC / 20 mA, Type 1 to EN 61131-2
Rated data digital outputs	24 V DC / 250 mA
Rated data relay outputs	24 V DC / 2 A and 230 V AC / 2 A
Pulse output lines	max. 250 mA

Environmental data	
Operating temperature	0°C ... +50°C [+32°F ... +122°F]
Storage temperature	-10°C ... +70°C [+14°F ... +158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178
EMC	acc. to EN 55011 and EN 61000-6-2

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 45 mm [3.90 x 4.51 x 1.77"]
Weight	310 g [10.94 oz]
Mounting	snap-on mounting on standard head rail

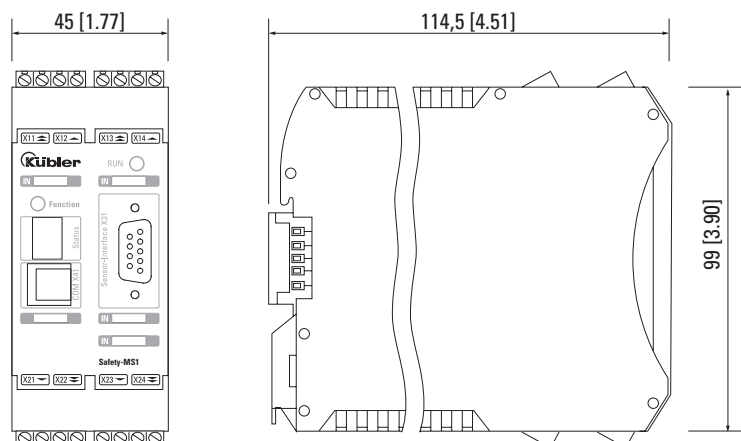
Safety characteristics	
Relevant standards	EN ISO 13849-1 / EN 62061, EN 61508
Classification	PL _e / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value	2.3 x 10 ⁻⁹ h ⁻¹
Proof-Test-Intervall	20 years

Encoder interface front X31 / X32	
Type of connection	D-Sub, 9-pin
Signal	SSI, SinCos, TTL
Frequency SinCos, TTL	max. 200 kHz
Clock frequency SSI	Mastermode 150 kHz Slavemode max. 250 kHz
Data length SSI	10-28 bit

Encoder interface terminal X23	
Type of connection	Plug-in terminal, 4-pin
Signal	Proximity switch, HTL
Frequency	max. 10 kHz

Dimensions

Dimensions in mm [inch]



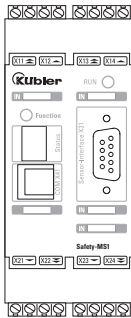
Safety module Basic module

Safety-M MS1 – Speed monitoring

1 axis

Terminal assignment

X11				X12				X13				X14			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Power supply module +24 V DC	U24 extern	Power supply module +24 V DC	U24 extern	Digital IN 13	DI 13 / E 0.13	Digital IN 14	DI 14 / E 0.14	Power supply encoder interface X31	U_ENC_1	Power supply encoder interface X31	GND_ENC.1	Digital IN 01 (OSSD compatible)	DI 01 / E 0.1	Digital IN 02 (OSSD compatible)	DI 02 / E 0.2
Power supply module 0 V DC	GND extern	Power supply module 0 V DC	GND extern	Pulse output P1	P1	Pulse output P2	P2	Messaging and auxiliary output DO 0.1	DO 0.1 / A 0.1	Messaging and auxiliary output DO 0.2	DO 0.2 / A 0.2	Digital IN 03 (OSSD compatible)	DI 03 / E 0.3	Digital IN 04 (OSSD compatible)	DI 04 / E 0.4



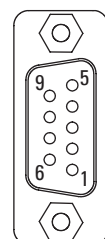
X21				X22				X23				X24			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
HISIDE output 0	DO 0-HI / AD 0.0P	LOSIDE output 0	DO 0-LO / AD 0.0M	Relay output 1	K1.1 / AK 0.1	Relay output 1	K1.2 / AK 0.1	Digital IN 05 / Proximity switch 1	DI 05 / E 0.5	Digital IN 06 / Proximity switch 1	DI 06 / E 0.6	Digital IN 09 (OSSD compatible)	DI 09 / E 0.9	Digital IN 10 (OSSD compatible)	DI 10 / E 0.10
HISIDE output 1	DO 1-HI / AD 0.1P	LOSIDE output 1	DO 1-LO / AD 0.1M	Relay output 2	K2.1 / AK 0.2	Relay output 2	K2.2 / AK 0.2	Digital IN 07 / Proximity switch 2	DI 07 / E 0.7	Digital IN 08 / Proximity switch 2	DI 08 / E 0.8	Digital IN 11 (OSSD compatible)	DI 11 / E 0.11	Digital IN 12 (OSSD compatible)	DI 12 / E 0.12

Interface	D-Sub female connector											
Terminal X31/X32	Signal:	TTL	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SinCos	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SSI	-	0 V	-	C-	D+	D-	-	C+	+V	\perp
	Pin:		1	2	3	4	5	6	7	8	9	PH

+V: Encoder power supply +V DC
 0 V: Encoder power supply ground GND (0 V)
 A, \bar{A} : Cosine signal / incremental output channel A
 B, \bar{B} : Sine signal / incremental output channel B

C+, C-: Clock signal
 D+, D-: Data signal
 PH \perp : Plug connector housing (Shield)

D-Sub female connector, 9-pin



Functional Safety

Safety module	Safety-M MSP1 – Speed and position monitoring	1 axis
Basic module		



MSP1 is a compact and modular safety control of the Safety-M family with integrated drive monitoring for one axis and extended encoder interface. This device is freely programmable for the safe processing of drive-related safety functions as well as of EMERGENCY STOP switches, two-hand operator controls, light barriers, operating mode selectors, etc.

The basic version allows 2 safe encoder connections to be implemented. 14 safe inputs and 3 safe shut-off channels are available.

- | | |
|--|--|
| <ul style="list-style-type: none"> 1-encoder solutions (TTL/HTL, resolver, SinCos, proximity switch) and to a limited extent also 2-encoder solutions (a combination of any encoder technologies) are supported for the safe speed and/or position detection. Extensive library of pre-configured safe sensors and command devices Complete range of speed- and position-related safe drive monitoring functions as per DIN EN 61800 already integrated (e.g. SS1, SS2, SOS, SLS, SDI, SLA, SSM, SCA, SBC, EDM, SLI, SLP) Parameterizable encoder interface for TTL / SinCos / SSI / Resolver on the front and proximity switch / HTL via terminal connection Graphical programming interface by SafePLC-SW | <ul style="list-style-type: none"> Basic unit comes with 14 safe input lines and 3 safe shut-off channels, comprising 1 safe relay output and 2 messaging outputs Cross-short-cut monitoring functionality Output contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts Extensive diagnostic functionality integrated in FW Status monitoring by coded 7-segment-display and status LED's Quit- / Start- / Reset button on the front display Extendable up to max. 65 safe I/O lines by means of an integrated backplane bus (connector for top hat rail mount) Optional field bus interface (bus modules for PROFIBUS DP, PROFINET IO, CANopen, EtherCAT, DeviceNet) |
|--|--|

Order No.	The programming software SafePLC and the programming cable are required for programming. T-BUS connectors are required for connecting a BUS module or an expansion module.	
MSP1	Speed and position monitoring for 1 axis	8.MSP1.000

Accessory	Order No.
T-bus connector	05.TBMS.000
Programming cable	8.0010.9000.0020
Licence key SafePLC	05.SPLC.001

Connection technology			
Cordset, pre-assembled, 1 m [3.28']	for SinCos signals	cable with 1 x M23 / 1 x D-Sub, 9-pin	8.0000.6900.0001.0069
	for SSI signals, X31/X32	cable with 1 x M23 / 1 x D-Sub, 9-pin	8.0000.6900.0001.0068
	for SSI signals, X33/X34	cable with 1 x M23 / 1 x D-Sub, 9-pin	8.0000.6900.0001.0072
	for SinCos+SSI signals	cable with 1 x M23 / 2 x D-Sub, 9-pin	8.0000.6900.0001.0070

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety

Modular construction

Basic module	Expansion modules	Field bus modules
Modular safety control system	For additional inputs and outputs	For standard field bus interface
MSP1	EM	BM

Overview inputs / outputs

14 x	safe digital inputs
2 x	relays outputs (safe due to redundant operation)
2 x	digital outputs LOSIDE / HISIDE (safe due to redundant operation)
2 x	messaging outputs

Functional Safety

Safety module Basic module	Safety-M MSP1 – Speed and position monitoring	1 axis
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Technical data

General data	
Max. number of expansion modules	2 x EM, 1 x BM
Interface for expansion modules	T-bus connector for top hat rail mount
Safe digital input lines	14 incl. 8 OSSD
Safe digital output lines	2
Safe relay outputs	1
Messaging outputs	2
Pulse output lines	2
Type of connection	pluggable terminals, coded
Max. terminal cross section	1.5 mm ² [AWG 15]
Drive monitoring - number of axis	1 axis

Electrical characteristics	
Power supply	24 V DC / 2 A
Tolerance	-15%, +20%
Power consumption	2.4 W
Fuse on power supply	max. 2 A
Rated data digital inputs	24 V DC / 20 mA, Type 1 to EN 61131-2
Rated data digital outputs	24 V DC / 250 mA
Rated data relay outputs	24 V DC / 2 A and 230 V AC / 2 A
Pulse output lines	max. 250 mA

Environmental data	
Operating temperature	0°C ... +50°C [+32°F ... +122°F]
Storage temperature	-10°C ... +70°C [+14°F ... +158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178
EMC	acc. to EN 55011 and EN 61000-6-2

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 67.5 mm [3.90 x 4.51 x 2.66"]
Weight	390 g [13.76 oz]
Mounting	snap-on mounting on standard head rail

Safety characteristics	
Relevant standards	EN ISO 13849-1 / EN 62061, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value	2.3 x 10 ⁻⁹ h ⁻¹
Proof-Test-Intervall	20 years

Encoder interface front X31	
Type of connection	D-Sub-pin
Signal	SSI, SinCos, TTL
Frequency SinCos, TTL	max. 200 kHz
Clock frequency SSI	Mastermode 150 kHz Slavemode max. 250 kHz
Data length SSI	10-28 bit

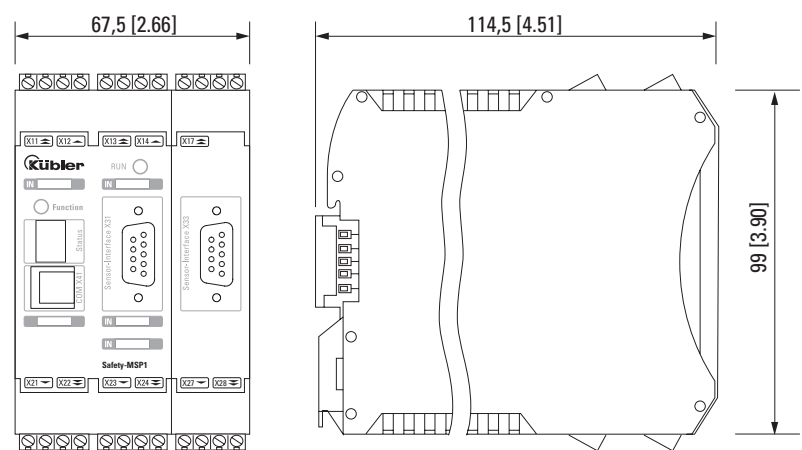
Encoder interface front X33	
Type of connection	D-Sub-pin
Signal	SSI, SinCos, TTL, Resolver
Frequency SinCos, TTL	max. 250 kHz
Clock frequency SSI	Mastermode 150 kHz Slavemode max. 350 kHz
Data length SSI	10-28 bit
Resolver	Signal frequency max. 600 kHz Input voltage max. 8 Vpp Reference frequency 6 - 16 kHz Reference amplitude 8 - 28 Vpp Number of pole pairs 1 - 8 Transformation ratio 2:1, 3:1, 4:1 Phase fault max. 8°

Encoder interface terminal X23	
Type of connection	Plug-in terminal, 4-pin
Signal	Proximity switch, HTL
Frequency	max. 10 kHz

Encoder interface terminal X27, X28	
Type of connection	Plug-in terminal, 4-pin
Signal	Proximity switch, HTL
Frequency	max. 200 kHz

Dimensions

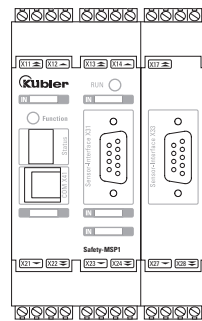
Dimensions in mm [inch]



Safety module
Basic module **Safety-M MSP1 – Speed and position monitoring** **1 axis**

Terminal assignment

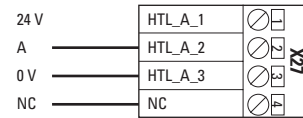
X11		X12		X13		X14		X17	
1	2	1	2	1	2	1	2	1	2
Power supply module +24 V DC	U24 extem	Digital IN 13	DI 13 / E.0.13	Power supply encoder interface X31	U_ENC_1	Digital IN 01 (OSSD compatible)	DI 01 / E.0.1	Power supply encoder interface X33	U_ENC_3
Power supply module +24 V DC	U24 extem	Digital IN 14	DI 14 / E.0.14	Power supply encoder interface X31	GND_ENC_1	Digital IN 02 (OSSD compatible)	DI 02 / E.0.2	Power supply encoder interface X33	GND_ENC_3
Power supply module 0 V DC	GND external	Pulse output P1	P1	Messaging and auxiliary output DO 0.1	DO 0.1 / A 0.1	Digital IN 03 (OSSD compatible)	DI 03 / E.0.3	Reference signal Res. f. encoder interf. X33	U_Ref_3
Power supply module 0 V DC	GND external	Pulse output P2	P2	Messaging and auxiliary output DO 0.2	DO 0.2 / A 0.2	Digital IN 04 (OSSD compatible)	DI 04 / E.0.4	NC	NC



X21		X22		X23		X24		X27		X28	
1	2	1	2	1	2	1	2	1	2	1	2
HISIDE output 0	DO 0-HI / AD 0.0P	Relay output 1	K1.1 / AK 0.1	Digital IN 05 / Proximity switch 1	DI 05 / E.0.5	Digital input A f. encoder interface X33	HTL_A_1	HTL input A f. encoder interface X33	HTL_A_1	HTL input B f. encoder interface X33	HTL_B_1
LOSIDE output 0	DO 0-LO / AD 0.0M	Relay output 1	K1.2 / AK 0.1	Digital IN 06 / Proximity switch 1	DI 06 / E.0.6	HTL input A f. encoder interface X33	HTL_A_2	HTL input B f. encoder interface X33	HTL_B_2	HTL input A f. encoder interface X33	HTL_A_3
HISIDE output 1	DO 1-HI / AD 0.1P	Relay output 2	K2.1 / AK 0.2	Digital IN 07 / Proximity switch 2	DI 07 / E.0.7	HTL input A f. encoder interface X33	HTL_A_3	NC	NC	HTL input B f. encoder interface X33	HTL_B_3
LOSIDE output 1	DO 1-LO / AD 0.1M	Relay output 2	K2.2 / AK 0.2	Digital IN 08 / Proximity switch 2	DI 08 / E.0.8	NC	NC	NC	NC	HTL input B f. encoder interface X33	HTL_B_3

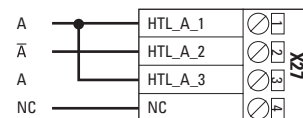
HTL encoder interface A / B

without inverted signal



HTL encoder interface A, A̅ / B, B̅

with inverted signal



Functional Safety

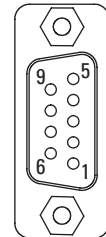
Safety module	Safety-M MSP1 – Speed and position monitoring	1 axis
Basic module		

Terminal assignment

Interface	D-Sub female connector											
Terminal X31/X32	Signal:	TTL	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SinCos	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SSI	-	0 V	-	C-	D+	D-	-	C+	+V	\perp
	Pin:		1	2	3	4	5	6	7	8	9	PH

Interface	D-Sub female connector											
Terminal X33/X34	Signal:	TTL	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SinCos	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SSI	-	0 V	C+	-	D+	D-	C-	-	+V	\perp
		Resolver	R1	R2	R3	S1	S2	S4	R4	S3	RV	\perp
	Pin:		1	2	3	4	5	6	7	8	9	PH

D-Sub female connector, 9-pin



- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Cosine signal / incremental output channel A
- B, \bar{B} : Sine signal / incremental output channel B
- C+, C-: Clock signal
- D+, D-: Data signal
- R1, R2: Reference output
- R3, R4: Reference input
- S1, S3: Cosine signal
- S2, S4: Sine signal
- RV: Reference power supply
- PH \perp : Plug connector housing (Shield)

Functional Safety

Safety module	Safety-M MS2 – Speed monitoring	2 axes
Basic module		



MS2 is a compact and modular safety control of the Safety-M family with integrated drive monitoring for 2 axes. This device is freely programmable for the safe processing of drive-related safety functions as well as of EMERGENCY STOP switches, two-hand operator controls, light barriers, operating mode selectors, etc. Complex motion monitoring tasks are also possible when both axes are combined.

The basic version allows 2 safe encoder connections to be implemented. 14 safe inputs, 3 safe shut-off channels and 2 safe analogue inputs (optional) are available.

- | | |
|---|--|
| <ul style="list-style-type: none"> 1-encoder solutions (TTL/HTL, Resolver, SinCos, proximity switch) and to a limited extent also 2-encoder solutions (a combination of any encoder technologies) are supported for the safe speed and/or position detection. Extensive library of pre-configured safe sensors and command devices Complete range of speed- and position-related safe drive monitoring functions as per DIN EN 61800 already integrated (e.g. SS1, SS2, SOS, SLS, SDI, SLA, SSM, SCA, SBC, EDM) Parameterizable encoder interface for TTL / SinCos / SSI on the front and proximity switch / HTL via terminal connection Graphical programming interface by SafePLC-SW | <ul style="list-style-type: none"> Basic unit comes with 14 safe input lines and 3 safe shut-off channels, comprising 1 safe relay output and 2 messaging outputs Cross-short-cut monitoring functionality Output contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts Extensive diagnostic functionality integrated in FW Status monitoring by coded 7-segment-display and status LED's Quit- / Start- / Reset button on the front display Extendable up to max. 65 safe I/O lines by means of an integrated backplane bus (connector for top hat rail mount) Optional field bus interface (bus modules for PROFIBUS DP, PROFINET IO, CANopen, EtherCAT, DeviceNet) 4 analogue inputs (optional) |
|---|--|

Order code	8 . MS2 . XXX	The programming software SafePLC and the programming cable are required for programming. T-BUS connectors are required for connecting a BUS module or an expansion module.
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<p>a Analogue inputs</p> <p>0 = without analogue inputs A = with analogue inputs</p>	<p>b Analogue voltage measuring ¹⁾</p> <p>0 = without 2 = 2 analogue voltage inputs (X25) 4 = 4 analogue voltage inputs (X25/X26)</p>	<p>c Analogue current measuring ¹⁾</p> <p>0 = without 2 = 2 analogue current inputs (X26) 4 = 4 analogue current inputs (X25/X26)</p>	<p>¹⁾ 4 analogue inputs are available</p>
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Accessory	Order No.
T-bus connector	05.TBMS.000
Programming cable	8.0010.9000.0020
Licence key SafePLC	05.SPLC.001
Connection technology	
Cordset, pre-assembled, 1 m [3.28']	for SinCos signals cable with 1 x M23 / 1 x D-Sub, 9-pin 8.0000.6900.0001.0069
	for SSI signals, X31/X32 cable with 1 x M23 / 1 x D-Sub, 9-pin 8.0000.6900.0001.0068

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety

Modular construction

Basic module	Expansion modules	Field bus modules
Modular safety control system	For additional inputs and outputs	For standard field bus interface
MS2	EM	BM

Overview inputs / outputs

14 x	safe digital inputs
2 x	relays outputs (safe due to redundant operation)
2 x	digital outputs LOSIDE / HISIDE (safe due to redundant operation)
2 x	messaging outputs
4 x	analogue inputs (safe due to redundant operation) – optional

Functional Safety

Safety module Basic module	Safety-M MS2 – Speed monitoring	2 axes
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Technical data

General data	
Max. number of expansion modules	2 x EM, 1 x BM
Interface for expansion modules	T-bus connector for top hat rail mount
Safe digital input lines	14 incl. 8 OSSD
Safe digital output lines	2
Safe relay outputs	1
Messaging outputs	2
Pulse output lines	2
Type of connection	pluggable terminals, coded
Max. terminal cross section	1.5 mm ² [AWG 15]
Drive monitoring - number of axis	1 axis / 2 axes

Electrical characteristics	
Power supply	24 V DC / 2 A
Tolerance	-15%, +20%
Power consumption	2.4 W
Fuse on power supply	max. 2 A
Rated data digital inputs	24 V DC / 20 mA, Type 1 to EN 61131-2
Rated data digital outputs	24 V DC / 250 mA
Rated data analogue inputs	±5 V DC / 0 - 10 V DC / 4-20 mA
Rated data relay outputs	24 V DC / 2 A and 230 V AC / 2 A
Pulse output lines	max. 250 mA

Environmental data	
Operating temperature	0°C ... +50°C [+32°F ... +122°F]
Storage temperature	-10°C ... +70°C [+14°F ... +158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178
EMC	acc. to EN 55011 and EN 61000-6-2

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 67.5 mm [3.90 x 4.51 x 2.66"]
Weight	390 g [13.76 oz]
Mounting	snap-on mounting on standard head rail

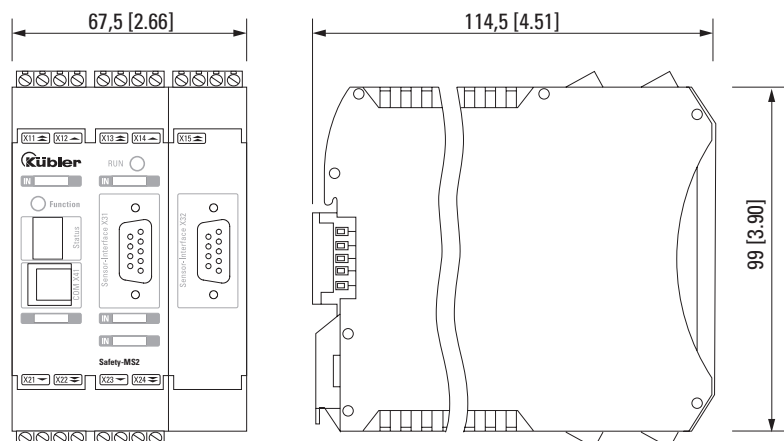
Safety characteristics	
Relevant standards	EN ISO 13849-1 / EN 62061, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value	2.3 x 10 ⁻⁹ h ⁻¹
Proof-Test-Intervall	20 years

Encoder interface front X31 / X32	
Type of connection	D-Sub-pin
Signal	SSI, SinCos, TTL
Frequency SinCos, TTL	max. 200 kHz
Clock frequency SSI	Mastermode 150 kHz Slavemode max. 250 kHz
Data length SSI	10-28 bit

Encoder interface terminal X23	
Type of connection	Plug-in terminal, 4-pin
Signal	Proximity switch, HTL
Frequency	max. 10 kHz

Dimensions

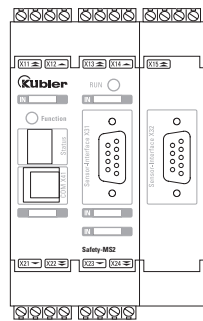
Dimensions in mm [inch]



Safety module **Safety-M MS2 – Speed monitoring** **2 axes**
Basic module

Terminal assignment

X11		X12		X13		X14		X15	
1	2	1	2	1	2	1	2	1	2
Power supply module +24 V DC	U24 extern	Digital IN 13	DI 13 / E.0.13	Power supply encoder interface X31	U_ENC_1	Digital IN 01 (OSSD compatible)	DI 01 / E.0.1	Power supply encoder interface X32	U_ENC_2
Power supply module +24 V DC	U24 extern	Digital IN 14	DI 14 / E.0.14	Power supply encoder interface X31	GND_ENC_1	Digital IN 02 (OSSD compatible)	DI 02 / E.0.2	Power supply encoder interface X32	GND_ENC_2
Power supply module 0 V DC	GND external	Pulse output P1	P1	Messaging and auxiliary output DO 0.1	DO 0.1 / A 0.1	Digital IN 03 (OSSD compatible)	DI 03 / E.0.3	NC	NC
Power supply module 0 V DC	GND external	Pulse output P2	P2	Messaging and auxiliary output DO 0.2	DO 0.2 / A 0.2	Digital IN 04 (OSSD compatible)	DI 04 / E.0.4	NC	NC

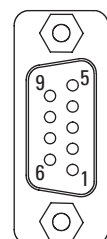


X21		X22		X23		X24		X25		X26	
1	2	1	2	1	2	1	2	1	2	1	2
HISIDE output 0	DO 0-HI / AD 0.0P	Relay output 1	K1.1 / AK 0.1	Digital IN 05 / Proximity switch 1	DI 05 / E.0.5	Digital IN 09 (OSSD compatible)	DI 09 / E.0.9	Analogue input AI1+	AI 1+	Analogue input AI3+	AI 3+
LOSIDE output 0	DO 0-LO / AD 0.0M	Relay output 1	K1.2 / AK 0.1	Digital IN 06 / Proximity switch 1	DI 06 / E.0.6	Digital IN 10 (OSSD compatible)	DI 10 / E.0.10	Analogue input AI1-	AI 1-	Analogue input AI3-	AI 3-
HISIDE output 1	DO 1-HI / AD 0.1P	Relay output 2	K2.1 / AK 0.2	Digital IN 07 / Proximity switch 2	DI 07 / E.0.7	Digital IN 11 (OSSD compatible)	DI 11 / E.0.11	Analogue input AI2+	AI 2+	Analogue input AI4+	AI 4+
LOSIDE output 1	DO 1-LO / AD 0.1M	Relay output 2	K2.2 / AK 0.2	Digital IN 08 / Proximity switch 2	DI 08 / E.0.8	Digital IN 12 (OSSD compatible)	DI 12 / E.0.12	Analogue input AI2-	AI 2-	Analogue input AI4-	AI 4-

optional (Type MS2.AXX)

Interface	D-Sub female connector											
Terminal X31/X32	Signal:	TTL	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SinCos	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SSI	-	0 V	-	C-	D+	D-	-	C+	+V	\perp
	Pin:		1	2	3	4	5	6	7	8	9	PH

D-Sub female connector, 9-pin



- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Cosine signal / incremental output channel A
- B, \bar{B} : Sine signal / incremental output channel B
- C+, C-: Clock signal
- D+, D-: Data signal
- PH \perp : Plug connector housing (Shield)

Functional Safety

Safety module	Safety-M MSP2 – Speed and position monitoring	2 axes
Basic module		



MSP2 is a compact and modular safety control of the Safety-M family with integrated drive monitoring for two axes and extended encoder interface. This device is freely programmable for the safe processing of drive-related safety functions as well as of EMERGENCY STOP switches, two-hand operator controls, light barriers, operating mode selectors, etc. Complex motion monitoring tasks are also possible when both axes are combined.

The basic version allows 4 safe encoder connections to be implemented. 14 safe inputs, 3 safe shut-off channels and 2 safe analogue inputs (optional) are available.

1-encoder solutions (TTL/HTL, Resolver, SinCos, proximity switch) and to a limited extent also 2-encoder solutions (a combination of any encoder technologies) are supported for the safe speed and/or position detection.

- Extensive library of pre-configured safe sensors and command devices
- Complete range of speed- and position-related safe drive monitoring functions as per DIN EN 61800 already integrated (e.g. SS1, SS2, SOS, SLS, SDI, SLA, SSM, SCA, SBC, EDM, SLI, SLP)
- Parameterizable encoder interface for TTL / SinCos / SSI / Resolver on the front and proximity switch / HTL via terminal connection
- Graphical programming interface by SafePLC-SW

- Basic unit comes with 14 safe input lines and 3 safe shut-off channels, comprising 1 safe relay output and 2 messaging outputs
- Cross-short-cut monitoring functionality
- Output contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts
- Extensive diagnostic functionality integrated in FW
- Status monitoring by coded 7-segment-display and status LED's
- Quit- / Start- / Reset button on the front display
- Extendable up to max. 65 safe I/O lines by means of an integrated backplane bus (connector for top hat rail mount)
- Optional field bus interface (bus modules for PROFIBUS DP, PROFINET IO, CANopen, EtherCAT, DeviceNet)
- 4 analogue inputs (optional)

Order code

8 . MSP2 . XXX
a b c

The programming software SafePLC and the programming cable are required for programming. T-BUS connectors are required for connecting a BUS module or an expansion module.

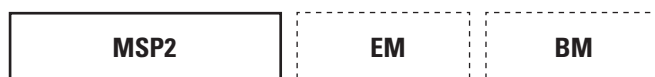
- | | | | |
|--|---|---|--|
| <p>a Analogue inputs
 0 = without analogue inputs
 A = with analogue inputs</p> | <p>b Analogue voltage measuring ¹⁾
 0 = without
 2 = 2 analogue voltage inputs (X25)
 4 = 4 analogue voltage inputs (X25/X26)</p> | <p>c Analogue current measuring ¹⁾
 0 = without
 2 = 2 analogue current inputs (X26)
 4 = 4 analogue current inputs (X25/X26)</p> | <p>¹⁾ 4 analogue inputs are available</p> |
|--|---|---|--|

Accessory	Order No.
T-bus connector	05.TBMS.000
Programming cable	8.0010.9000.0020
Licence key SafePLC	05.SPLC.001
Connection technology	
Cordset, pre-assembled, 1 m [3.28']	
for SinCos signals	cable with 1 x M23 / 1 x D-Sub, 9-pin 8.0000.6900.0001.0069
for SSI signals, X31/X32	cable with 1 x M23 / 1 x D-Sub, 9-pin 8.0000.6900.0001.0068
for SSI signals, X33/X34	cable with 1 x M23 / 1 x D-Sub, 9-pin 8.0000.6900.0001.0072
for SinCos+SSI signals	cable with 1 x M23 / 2 x D-Sub, 9-pin 8.0000.6900.0001.0070

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety

Modular construction

<p>Basic module Modular safety control system</p>	<p>Expansion modules For additional inputs and outputs</p>	<p>Field bus modules For standard field bus interface</p>
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Overview inputs / outputs

14 x	safe digital inputs
2 x	relays outputs (safe due to redundant operation)
2 x	digital outputs LOSIDE / HISIDE (safe due to redundant operation)
2 x	messaging outputs
4 x	analogue inputs (safe due to redundant operation) – optional

Functional Safety

Safety module Basic module	Safety-M MSP2 – Speed and position monitoring	2 axes
---------------------------------------	--	---------------

Technical data

General data	
Max. number of expansion modules	2 x EM, 1 x BM
Interface for expansion modules	T-bus connector for top hat rail mount
Safe digital input lines	14 incl. 8 OSSD
Safe digital output lines	2
Safe relay outputs	1
Messaging outputs	2
Pulse output lines	2
Type of connection	pluggable terminals, coded
Max. terminal cross section	1.5 mm ² [AWG 15]
Drive monitoring - number of axis	2 axes

Electrical characteristics	
Power supply	24 V DC / 2 A
Tolerance	-15%, +20%
Power consumption	2.4 W
Fuse on power supply	max. 2 A
Rated data digital inputs	24 V DC / 20 mA, Type 1 to EN 61131-2
Rated data digital outputs	24 V DC / 250 mA
Rated data analogue inputs	±5 V DC / 0 - 10 V DC / 4-20 mA
Rated data relay outputs	24 V DC / 2 A and 230 V AC / 2 A
Pulse output lines	max. 250 mA

Environmental data	
Operating temperature	0°C ... +50°C [+32°F ... +122°F]
Storage temperature	-10°C ... +70°C [+14°F ... +158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178
EMC	acc. to EN 55011 and EN 61000-6-2

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 112.5 mm [3.90 x 4.51 x 4.43"]
Weight	520 g [18.34 oz]
Mounting	snap-on mounting on standard head rail

Safety characteristics	
Relevant standards	EN ISO 13849-1 / EN 62061, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value	2.3 x 10 ⁻⁹ h ⁻¹
Proof-Test-Intervall	20 years

Encoder interface front X31 / X32	
Type of connection	D-Sub-pin
Signal	SSI, SinCos, TTL
Frequency SinCos, TTL	max. 200 kHz
Clock frequency SSI	Mastermode 150 kHz Slavemode max. 250 kHz
Data length SSI	10-28 bit

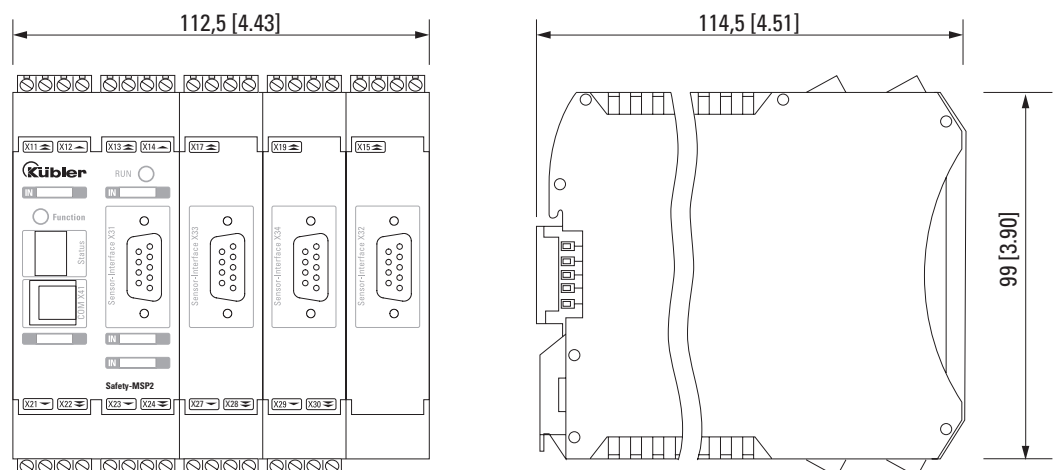
Encoder interface front X33 / X34	
Type of connection	D-Sub-pin
Signal	SSI, SinCos, TTL, Resolver
Frequency SinCos, TTL	max. 250 kHz
Clock frequency SSI	Mastermode 150 kHz Slavemode max. 350 kHz
Data length SSI	10-28 bit
Resolver	Signal frequency max. 600 kHz Input voltage max. 8 Vpp Reference frequency 6 - 16 kHz Reference amplitude 8 - 28 Vpp Number of pole pairs 1 - 8 Transformation ratio 2:1, 3:1, 4:1 Phase fault max. 8°

Encoder interface terminal X23	
Type of connection	Plug-in terminal, 4-pin
Signal	Proximity switch, HTL
Frequency	max. 10 kHz

Encoder interface terminal X27, X28, X29, X30	
Type of connection	Plug-in terminal, 4-pin
Signal	Proximity switch, HTL
Frequency	max. 200 kHz

Dimensions

Dimensions in mm [inch]



Safety module Basic module

Safety-M MSP2 – Speed and position monitoring

2 axes

Terminal assignment

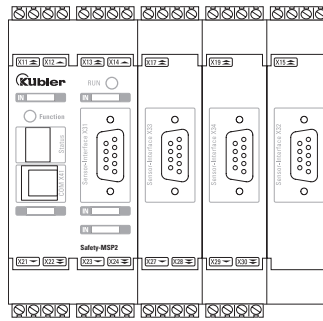
	1	2	3	4
Power supply module +24 V DC	U24 extern			
Power supply module +24 V DC	U24 extern			
Power supply module 0 V DC	GND external			
Power supply module 0 V DC	GND external			
Digital IN 13	DI 13 / E 0.13			
Digital IN 14	DI 14 / E 0.14			
Pulse output P1	P1			
Pulse output P2	P2			

	1	2	3	4
Power supply encoder interface X31	U_ENC_1			
Power supply encoder interface X31	GND_ENC_1			
Messaging and auxiliary output DO 0.1	DO 0.1 / A 0.1			
Messaging and auxiliary output DO 0.2	DO 0.2 / A 0.2			
Digital IN 01 (OSSD compatible)	DI 01 / E 0.1			
Digital IN 02 (OSSD compatible)	DI 02 / E 0.2			
Digital IN 03 (OSSD compatible)	DI 03 / E 0.3			
Digital IN 04 (OSSD compatible)	DI 04 / E 0.4			

	1	2	3	4
Power supply encoder interface X33	U_ENC_3			
Power supply encoder interface X33	GND_ENC_3			
Reference signal Res. f. encoder interf. X33	U_Ref_3			
NC	NC			

	1	2	3	4
Power supply encoder interface X34	U_ENC_4			
Power supply encoder interface X34	GND_ENC_4			
Reference signal Res. f. encoder interf. X34	U_Ref_4			
NC	NC			

	1	2	3	4
Power supply encoder interface X32	U_ENC_2			
Power supply encoder interface X32	GND_ENC_2			
NC	NC			
NC	NC			



	1	2	3	4
HISIDE output 0	DO 0-HI / AD 0.0P			
LOSIDE output 0	DO 0-LO / AD 0.0M			
HISIDE output 1	DO 1-HI / AD 0.1P			
LOSIDE output 1	DO 1-LO / AD 0.1M			
Relay output 1	K1.1 / AK 0.1			
Relay output 1	K1.2 / AK 0.1			
Relay output 2	K2.1 / AK 0.2			
Relay output 2	K2.2 / AK 0.2			

	1	2	3	4
Digital IN 05 / Proximity switch 1	DI 05 / E 0.5			
Digital IN 06 / Proximity switch 1	DI 06 / E 0.6			
Digital IN 07 / Proximity switch 2	DI 07 / E 0.7			
Digital IN 08 / Proximity switch 2	DI 08 / E 0.8			
Digital IN 09 (OSSD compatible)	DI 09 / E 0.9			
Digital IN 10 (OSSD compatible)	DI 10 / E 0.10			
Digital IN 11 (OSSD compatible)	DI 11 / E 0.11			
Digital IN 12 (OSSD compatible)	DI 12 / E 0.12			

	1	2	3	4
HTL input A f. encoder interface X33	HTL_A_1			
HTL input A f. encoder interface X33	HTL_A_2			
HTL input A f. encoder interface X33	HTL_A_3			
NC	NC			
HTL input B f. encoder interface X33	HTL_B_1			
HTL input B f. encoder interface X33	HTL_B_2			
HTL input B f. encoder interface X33	HTL_B_3			
NC	NC			

	1	2	3	4
HTL input A f. encoder interface X34	HTL_A_1			
HTL input A f. encoder interface X34	HTL_A_2			
HTL input A f. encoder interface X34	HTL_A_3			
NC	NC			
HTL input B f. encoder interface X34	HTL_B_1			
HTL input B f. encoder interface X34	HTL_B_2			
HTL input B f. encoder interface X34	HTL_B_3			
NC	NC			

optional (Type MSP2.AXX)

	1	2	3	4
Analogue input AI1+	AI1+			
Analogue input AI1-	AI1-			
Analogue input AI2+	AI2+			
Analogue input AI2-	AI2-			
Analogue input AI3+	AI3+			
Analogue input AI3-	AI3-			
Analogue input AI4+	AI4+			
Analogue input AI4-	AI4-			

Functional Safety

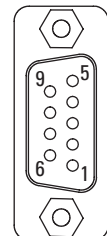
Safety module	Safety-M MSP2 – Speed and position monitoring	2 axes
Basic module		

Terminal assignment

Interface	D-Sub female connector											
Terminal X31/X32	Signal:	TTL	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SinCos	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SSI	-	0 V	-	C-	D+	D-	-	C+	+V	\perp
	Pin:		1	2	3	4	5	6	7	8	9	PH

Interface	D-Sub female connector											
Terminal X33/X34	Signal:	TTL	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SinCos	-	0 V	-	\bar{A}	B	\bar{B}	-	A	+V	\perp
		SSI	-	0 V	C+	-	D+	D-	C-	-	+V	\perp
		Resolver	R1	R2	R3	S1	S2	S4	R4	S3	RV	\perp
	Pin:		1	2	3	4	5	6	7	8	9	PH

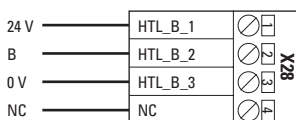
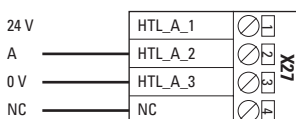
D-Sub female connector, 9-pin



- +V: Encoder power supply +V DC
- 0 V: Encoder power supply ground GND (0 V)
- A, \bar{A} : Cosine signal / incremental output channel A
- B, \bar{B} : Sine signal / incremental output channel B
- C+, C-: Clock signal
- D+, D-: Data signal
- R1, R2: Reference output
- R3, R4: Reference input
- S1, S3: Cosine signal
- S2, S4: Sine signal
- RV: Reference power supply
- PH \perp : Plug connector housing (Shield)

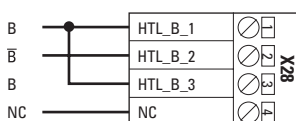
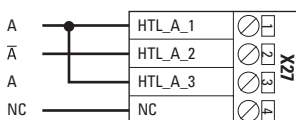
HTL encoder interface A / B

without inverted signal



HTL encoder interface A, \bar{A} / B, \bar{B}

with inverted signal



Functional Safety

Safety module	Safety-M EM3 – I/O expansion	Digital
Expansion module		



Digital I/O expansion for the Safety-M basis modules.

The module is connected to the basic module via a backplane bus connector that snaps onto the standard top-hat rail.

The expansion module has 10 safe I/O optionally configurable as inputs or outputs, 12 safe inputs and 2 messaging outputs.



- 10 safe I/O – configurable as inputs or outputs
- 12 safe inputs, incl. 8 OSSD compatible
- 2 messaging outputs

- Cross-short-cut monitoring functionality
- Output contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts
- Extensive diagnostic functionality integrated in FW

Order No.			
EM3	I/O expansion, digital	8.EM3.000	T-BUS connectors are required for connecting basic modules.

Accessory		Order No.
T-bus connector		05.TBMS.000

Modular construction

Basic module

Modular safety control system

Expansion modules

For additional inputs and outputs

Field bus modules

For standard field bus interface



Overview inputs / outputs

12 x	safe digital inputs (8 x OSSD compatible)
10 x	safe digital inputs / outputs I/O
2 x	messaging outputs

Technical data

General data	
Interface for basic modules	T-bus connector for top hat rail mount
Safe digital input lines	12 incl. 8 OSSD
Safe digital I/O	10
Messaging outputs	2
Pulse output lines	2
Type of connection	pluggable terminals, coded
Max. terminal cross section	1.5 mm ² [AWG 15]

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 45 mm [3.90 x 4.51 x 1.77"]
Weight	250 g [8.82 oz]
Mounting	snap-on mounting on standard head rail

Environmental data	
Operating temperature	0°C ... +50°C [+32°F ... +122°F]
Storage temperature	-10°C ... +70°C [+14°F ... +158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178
EMC	acc. to EN 55011 and EN 61000-6-2

Electrical characteristics	
Power consumption	3.8 W
Rated data digital inputs	24 V DC / 20 mA, type 1 acc. to EN 61131-2
Rated data digital outputs	24 V DC / 250 mA
Pulse output lines	max. 250 mA

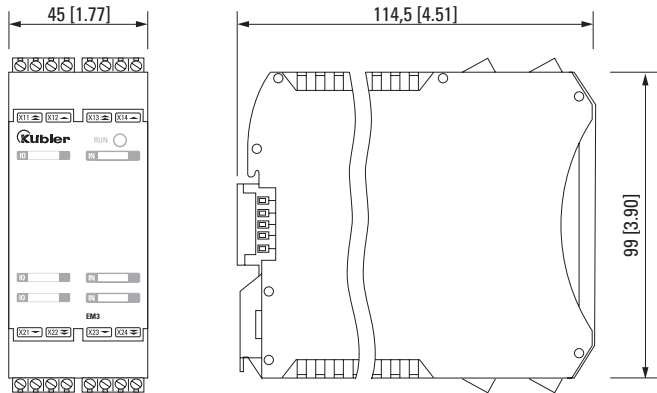
Safety characteristics	
Relevant standards	EN ISO 13849-1 / EN 62061, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value	2.2 x 10 ⁻⁹ h ⁻¹
Proof-Test-Intervall	20 years

Functional Safety

Safety module	Expansion module	Safety-M EM3 – I/O expansion	Digital
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Dimensions

Dimensions in mm [inch]



Terminal assignment

X11		X12		X13		X14	
1	2	3	4	1	2	3	4
Power supply module +24 V DC	U24 extern	Power supply module +24 V DC	U24 extern	NC	NC	Messaging and auxiliary output DO 1.1	DI 01 / Ex.1
Power supply module 0 V DC	GND external	Power supply module 0 V DC	GND external	NC	NC	Messaging and auxiliary output DO 1.2	DI 02 / Ex.2
Power supply module 0 V DC	GND external	Digital I/O 1	IO 01 / EA y.1			Digital IN 01 (OSSD compatible)	DI 03 / Ex.3
		Digital I/O 2	IO 02 / EA y.2			Digital IN 02 (OSSD compatible)	DI 04 / Ex.4
		Pulsausgang	P1			Digital IN 03 (OSSD compatible)	
		Pulsausgang	P2			Digital IN 04 (OSSD compatible)	



x = 1 or 2, depending on the address of the expansion module
 y = 1 or 0, depending on whether selected as input or output

X21		X22		X23		X24	
1	2	3	4	1	2	3	4
Digital I/O 3	IO 03 / EA y.3	Digital I/O 7	IO 07 / EA y.7	Digital IN 05	DI 05 / Ex.5	Digital IN 09 (OSSD compatible)	DI 09 / Ex.9
Digital I/O 4	IO 04 / EA y.4	Digital I/O 8	IO 08 / EA y.8	Digital IN 06	DI 06 / Ex.6	Digital IN 10 (OSSD compatible)	DI 10 / Ex.10
Digital I/O 5	IO 05 / EA y.5	Digital I/O 9	IO 09 / EA y.9	Digital IN 07	DI 07 / Ex.5	Digital IN 11 (OSSD compatible)	DI 11 / Ex.11
Digital I/O 6	IO 06 / EA y.6	Digital I/O 10	IO 10 / EA y.10	Digital IN 08	DI 08 / Ex.8	Digital IN 12 (OSSD compatible)	DI 12 / Ex.12

Functional Safety

Safety module	Safety-M EM4 – I/O expansion	Relay
Expansion module		



Digital I/O expansion for the Safety-M basis modules.

The module is connected to the basic module via a backplane bus connector that snaps onto the standard top-hat rail.

The expansion module has 2 safe I/O optionally configurable as inputs or outputs, 12 safe inputs, 2 messaging outputs as well as 4 safe relay outputs.

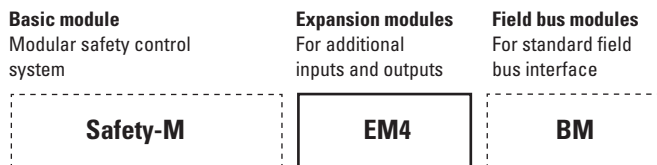


- 2 safe I/O – configurable as inputs or outputs
- 12 safe inputs, incl. 8 OSSD compatible
- 2 messaging outputs
- 4 safe relay outputs
- Cross-short-cut monitoring functionality
- Output contact multiplication or increase of power capability by external contactors in connection with the device-internal monitoring function for external contacts
- Extensive diagnostic functionality integrated in FW

Order No.			
EM4	I/O expansion, relay	8.EM4.000	T-BUS connectors are required for connecting basic modules.

Accessory	Order No.
T-bus connector	05.TBMS.000

Modular construction



Overview inputs / outputs

12 x	safe digital inputs (8 x OSSD compatible)
2 x	safe digital inputs / outputs I/O
8 x	relay outputs (safe due to redundant operation)
2 x	messaging outputs

Technical data

General data	
Interface for basic modules	T-bus connector for top hat rail mount
Safe digital input lines	12 incl. 8 OSSD
Safe digital I/O	10
Messaging outputs	2
Pulse output lines	2
Type of connection	pluggable terminals, coded
Max. terminal cross section	1.5 mm ² [AWG 15]

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 90 mm [3.90 x 4.51 x 3.54"]
Weight	540 g [19.05 oz]
Mounting	snap-on mounting on standard head rail

Environmental data	
Operating temperature	0°C ... +50°C [+32°F ...+122°F]
Storage temperature	-10°C ... +70°C [+14°F ...+158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178
EMC	acc. to EN 55011 and EN 61000-6-2

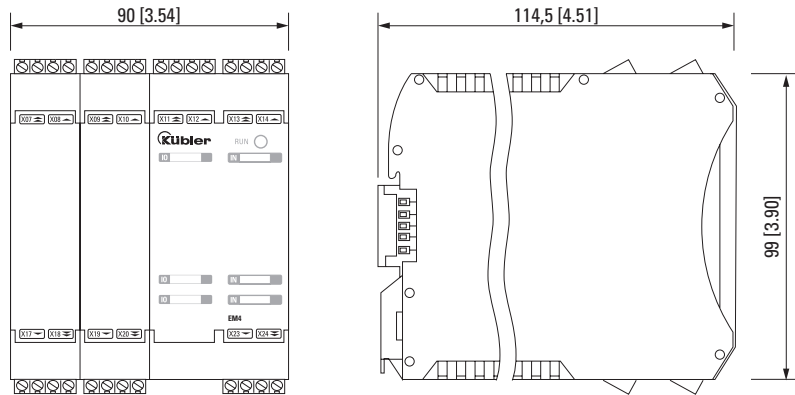
Electrical characteristics	
Power consumption	3.8 W
Rated data digital inputs	24 V DC / 20 mA, type 1 acc. to EN 61131-2
Rated data digital outputs	24 V DC / 250 mA
Pulse output lines	max. 250 mA

Safety characteristics	
Relevant standards	EN ISO 13849-1 / EN 62061, EN 61508
Classification	PLe / SIL3
System structure	2 channel (Cat. 4 / HFT = 1)
PFH_d value	6.0 x 10 ⁻⁹ h ⁻¹
Proof-Test-Intervall	20 years

Functional Safety

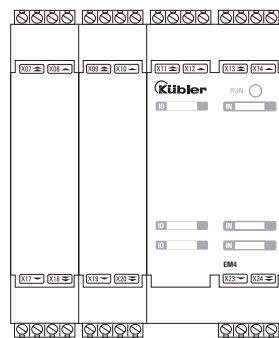
Safety module **Safety-M EM4 – I/O expansion** **Relay**

Dimensions
Dimensions in mm [inch]



Terminal assignment

X07		X08		X09		X10		X11		X12		X13		X14	
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Read back contact relay 1	K1/11	Read back contact relay 1	K1/12	Read back contact relay 5	K5/11	Read back contact relay 7	K7/11	Power supply module +24 VDC	U24 extern	Digital I/O 1	IO 01 / EA y1	NC	NC	Digital IN 01 (OSSD compatible)	DI 01 / E.x.1
Read back contact relay 2	K2/11	Read back contact relay 3	K3/12	Read back contact relay 5	K5/12	Read back contact relay 7	K7/12	Power supply module +24 VDC	U24 extern	Digital I/O 2	IO 02 / EA y2	NC	NC	Digital IN 02 (OSSD compatible)	DI 02 / E.x.2
Read back contact relay 2	K2/12	Read back contact relay 4	K4/11	Read back contact relay 6	K6/11	Read back contact relay 8	K8/11	Power supply module 0 V DC	GND external	Pulse output	P1	Messaging and auxiliary output DO 1.1	DO 1.1 / A.x.1	Digital IN 03 (OSSD compatible)	DI 03 / E.x.3
Read back contact relay 2	K2/12	Read back contact relay 4	K4/12	Read back contact relay 6	K6/12	Read back contact relay 8	K8/12	Power supply module 0 V DC	GND external	Pulse output	P2	Messaging and auxiliary output DO 1.2	DO 1.2 / A.x.2	Digital IN 04 (OSSD compatible)	DI 04 / E.x.4



x = 1 or 2, depending on the address of the expansion module
y = 1 or 0, depending on whether selected as input or output

X17		X18		X19		X20		X23		X24	
1	2	3	4	1	2	3	4	1	2	3	4
Relay output 1	K1.1 / AK x.1	Relay output 3	K3.1 / AK x.3	Relay output 5	K5.1 / AK x.5	Relay output 7	K7.1 / AK x.7	Digital IN 05	DI 05 / E.x.5	Digital IN 09 (OSSD compatible)	DI 09 / E.x.9
Relay output 1	K1.2 / AK x.1	Relay output 3	K3.2 / AK x.3	Relay output 5	K5.2 / AK x.5	Relay output 7	K7.2 / AK x.7	Digital IN 06	DI 06 / E.x.6	Digital IN 10 (OSSD compatible)	DI 10 / E.x.10
Relay output 2	K2.1 / AK x.2	Relay output 4	K4.1 / AK x.4	Relay output 6	K6.1 / AK x.6	Relay output 8	K8.1 / AK x.8	Digital IN 07	DI 07 / E.x.7	Digital IN 11 (OSSD compatible)	DI 11 / E.x.11
Relay output 2	K2.2 / AK x.2	Relay output 4	K4.2 / AK x.4	Relay output 6	K6.2 / AK x.6	Relay output 8	K8.2 / AK x.8	Digital IN 08	DI 08 / E.x.8	Digital IN 12 (OSSD compatible)	DI 12 / E.x.12

Functional Safety

Safety module Communication module	Safety-M BM11 – Communication module	DeviceNet
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DeviceNet 

The BM communication modules ensure data exchange between the Safety-M basic modules and non-safe controls. It is for example possible to send error and operating messages. In addition, they allow transmitting process and logic data such as the current position and/or speed, as well as the status of the inputs and outputs.

The communication modules are operated together with a basic module on a common backplane bus and thus take on the functionality of a gateway to the corresponding field bus.

- The binary or analogue input or output data, configured for each module by a safe PLC, are transmitted from and to the non-safe control via field bus.
- This connection allows for coordination of the non-safe and of the safe sections of the global system thanks to easily configurable functions.
- The communication modules BM are to be parameterised as slave elements.
- The communication modules permit a basic module to be connected to a field bus communication module via a common backplane.

DeviceNet

EDS files are available on the Safety-M software CD and online on our homepage.

The DeviceNet baud rates of 125 kbps, 250 kbps und 500 kbps can be set with the address switches on the front side.

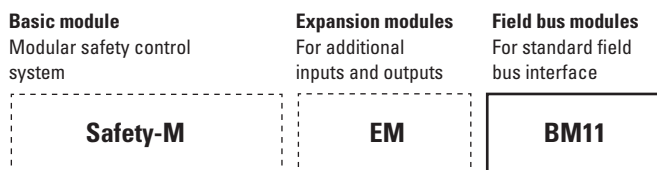
Order No.		
BM11	BUS communication - DeviceNet	8.BM11.000

Accessory	Order No.
T-bus connector	05.TBMS.000
To connect several basic modules	05.TBFM.000

Connection technology		
Unprepared cable	DeviceNet cable	05.KABEL5723.XXX ¹⁾

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety

Modular construction



¹⁾ cable length in meters (xxx = length in m; e.g. 10 m = 010)

Functional Safety

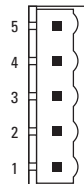
Safety module	Safety-M BM11 – Communication module	DeviceNet
Communication module		

Technical data

Data interface		Environmental data	
Max. numbers of basic modules	1	Operating temperature	0°C ... +50°C [+32°F ...+122°F]
Output data	max. 128 bit / basic module	Storage temperature	-10°C ... +70°C [+14°F ...+158°F]
Minimum operating time	> 8 ms	Type of protection	IP52
Timeout WD	adjustable, max. 400 ms	Climate class	3 acc. to DIN 50178
Electrical characteristics		Mechanical characteristics	
Power consumption	2.4 W	Size h x d x w	99 x 114.5 x 22.5 mm [3.90 x 4.51 x 0.89"]
Power supply	5.7 V via backplane bus	Weight	110 g [3.88 oz]
		Mounting	snap-on mounting on standard head rail

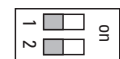
Connector pin assignment

Pin	Assignment
1	BUS_GND ¹⁾
2	CAN_L
3	CAN_GND
4	CAN_H
5	BUS_VDC ¹⁾



DIP switches

Switch	Assignment
1	120 Ohm terminating resistor Backplane bus
2	120 Ohm terminating resistor ND connector DeviceNet

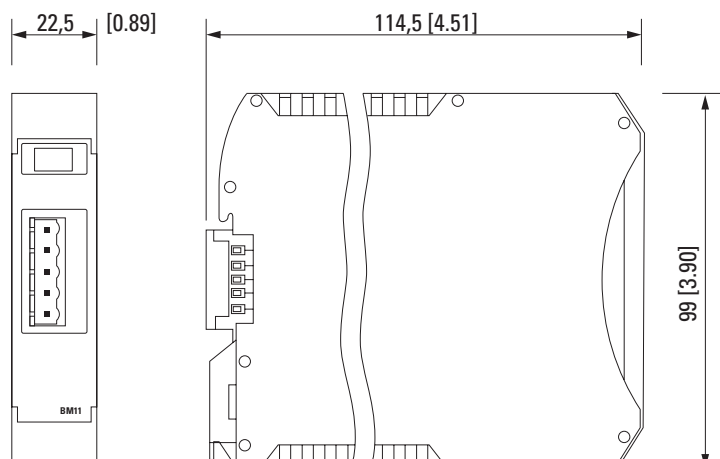


Address switches

Addr HIGH				Addr LOW				Baudrate	Node ID
B7	B6	B5	B4	B3	B2	B1	B0		
-	-	0	0	0	0	0	0	-	0
-	-	0	0	0	0	0	1	-	1
-	-	0	0	0	0	1	0	-	2
-	-	0	0	0	0	1	1	-	3
-	-	-	...
-	-	1	1	1	1	0	1	-	61
-	-	1	1	1	1	1	0	-	62
-	-	1	1	1	1	1	1	-	63
0	0	-	-	-	-	-	-	125 kbps	-
0	1	-	-	-	-	-	-	250 kbps	-
1	0	-	-	-	-	-	-	500 kbps	-
1	1	-	-	-	-	-	-	AutoBaud	not supported

Dimensions

Dimensions in mm [inch]



1) For supplying an external DeviceNet termination resistor

Functional Safety

Safety module Communication module	Safety-M BM21 – Communication module	CANopen
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The BM communication modules ensure data exchange between the Safety-M basic modules and non-safe controls. It is for example possible to send error and operating messages. In addition, they allow transmitting process and logic data such as the current position and/or speed, as well as the status of the inputs and outputs.

The communication modules are operated together with a basic module on a common backplane bus and thus take on the functionality of a gateway to the corresponding field bus.

- The binary or analogue input or output data, configured for each module by a safe PLC, are transmitted from and to the non-safe control via field bus.
- This connection allows for coordination of the non-safe and of the safe sections of the global system thanks to easily configurable functions.
- The communication modules BM are to be parameterised as slave elements.
- The communication modules permit 4 basic modules to be connected to a field bus communication module via a common backplane.

CANopen

EDS files are available on the Safety-M software CD and online on our homepage.

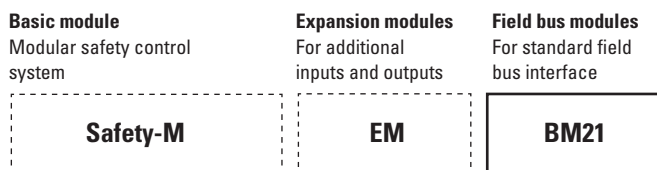
The CANopen baud rate of 500 kbps is fixed.

Order No.		
BM21	BUS communication - CANopen	8.BM21.000

Accessory		Order No.
T-bus connector		05.TBMS.000
	To connect several basic modules	05.TBFM.000
Connection technology		
Unprepared cable	CANopen cable	8.0000.6V00.XXX ¹⁾
Connector, self-assembly	D-Sub connector, 9-pin – angled 70°	8.0000.514A.0000

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety

Modular construction



¹⁾ cable length in meters (xxx = length in m; e.g. 10 m = 010)

Functional Safety

Safety module	Safety-M BM21 – Communication module	CANopen
Communication module		

Technical data

Data interface	
Max. numbers of basic modules	4
Input data	max. 32 bit / basic module
Output data (binary, analogue)	max. 128 bit / basic module
Minimum operating time	> 8 ms
Timeout WD	adjustable, max. 400 ms

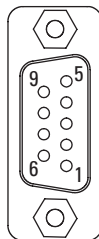
Environmental data	
Operating temperature	0°C ... +50°C [+32°F ...+122°F]
Storage temperature	-10°C ... +70°C [+14°F ...+158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178

Electrical characteristics	
Power consumption	2.4 W
Power supply	5.7 V via backplane bus

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 22.5 mm [3.90 x 4.51 x 0.89"]
Weight	110 g [3.88 oz]
Mounting	snap-on mounting on standard head rail

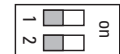
Connector pin assignment

Pin	Assignment
1	-
2	-
3	CAN_L
4	-
5	CAN_GND
6	-
7	-
8	CAN_H
9	-
housing	SHIELD



DIP switches

Switch	Assignment
1	120 Ohm terminating resistor Backplane bus
2	120 Ohm terminating resistor D-Sub female connector CANopen

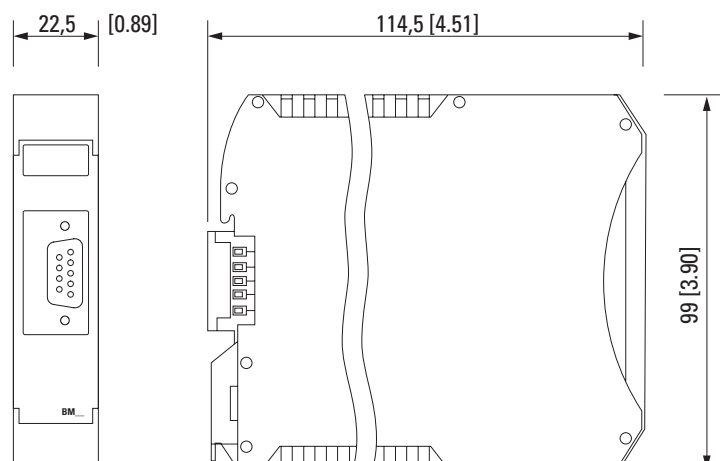


Address switches

B7	Addr HIGH				Addr LOW				Baud rate	Node ID
	B6	B5	B4	B3	B2	B1	B0			
-	0	0	0	0	0	0	0	-	0	
-	0	0	0	0	0	0	1	-	1	
-	0	0	0	0	0	1	0	-	2	
-	0	0	0	0	0	1	1	-	3	
-	-	...	
-	1	1	1	1	1	0	1	-	125	
-	1	1	1	1	1	1	0	-	126	
-	1	1	1	1	1	1	1	-	127	
0	-	-	-	-	-	-	-	500 kbps		
1	-	-	-	-	-	-	-	1000 kbps	not supported	

Dimensions

Dimensions in mm [inch]



Functional Safety

Safety module Communication module	Safety-M BM31 – Communication module	PROFIBUS DP
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The BM communication modules ensure data exchange between the Safety-M basic modules and non-safe controls. It is for example possible to send error and operating messages. In addition, they allow transmitting process and logic data such as the current position and/or speed, as well as the status of the inputs and outputs.

The communication modules are operated together with a basic module on a common backplane bus and thus take on the functionality of a gateway to the corresponding field bus.

- The binary or analogue input or output data, configured for each module by a safe PLC, are transmitted from and to the non-safe control via field bus.
- This connection allows for coordination of the non-safe and of the safe sections of the global system thanks to easily configurable functions.
- The communication modules BM are to be parameterised as slave elements.
- The communication modules permit 4 basic modules to be connected to a field bus communication module via a common backplane.

PROFIBUS DP

GSD files are available on the Safety-M software CD and online on our homepage.

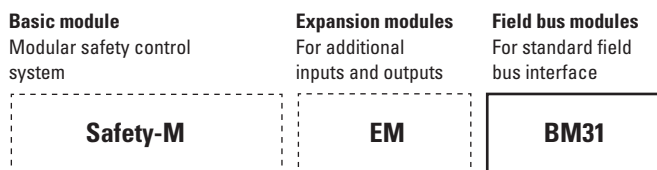
The Profibus baud rate of 9.6 kBaud up to 12 Mbaud is recognised automatically.

Order No.		
BM31	BUS communication - PROFIBUS DP	8.BM31.000

Accessory		Order No.
T-bus connector		05.TBMS.000
	To connect several basic modules	05.TBFM.000
Connection technology		
Unprepared cable	Profibus cable	05.KABEL451.XXX¹⁾
Connector, self-assembly	D-Sub connector, 9-pin – angled 70°	8.0000.514A.0000

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories
 Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology
 You will find an overview of our systems and components for Functional Safety under www.kuebler.com/safety

Modular construction



¹⁾ cable length in meters (xxx = length in m; e.g. 10 m = 010)

Functional Safety

Safety module	Safety-M BM31 – Communication module	PROFIBUS DP
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Technical data

Data interface	
Max. numbers of basic modules	4
Output data (binary, analogue)	max. 128 bit / basic module
Minimum operating time	> 8 ms
Timeout WD	adjustable, max. 400 ms

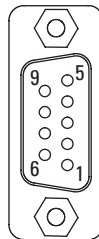
Environmental data	
Operating temperature	0°C ... +50°C [+32°F ...+122°F]
Storage temperature	-10°C ... +70°C [+14°F ...+158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178

Electrical characteristics	
Power consumption	2.4 W
Power supply	5.7 V via backplane bus

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 22.5 mm [3.90 x 4.51 x 0.89"]
Weight	110 g [3.88 oz]
Mounting	snap-on mounting on standard head rail

Connector pin assignment

Pin	Assignment
1	-
2	-
3	PB_B
4	-
5	BUS_GND ¹⁾
6	BUS_VDC ¹⁾
7	-
8	PB_A
9	-



DIP switches

Switch	Assignment
1	120 Ohm terminating resistor Backplane bus
2	120 Ohm terminating resistor D-Sub female connector PROFIBUS DP

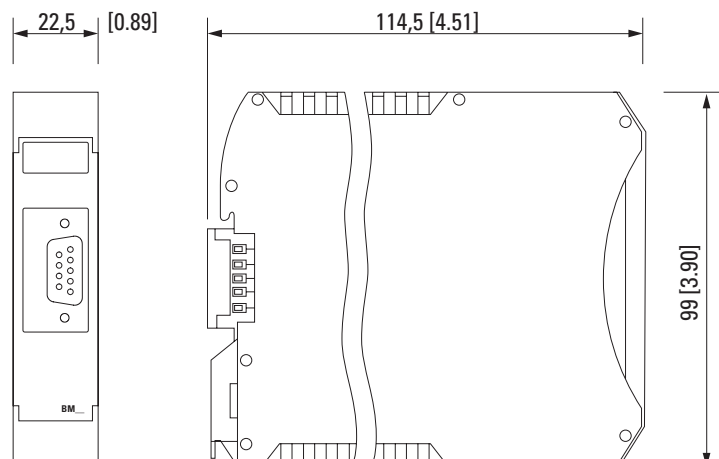


Address switches

Addr HIGH				Addr LOW				Baud rate	Node ID
B7	B6	B5	B4	B3	B2	B1	B0		
0	0	0	0	0	0	0	0	-	0
0	0	0	0	0	0	0	1	-	1
0	0	0	0	0	0	1	0	-	2
0	0	0	0	0	0	1	1	-	3
-	-	...
1	1	1	1	1	1	0	1	-	253
1	1	1	1	1	1	1	0	-	254
1	1	1	1	1	1	1	1	-	255

Dimensions

Dimensions in mm [inch]



1) For supplying an external Profibus-DP termination resistor

Functional Safety

Safety module Communication module	Safety-M BMB1 – Communication module	EtherCAT
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EtherCAT
Conformance tested



The BM communication modules ensure data exchange between the Safety-M basic modules and non-safe controls. It is for example possible to send error and operating messages. In addition, they allow transmitting process and logic data such as the current position and/or speed, as well as the status of the inputs and outputs.

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EtherCAT

ESI files are available on the Safety-M software CD and online on our homepage.

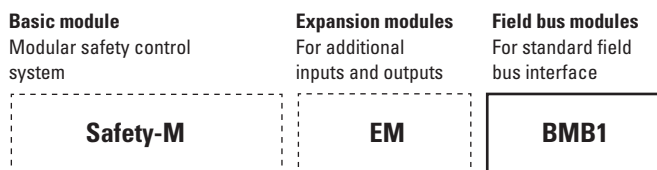
The EtherCAT transmission rate is 100 Mbit/s in full-duplex mode.

Order No.		
BMB1	BUS communication - EtherCAT	8.BMB1.000

Accessory		Order No.
T-bus connector		05.TBMS.000
	To connect several basic modules	05.TBFM.000
Connection technology		
Unprepared cable	Ethernet cable	05.00.6031.1111.XXXM ¹⁾
Connector, self-assembly	RJ45 connector straight, IP20	05.VS-08-RJ45-5-Q/IP20

Further accessories can be found in accessories area of our website at: www.kuebler.com/accessories
 Additional 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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Modular construction



¹⁾ cable length in meters (xxx = length in m; e.g. 10 m = 010)

Functional Safety

Safety module	Safety-M BMB1 – Communication module	EtherCAT
Communication module		

Technical data

Data interface	
Max. numbers of basic modules	4
Input data	max. 64 bit / basic module
Output data	max. 128 bit / basic module
Minimum operating time	> 8 ms
Timeout WD	adjustable, max. 400 ms

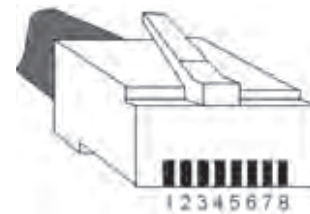
Environmental data	
Operating temperature	0°C ... +50°C [+32°F ...+122°F]
Storage temperature	-10°C ... +70°C [+14°F ...+158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178

Electrical characteristics	
Power consumption	2.4 W
Power supply	5.7 V via backplane bus

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 22.5 mm [3.90 x 4.51 x 0.89"]
Weight	110 g [3.88 oz]
Mounting	snap-on mounting on standard head rail

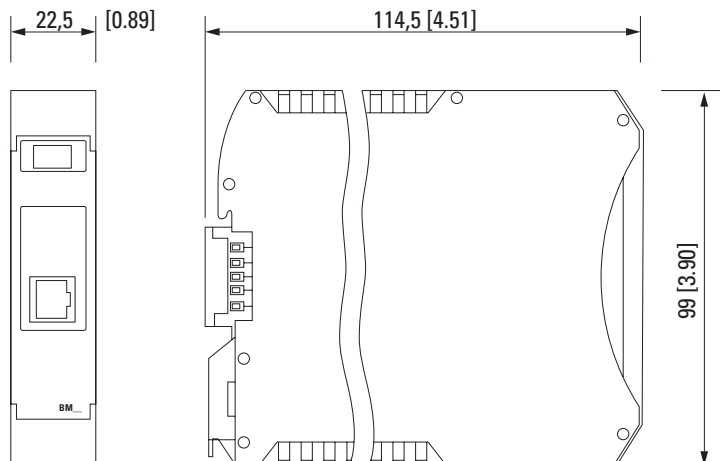
Connector pin assignment

Pin	Assignment	colour
1	TxD+	white-orange
2	TxD-	orange
3	RxD+	white-green
4	-	blue
5	-	white-blue
6	RxD-	green
7	-	white-brown
8	-	brown



Dimensions

Dimensions in mm [inch]



Functional Safety

Safety module Communication module	Safety-M BMC1 – Communication module	PROFINET IO
---	---	--------------------



The BM communication modules ensure data exchange between the Safety-M basic modules and non-safe controls. It is for example possible to send error and operating messages. In addition, they allow transmitting process and logic data such as the current position and/or speed, as well as the status of the inputs and outputs.

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- The communication modules permit 4 basic modules to be connected to a field bus communication module via a common backplane.

PROFINET IO

GSDML files are available on the Safety-M software CD and online on our homepage.

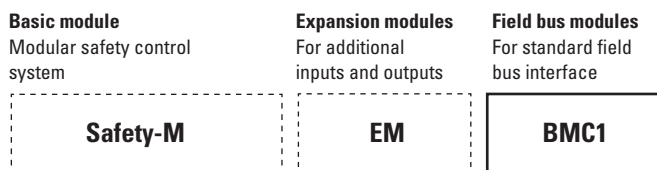
The PROFINET baud rate is 100 Mbit/s in full-duplex mode.

Order No.		
BMC1	BUS communication - PROFINET IO	8.BMC1.000

Accessory		Order No.
T-bus connector		05.TBMS.000
	To connect several basic modules	05.TBFM.000
Connection technology		
Unprepared cable	Ethernet cable	05.00.6031.1111.XXXM ¹⁾
Connector, self-assembly	RJ45 connector straight, IP20	05.VS-08-RJ45-5-Q/IP20

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Modular construction



¹⁾ cable length in meters (xxx = length in m; e.g. 10 m = 010)

Functional Safety

Safety module	Safety-M BMC1 – Communication module	PROFINET IO
Communication module		

Technical data

Data interface	
Max. numbers of basic modules	4
Input data	max. 92 bit / basic module
Output data (binary, analogue)	max. 128 bit / basic module
Minimum operating time	> 8 ms
Timeout WD	adjustable, max. 400 ms

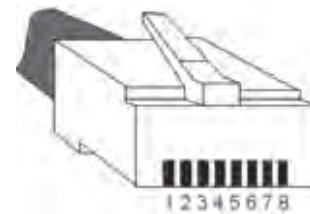
Electrical characteristics	
Power consumption	2.4 W
Power supply	5.7 V via backplane bus

Environmental data	
Operating temperature	0°C ... +50°C [+32°F ...+122°F]
Storage temperature	-10°C ... +70°C [+14°F ...+158°F]
Type of protection	IP52
Climate class	3 acc. to DIN 50178

Mechanical characteristics	
Size h x d x w	99 x 114.5 x 22.5 mm [3.90 x 4.51 x 0.89"]
Weight	110 g [3.88 oz]
Mounting	snap-on mounting on standard head rail

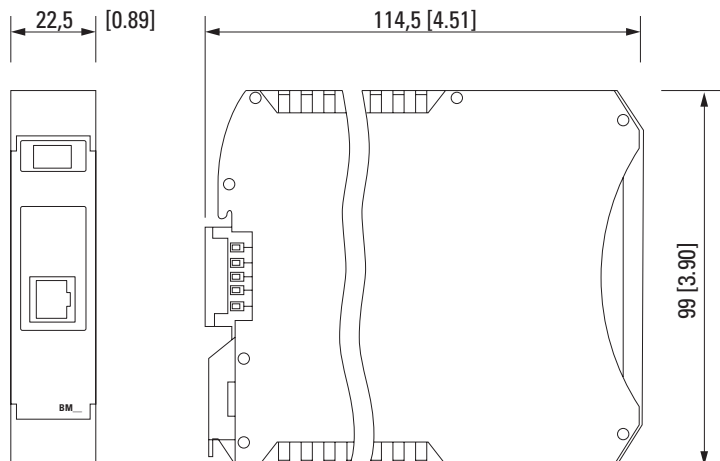
Connector pin assignment

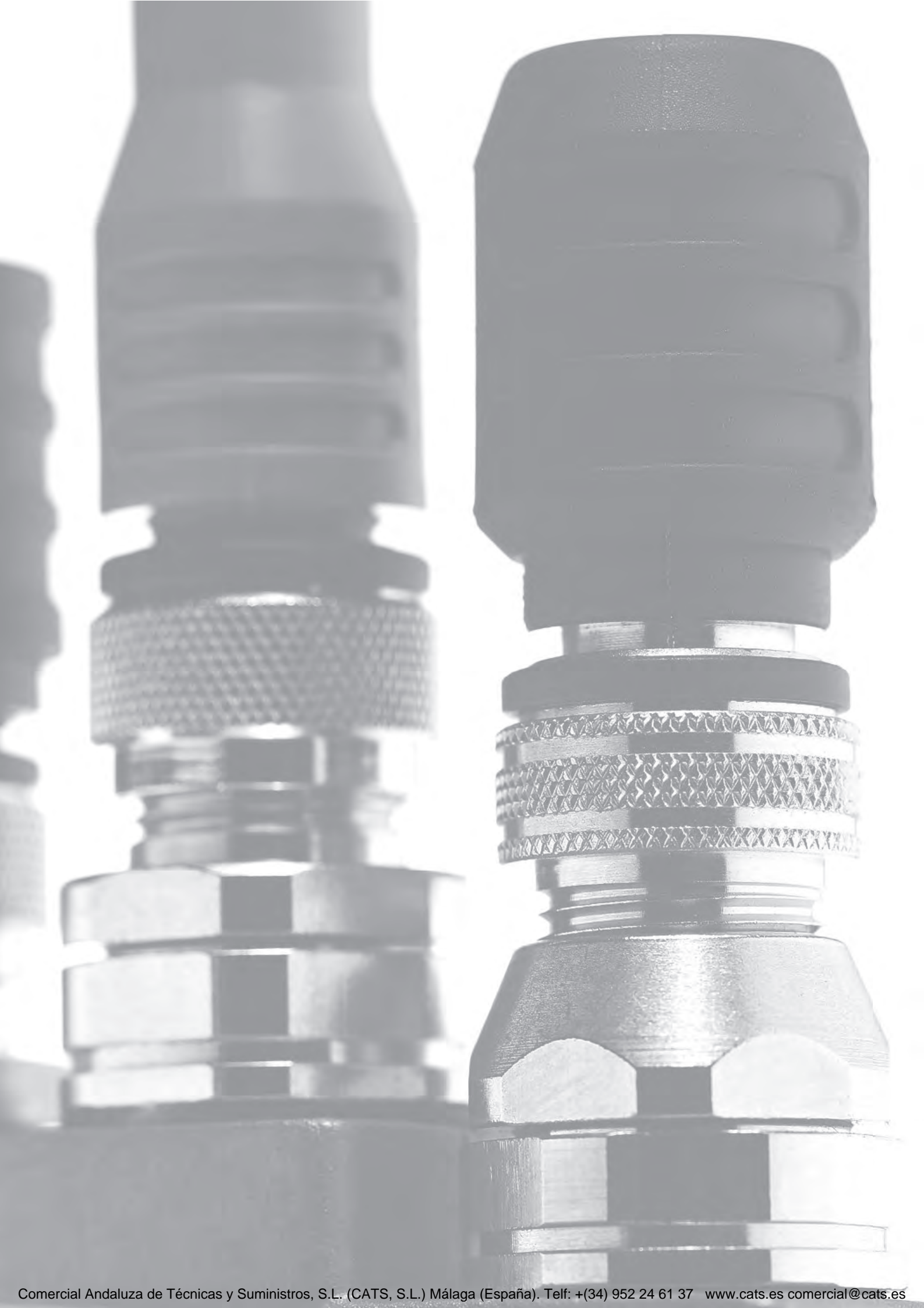
Pin	Assignment	colour
1	TxD+	white-orange
2	TxD-	orange
3	RxD+	white-green
4	-	blue
5	-	white-blue
6	RxD-	green
7	-	white-brown
8	-	brown




Dimensions

Dimensions in mm [inch]





Connection Technology

			Page
Cable	Unprepared, cut to length		384
M12 connection technology	Incremental, SSI, Analogue	Connectors, self-assembly	386
		Cordsets, pre-assembled	387
	PROFIBUS DP	Connectors, self-assembly	389
		Bus cable, pre-assembled	392
		CANopen / DeviceNet	Connectors, self-assembly
		Bus cable, pre-assembled	399
M12 and RJ45 connection technology	EtherCAT / PROFINET IO	Connectors, self-assembly	402
		Cordsets, pre-assembled	403
M23 connection technology	Standard	Connectors, self-assembly	404
		Cordsets, pre-assembled	406
MIL connection technology	Standard	Connectors, self-assembly	409
Safety technology 		Connectors, self-assembly	410
		Cordsets, pre-assembled	411
Optical fibre signal transmission	Optical fibre transmitter and receiver	RS422/HTL	414
		SSI	416

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:


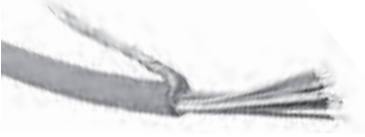





- Elimination of connection errors
– no laborious fault finding
- Optimal shielding
– avoids EMC problems
- Shorter installation times
– saves time, cuts costs
- No time-consuming search for the right connector or cable
– saves time, eliminates errors

Connection Technology

Cable		Unprepared, cut to length		
5 core + shield				
Order No.				
PVC electronic cable LiVCY 	Cross section	5 x 0.14 mm ² [AWG25]	suitable for: incremental encoders without inversions	8.0000.6300.XXXX ¹⁾
	Permanent working temp. 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. 75 mm [2.95"] secure installation min. 75 mm [2.95"]		
	Cable diameter	approx. 4.7 ±0.2 mm		
TPE electronic trailing cable halogen-free 	Cross section	5 x 0.75 mm ² [AWG18]	suitable for: speed switch, robust incremental encoders without inversions	8.0000.6600.XXXX ¹⁾
	Permanent working temp. 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 ±0.3 mm		
8 core + shield				
Order No.				
PUR trailing cable halogen-free, flame resistant 	Cross section	8 x 0.14 mm ² [AWG25]	suitable for: Limes, 365X, 368X SSI and analogue	8.0000.6P00.XXXX ¹⁾
	Permanent working temp. range	flexible installation -20°C ... +80°C [-4°F ... +176°F] secure installation -40°C ... +80°C [-40°F ... +176°F]		
	Bending radius	flexible installation min. 65 mm [2.56"] secure installation min. 45 mm [1.77"]		
	Cable diameter	approx. 5.5 ±0.2 mm		
10 core + shield				
Order No.				
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: H100 with speed switch	8.0000.6400.XXXX ¹⁾
	Permanent working temp. 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 ±10%		
12 core + shield				
Order No.				
PUR electronic trailing cable halogen-free 	Cross section	10 x 0.14 mm ² [AWG25] + 2 x 0.5 mm ² [AWG20]	suitable for: robust incremental encoders	8.0000.6100.XXXX ¹⁾
	Permanent working temp. range	flexible installation -30°C ... +80°C [-22°F ... +176°F] secure installation -50°C ... +90°C [-58°F ... +194°F]		
	Bending radius	flexible installation min. 50 mm [1.97"] secure installation min. 35 mm [1.38"]		
	Cable diameter	approx. 6.9 ±0.3 mm		
PVC electronic cable LiVCY 	Cross section	12 x 0.14 mm ² [AWG25]	suitable for: incremental encoders Standard cable	8.0000.6200.XXXX ¹⁾
	Permanent working temp. 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. 100 mm [3.94"] secure installation min. 70 mm [2.76"]		
	Cable diameter	approx. 6.7 ±0.2 mm		


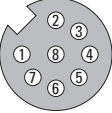
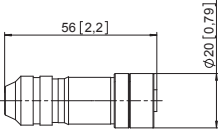


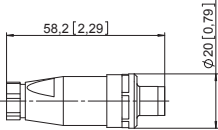

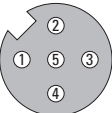
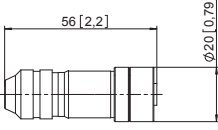

1) XXXX = cable length in meters (e.g. 10 m = 0010)

Connection Technology

Cable		Unprepared, cut to length		
12 core + shield		Order No.		
TPE electronic cable (TP) halogen-free 	Cross section	5 x 2 x 0.14 mm ² [AWG25] + 2 x 0.5 mm ² [AWG20]	suitable for: high temperatures or encoders with sine wave output	8.0000.6E00.XXXX ¹⁾
	Permanent working temp. range	flexible installation -40°C ... +110°C [-40°F ... +230°F] secure installation -60°C ... +135°C [-76°F ... +275°F]		
	Bending radius	flexible installation min. 90 mm [3.54"] secure installation min. 70 mm [2.76"]		
	Cable diameter	approx. 8.5 ±0.4 mm		
PVC electronic cable LiYCY (TP) 	Cross section	6 x 2 x 0.14 mm ² [AWG25]	suitable for: absolute encoders with SSI or 4 ... 20 mA ana- logue output, twisted pair conductors	8.0000.6900.XXXX ¹⁾
	Permanent working temp. 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. 110 mm [4.33"] secure installation min. 75 mm [2.95"]		
	Cable diameter	approx. 7.3 ±0.2 mm		
18 core + shield		Order No.		
PVC electronic cable LiYCY 	Cross section	18 x 0.14 mm ² [AWG25]	suitable for: absolute encoders with parallel output, twisted pair conductors	8.0000.6700.XXXX ¹⁾
	Permanent working temp. 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. 100 mm [3.94"]		
	Cable diameter	approx. 7.8 ±0.2 mm		
PROFIBUS DP - cable		Order No.		
PUR outer jacket, PE wire insulation 	Cross section	2 x 0.34 mm ² [AWG22]	suitable for: all Profibus fieldbus encoders and Safety-M safety module BMB1	05.KABEL451.XXX ¹⁾
	Permanent working temp. range	flexible installation -30°C ... +70°C [-22°F ... +158°F] secure installation -50°C ... +90°C [-58°F ... +194°F]		
	Bending radius	flexible installation min. 70 mm [2.76"] secure installation min. 50 mm [1.97"]		
	Cable diameter	approx. 7.6 ±0.2 mm		
DeviceNet - cable		Order No.		
PUR outer jacket, PE wire insulation 	Cross section	2 x 0.52 mm ² [AWG24] + 2 x 1,04 mm ² [AWG17]	suitable for: all DeviceNet fieldbus encoders and Safety-M fieldbus module BM11	05.KABEL5723.XXX ¹⁾
	Permanent working temp. range	flexible installation -30°C ... +70°C [-22°F ... +158°F] secure installation -50°C ... +90°C [-58°F ... +194°F]		
	Bending radius	flexible installation min. 70 mm [2.76"] secure installation min. 50 mm [1.97"]		
	Cable diameter	approx. 8.4 ±0.2 mm		
CANopen - cable		Order No.		
PVC electronic cable 	Cross section	3 x 2 x 0.25 mm ² [AWG23]	suitable for: all CANopen fieldbus encoders and Safety-M fieldbus module BM21	8.0000.6V00.XXXX ¹⁾
	Permanent working temp. 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. 120 mm [4.72"] secure installation min. 40 mm [1.57"]		
	Cable diameter	approx. 6.2 ±0.2 mm		
EtherCAT / PROFINET IO - cable		Order No.		
PVC electronic cable 	Cross section	2 x 2 x 0.34 mm ² [AWG22]	suitable for: all EtherCAT / PROFINET IO encoders and Safety-M fieldbus modules BM31 + BMC1	05.00.6031.1111.XXXM ¹⁾
	Permanent working temp. 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 ±0.2 mm		

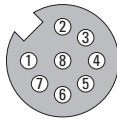

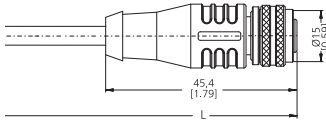
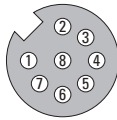

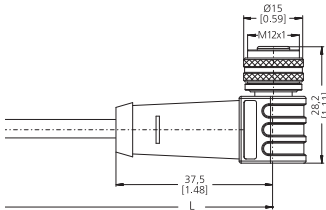
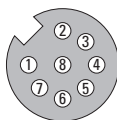

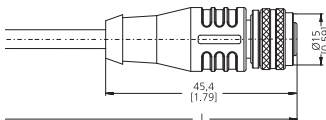
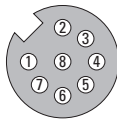

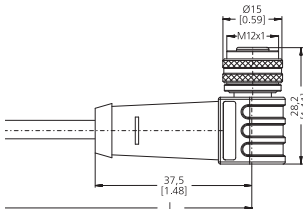
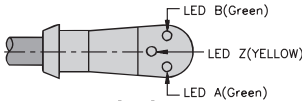
1) XXXX = cable length in meters (e.g. 10 m = 0010)

Connection Technology

M12 connection technology		Incremental, SSI, Analogue	Connectors, self-assembly	Order No.
8-pin				
Female connector with coupling nut straight, IP67 Housing: metal		A coded, screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]	suitable for our incremental and SSI series: 3610 / 3620 F3653 / F3673 5000 / 5020 5006 5814 / 5834 5821 5853 / 5873 5863 / 5883 58x4FSx 5876 A020 / A02H	05.CMB 8181-0
		 		
Male connector with external thread straight, IP67 Housing: metal		A coded, screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]	suitable for: versions with cable outlet	05.CMBS 8181-0
		 		
5-pin				
Female connector with coupling nut straight, IP67 Housing: metal		A coded, screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]	suitable for our analogue series: A50, B80, C120, D135, IS40, IS60 3651 / 3671	8.0000.5116.0000
		 		
Accessories		(Working temperature range -25°C ... +90°C)		Order No.
Securing clip for M12 connectors EX zone 2/22 Material: plastic		suitable for use in areas with combustible dust acc. to EN 50281-1-1		8.0000.5000.0006
				


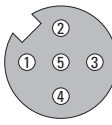
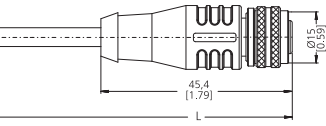
Connection Technology

M12 connection technology Incremental, SSI, Analogue Cordsets, pre-assembled


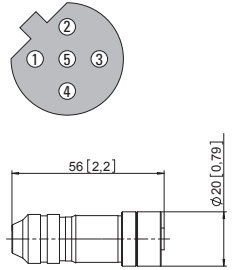

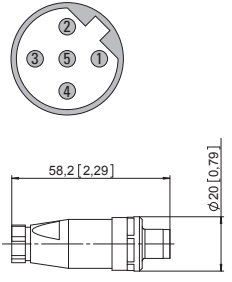

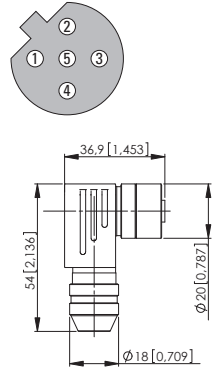

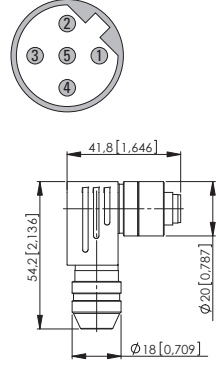
With connector, 8-pin		(Working temperature range -30°C ... +80°C)		Order No.
Female connector with coupling nut straight, IP67, single-ended Cable: PVC, 8 x 0.25 mm ² [AWG23] Housing: metal / plastic	A coded  1: WH 5: GY 2: BN 6: PK 3: GN 7: BU 4: YE 8: RD Shield on housing	suitable for our incremental and SSI series: 3610 / 3620 F3653 / F3673 5000 / 5020 5006 5814 / 5834 5821 5853 / 5873 5863 / 5883 58x4FSx 5876 A020 / A02H	Cable length 2 m [6.56'] 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
				
Female connector with coupling nut right-angle, IP67, single-ended Cable: PVC, 8 x 0.25 mm ² [AWG23] Housing: metal / plastic	A coded  1: WH 5: GY 2: BN 6: PK 3: GN 7: BU 4: YE 8: RD Shield on housing	suitable for our incremental and SSI series: 3610 / 3620 F3653 / F3673 5000 / 5020 5006 5814 / 5834 5821 5853 / 5873 5863 / 5883 58x4FSx 5876 A020 / A02H	Cable length 2 m [6.56'] 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
				
Female connector with coupling nut straight, IP67, single-ended Cable: PVC, 8 x 0.25 mm ² [AWG23] Housing: metal / plastic	A coded  1: WH 5: GY 2: BN 6: PK 3: GN 7: BU 4: YE 8: RD Shield on housing	suitable for our incremental and SSI series: 3610 / 3620 F3653 / F3673 5000 / 5020 5006 5814 / 5834 5821 5853 / 5873 5863 / 5883 58x4FSx 5876 A020 / A02H	Cable length 2 m [6.56'] 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
				
Female connector with coupling nut right-angle, IP67, single-ended with integrated control LEDs Cable: PVC, 8 x 0.25 mm ² [AWG23] Housing: metal / plastic	A coded  1: WH 5: PK 2: BN 6: GY 3: YE 7: RD 4: GN 8: BU Shield on housing	suitable for our incremental and SSI series: 3610 / 3620 5006 5000 / 5020 5821 A020 A02H	Cable length 2 m [6.56'] 4 m [13.12'] 6 m [19.69'] 10 m [32.81']	05.E-WKC 8T-PX3-930-0002 05.E-WKC 8T-PX3-930-0004 05.E-WKC 8T-PX3-930-0006 05.E-WKC 8T-PX3-930-0010
	 			

Connection Technology


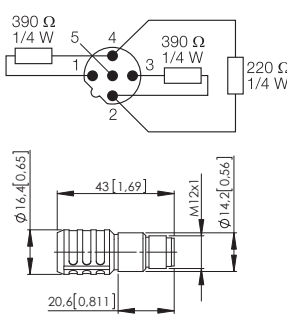

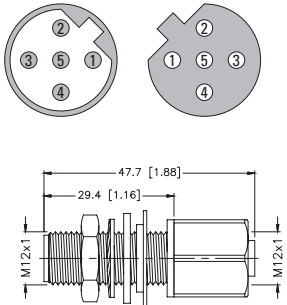
M12 connection technology	Incremental, SSI, Analog	Cordsets, pre-assembled
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With connector, 5-pin	(Working temperature range -30°C ... +80°C)		Order No.														
<p>Female connector with coupling nut straight, IP67, single-ended</p> <p>Cable: PVC, 5 x 0.25 mm² [AWG23] Housing: metal / plastic</p> 	<p>A coded</p>  <p>1: BN 4: BK 2: WH 5: GY 3: BU Shield on housing</p> 	<p>suitable for our analogue series:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">A50</td> <td style="width: 50%;">B80</td> </tr> <tr> <td>C120</td> <td>D135</td> </tr> <tr> <td>IS40</td> <td></td> </tr> </table>	A50	B80	C120	D135	IS40		<p><i>Cable length</i></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">2 m [6.56']</td> <td style="width: 50%;">05.00.6081.2211.002M</td> </tr> <tr> <td>5 m [16.40']</td> <td>05.00.6081.2211.005M</td> </tr> <tr> <td>10 m [32.81']</td> <td>05.00.6081.2211.010M</td> </tr> <tr> <td>15 m [49.21']</td> <td>05.00.6081.2211.015M</td> </tr> </table>	2 m [6.56']	05.00.6081.2211.002M	5 m [16.40']	05.00.6081.2211.005M	10 m [32.81']	05.00.6081.2211.010M	15 m [49.21']	05.00.6081.2211.015M
A50	B80																
C120	D135																
IS40																	
2 m [6.56']	05.00.6081.2211.002M																
5 m [16.40']	05.00.6081.2211.005M																
10 m [32.81']	05.00.6081.2211.010M																
15 m [49.21']	05.00.6081.2211.015M																


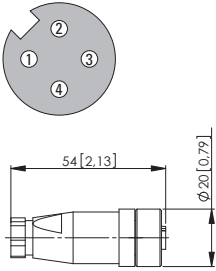

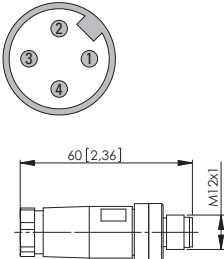

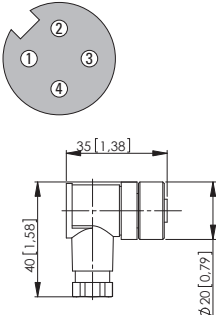
Connection Technology

M12 connection technology		PROFIBUS DP	Connectors, self-assembly	Order No.
5-pin				
Female connector with coupling nut Bus in, straight, IP67 Housing: metal	B coded, screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]	suitable for our series: 5858 / 5878 5868 / 5888 9080		05.BMWS 8151-8.5
				
Male connector with external thread, Bus out, straight, IP67 Housing: metal	B coded, screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]	suitable for our series: 5858 / 5878 5868 / 5888 9080		05.BMSWS 8151-8.5
				
Female connector with coupling nut Bus in, right-angle, IP67 Housing: metal	B coded, screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]	suitable for our series: 5858 / 5878 5868 / 5888 9080		05.BMWS 8251-8.5
				
Male connector with external thread Bus out, right-angle, IP67 Housing: metal	B coded, screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]	suitable for our series: 5858 / 5878 5868 / 5888 9080		05.BMSWS 8251-8.5
				

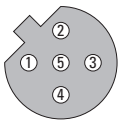

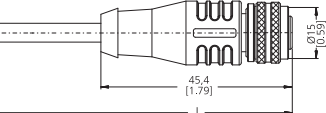
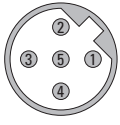

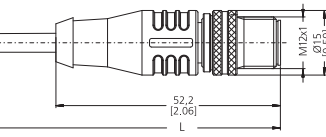
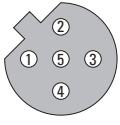

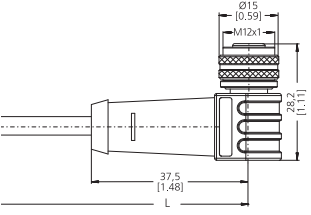
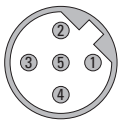

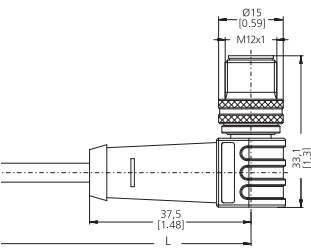
M12 connection technology	PROFIBUS DP	Connectors, self-assembly
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Accessories	Order No.	
<p>Terminating resistor straight, IP67 Housing: metal / plastic</p> 	<p>B coded</p>  <p>suitable for our series: 5858 / 5878 5868 / 5888 9080</p>	<p>05.RSS4.5-PDP-TR</p>
<p>M12 lead-through straight, IP67 Housing: metal</p> 	<p>B coded</p>  <p>suitable for our series: 5858 / 5878 5868 / 5888 9080</p>	<p>05.FKW-FSW45/M12</p>

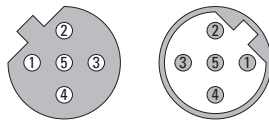
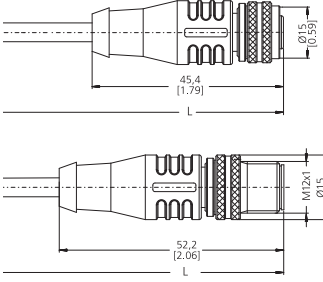

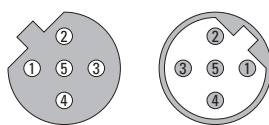
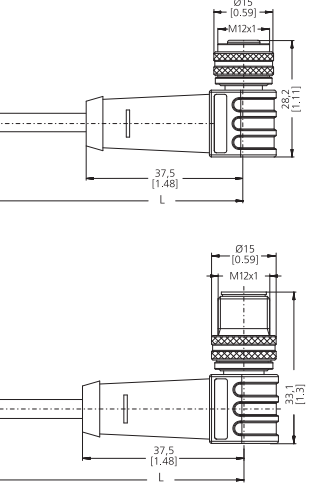

Connection Technology

M12 connection technology		PROFIBUS DP	Connectors, self-assembly	Order No.
4-pin, PROFIBUS DP power supply				
<p>Female connector with coupling nut straight, IP67</p> <p>Housing: plastic</p> 	<p>A coded, screw connections, for cable \varnothing 4 ... 6 mm</p> 	<p>suitable for our series: 5858 / 5878 5868 / 5888 9080</p>	<p>05.B8141-0</p>	
<p>Male connector with external thread straight, IP67</p> <p>Housing: metal / plastic</p> 	<p>A coded, screw connections, for cable \varnothing 4 ... 6 mm [0.16 ... 0.24"]</p> 	<p>suitable for: versions with cable outlet</p>		<p>05.BS8141-0</p>
<p>Female connector with coupling nut right-angle, IP67</p> <p>Housing: plastic</p> 	<p>A coded, screw connections, for cable \varnothing 4 ... 6 mm [0.16 ... 0.24"]</p> 	<p>suitable for our series: 5858 / 5878 5868 / 5888 9080</p>		


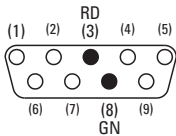

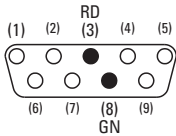
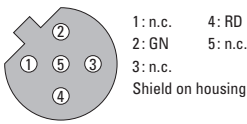
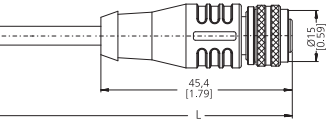

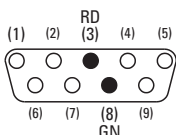
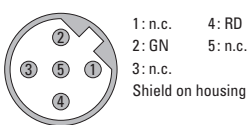
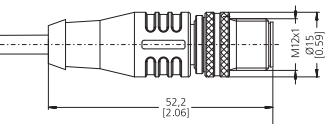
Connection Technology

M12 connection technology		PROFIBUS DP	Bus cable, pre-assembled	
With connector, 5-pin		Working temperature range -30°C ... +80°C [-22°F ... +176°F]		Order No.
Female connector with coupling nut Bus in, straight, IP67, single-ended Cable: PUR, 2 x 0.34 mm ² [AWG22] Housing: metal / plastic	B coded  1: n.c. 4: RD 2: GN 5: n.c. 3: n.c. Shield on housing	suitable for our series: 5858 / 5878 5868 / 5888 9080	Cable length 6 m [19.69'] 10 m [32.81'] 15 m [49.21']	05.00.6011.3211.006M 05.00.6011.3211.010M 05.00.6011.3211.015M
				
Male connector with external thread Bus out, straight, IP67, single-ended Cable: PUR, 2 x 0.34 mm ² [AWG22] Housing: metal / plastic	B coded  1: n.c. 4: RD 2: GN 5: n.c. 3: n.c. Shield on housing	suitable for our series: 5858 / 5878 5868 / 5888 9080	Cable length 6 m [19.69'] 10 m [32.81'] 15 m [49.21']	05.00.6011.3411.006M 05.00.6011.3411.010M 05.00.6011.3411.015M
				
Female connector with coupling nut Bus in, right-angle, IP67, single-ended Cable: PUR, 2 x 0.34 mm ² [AWG22] Housing: metal / plastic	B coded  1: n.c. 4: RD 2: GN 5: n.c. 3: n.c. Shield on housing	suitable for our series: 5858 / 5878 5868 / 5888 9080	Cable length 6 m [19.69'] 10 m [32.81'] 15 m [49.21']	05.00.6011.3311.006M 05.00.6011.3311.010M 05.00.6011.3311.015M
				
Male connector with external thread Bus out, right-angle, IP67, single-ended Cable: PUR, 2 x 0.34 mm ² [AWG22] Housing: metal / plastic	B coded  1: n.c. 4: RD 2: GN 5: n.c. 3: n.c. Shield on housing	suitable for our series: 5858 / 5878 5868 / 5888 9080	Cable length 6 m [19.69'] 10 m [32.81'] 15 m [49.21']	05.00.6011.3511.006M 05.00.6011.3511.010M 05.00.6011.3511.015M
				

Connection Technology

M12 connection technology	PROFIBUS DP	Bus cable, pre-assembled	
With connector, 5-pin		Working temperature range -30°C ... +80°C [-22°F ... +176°F]	Order No.
Female connector with coupling nut, Bus in Male connector with external thread, Bus out straight, IP67	B coded 	suitable for our series: 5858 / 5878 5868 / 5888 9080	<i>Cable length</i> 2 m [6.56'] 6 m [19.69'] 10 m [32.81'] 15 m [49.21']
Cable: PUR, 2 x 0.34 mm ² [AWG22] Housing: metal / plastic			
			
Female connector with coupling nut, Bus in Male connector with external thread, Bus out right-angle, IP67	B coded 	suitable for our series: 5858 / 5878 5868 / 5888 9080	<i>Cable length</i> 2 m [6.56'] 6 m [19.69'] 10 m [32.81'] 15 m [49.21']
Cable: PUR, 2 x 0.34 mm ² [AWG22] Housing: metal / plastic			
			

Connection Technology

M12 connection technology		PROFIBUS DP	Bus cable, pre-assembled		Order No.
With D-Sub connector					
Working temperature range -30°C ... +80°C [-22°F ... +176°F]					
<p>D-Sub connector, Profibus master single-ended, with terminating resistor</p> <p>Cable: PUR, 2 x 0.34 mm² [AWG22] Housing: metal / plastic</p> 	<p>D-Sub connector</p>  <p>Shield on housing</p>	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p> <p>Safety-M safety modules</p>	<p><i>Cable length</i></p> <p>0.5 m [1.64'] 2 m [6.56']</p>	<p>05.00.6011.5511.00M5 05.00.6011.5511.002M</p>	
<p>D-Sub connector + M12 female connector with coupling nut Profibus master, Bus in, with terminating resistor</p> <p>Cable: PUR, 2 x 0.34 mm² [AWG22] Housing: metal / plastic</p> 	<p>D-Sub connector</p>  <p>Shield on housing</p> <p>M12 connector, B coded</p>  <p>Shield on housing</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p>	<p><i>Cable length</i></p> <p>0.5 m [1.64'] 2 m [6.56']</p>	<p>05.00.6011.5532.00M5 05.00.6011.5532.002M</p>	
<p>D-Sub connector + M12 male connector with external thread Profibus master, Bus out, with terminating resistor</p> <p>Cable: PUR, 2 x 0.34 mm² Housing: metal / plastic</p> 	<p>D-Sub connector</p>  <p>Shield on housing</p> <p>M12 connector, B coded</p>  <p>Shield on housing</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p>	<p><i>Cable length</i></p> <p>0.5 m [1.64'] 2 m [6.56']</p>	<p>05.00.6011.5534.00M5 05.00.6011.5534.002M</p>	

M12 connection technology	PROFIBUS DP	Bus cable, pre-assembled
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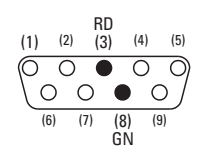
With D-Sub connector	Working temperature range -30°C ... +80°C [-22°F ... +176°F]	Order No.
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**D-Sub connector +
M12 female connector with coupling nut +
M12 male connector with external thread
Profibus Master, Bus in / Bus out
with terminating resistor**

Cable: PUR, 2 x 0.34 mm² [AWG22]
Housing: metal / plastic



D-Sub connector

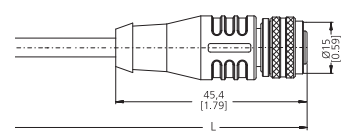
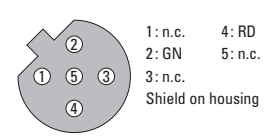


Shield on housing

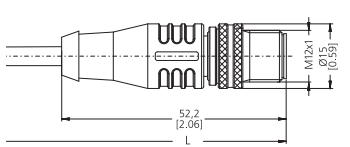
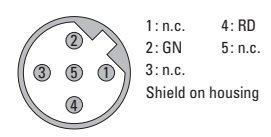
suitable for our series:	<i>Cable length</i>
5858 / 5878	2 x 0.5 m [1.64']
5868 / 5888	2 x 2 m [6.56']
9080	

05.00.6012.5536.00M5
05.00.6012.5536.002M


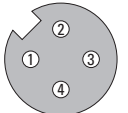
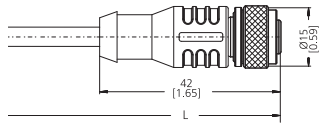

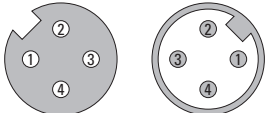
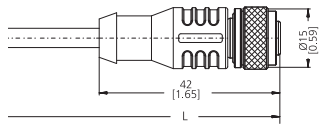
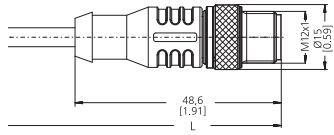
M12 connector, B coded




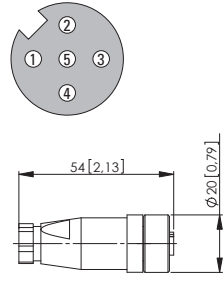

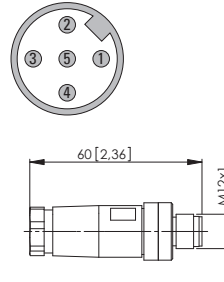

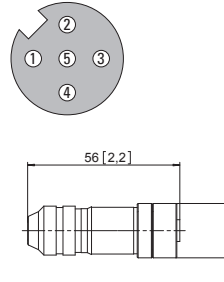

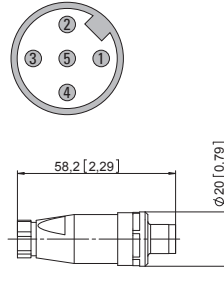
M12 connector, B coded




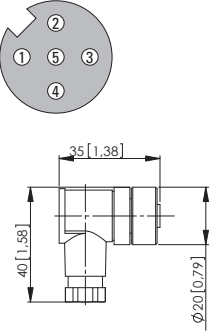

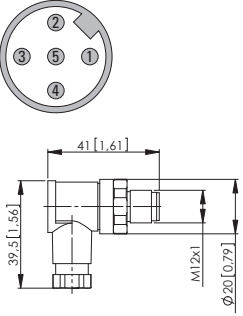

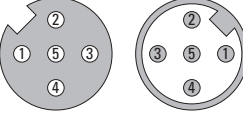

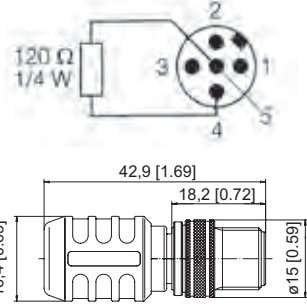
Connection Technology

M12 connection technology		PROFIBUS DP	Bus cable, pre-assembled	
With connector 4-pin, power supply		Working temperature range -30°C ... +90°C [-22°F ... +194°F]		Order No.
<p>Female connector with coupling nut straight, single-ended, IP67</p> <p>Cable: PUR, 4 x 0.34 mm² [AWG22] Housing: metal / plastic</p> 	<p>A coded</p>  <p>1: BN 2: WH 3: BU 4: BK</p> 	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p>	<p>Cable length</p> <p>2 m [6.56'] 6 m [19.69'] 10 m [32.81']</p>	<p>05.00.6061.6211.002M 05.00.6061.6211.006M 05.00.6061.6211.010M</p>
<p>Female connector with coupling nut + Male connector with external thread straight, IP67</p> <p>Cable: PUR, 4 x 0.34 mm² [AWG22] Housing: metal / plastic</p> 	<p>A coded</p>   	<p>suitable for our series:</p> <p>5858 / 5878 5868 / 5888 9080</p>	<p>Cable length</p> <p>2 m [6.56'] 5 m [16.40'] 10 m [32.81']</p>	<p>05.00.6061.6462.002M 05.00.6061.6462.005M 05.00.6061.6462.010M</p>

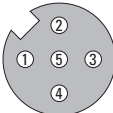

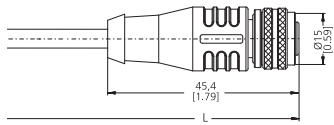


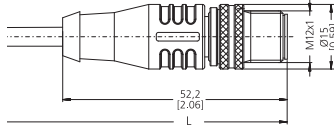
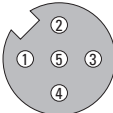

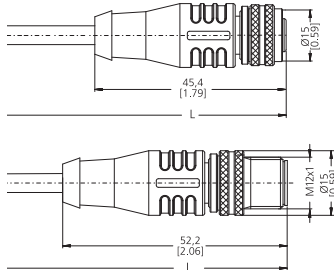
Connection Technology

M12 connection technology		CANopen / DeviceNet		Connectors, self-assembly							
5-pin					Order No.						
<p>Female connector with coupling nut, Bus in, straight, IP67</p> <p>Housing: plastic</p> 	<p>A coded, screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>F3658 / F3678 M3658 / M3678 5858 / 5878 9080 5868 / 5888 IS40 / IS60</p>	<p>05.B-8151-0/9</p>								
<p>Male connector with external thread Bus out, straight, IP67</p> <p>Housing: metal / plastic</p> 	<p>A coded, screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>9080 IS60</p>				<p>05.BS-8151-0/9</p>					
<p>Female connector with coupling nut Bus in, straight, IP67</p> <p>Housing: metal</p> 	<p>A coded, screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>F3658 / F3678 M3658 / M3678 5858 / 5878 9080 5868 / 5888 IS60</p>							<p>8.0000.5116.0000</p>		
<p>Male connector with external thread Bus out, straight, IP67</p> <p>Housing: metal</p> 	<p>A coded, screw connections, for cable \varnothing 6 ... 8 mm [0.24 ... 0.32"]</p> 	<p>suitable for our series:</p> <p>F3658 / F3678 M3658 / M3678 5858 / 5878 9080 5868 / 5888 IS60</p>									

Connection Technology


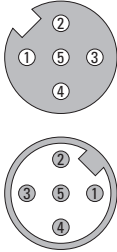
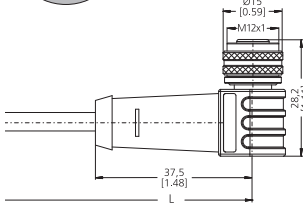
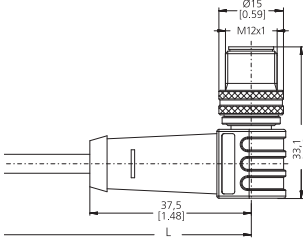
M12 connection technology		CANopen / DeviceNet	Connectors, self-assembly	Order No.
5-pin				
Female connector with coupling nut Bus in, right-angle, IP67 Housing: plastic	A coded, screw connections, for cable \varnothing 4 ... 8 mm [0.16 ... 0.32]	suitable for our series: 9080 IS60		05.B-8251-0/9
				
Male connector with external thread Bus out, right-angle, IP67 Housing: metal / plastic	A coded, screw connections, for cable \varnothing 4 ... 8 mm [0.16 ... 0.32]	suitable for our series: 9080 IS60		05.BS-8251-0/9
				
Accessories				
T-junction, IP67 2 x Female connector with coupling nut 1 x Male connector with external thread Housing: metal / plastic	A coded	suitable for: M12 connector		05.FKM5-FKM5-FSM5
				
Terminating resistor, IP67 Housing: metal / plastic	A coded	suitable for our series: 5858 / 5878 9080 5868 / 5888		05.RSE 57 TR2
				

Connection Technology

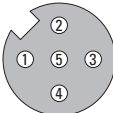

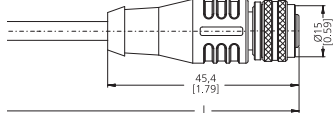


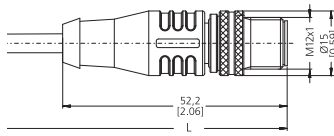
M12 connection technology		DeviceNet	Bus cable, pre-assembled		Order No.															
With connector, 5-pin																				
Working temperature range -30°C ... +80°C [-22°F ... +176°F]																				
Female connector with coupling nut Bus in, straight, IP67, single-ended Cable: PUR, 4 x 0.34 mm ² [AWG22] Housing: metal / plastic		A coded  <ul style="list-style-type: none"> 1: shield 2: RD (+) 3: BK (-) 4: WH (CAN_H) 5: BU (CAN_L) 	suitable for our series: <table border="0"> <tr> <td>9080</td> <td>Cable length</td> <td>6 m [19.69']</td> </tr> <tr> <td>IS60</td> <td></td> <td>10 m [32.81']</td> </tr> <tr> <td></td> <td></td> <td>15 m [49.21']</td> </tr> </table>	9080	Cable length	6 m [19.69']	IS60		10 m [32.81']			15 m [49.21']	<table border="0"> <tr> <td></td> <td>05.00.6021.2211.006M</td> </tr> <tr> <td></td> <td>05.00.6021.2211.010M</td> </tr> <tr> <td></td> <td>05.00.6021.2211.015M</td> </tr> </table>			05.00.6021.2211.006M		05.00.6021.2211.010M		05.00.6021.2211.015M
9080	Cable length	6 m [19.69']																		
IS60		10 m [32.81']																		
		15 m [49.21']																		
	05.00.6021.2211.006M																			
	05.00.6021.2211.010M																			
	05.00.6021.2211.015M																			
																				
Male connector with external thread Bus out, straight, IP67, single-ended Cable: PUR, 4 x 0.34 mm ² [AWG22] Housing: metal / plastic		A coded  <ul style="list-style-type: none"> 1: shield 2: RD (+) 3: BK (-) 4: WH (CAN_H) 5: BU (CAN_L) 	suitable for our series: <table border="0"> <tr> <td>9080</td> <td>Cable length</td> <td>6 m [19.69']</td> </tr> <tr> <td>IS60</td> <td></td> <td>10 m [32.81']</td> </tr> <tr> <td></td> <td></td> <td>15 m [49.21']</td> </tr> </table>	9080	Cable length	6 m [19.69']	IS60		10 m [32.81']			15 m [49.21']	<table border="0"> <tr> <td></td> <td>05.00.6021.2411.006M</td> </tr> <tr> <td></td> <td>05.00.6021.2411.010M</td> </tr> <tr> <td></td> <td>05.00.6021.2411.015M</td> </tr> </table>			05.00.6021.2411.006M		05.00.6021.2411.010M		05.00.6021.2411.015M
9080	Cable length	6 m [19.69']																		
IS60		10 m [32.81']																		
		15 m [49.21']																		
	05.00.6021.2411.006M																			
	05.00.6021.2411.010M																			
	05.00.6021.2411.015M																			
																				
Female connector with coupling nut + Male connector with external thread Bus in / out, straight, IP67 Cable: PUR, 4 x 0.34 mm ² [AWG22] Housing: metal / plastic		A coded  <ul style="list-style-type: none"> 1: shield 2: RD (+) 3: BK (-) 4: WH (CAN_H) 5: BU (CAN_L) 	suitable for our series: <table border="0"> <tr> <td>9080</td> <td>Cable length</td> <td>2 m [6.56']</td> </tr> <tr> <td></td> <td></td> <td>4 m [13.12']</td> </tr> <tr> <td></td> <td></td> <td>10 m [32.81']</td> </tr> </table>	9080	Cable length	2 m [6.56']			4 m [13.12']			10 m [32.81']	<table border="0"> <tr> <td></td> <td>05.00.6021.2422.002M</td> </tr> <tr> <td></td> <td>05.00.6021.2422.004M</td> </tr> <tr> <td></td> <td>05.00.6021.2422.010M</td> </tr> </table>			05.00.6021.2422.002M		05.00.6021.2422.004M		05.00.6021.2422.010M
9080	Cable length	2 m [6.56']																		
		4 m [13.12']																		
		10 m [32.81']																		
	05.00.6021.2422.002M																			
	05.00.6021.2422.004M																			
	05.00.6021.2422.010M																			
																				

Connection Technology


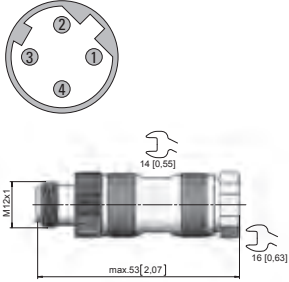

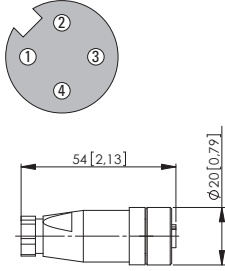

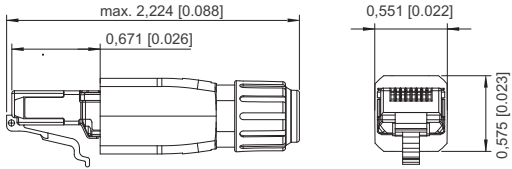
M12 connection technology	DeviceNet	Bus cable, pre-assembled
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With connector, 5-pin	Working temperature range -30°C ... +80°C [-22°F ... +176°F]	Order No.						
<p>Female connector with coupling nut + male connector with external thread Bus in / out, right-angle, IP67</p> <p>Cable: PUR, 4 x 0.34 mm² [AWG22] Housing: metal / plastic</p> 	<p>A coded</p>  <p>1: shield 2: RD (+) 3: BK (-) 4: WH (CAN_H) 5: BU (CAN_L)</p>  	<p>suitable for our series: <i>Cable length</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 100px;">9080</td> <td style="width: 150px;">2 m [6.56']</td> <td style="width: 150px;">05.00.6021.2523.002M</td> </tr> <tr> <td></td> <td>6 m [19.69']</td> <td>05.00.6021.2523.006M</td> </tr> </table>	9080	2 m [6.56']	05.00.6021.2523.002M		6 m [19.69']	05.00.6021.2523.006M
9080	2 m [6.56']	05.00.6021.2523.002M						
	6 m [19.69']	05.00.6021.2523.006M						

Connection Technology

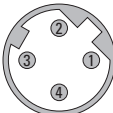
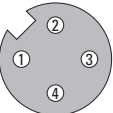
M12 connection technology		CANopen	Bus cable, pre-assembled		Order No.
With connector, 5-pin		Working temperature range -30°C ... +80°C [-22°F ... +176°F]			
Female connector with coupling nut Bus in, straight, IP67, single-ended Cable: PVC, 3 x 2 x 0.25 mm ² [AWG23] Housing: metal / plastic	A coded  <ul style="list-style-type: none"> 1: GY 4: GN 2: BN 5: YE 3: WH Shield on housing	suitable for our series: M3658 / M3678 5858 / 5878 5868 / 5888	Cable length 6 m [19.69'] 10 m [32.81'] 15 m [49.21']	05.00.6091.A211.006M 05.00.6091.A211.010M 05.00.6091.A211.015M	
					
Male connector with external thread Bus out, straight, IP67, single-ended Cable: PVC, 3 x 2 x 0.25 mm ² [AWG23] Housing: metal / plastic	A coded  <ul style="list-style-type: none"> 1: GY 4: GN 2: BN 5: YE 3: WH Shield on housing	suitable for our series: M3658 / M3678 5858 / 5878 5868 / 5888 Safety-M safety modules	Cable length 6 m [19.69'] 10 m [32.81'] 15 m [49.21']	05.00.6091.A411.006M 05.00.6091.A411.010M 05.00.6091.A411.015M	
					

Connection Technology


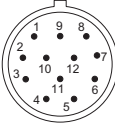
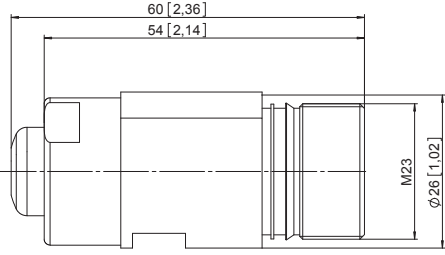

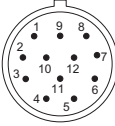
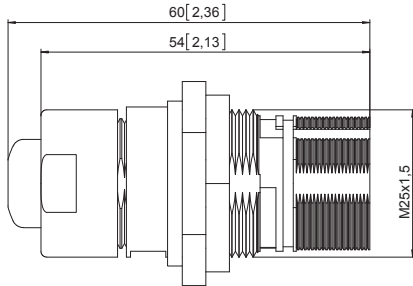


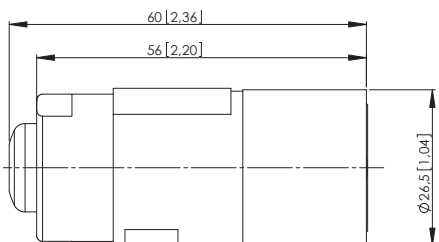
M12 and RJ45 connection technology		EtherCAT / PROFINET IO		Connectors, self-assembly		
4-pin				Order No.		
<p>Male connector with external thread Port A (1) and B (2) straight, IP67</p> <p>Housing: metal</p> 	<p>D-codiert, screw connections, for cable \varnothing 4 ... 9 mm [0.16 ... 0.35"]</p> 	<p>suitable for our series: 5858 / 5878 5868 / 5888</p>	<p>05.WASCSY4S</p>			
<p>Female connector with coupling nut power supply, straight, IP67</p> <p>Housing: plastic</p> 	<p>A coded, screw connections, for cable \varnothing 4 ... 6 mm [0.16 ... 0.24"]</p> 	<p>suitable for our series: 5858 / 5878 5868 / 5888</p>			<p>05.B8141-0</p>	
<p>RJ45 connector straight, IP20</p> <p>Housing: plastic</p> 	<p>screw connections, for cable \varnothing 4,5 ... 8 mm [0.18 ... 0.32"]</p> 	<p>suitable for: EtherCAT bus cable</p>				

Connection Technology

M12 and RJ45 connection technology **EtherCAT / PROFINET IO** Cordsets, pre-assembled



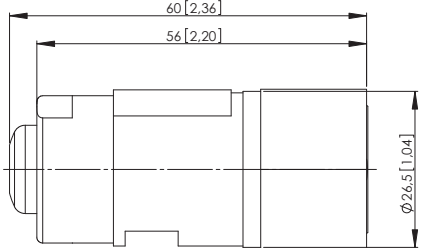
With connector, 4-pin		Working temperature range -30°C ... +80°C [-22°F ... +176°F]		Order No.
Male connector with external thread Port A (1) and B (2) straight, IP67, single-ended Cable: PUR, 2 x 2 x 0.34 mm ² [AWG22] Housing: metal /plastic	D-codiert  1: YE 2: OG 3: WH 4: BU Shield on housing	suitable for our series: 5858 / 5878 5868 / 5888	Cable length 2 m [6.56'] 5 m [16.40'] 10 m [32.81']	05.00.6031.4411.002M 05.00.6031.4411.005M 05.00.6031.4411.010M
Female connector with coupling nut power supply straight, IP67, single-ended Cable: PUR, 4 x 0.34 mm ² [AWG22] Housing: metal /plastic	A coded  1: BN 2: WH 3: BU 4: BK Shield on housing	suitable for our series: 5858 / 5878 5868 / 5888	Cable length 2 m [6.56'] 5 m [16.40'] 10 m [32.81']	05.00.6061.6211.002M 05.00.6061.6211.005M 05.00.6061.6211.010M



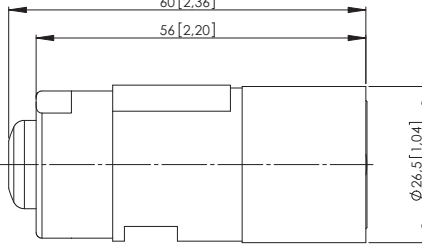
Connection Technology

M23 connection technology	Standard	Connectors, self-assembly
12-pin		
Male connector with external thread IP67 Housing: metal	pin assignment ccw, solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41"]	suitable for: versions with cable outlet
		
Male connector with external thread IP67, central fastening Housing: metal	pin assignment ccw, solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41"]	suitable for: versions with cable outlet
		
Female connector with coupling nut IP67 Housing: metal	pin socket assignment cw, solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41"]	suitable for our series: 5000 / 5020 5814 / 5834 580X / 582X 585X / 587X 586X / 588X 58xxFSx 9000 908X A02X
		
Order No.		
		8.0000.5015.0001
		8.0000.5015.0000
		8.0000.5012.0000

Connection Technology

M23 connection technology	Standard	Connectors, self-assembly
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12-pin		Order No.										
<p>Female connector with coupling nut IP67, EX zone 2/22</p> <p>Housing: metal</p>	<p>pin socket assignment cw, solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41"]</p> <p>suitable for our series:</p> <table style="margin-left: 20px;"> <tr><td>5000 / 5020</td><td>5814 / 5834</td></tr> <tr><td>580X / 582X</td><td>585X / 587X</td></tr> <tr><td>586X / 588X</td><td>58xxFSx</td></tr> <tr><td>9000</td><td>908X</td></tr> <tr><td>A02X</td><td></td></tr> </table>	5000 / 5020	5814 / 5834	580X / 582X	585X / 587X	586X / 588X	58xxFSx	9000	908X	A02X		8.0000.5012.0000.Ex
5000 / 5020	5814 / 5834											
580X / 582X	585X / 587X											
586X / 588X	58xxFSx											
9000	908X											
A02X												
												

17-pin		Order No.
<p>Female connector with coupling nut IP67</p> <p>Housing: metal</p>	<p>pin socket assignment ccw, solder connections, for cable ø 5.5 ... 10.5 mm [0.22 ... 0.41"]</p> <p>suitable for our series:</p> <p>5850 / 5870 with parallel interface</p>	8.0000.5042.0000
		

M23 connection technology	Standard	Cordsets, pre-assembled
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With connector, 12-pin, for incremental encoders	Working temperature range -30°C ... +80°C [-22°F ... +176°F]	Order No.
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Female connector with coupling nut IP67

Cable: PUR,
10 x 0.14 mm² [AWG25] +
2 x 0.5 mm² [AWG20]

Housing: metal

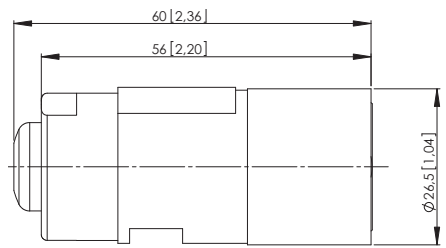
assignment cw

suitable for our series:
5000 / 5020 5814 / 5834
580X / 582X 9000
(Push-Pull output)

Cable length

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

8.0000.6101.0002
8.0000.6101.0005
8.0000.6101.0010
8.0000.6101.0015



PIN:	1	2	3	4	5	6	7	8	9	10	11	12
Cable colour:	PK	BN	BU	RD	GN	YE	-	GY	-	WH 0.5 mm ²	WH 0.5 mm ²	BN 0.5 mm ²

Female connector with coupling nut IP67

Cable: PVC,
12 x 0.14 mm² [AWG25]

Housing: metal

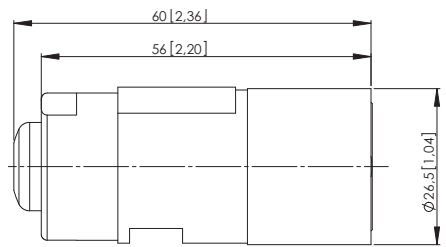
assignment cw

suitable for our series:
5000 / 5020 5814 / 5834
580X / 582X 9000
(Push-Pull output)

Cable length

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

8.0000.6201.0002
8.0000.6201.0005
8.0000.6201.0010
8.0000.6201.0015



PIN:	1	2	3	4	5	6	7	8	9	10	11	12
Cable colour:	PK	RD-BU	BU	RD	GN	YE	-	GY	-	WH	GY-PK	BN

Female connector with coupling nut IP67

Cable: PVC,
6 x 2 x 0.14 mm² [AWG25]

Housing: metal

assignment cw

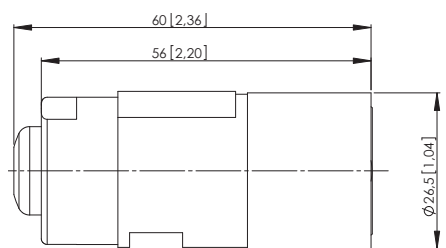
suitable for our series:
5000 / 5020 5814 / 5834
580X / 582X 58x4FSx
9000
(RS422 or SinCos output)

Cable length

2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']

Best.-Nr.

8.0000.6901.0002
8.0000.6901.0005
8.0000.6901.0010
8.0000.6901.0015



PIN:	1	2	3	4	5	6	7	8	9	10	11	12
Cable colour:	PK	RD-BU	BU	RD	GN	YE	-	GY	-	WH	GY-PK	BN

Connection Technology

M23 connection technology Standard Cordsets, pre-assembled

With connector, 12-pin, for absolute encoders Working temperature range -30°C ... +80°C [-22°F ... +176°F] Order No.

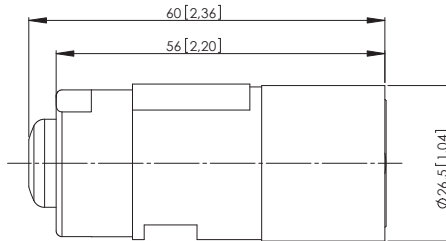
Female connector with coupling nut IP67
 Cable: PVC,
 6 x 2 x 0.14 mm² [AWG25]
 Housing: metal

assignment cw

suitable for our series:
 5850 / 5870 5853 / 5873
 5863 / 5883 5862 / 5882
 58x3FSx 9081
 (SSI- or analogue output)

Cable length
 2 m [6.56']
 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



PIN:	1	2	3	4	5	6	7	8	9	10	11	12
Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU

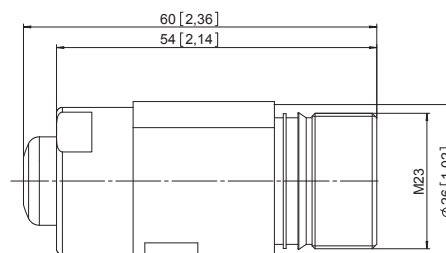
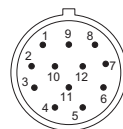
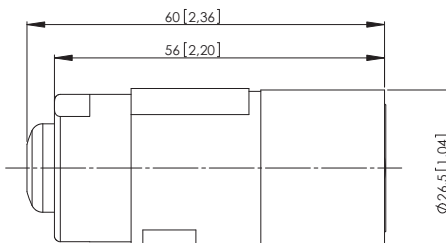
Female connector with coupling nut + male connector with external thread IP67
 Cable: PVC,
 6 x 2 x 0.14 mm² [AWG25]
 Housing: metal

assignment cw
 assignment ccw

suitable for our series:
 5850 / 5870 5853 / 5873
 5863 / 5883 5862 / 5882
 58x3FSx 9081
 (SSI-output)

Cable length
 2 m [6.56']
 5 m [16.40']
 10 m [32.81']
 15 m [49.21']

8.0000.6905.0002.0032
8.0000.6905.0005.0032
8.0000.6905.0010.0032
8.0000.6905.0015.0032



PIN:	1	2	3	4	5	6	7	8	9	10	11	12
Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU

M23 connection technology	Standard	Cordsets, pre-assembled
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With connector, 17-pin, for absolute encoders	Working temperature range -30°C ... +80°C [-22°F ... +176°F]	Order No.
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Female connector with coupling nut
IP67

Cable: PVC,
18 x 0.14 mm² [AWG25]
Housing: metal

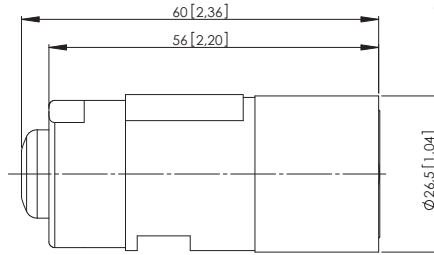
assignment ccw

suitable for our series:
5850 / 5870 5852 / 5872
(Parallel interface)

Cable length



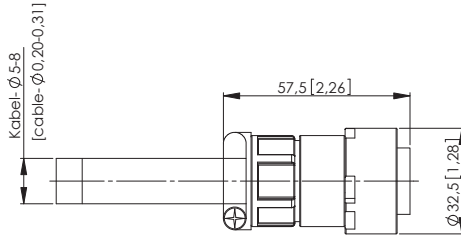

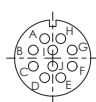
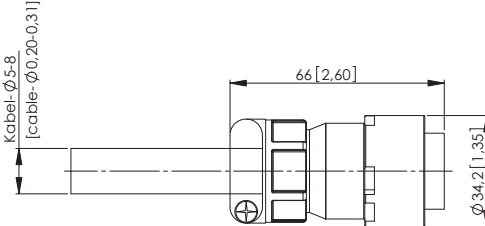
2 m [6.56']
5 m [16.40']
10 m [32.81']
15 m [49.21']


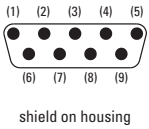
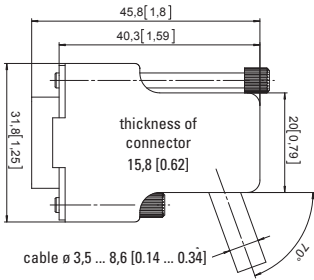

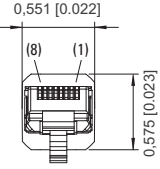
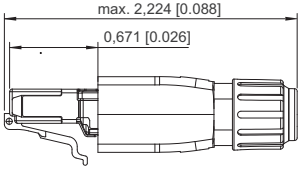
8.0000.6741.0002
8.0000.6741.0005
8.0000.6741.0010
8.0000.6741.0015



PIN:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Cable colour:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	WH-GN	BN-GN	WH-YE	YE-BN	WH-GY

Connection Technology

MIL connection technology	Standard	Connectors, self-assembly	
7-pin			Order No.
Female connector with coupling nut IP67 Housing: metal	Solder connections, for cable \varnothing 5 ... 8 mm [0.20 ... 0.32"]	suitable for our series: 580X, 582X	8.0000.5052.0000
			
10-pin			Order No.
Female connector with coupling nut IP67 Housing: metal	Solder connections, for cable \varnothing 5 ... 8 mm [0.20 ... 0.32"]	suitable for our series: 580X, 582X, 5000, 5020	8.0000.5062.0000
			

Safety technology		Connectors, self-assembly		Order No.
D-Sub connector, 9-pin				
Connector with cable outlet 70° Housing: ABS, metallised	solder contacts, self-assembly	suitable for our Safety-M modules: MS1, MSP1, MS2, MSP2, BM21 (CANopen), BM31 (PROFIBUS DP)	8.0000.514A.0000	
				
RJ45 connector				
RJ45 connector straight, IP20 Housing: plastic	screw connections, for cable \varnothing 4,5 ... 8 mm [0.18 ... 0.32"]	suitable for our Safety-M modules: BMB1 (EtherCAT), BMC1 (PROFINET IO)	05.VS-08-RJ45-5-Q/IP20	
				

Connection Technology

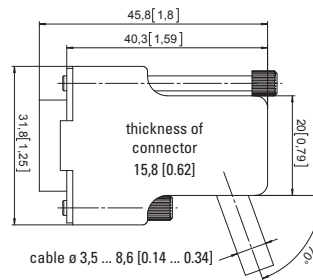
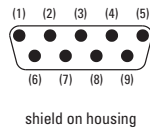
Safety technology Cordsets, pre-assembled

With D-Sub connector, single-ended, 9-pin Order No.

Connector with cable outlet 70°

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: ABS, metallised

suitable for our Safety-M modules:
MS1, MSP1, MS2, MSP2



Cable length

Terminal assignment SinCos signal

Signal SinCos	0 V	+V	A	\bar{A}	B	\bar{B}
Pin D-Sub	2	9	8	4	5	6
Cable colour	WH	BR	BK	VT	GY/PK	RD/BU

Connection X31, X32, X33, X34
for SinCos signal

1 m [3.28']
2 m [6.56']
5 m [16.40']

8.0000.6900.0001.0076
8.0000.6900.0002.0076
8.0000.6900.0005.0076

Terminal assignment SSI signal

Signal SSI	0 V	+V	C+	C-	D+	D-
Pin D-Sub	2	9	8	4	5	6
Cable colour	WH	BR	GN	YE	GY	PK

Connection X31, X32
for SSI signal

1 m [3.28']
2 m [6.56']
5 m [16.40']

8.0000.6900.0001.0075
8.0000.6900.0002.0075
8.0000.6900.0005.0075

Terminal assignment SSI signal

Signal SSI	0 V	+V	C+	C-	D+	D-
Pin D-Sub	2	9	3	7	5	6
Cable colour	WH	BR	GN	YE	GY	PK

Connection X33, X34
for SSI signal

1 m [3.28']
2 m [6.56']
5 m [16.40']

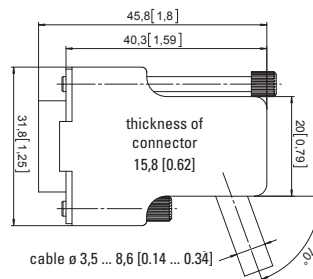
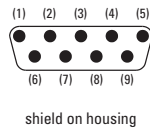
8.0000.6900.0001.0078
8.0000.6900.0002.0078
8.0000.6900.0005.0078

With 2 D-Sub connector, single-ended, 9-pin Order No.

Connector with cable outlet 70°

Cable: PVC, 6 x 2 x 0.14 mm² [AWG25]
Housing: ABS, metallised

suitable for our Safety-M modules:
MSP1, MSP2



Cable length

Terminal assignment

Signal	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{B}
Pin D-Sub 1	2	9	3	7	5	6				
Pin D-Sub 2							8	4	5	6
Cable colour	WH	BR	GN	YE	GY	PK	BK	VT	GY/PK	RD/BU

Connection X31/X33, X32/X34
for SSI- and SinCos signals

1 m [3.28']
2 m [6.56']
5 m [16.40']

8.0000.6900.0001.0077
8.0000.6900.0002.0077
8.0000.6900.0005.0077

Safety technology

Cordsets, pre-assembled

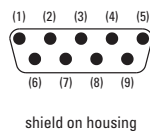
With M23 and D-Sub connector, 9-pin

Order No.

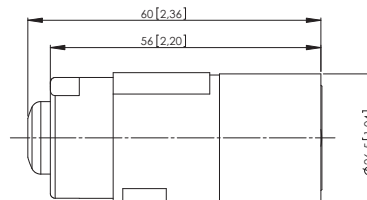
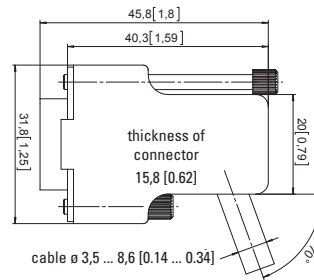
M23 Female connector with coupling nut + D-Sub connector with cable outlet 70°

Cable: PVC,
6 x 2 x 0.14 mm² [AWG25]
Housing M23: metal
Housing D-Sub: ABS, metallised

suitable for our encoder series:
Sendix 58x3, 58x3FS2, 58x3FS3,
Sendix 58x4, 58x4FS2, 58x4FS3
suitable for our Safety-M modules:
MS1, MSP1, MS2, MSP2



assignment cw



Cable length

Terminal assignment

Signal	0 V	+V	A	\bar{A}	B	\bar{B}
Pin D-Sub	2	9	8	4	5	6
Pin M23, 12-pin	1	2	9	10	11	12
Cable colour	WH	BR	BK	VT	GY/PK	RD/BU

Connection X31, X32, X33, X34
for SinCos signal

1 m [3.28']	8.0000.6900.0001.0069
2 m [6.56']	8.0000.6900.0002.0069
5 m [16.40']	8.0000.6900.0005.0069

Terminal assignment

Signal	0 V	+V	C+	C-	D+	D-
Pin D-Sub	2	9	8	4	5	6
Pin M23, 12-pin	1	2	3	4	5	6
Cable colour	WH	BR	GN	YE	GY	PK

Connection X31, X32
for SSI signal

1 m [3.28']	8.0000.6900.0001.0068
2 m [6.56']	8.0000.6900.0002.0068
5 m [16.40']	8.0000.6900.0005.0068

Terminal assignment

Signal	0 V	+V	C+	C-	D+	D-
Pin D-Sub	2	9	3	7	5	6
Pin M23, 12-pin	1	2	3	4	5	6
Cable colour	WH	BR	GN	YE	GY	PK

Connection X33, X34
for SSI signal

1 m [3.28']	8.0000.6900.0001.0072
2 m [6.56']	8.0000.6900.0002.0072
5 m [16.40']	8.0000.6900.0005.0072

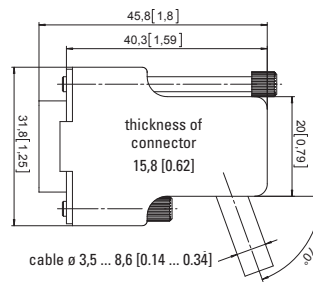
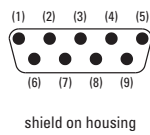
Safety technology Cordsets, pre-assembled

With M23 and 2 x D-Sub connector, 9-pin Order No.

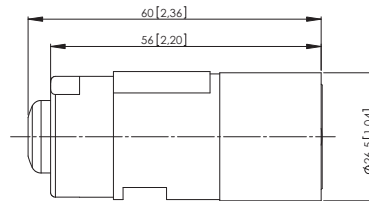
M23 Female connector with coupling nut + 2 x D-Sub connector with cable outlet 70°

Cable: PVC,
6 x 2 x 0.14 mm² [AWG25]
Housing M23: metal
Housing D-Sub: ABS, metallised

suitable for our encoder series:
Sendix 58x3, 58x3FS2, 58x3FS3
suitable for our Safety-M modules:
MSP1, MSP2



assignment cw



Cable length

Terminal assignment

Connection X31/X33, X32/X34
for SSI + SinCos signal

1 m [3.28']
2 m [6.56']
5 m [16.40']

8.0000.6900.0001.0070
8.0000.6900.0002.0070
8.0000.6900.0005.0070

Signal	0 V	+V	C+	C-	D+	D-	A	\bar{A}	B	\bar{B}
Pin D-Sub 1	2	9	3	7	5	6				
Pin D-Sub 2							8	4	5	6
Pin M23, 12-pin	1	2	3	4	5	6	9	10	11	12
Cable colour	WH	BR	GN	YE	GY	PK	BK	VT	GY/PK	RD/BU

Optical fibre signal transmission **Optical fibre transmitter and receiver** **RS422/HTL**

eco plus

Cost advantage compared to conventional wiring over 150 m length*



The solution where signal transmission is difficult.

The system is made up of an optical fibre transmitter and an optical fibre receiver. The optical fibre transmitter converts the electrical signals of a normal incremental encoder into a light signal for transmission by means of an optical fibre.

The receiving module converts the optical signal back into electrical signals. Up to 4 channels with inverted signals may be transmitted safely.

Innovative

- Signal transmission via just a single glass fibre
- Safe signal transmission up to 1000 m
- Input frequency up to 400 kHz
- Input level 10 ... 30 V or RS422
- Inverted input signals
- Resists extremely strong electro-magnetical fields

Compact

- Can be installed even where space is tight
- Minimal installation depth
- Connections plug-in HD-SubD15 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 fibre transmitter / receiver

6.LWLX.XX
a b c

a
 S = Optical fibre transmitter
 E = Optical fibre receiver

b Output circuit / Power supply
 1 = RS422 / 10 ... 30 V DC
 2 = HTL, without inverted signals / 10 ... 30 V DC (only for optical fibre transmitter)
 4 = RS422 / 5 V DC
 5 = HTL / 10 ... 30 V DC, input

c Type of connection
 0 = Terminal clamp
 1 = Plug-in connector HD-Sub D15

Scope of delivery:
 • Optical fibre module
 • Multilingual operating manual

Optical fibre transmitter versions can be combined with any version of the optical fibre receivers.

Accessories

Simplex Patch cable
ST-ST - Multimode



Connector:
 2 x ST/PC, optical fibre:
 1 x 50/125

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

05.LWLK.001

* Comparison of costs:
 Costs per meter standard copper cable compared to costs per meter optical fibre signal cable + costs of transmitter + costs of receiver

Connection Technology

Optical fibre signal transmission Optical fibre transmitter and receiver RS422/HTL

Technical data		
Power supply	10 ... 30 DC V bzw. 5 V DC ±5%	
Power consumption per module	< 2 W	
Operating voltage reverse connection protection	available	
Encoder inputs optical fibre transmitter channels	A, \bar{A} , B, \bar{B} , 0, $\bar{0}$	
Max. input frequency optical fibre transmitter and output frequency optical fibre receiver	400 kHz	
Input level optical fibre transmitter	10 ... 30 V or RS 422	
Optical wavelength	820 nm	
Optical transmission rate	120 Mbit/s	
Optical fibre synchronisation display	LED on the receiver	
Optical fibre connection	ST connector, \varnothing 9 mm [0.35"] on the bottom side of the housing	
Glass fibre	multimode fibre, 50/125 μ m, 62,5/125 μ m	
Input signals sampling rate	10 MSamples/s	
Optical fibre transmission distance	max. 1000 m [3280.8']	
Dimensions (W x L x H)	Terminal clamp	22.5 x 110.8 x 88.4 mm [0.89 x 4.36 x 3.48"]
	Plug-in connector	19.0 x 110.8 x 88.4 mm [0.75 x 4.36 x 3.48"]
Protection	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]	
Standards	EN 55011 Class B EN 61000-6-2: 2006	

Terminal assignment

Type of connection	Terminal clamp, optical fibre transmitter and optical fibre receiver											
0	Signal	\bar{A}	\bar{B}	$\bar{0}$ (\bar{C})	A	B	0 (C)	\bar{D}	D	+V	0 V linked internally	Shield
	Terminal	1	2	3	4	5	6	7	10	8	9, 11, 12	–

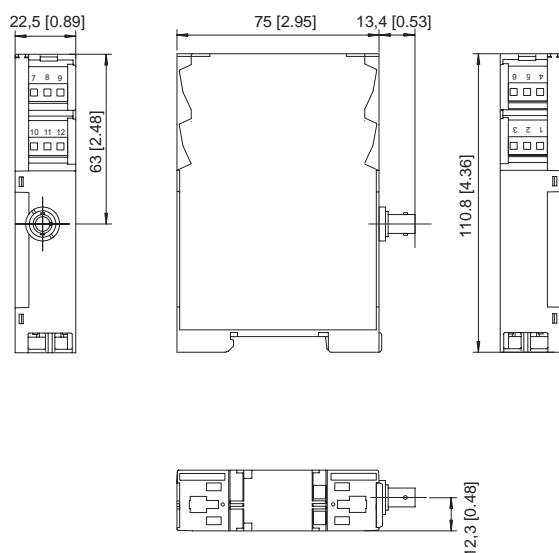
Type of connection	HD-Sub D15, optical fibre transmitter											Terminal		
1	Signal	\bar{A}	\bar{B}	$\bar{0}$ (\bar{C})	A	B	0 (C)	\bar{D}	D	+V _{out} to encoder	0 V linked internally	Shield	0 V linked internally	+V _{out} to encoder, linked internally
	Terminal	8	6	3	9	7	4	1	2	15	11, 12	13	1	2

Type of connection	HD-Sub D15, optical fibre receiver											Terminal		
1	Signal	\bar{A}	\bar{B}	$\bar{0}$ (\bar{C})	A	B	0 (C)	\bar{D}	D	+V _{in} power supply	0 V linked internally	Shield	0 V linked internally	+V _{in} power supply, linked internally
	Terminal	8	6	3	9	7	4	1	2	15	11, 12	13	1	2

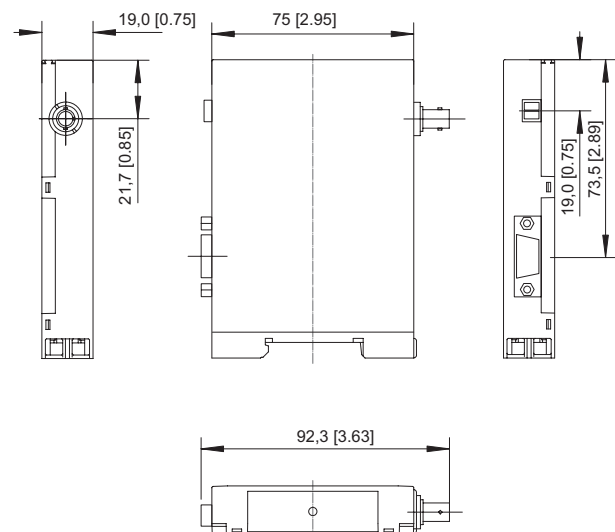
Dimensions

Dimensions in mm [inch]

Terminal clamp



Plug-in connector, HD-Sub D15



Optical fibre signal transmission	Optical fibre transmitter and receiver	SSI
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eco plus

Cost advantage compared to conventional wiring over 150 m length*



Optical fibre transmission system for SSI absolute encoders

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

The optical fibre transmitter converts the electrical signals of a normal absolute encoder with Synchronous Serial Interface (SSI) into a light signal for transmission by means of an optical fibre. The receiving module converts the optical signal back into electrical signals.

Absolute signals can be transmitted safely through one glass fibre over distances of up to 1500 m. The resolution of 13 bit for a singleturn encoder or 25 bit for a multiturn encoder can be defined by means of a DIP-switch on the front side of the module.

Reliable transmission

- Safe signal transmission up to 1500 m
- Resists extremely strong electro-magnetic fields

Easy installation

- Signal transmission via a single glass fibre
- Resolution of 13 bit or 25 bit can be set via DIP-switch
- LED for monitoring of power supply, clock and date
- DIN-rail mounting – requires min. installation space – only 22 mm wide

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 fibre transmitter / receiver

6.LWLX . AX

a
S = Optical fibre transmitter
E = Optical fibre receiver

b Power supply
1 = 10 ... 30 V DC
4 = 5 V DC

Scope of delivery:

- Optical fibre module
- Operating manual, dual language, German and English

Accessories	Order No.
<p>Simplex Patch cable ST-ST - Multimode</p>	<p>Connector: 2 x ST/PC, Optical fibre: 1 x 50/125</p> <p>05.B09-B09-821-XXXX</p> <p>XXXX = Length in m Standard lengths: 2 m, 5 m, 8 m, 10 m, 15 m, 20 m, ... (in 5 m steps)</p>
<p>ST Multimode coupling</p>	<p>Barrel: ceramic, slotted</p> <p>05.LWLK.001</p>

* Comparison of costs:
Costs per meter standard copper cable compared to costs per meter optical fibre signal cable + costs of transmitter + costs of receiver

Connection Technology

Optical fibre signal transmission Optical fibre transmitter and receiver SSI

Technical data	
Power supply	10 ... 30 DC V or 5 V DC $\pm 5\%$
Power consumption per module	
+V = 10 ... 30 V DC	max 1.6 W
+V = 5 V DC	max 0.8 W
Operating voltage reverse connection protection	available
Encoder inputs optical fibre transmitter	C-, C+ and D-, D+
SSI clock rate	500 kHz fixed setting
Optical wavelength	820 nm (infrared)
Optical transmission rate	120 Mbit/s
Optical fibre connection	ST connector, \varnothing 9 mm [0.35"] on the bottom side of the housing

Glass fibre	multimode fibre, 50/125 μ m, 62,5/125 μ m
Optical fibre transmission distance	max. 1500 m [4921.3']
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"]
Protection	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. 100 g [3.53 oz]
Normen	EN 55011 Klasse B1 EN 61000-6-2: 2006

Connection diagram Optical fibre transmitter

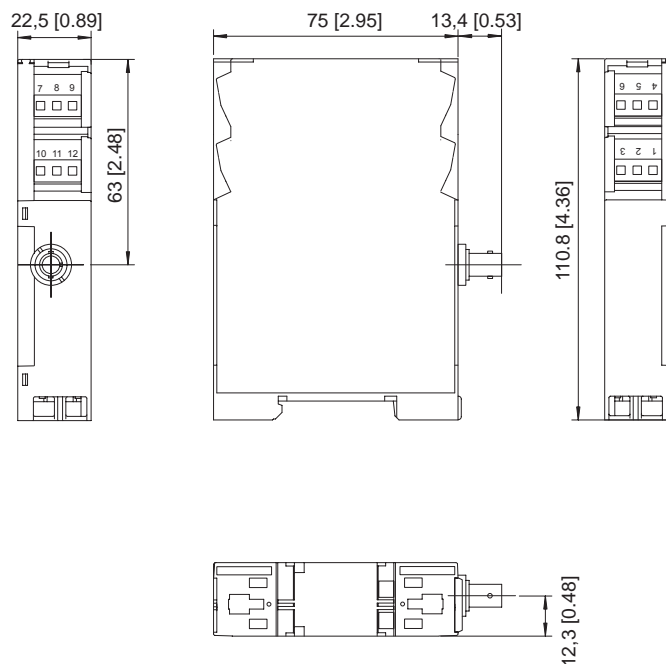
Pin	Signal
1	0 V (GND)
2	+V
3	C+
4	C-
5	D+
6	D-
7	0 V (GND)
8	+V

Connection diagram Optical fibre receiver

Pin	Signal	
1	0 V (GND)	
2	+V	from power supply
3	D+	
4	D-	to controller
5	C+	
6	C-	from controller
7	emitter (-)	
8	collector (+)	optocoupler output alarm output


Dimensions

Dimensions in mm [inch]





Accessories

			Page
Encoder mounting attachments	Fixing components for hollow shaft encoders	Overview	420
		Details	422
	Fixing components for shaft encoders	Overview	427
		Details	428
<hr/>			
Robust bearing unit	Suitable for Sendix 50xx and 58xx		433
<hr/>			
Connection of motor and encoder	 Couplings	Bellows- / Spring washer-type coupling	434
		Flexible shaft coupling	436
<hr/>			
Bearing box			437
<hr/>			

Encoder mounting attachments	Fixing components for hollow shaft encoders	Overview
------------------------------	---	----------

Fig.	Description	Pitch circle diameter in mm [inch]	Order No.	Details s. page	Incremental Encoders		Absolute Singleturn Encoders			Absolute Multiturn Encoders				
					3620, 3720	5020	5823, 5824, 5825	3670, 3671, M3678	F3673, F3678	5873, 5878	5870, 5872	F3683, F3688	5883, 5888,	F5883, F5885
	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	422	X	X	X	X	X	X	X	X	X	X
	Spring element, long For applications with axial play and low dynamics	36XX 60 [2.36] M36XX 60 [2.36] F36XX 60 [2.36] 37XX 63 [2.48] 50XX 44 [1.73] 58XX 65 [2.56] F58XX 65 [2.56]	8.0010.4I00.0000	422	X	X	X	X	X	X	X	X	X	X
	Fastening arm, short (flexible) For applications with axial and radial play, low dynamics	64.5 [2.54]	8.0010.40M0.0000	422		X	X			X	X		X	X
	Fastening arm, medium (flexible) For applications with axial and radial play for constant rotary movements	65 ... 91.5 [2.56 ... 3.60]	8.0010.40E0.0000	422		X	X			X	X		X	X
	Fastening arm, long (flexible) For applications with axial and radial play and low dynamics	80 ... 170 [3.15 ... 6.69]	8.0010.4R00.0000	423		X	X			X	X		X	X
	Stator coupling, double-winged For applications with axial and radial play and high dynamics	46 [1.81]	8.0010.4C00.0000	423	X			X	X			X		
	Stator coupling, double-winged For applications with high demands for accuracy	63 [2.48]	8.0010.4D00.0000	423		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	424		flange C+D	X			X	X		X	X
	Stator coupling, for fixing to front of encoder For applications with axial and radial play and high dynamics	65 [2.56]	8.0010.40L0.0000	424		X	X			X	X		X	X
	Spring tether element For applications with low axial and radial play and low dynamics	42 ... 84.5 [1.65 ... 3.33]	8.0010.40W0.0000	424		X	X			X	X		X	X

Accessories

Encoder mounting attachments		Fixing components for hollow shaft encoders			Overview			
Fig.	Description	Pitch circle diameter in mm [inch]	Order No.	Details s. page	A020	A02H	9080, 9081	H120
	Spring element, short For applications with reduced mounting space	76 [2.99]	8.0010.4J00.0000 <i>Connection to the application:</i> cylindrical pin	425	X	X	X	
	Spring element, long For applications with high axial play	110 [4.33]	8.0010.4K00.0000 <i>Connection to the application:</i> cylindrical pin	425	X	X	X	
	Tether square For applications with axial and radial play with low dynamics for constant rotary movements	9080: 120 [4.72] 9081: 120 [4.72]	8.0010.4G00.0000 <i>Connection to the application:</i> 1 screw	425			X	
	Fastening arm, short For applications with axial play	149 [5.87]	8.0010.4T00.0000 <i>Connection to the application:</i> s. details	425	X	X	X	
	Fastening arm, long For applications with fastening points located on variable pitch circle diameters	104 ... 206 [4.09 ... 8.11]	8.0010.4E00.0000 <i>Connection to the application:</i> 1 screw	426	X	X	X	
	Tether arm, long For applications with low axial and radial play, flexible in use	Length = 70 [2.75] Length = 100 [3.94] Length = 150 [5.91] 262 ... 422 [10.32 ... 16.61]	8.0010.40S0.0000 8.0010.40T0.0000 8.0010.40U0.0000 <i>Connection to the application:</i> 1 screw	426	X	X	X	X
	Stator coupling For applications with axial and radial play and high dynamics	119 [4.69]	8.0010.40V0.0000 <i>Connection to the application:</i> 2 screws	426	X	X		X

Accessories

Encoder mounting attachments Fixing components for hollow shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

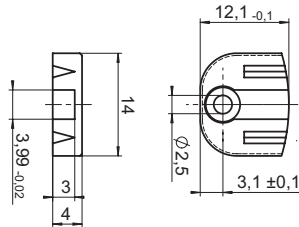
Spring element, short

Scope of delivery:

- spring element (plastic)
- 1 screw for fixing to the encoder

Connection to application:

- cylindrical pin (8.0010.4700.0000) (not supplied)



Order No.

8.0010.4H00.0000

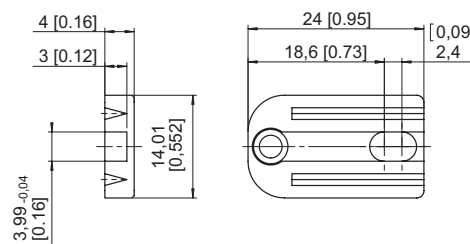
Spring element, long

Scope of delivery:

- spring element (plastic)
- 1 screw for fixing to the encoder

Connection to application:

- cylindrical pin (8.0010.4700.0000) (not supplied)

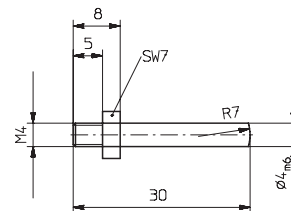


Order No.

8.0010.4I00.0000

Cylindrical pin, long with fastening thread

suitable for spring element short (8.0010.4H00.0000) and long (8.0010.4I00.0000)



Order No.

8.0010.4700.0000

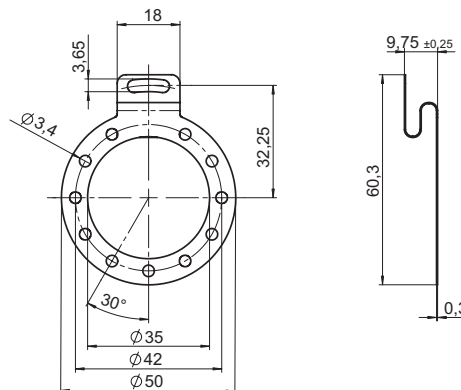
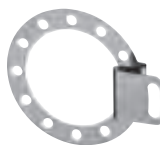
Fastening arm, short

Scope of delivery:

- Fastening arm (stainless steel)
- 3 screws for fixing to the encoder

Connection to application:

- 1 screw (not supplied)



Order No.

8.0010.40M0.0000

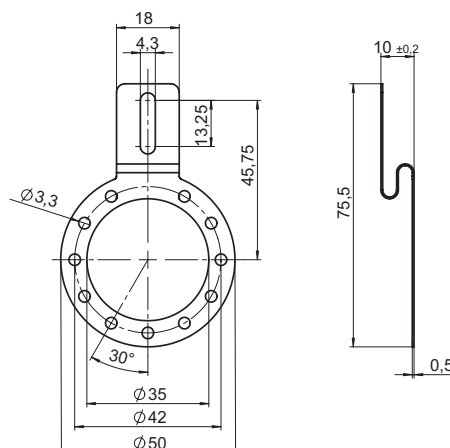
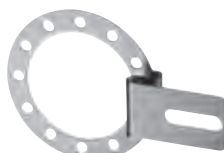
Fastening arm, medium

Scope of delivery:

- Fastening arm (stainless steel)
- 3 screws for fixing to the encoder

Connection to application:

- 1 screw (not supplied)



Order No.

8.0010.40E0.0000

Accessories

Encoder mounting attachments Fixing components for hollow shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

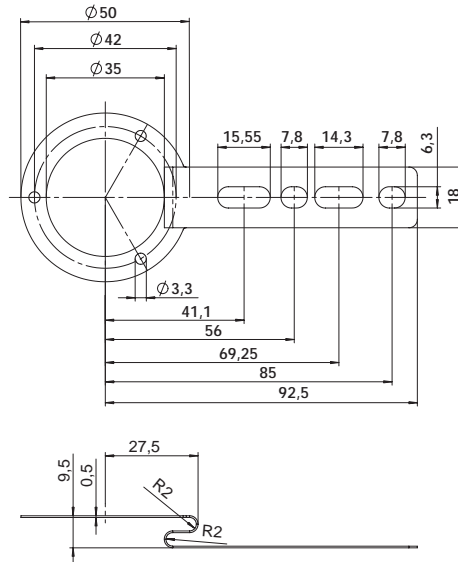
Fastening arm, long

Scope of delivery:

- Fastening arm (stainless steel)
- 3 screws for fixing to the encoder

Connection to application:

- 1 screw (not supplied)



Order No.

8.0010.4R00.0000

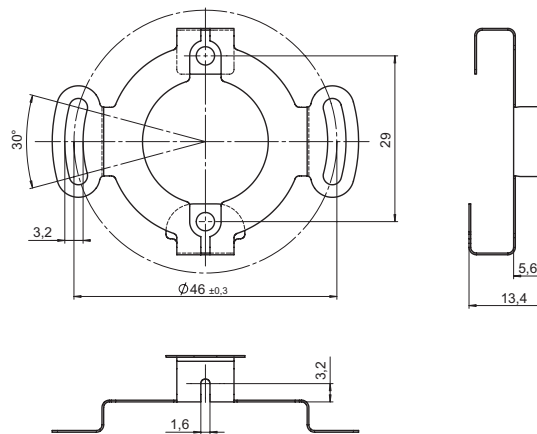
Stator coupling, double-winged for front fixing onto the encoder flange

Scope of delivery:

- Stator coupling (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:

- 2 screws (not supplied)



Order No.

8.0010.4C00.0000

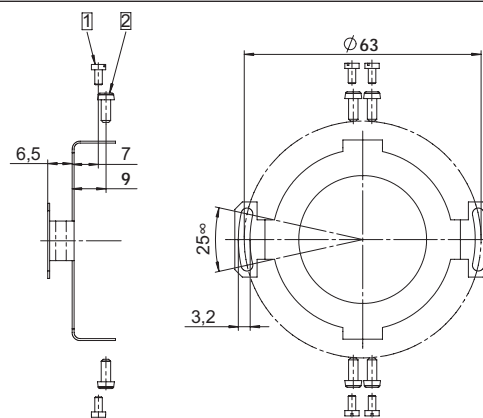
Stator coupling, double-winged for side fixing onto the encoder flange

Scope of delivery:

- Stator coupling (stainless steel)
- ① 4 screws M2 x 4 [0.16] for fixing to the encoder 5882
- ② 4 screws M2.5 x 6 [0.24] for fixing to the encoders 582X, 587X, 502X

Connection to application:

- 2 socket head screws M3 x 8 [0.32] with washer (supplied)



Order No.

8.0010.4D00.0000

Accessories

Encoder mounting attachments Fixing components for hollow shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

Stator coupling, for side fixing onto the encoder flange

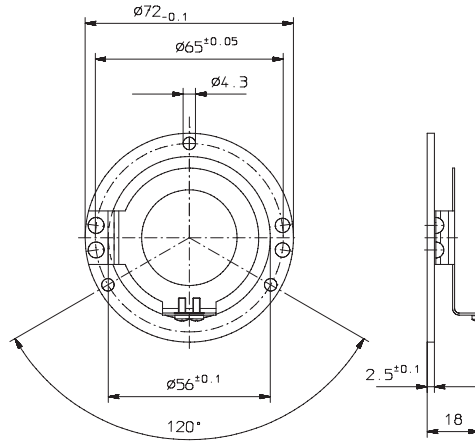
Scope of delivery:

- Stator coupling (stainless steel)
- 1 2 screws M2 x 4 [0.16] for fixing to the encoder 5882

- 2 2 screws M2.5 x 6 [0.24] for fixing to the encoders 582X, 587X, 502X

Connection to application:

- 3 screws (not supplied)



Order No.

8.0010.1602.0000

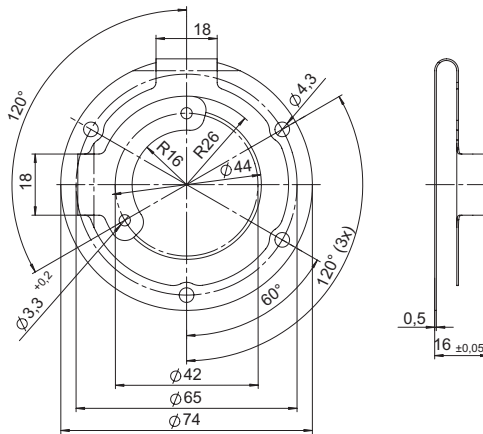
Stator coupling, for front fixing onto the encoder flange

Scope of delivery:

- Stator coupling (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:

- 3 screws (not supplied)



Order No.

8.0010.40L0.0000

Spring tether element

Scope of delivery:

- Spring tether element
- 1 screw for fixing to the encoder

Connection to application:

- 1 screw (not supplied)

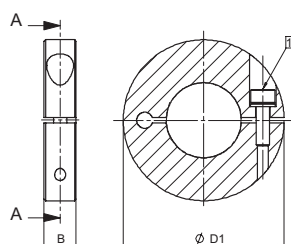


Order No.

8.0010.40W0.0000

Clamping ring

Stainless steel, for high rotational speeds



	for encoder	B	D1	for hollow shaft \varnothing
582X		6 [0.236]	29 [1.14]	10 [0.39]
		6.2 [0.244]	30 [1.18]	12 [0.47]
5020		6.2 [0.244]	30 [1.18]	12 [0.47]

Order No.

8.0000.4V00.0000

8.0000.4W00.0000

8.0010.4W01.0000

- 1 screw DIN 912 A2 M2.5, max. tightening torque 0.45 Nm

Accessories

Encoder mounting attachments Fixing components for hollow shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

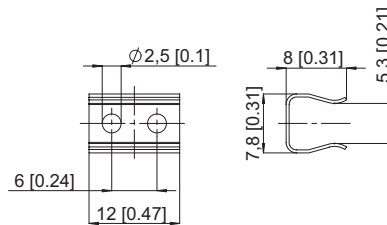
Spring element, short

Scope of delivery:

- spring element (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:

- cylindrical pin (8.0010.4700.0003) (not supplied)



Order No.

8.0010.4J00.0000

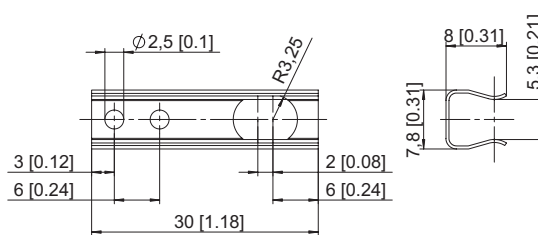
Spring element, long

Scope of delivery:

- spring element (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:

- cylindrical pin (8.0010.4700.0003) (not supplied)

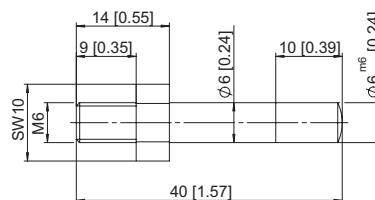


Order No.

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)



Order No.

8.0010.4700.0003

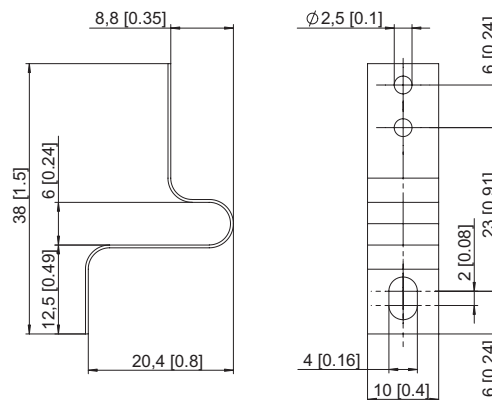
Tether square

Scope of delivery:

- tether square (stainless steel)
- 2 screws for fixing to the encoder

Connection to application:

- 1 screw (not supplied)



Order No.

8.0010.4G00.0000

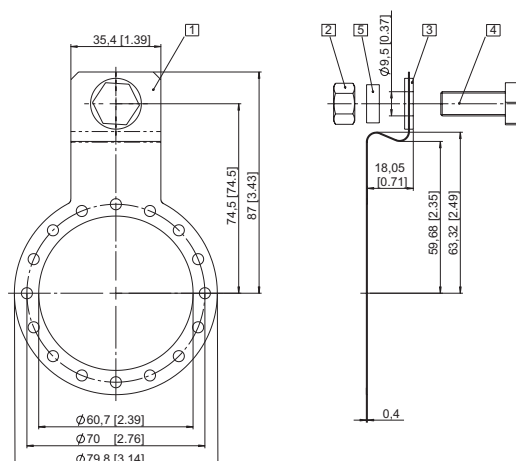
Fastening arm, short

Scope of delivery:

- ① Fastening arm (stainless steel)
- 3 screws for fixing to the encoder

Connection to application:

- ② Hexagonal nut 3/8 - 16 UNC
- ③ Washer (isolating)
- ④ Hexagonal screw 3/8 16 UNC x 1"
- ⑤ Washer D10.4 x 15 x 15 (supplied)



Order No.

8.0010.4T00.0000

Accessories

Encoder mounting attachments Fixing components for hollow shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

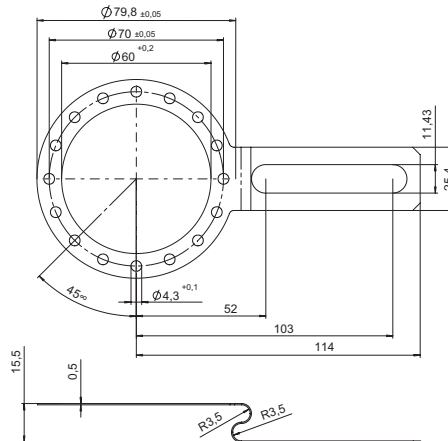
Fastening arm, short

Scope of delivery:

- Fastening arm (stainless-steel)
- 3 screws for fixing to the encoder

Connection to application:

- 1 screw (not supplied)



Order No.

8.0010.4E00.0000

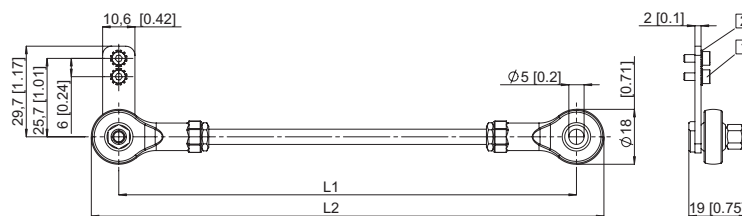
Tether arm, long

Scope of delivery:

- Tether arm
- 1 2 Socket cap screws M2.5 x 6 [0.24]
- 2 2 Lock washers for fixing to the encoder

Connection to application:

- 1 screw (not supplied)



Tether 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]

Order No.

8.0010.40S0.0000

8.0010.40T0.0000

8.0010.40U0.0000

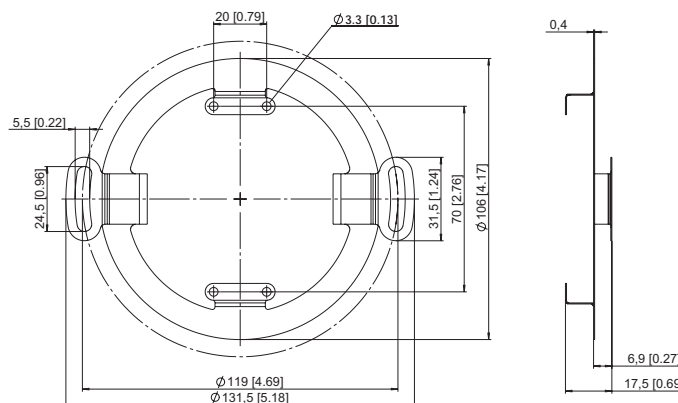
Stator coupling

Scope of delivery:

- Stator coupling (stainless steel)
- 4 screws for fixing to the encoder

Connection to application:









- 2 screws (not supplied)



Order No.

8.0010.40V0.0000

Accessories

Encoder mounting attachments		Fixing components for shaft encoders				Overview					
Overview		Description	Order No.	Details s.page	Incremental Encoders			Abs. Singleturn Encoders		Abs. Multiturn Encoders	
Fig.	5000				5803, 5804, 5805	7000	5853, 5858	5850, 5852	7053, 7058	5863, 5868	F5863, F5868
	Flange, square Suitable for shaft encoders with clamping flange <input type="checkbox"/> 58.0 [2.28"] 4 [0.16"] thick <input type="checkbox"/> 63.5 [2.5"] 3 [0.12"] thick <input type="checkbox"/> 70.0 [2.76"] 10 [0.39"] thick <input type="checkbox"/> 80.0 [3.15"] 4 [0.16"] thick	8.0010.2100.0000 8.0010.2120.0000 8.0010.2600.0000 8.0010.2800.0000	428 428 428 428	X X X X	X X X X	X X X X	X X X X	X X 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	429	X	X	X	X	X	X	X	
	Flange, ø 115 mm [4.53"] Euroflange	8.0010.2160.0000 8.0010.2170.0000	429	X	X	X	X	X	X	X	
	Flange, ø 58 mm [2.28"] Converts encoders with a clamping flange into synchro flange.	8.0010.2180.0000	429	X	X	X	X	X	X		
	Flange, ø 90 mm [3.54"] Mechanically compatible with former encoder Type 9000	8.0010.2270.0000	430	X	X	X	X	X	X		
	Angular flange 80 mm x 80 mm x 40 mm [3.15" x 3.15" x 1.57"]	8.0010.2300.0000	430	X	X	X	X	X	X		
	Assembly bell Electrical and thermal isolation by means of glass fibre reinforced plastic and isolating spring washer coupling – supplied as complete set	8.0000.4500.XXYY	431	X	X	X	X	X	X		
	Fastening eccentrics For shaft encoders with synchronous flange. Use at least three fastening eccentrics to mount the encoder.	8.0010.4200.0000 8.0010.4100.0000	432	see table page 432							

Accessories

Encoder mounting attachments Fixing components for shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

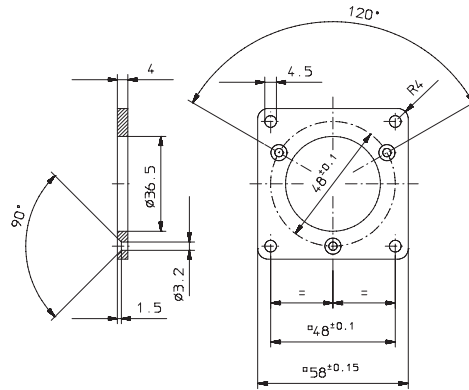
Flange, square

Scope of delivery:

- flange (aluminium)
- 3 screws for fixing to the encoder

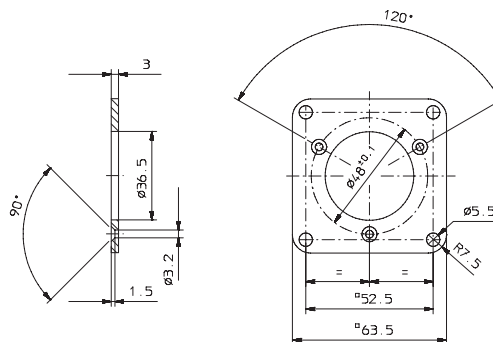
Connection to application:

- 4 screws (not supplied)



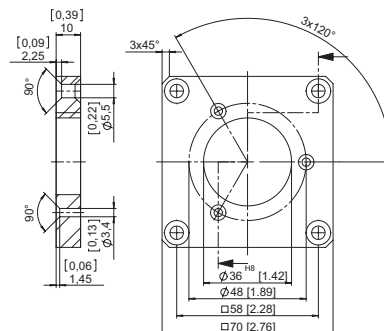
Order No.

8.0010.2100.0000



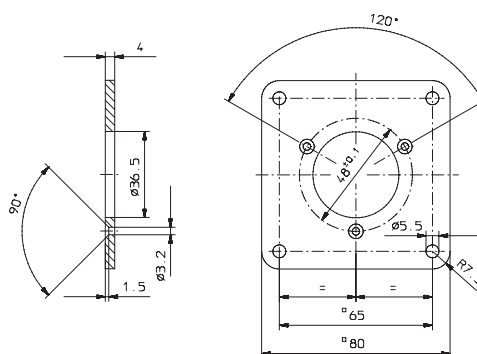
Order No.

8.0010.2120.0000



Order No.

8.0010.2600.0000



Order No.

8.0010.2800.0000

Accessories

Encoder mounting attachments Fixing components for shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

Flange, ø 65 [2.56]

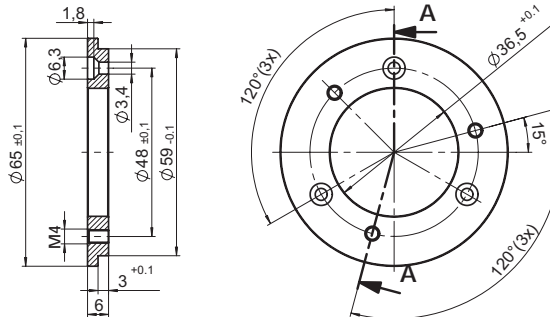
With this adapter flange, Kübler encoders with size 58 [2.28] can replace encoders with diameter 65 [2.56] and pitch circle diameter 48 [1.89].

Scope of delivery:

- flange (aluminium)
- 3 screws for fixing to the encoder

Connection to application:

- 3 screws (not supplied)



Order No.

8.0010.2230.0000

Flange, ø 115 [4.53], Euroflange (Euro REO 444)

Scope of delivery:

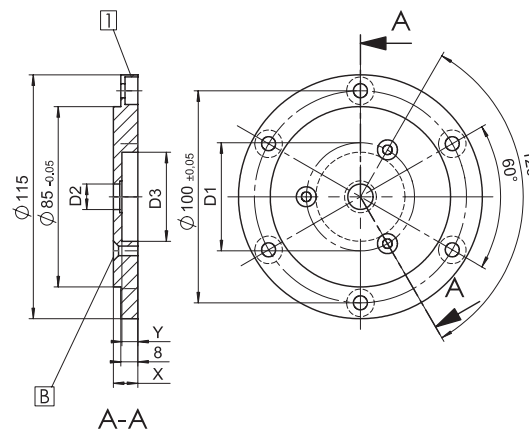
- flange (aluminium)
- 3 screws for encoder mounting

Connection to application:

- 6 screws (not supplied)



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



1 countersunk DIN 74-Hm6

B see table

Order No.

8.0010.2160.0000

8.0010.2170.0000

Flange, ø 58 [2.28]

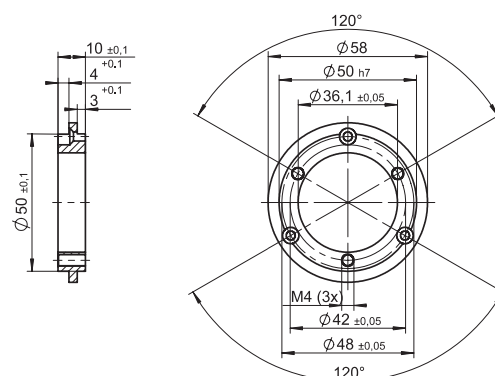
Converts encoders with a clamping flange into synchro flange.

Scope of delivery:

- flange (aluminium)
- 3 screws for encoder mounting

Connection to application:

- 3 screws (not supplied)



Order No.

8.0010.2180.0000

Encoder mounting attachments	Fixing components for shaft encoders	Details
-------------------------------------	---	----------------

Dimensions / Details

Dimensions in mm [inch]

Flange, $\varnothing 90$ [3.54]

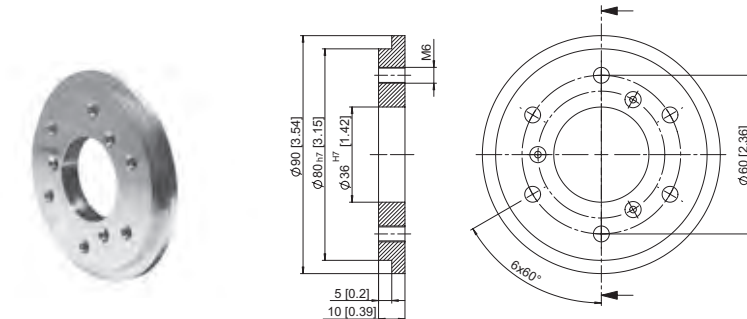
Mechanically compatible with former encoder Type 9000

Scope of delivery:

- flange
- 3 screws for encoder mounting

Connection to application:

- 6 screws (not supplied)



Order No.

8.0010.2270.0000

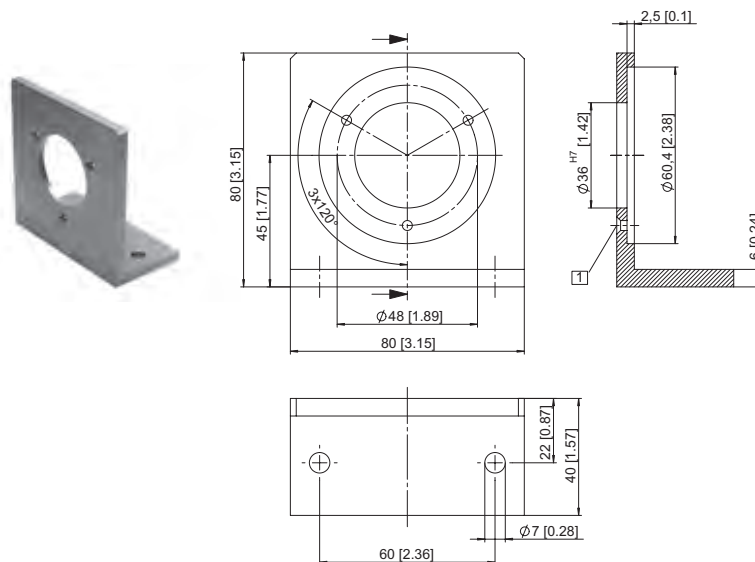
Angular flange

Scope of delivery:

- angular flange (aluminium)
- 3 screws for encoder mounting

Connection to application:

- 2 screws (not supplied)



Order No.

8.0010.2300.0000

1 countersunk DIN 74-Hm6

Accessories

Encoder mounting attachments Fixing components for shaft encoders Details

Dimensions / Details

Dimensions in mm [inch]

Assembly bell

- Easy and quick encoder mounting
- Electrical and thermal isolation by means of glass fibre reinforced plastic and isolating spring washer coupling
- Supplied as complete set

Scope of delivery:

- Assembly bell
- Spring washer type coupling (8.0000.1401.XXXX)
- 4 hexagon socket head cap screws DIN 912 M4 x 12 [0.47]
- 3 hexagon socket head cap screws DIN 912 M4 x 10 [0.39]
- 7 washers DIN 433 \varnothing 4 [0.16]
- 3 fastening eccentrics (8.0000.4B00.0000)
- 3 hexagon head screws DIN 84 M 4 x 35 [0.16 x 1.38]
- 3 hexagon nuts DIN 934 - M4

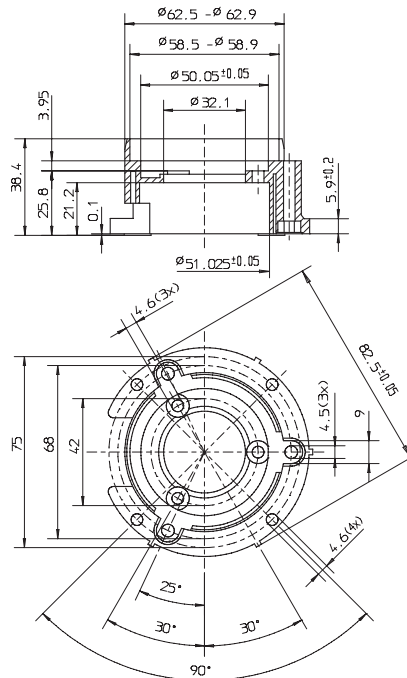
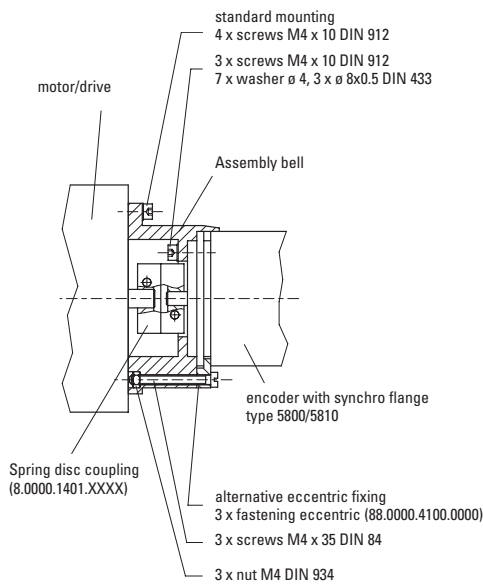


Order No.

8.0000.4500.XXYY

XX = Coupling diameter
d1 in mm

YY = Coupling diameter
d2 in mm



Accessories

Encoder mounting attachments	Fixing components for shaft encoders	Details
------------------------------	--------------------------------------	---------

Dimensions / Details

Dimensions in mm [inch]

Fastening eccentrics

for encoders with synchro flange

- Suitable for Kübler encoders with synchro flange
- Material ACu Zn 39 Pb 3
- Surface finish: galvanised Ni

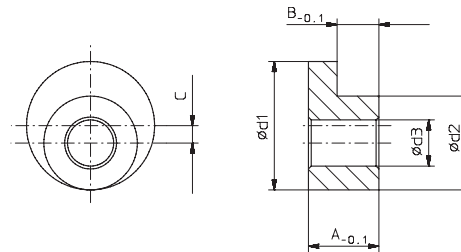
Scope of delivery:

- 3 eccentrics
- 3 screws

(Use at least three fastening eccentrics to mount the encoder)

<i>encoder type</i>	<i>D1</i>	<i>D2</i>	<i>D3</i>	<i>A</i>	<i>B</i>	<i>C</i>
3610 3651 M3658 F3653 / F3658 F3663 / F3668	6.8 [0.27]	5 [0.20]	2.8 [0.11]	3.5 [0.14]	2.25 [0.09]	0.9 [0.035]
5000 5803 / 5804 / 5805 5853 / 5858 5863 / 5868 F5863 / F5868 5850 / 5852 7053 / 7058 7063 / 7068	9.6 [0.38]	6.5 [0.26]	3.2 [0.13]	5.6 [0.22]	2.9 [0.11]	1.2 [0.047]

<i>Order No.</i>
8.0010.4200.0000
8.0010.4100.0000



Accessories

Robust bearing unit Suitable for Sendix 50xx and 58xx



Quick and simple – More protection

Separating the bearing load and the sensor technology affords the encoder greater protection in harsh environments.

Retrofitting to all encoders with a 58 mm clamping flange is very easy and quick.



Shock / vibration resistant



Temperature -40° + 85°



High IP value



High shaft load capacity

Order No. 8.0010.8200.000C

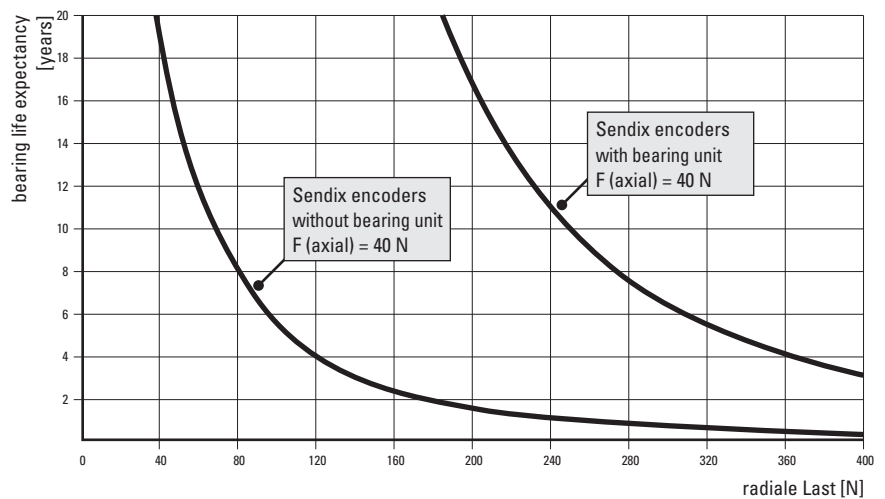
Robust bearing unit

matching shaft encoders with clamping flange and shaft 10 mm [0.39"]

Technical Data	
Speed	max. 6.000 min ⁻¹
Weight	approx. 560 g [19.75 oz]
Protection	IP67
Material	housing aluminium optional: seawater resistant shaft stainless steel

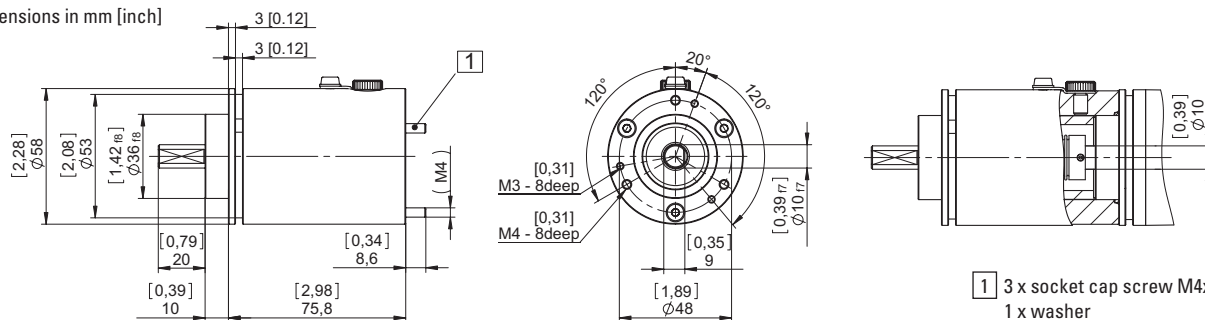
Bearing life expectancy L10

at 3000 revolutions/min with continuous operation



Dimensions

Dimensions in mm [inch]



- 1 3 x socket cap screw M4x25 (SW3)
- 1 x washer
- included as mounting set

Accessories

Connection of motor and encoder

Couplings

Bellows and spring washer couplings



Bellows couplings provide cost-effective connection of the motor and encoder. They are also able to correct any angular errors between the drive and encoder.

Spring washer couplings are used with high speeds.

Order code Couplings

8.0000 . 1 X 02 . XX XX
Type a b c

a Type of coupling

- 1 = Bellows-type \varnothing 19 mm [0.75"]
- 2 = Bellows-type \varnothing 15 mm [0.59"]
- 3 = Spring washer type, \varnothing 30 mm [1.18"], one-part
- 4 = Spring washer type, \varnothing 30 mm [1.18"], three part, plug-in
- 5 = Bellows-type \varnothing 25 mm [0.98"]

b Bore diameter d1 (see technical data)

Note:
for the bore diameter
d1 = 3/8" please enter Code A1
d1 = 1/4" please enter Code A2

c Bore diameter d2 (see technical data)

Example a) : d1 = 10 mm [0.39"] and d2 = 12 mm [0.47"]
Order No. = 8.0000.1X01.1012

Example b) : d1 = 3/8" and d2 = 10 mm [0.39"]
Order No. = 8.0000.1X01.A110

Technical data

Type	8.0000.1102.XXXX	8.0000.1202.XXXX	8.0000.1302.XXXX	8.0000.1402.XXXX	8.0000.1502.XXXX
Max. speed	min ⁻¹ 10000	10000	12000	12000	10000
Max. torque	Ncm 120	40	80	60	200
Max. radial displacement	radial mm \pm 0.3	\pm 0.25	\pm 0.4	\pm 0.3	\pm 0.35
	axial mm \pm 0.5	\pm 0.45	\pm 0.4	\pm 0.4	\pm 0.54
	angular - \pm 4°	\pm 4°	\pm 3°	\pm 2,5°	\pm 4°
Torsion spring stiffness	Nm/rad 150	85	150	30	183
Radial spring stiffness	N/mm 10	20	6	40	17.8
Moment of inertia	gcm ² 9.5	2.1	19	35	20
Max. tightening torque	Ncm 150	70	80	80	120
Working temperature	-30°C ... +120°C [-22°F ... +248°F]	-30°C ... +120°C [-22°F ... +248°F]	-30°C ... +120°C [-22°F ... +248°F]	-10°C ... +80°C [+14°F ... +176°F]	-30°C ... +120°C [-22°F ... +248°F]
Weight approx.	16 g [0.56 oz]	6.5 g [0.23 oz]	16 g [0.56 oz]	30 g [1.06 oz]	24 g [0.85 oz]
Material	flange Al, anodised steel Bellow or spring washer/casing stainless steel	Al, anodised stainless steel	Al, anodised stainless steel	Al, anodised PA 6.6 gf.	Al, anodised stainless steel
Diameter d/d1 from ... to	mm [inch] 3...12 [0.12...0.47]	3...9 [0.12...0.35]	3...8 [0.12...0.32]	4...16 [0.16...0.47]	3...16 [0.12...0.63]
Standard bore diameter	(d1 / d2) mm [inch] 12 / 12 [0.47...0.47]	08 / 06 [0.32...0.24]	06 / 06 [0.24...0.24]	12 / 12 [0.47...0.47]	15 / 12 [0.59...0.47]
	12 / 10 [0.47...0.39]	06 / 06 [0.24...0.24]	12 / 10 [0.47...0.39]	14 / 12 [0.55...0.47]	
	10 / 10 [0.39...0.39]	06 / 04 [0.24...0.16]	10 / 10 [0.39...0.39]	14 / 10 [0.55...0.39]	
	10 / 08 [0.39...0.32]	04 / 04 [0.16...0.16]	10 / 06 [0.39...0.24]	10 / 10 [0.39...0.39]	
	10 / 06 [0.39...0.24]		06 / 06 [0.24...0.24]	06 / 06 [0.24...0.24]	
	08 / 08 [0.32...0.32]		1/4" / 10		
	06 / 06 [0.24...0.24]		1/4" / 06		

Description and applications

Manufacturing and installation tolerances as well as the effects of temperature cause alignment errors between shafts in drive engineering which can sometimes lead to extreme overload on the bearings.

This may result in increased wear of the bearings and may lead to premature failure of the encoder. By using couplings, these alignment errors can be compensated, thereby reducing the load on the bearings to a minimum. A distinction should be made between three different kinds of alignment error: radial, angular and axial displacement.

Whilst with torsion-free but flexible shaft couplings, axial shaft displacements produce only static forces in the coupling, radial and angular displacements produce alternating stresses, restoring forces and moments which may have an impact on adjoining components (shaft bearings).

Depending on the type of coupling, particular attention should be paid to radial shaft displacement which should be kept to a minimum.

Accessories

Connection of motor and encoder

Couplings

Bellows and spring washer couplings

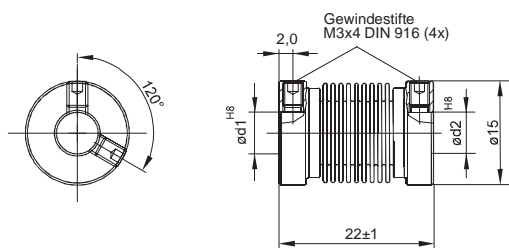
Metal bellows-type couplings (.1102, .1202 and .1502)

Metal bellows-type couplings are recommended as an inexpensive type of coupling. They are also suitable for compensating larger angle displacements.

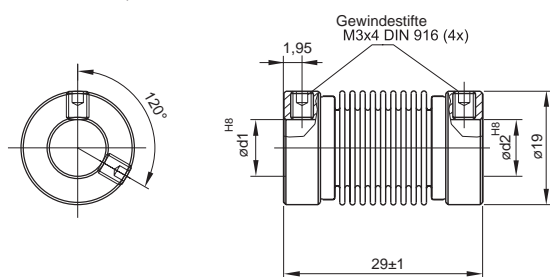
Dimensions

Dimensions in mm

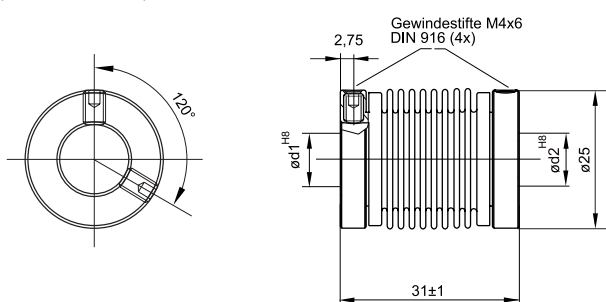
Bellows-type coupling $\varnothing 15$ [0.59]
(8.0000.1202.XXXX)



Bellows-type coupling $\varnothing 19$ [0.75]
(8.0000.1102.XXXX)



Bellows-type coupling $\varnothing 25$ [0.98]
(8.0000.1502.XXXX)



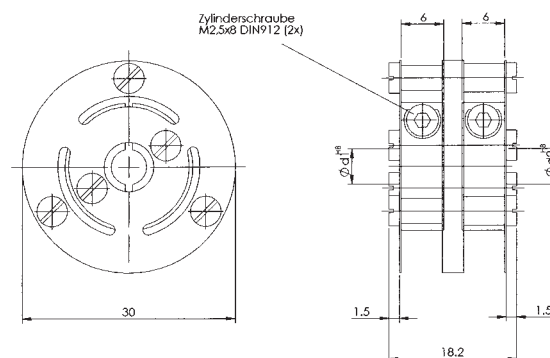
Installation instructions

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.

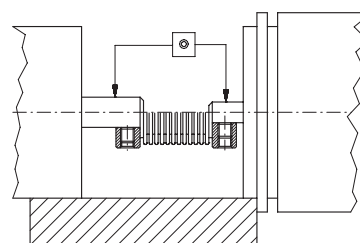
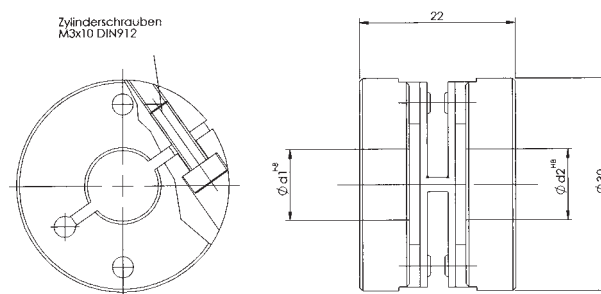
Spring washer-type couplings (.1302 and .1402)

Spring washer-type couplings are used mainly in those cases where high speeds and smaller angular displacements are involved. For applications where electrical insulation between rotary encoder and drive is required, the electrically insulating spring washer-type coupling should be used.

Spring washer-type coupling, one-part
(8.0000.1302.XXXX)



Spring washer-type coupling, three part, plug-in
(8.0000.1402.XXXX)



Accessories

Connection of motor and encoder	Flexible shaft coupling	Double loop coupling
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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

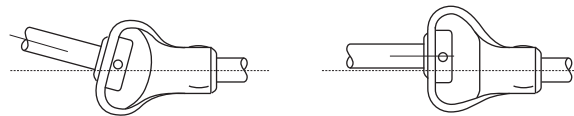
Bore diameter both sides 10 mm [0.39"] **8.0000.1K01.1010**

Bore diameter 11 mm [0.43"] and 12 mm [0.47"] with keyway **8.0000.1L01.1112**

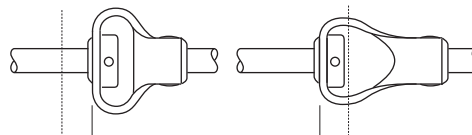
Technical data		
	Size 1	Size 2
Max. speed	3.000 min ⁻¹	3.000 min ⁻¹
Max. torque	0.5 Nm	2,0 Nm
Max.offset of shafts	radial ± 2 mm axial ± 2 mm angular ± 10°	± 3 mm ± 4 mm ± 12°
Torsion spring stiffness	13 Nm/rad	28 Nm/rad
Radial spring stiffness	13 N/mm	7 N/mm
Moment of inertia	41 gcm ²	106 gcm ²
Max. 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 steel galvanized connecting element Polyurethane	

Functional principle

Compensation of an angular misalignment Compensation of a radial misalignment

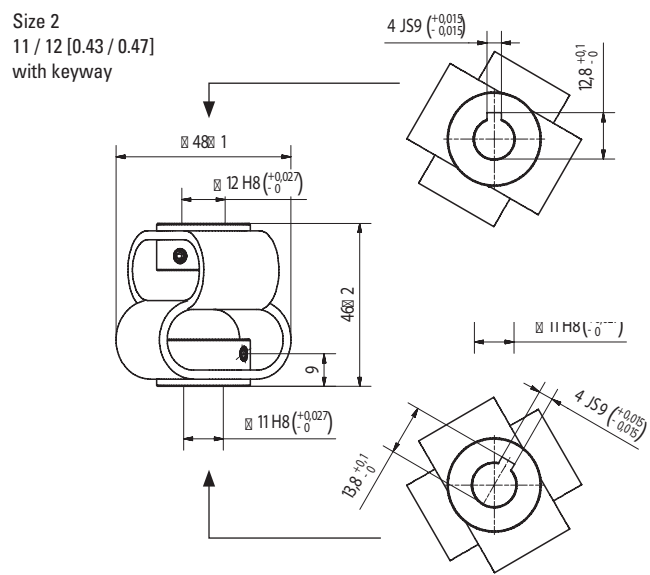
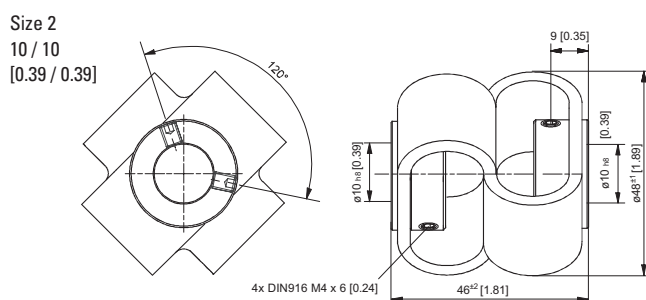
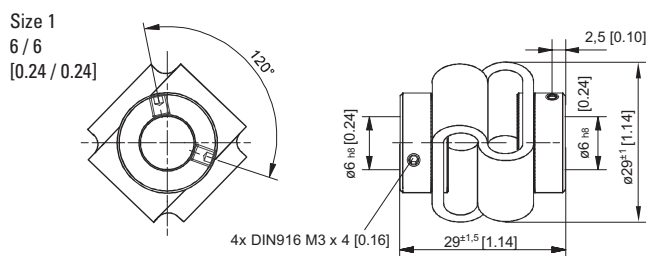


Compensation of a axial misalignment



Dimensions

Dimensions in mm



Accessories

Bearing box



In applications where the encoder is driven by use of gears, chains, belts etc. and the permitted axial and radial shaft loads are exceeded, we recommend the use of the special designed bearing box which has stronger bearings.

This can be combined with all encoders with a 58 mm clamping flange and shaft $\varnothing 10 \times 20$ mm.

Order No. 8.0010.8200.0004

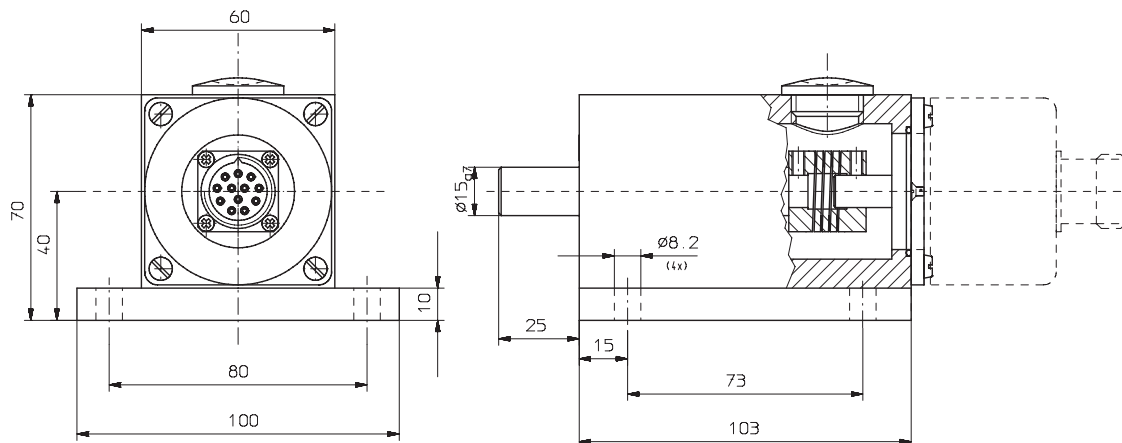
Scope of delivery

- Bearing box with lock cover and sealing
- Coupling for shaft $\varnothing 10$ mm
- Flange adapter 8.0010.2100.0000
- 3 x countersunk head screws DIN 63 M 3 x 8
- 4 x slotted cheese head screws DIN 84 M 4 x 8

Technical data		
Shaft load	axial	150 N
	radial	250 N
Lifetime of bearings		50.000 h
Protection acc. to EN 60529		IP65
Max. speed		4000 min ⁻¹

Dimensions

Dimensions in mm



Accessories

Addresses

	Page
Kübler worldwide	440
Contact partners in Germany	442

Kübler worldwide

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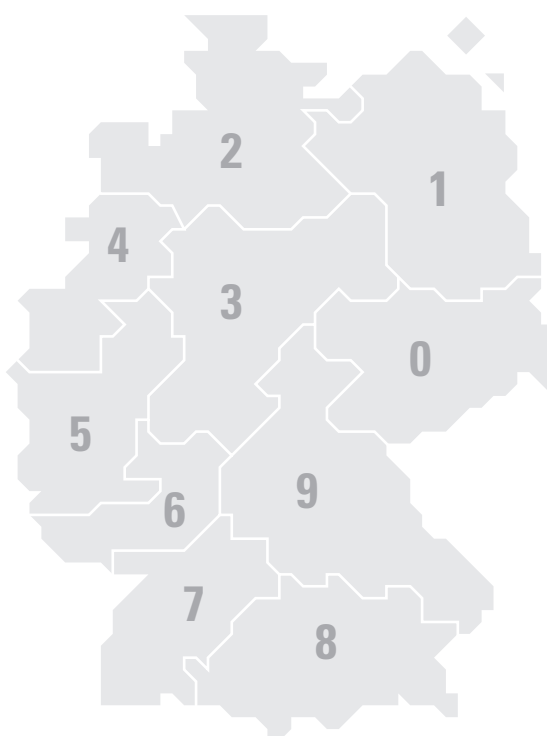
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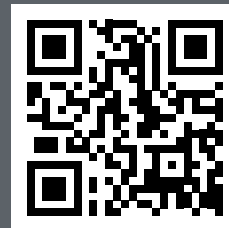


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