PRODUCT INFORMATION

EcoLine

MODULAR WIRE DRAW ENCODERS IN SMALLEST DESIGN

Wire draw encoder

SICK
Sensor Intelligence.

TYPICAL APPLICATION

Automated guided systems – positioning of lift height and measurement of fork width

Automated guided systems are fully automated vehicles that are primarily used for transporting goods. SICK sensors give the vehicles guidance and safeguard them against danger. Height positioning of the lifting surface and measurement of the fork width can also be automated. Wire draw encoders are particularly reliable at these tasks.

BCG wire draw encoders from the EcoLine product family can be used to calculate lift height with a measured length of up to 10 m. They are specifically designed for this purpose and their slim design, light weight, and flexible mounting options facilitate vehicle loading. A special rope outlet nozzle also prevents damage from shock and vibration. The smallest variant in the BCG EcoLine product family can measure fork widths up to 1.25 m.

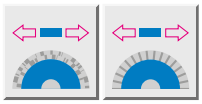
8013380/2015-08-17

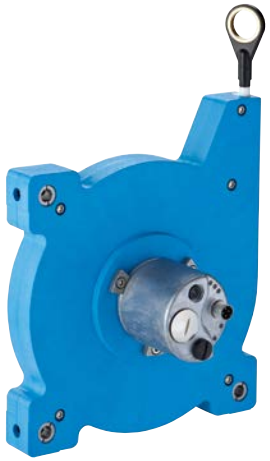
SELECTION GUIDE

		Measuring length (m)								Interfaces												Page
										Analog		Absolute								Incre-mental		
		1.25	2	3	5	10	20	30	50	0 V ... 10 V	4 mA ... 20 mA	SSI	PROFIBUS	DeviceNet	CANopen	EtherNet/IP	EtherCAT®	PROFINET	HIPERFACE®	HTL	TTL	
EcoLine																						
	BCG05	■								■	■	■			■							→4
	BCG08			■						■	■	■	■	■	■	■	■	■	■ [1]			→4
	BCG13				■					■	■	■	■	■	■	■	■	■	■ [1]			→4
	BCG19					■				■	■	■	■	■	■	■	■	■	■ [1]			→4
	PFG05	■																		■	■	→4
	PFG08			■																■	■	→4
	PFG13				■															■	■	→4
	PFG19					■														■	■	→4

[1] Optional, on request.

MODULAR WIRE DRAW ENCODERS IN SMALLEST DESIGN





Product description

The slim design of the EcoLine family is ideal for applications with limited space. Its modularity makes it suitable for a large selection of measuring lengths, interfaces, and encoders. Thanks to the spring, which is integrated into the drum, as well as the adaption without coupling, it is possible to achieve high precision and stability. The special nozzle serves to protect the measuring wire from damage caused by vibration. The intuitive teach-in function provided in analog variants also enables easy system integration.

At a glance

- Measuring lengths: 1.25 m ... 10 m
- Modular measuring system with a wide selection of interfaces/measuring lengths
- Very small, slim housing (55 mm ... 190 mm) with spring integrated in the measurement drum
- Light yet shock-resistant and temperature-resistant plastic housing
- Analog interface with teach-in function on the encoder

Your benefits

- Space- and cost-saving design thanks to slimline mechanism
- Numerous combinations of interfaces and measuring lengths
- Advanced programming options lead to a reduction in the amount of variants, save costs, and reduce storage
- Quick commissioning thanks to analog interface and cheap interface card can be used

Fields of application

- Measuring fork height and tilt of automated guided systems
- Height measurement in small warehouse systems
- Applications in medical technology (operating tables, MRT)
- Height measurement of scissor lift tables
- Height measurement of overhead conveyors in the automotive industry

→ www.mysick.com/en/EcoLine

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

8013380/2015-08-17
Subject to change without notice

Detailed technical data

BCG

Performance

	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
Measuring range	0 m ... 1.25 m	0 m ... 3 m	0 m ... 5 m	0 m ... 10 m
Repeatability [1]	Max. 0.2 mm [2]	Max. 0.3 mm [2]	Max. 0.5 mm [2]	Max. 1 mm [2]
Linearity [3]	Max. ± 2 mm [2]		Max. ± 3 mm [2]	Max. ± 6 mm [2]
Hysteresis [4]	Max. 0.5 mm [2]	Max. 1.2 mm [2]	Max. 1.5 mm [2]	Max. 3 mm [2]
Resolution (wire draw mechanism + encoder)				
Analog	4 ... 20 mA = 0.05 mm; 0 ... 10 V = 0.04 mm [5] [6]	4 ... 20 mA = 0.08 mm; 0 ... 10 V = 0.06 mm [5] [6]	4 ... 20 mA = 0.13 mm; 0 ... 10 V = 0.10 mm [5] [6]	4 ... 20 mA = 0.05 mm; 0 ... 10 V = 0.04 mm [5] [6]
SSI	0.02 mm (AHM36) [5] [6]	0.06 mm (AFM60E) [5] [6] 0.03 mm (AFM60B, AHM36) [5] [6]	0.1 mm (AFM60E) [5] [6] 0.05 mm (AFM60B, AHM36) [5] [6]	0.14 mm (AFM60E) [5] [6] 0.07 mm (AFM60B, AHM36) [5] [6]
CANopen	0.01 mm (AHM36) [5] [6]	0.03 mm (ATM60) [5] [6] 0.01 mm (AHM36) [5] [6]	0.05 mm (ATM60) [5] [6] 0.02 mm (AHM36) [5] [6]	0.07 mm (ATM60) [5] [6] 0.03 mm (AHM36) [5] [6]
DeviceNet	–	0.03 mm [5] [6]	0.05 mm [5] [6]	0.07 mm [5] [6]
PROFIBUS	–	0.03 mm [5] [6]	0.05 mm [5] [6]	0.07 mm [5] [6]
EtherNet/IP	–	0.001 mm [5] [6]		0.002 mm [5] [6]
PROFINET	–	0.001 mm [5] [6]		0.002 mm [5] [6]
EtherCAT®	–	0.001 mm [5] [6]		0.002 mm [5] [6]

[1] Repeatability or repeat accuracy is defined as the maximum distribution from consecutive positioning movements to one point from one direction, carried out under identical conditions.

[2] Value applies to wire draw mechanism.

[3] The accuracy of wire draw encoders is primarily described by the linearity. This indicates the maximum deviation for the measurement of a defined measurement distance. In contrast to repeatability, this relates to the measuring range covered and not to a positioning point.

[4] Hysteresis is defined as the maximum distribution from consecutive positioning movements to one point from various directions, carried out under identical conditions.

[5] The values shown have been rounded.

[6] Example calculation based on the BCG08 with PROFINET: 230 mm (wire draw length per revolution – see mechanical data): 262,144 (number of steps per revolution) = 0.001 mm (resolution of the wire draw mechanism + encoder combination)

Interfaces

	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
Encoder	Absolute encoder			
Electrical interface	See type code			
Connection type	See type code			
Clock frequency				
Analog	32 kHz			
SSI	2 MHz (AHM36)	1 MHz (AFM60E) 2 MHz (AFM60B, AHM36)		
Address setting				
CANopen	0 ... 127 (AHM36)	0 ... 63 (ATM60) 0 ... 127 (AHM36)		
DeviceNet	–	0 ... 63, DIP switch or protocol		
PROFIBUS	–	0 ... 127, DIP switch		
EtherNet/IP	–	Via DHCP / DEC switches		
PROFINET	–	Via DCP		
Protocol				
CANopen	Communication profile DS 301 V4.02 (AHM36)	Communication profile DS 301 V4.0 (ATM60) Communication profile DS 301 V4.02 (AHM36)		
DeviceNet	–	DeviceNet Specification Release 2.0		
PROFIBUS	–	PROFIBUS DP V0		
EtherNet/IP	–	EtherNet/IP IEC 61784-1		
PROFINET	–	PROFINET IO / RT Class B		
EtherCAT®	–	EtherCAT, CoE (CiA DS-301)		
Bus termination				
CANopen	Via external terminator (AHM36)	Via DIP switches (ATM60) Via external terminator (AHM36)		
DeviceNet	–	Via DIP switches		
PROFIBUS	–	Via DIP switches		
Set (electronic adjustment)				
Analog	Via membrane keyboard			
SSI	H active (L = 0 – 3 V, H = 4.0 – U_S V) (AHM36)	Via SET cable (AFM60) H active (L = 0 – 3 V, H = 4.0 – U_S V) (AHM36)		
CANopen	Via PRESET pushbutton or protocol			
DeviceNet	–	Via PRESET pushbutton or protocol		
PROFIBUS	–	Via PRESET pushbutton or protocol		
EtherNet/IP	–	Via PRESET pushbutton or protocol		
PROFINET	–	Via PRESET pushbutton or protocol		
EtherCAT®	–	Via PRESET pushbutton or protocol		
Encoder profile				
CANopen	CiA DS-406, V3.2. – Class C2 (AHM36)	Device profile DSP 406 V 2.0 (ATM60) CiA DS-406, V3.2. – Class C2 (AHM36)		
DeviceNet	–	Generic profile		
PROFIBUS	–	Encoder profile Version 1.1 Class 1 and Class 2		
EtherNet/IP	–	0 x 22		
PROFINET	–	V4.1 Class 3		
EtherCAT®	–	CiA DS-406		

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Electrical data

	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
Initialization time				
Analog	< 2 ms [1]	≤ 2 ms [1]		
SSI	≥ 50 ms (AHM36) [1]	Approx. 50 ms (AFM60) [1] ≥ 50 ms (AHM36) [1]		
CANopen	2 s (AHM36) [1]	Approx. 12 s (ATM60) [1] ≥ 2 s (AHM36) [1]		
DeviceNet	–	Approx. 12 s [1]		
PROFIBUS	–	Approx. 1 s [1]		
EtherNet/IP	–	Approx. 12 s [1]		
PROFINET	–	Approx. 12 s [1]		
EtherCAT®	–	Approx. 12 s [1]		
Supply voltage				
Analog	19 V ... 33 V			18 V ... 33 V
SSI	4.5 V ... 32 V (AHM36)	4.5 V ... 32 V (AFM60, AHM36)		
CANopen	10 V ... 30 V (AHM36)	10 V ... 32 V (ATM60) 10 V ... 30 V (AHM36)		
DeviceNet	–	10 V ... 32 V		
PROFIBUS	–	10 V ... 32 V		
EtherNet/IP	–	10 V ... 30 V		
PROFINET	–	10 V ... 30 V		
EtherCAT®	–	10 V ... 30 V		
Code type				
SSI	Gray, binary (AHM36)	Gray (AFM60) Gray, binary (AHM36)		
Power consumption				
Analog	2 W			
SSI	1.5 W (AHM36)	0.7 W (AFM60E, AFM60B) 1.5 W (AHM36)		
CANopen	1.5 W (AHM36)	2 W (ATM60) 1.5 W (AHM36)		
DeviceNet	–	2 W		
PROFIBUS	–	1.5 W		
EtherNet/IP	–	3 W		
PROFINET	–	3 W		
EtherCAT®	–	3 W		
MTTFd: mean time to dangerous failure				
SSI	230 years (AHM36) [2] [3]	250 years (AFM60) [2] [3] 230 years (AHM36) [2] [3]		
CANopen	270 years (AHM36) [2] [3]	150 years (ATM60) [2] [3] 270 years (AHM36) [2] [3]		
DeviceNet	–	150 years [2] [3]		
PROFIBUS	–	60 years [2] [3]		
EtherNet/IP	–	80 years [2] [3]		
PROFINET	–	80 years [2] [3]		
EtherCAT®	–	80 years [2] [3]		

[1] Valid positional data can be measured once this time has elapsed.

[2] This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of devices, average ambient temperature 40 °C, frequency of use 8,760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

[3] This value relates to the connected encoder only.

Mechanical data

	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
Mass (incl. encoder)				
Analog	200 g	650 g	1.2 kg	2.3 kg
SSI	200 g (AHM36)	510 g (AFM60) 370 g (AHM36)	1.06 kg (AFM60) 920 g (AHM36)	2.16 kg (AFM60) 2.02 kg (AHM36)
CANopen	200 g (AHM36)	840 g (ATM60) 370 g (AHM36)	1.39 kg (ATM60) 920 g (AHM36)	2.49 kg (ATM60) 2.02 kg (AHM36)
DeviceNet	–	840 g	1.39 kg	2.49 kg
PROFIBUS	–	530 g	1.08 kg	2.18 kg
EtherNet/IP	–	450 g	1 kg	2.1 kg
PROFINET	–	450 g	1 kg	2.1 kg
EtherCAT®	–	450 g	1 kg	2.1 kg
Mass (mechanism)	80 g	250 g	800 g	1.9 kg
Measuring wire material	Highly flexible stranded steel 1.4401 stainless steel V4A / PA12-sheathed	Highly flexible stranded steel 1.4401 stainless steel V4A		
Mass (measuring wire)	0.58 g/m	1.2 g/m		
Material, wire draw mechanism housing	Plastic, Noryl			
Wire draw lengths per revolution	150 mm	230 mm	385 mm	555 mm
Spring return force	Approx. 1 N ... approx. 1.4 N [1]	Approx. 5 N ... approx. 6.3 N [1]	Approx. 4.5 N ... approx. 7 N [1]	Approx. 9 N ... approx. 12 N [1]
Service life of wire draw mechanism	1 million cycles [2]			
Actual wire draw length	1.45 m	3.2 m	5.2 m	10.2 m
Measuring wire diameter	0.45 mm	0.55 mm		
Wire acceleration	10 m/s²		4 m/s²	8 m/s²
Adjustment speed	4 m/s			
Connected encoder				
Analog	ACM36			ACM60
SSI	AHM36 SSI	AFM60 SSI AHM36 SSI		
CANopen	AHM36 CANopen	ATM60 CANopen AHM36 CANopen		
DeviceNet	–	ATM60 DeviceNet		
PROFIBUS	–	A3M60		
EtherNet/IP	–	AFM60 EtherNet/IP		
PROFINET	–	AFM60 PROFINET		
EtherCAT®	–	AFM60 EtherCAT®		
Number of steps per revolution				
SSI	8,192 (AHM36)	4,096 (AFM60E) 8,192 (AFM60B, AHM36)		
CANopen	16,384 (AHM36)	8,192 (ATM60) 16,384 (AHM36)		
DeviceNet	–	8,192		
PROFIBUS	–	8,192		
EtherNet/IP	–	262,144		
PROFINET	–	262,144		
EtherCAT®	–	262,144		

[1] These values were measured at an ambient temperature of 25 °C. There may be variations at other temperatures.

[2] The wire is drawn out and drawn in once per cycle.

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	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
Part number (encoder)				
Analog	6039751 6039752			6045312 6045313
SSI	1068328 (AHM36)	1037649 (AFM60E) 1037863 (AFM60B) 1037438 (AFM60E) 1068330 (AHM36)		1037869 (AFM60E) 1037863 (AFM60B) 1037868 (AFM60E) 1068330 (AHM36)
CANopen	1067977 (AHM36)	1030025 (ATM60) 1065999 (AHM36)		
DeviceNet	–	1030018		
PROFIBUS	–	1051018		
EtherNet/IP	–	1055331		
PROFINET	–	1059040		
EtherCAT®	–	1059061		
Connected mechanism	MRA-G055-101D4	MRA-G080-103D3	MRA-G130-105D3	MRA-G190-110D3
Part number (mechanism)	5324019	5322778	5322779	5326242

[1] These values were measured at an ambient temperature of 25 °C. There may be variations at other temperatures.

[2] The wire is drawn out and drawn in once per cycle.

Ambient data

	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
EMC	According to EN 61000-6-2 and EN 61000-6-3			
Enclosure rating (encoder)				
Analog	IP 65			
SSI	IP 66 / IP 67 on housing side (acc. to IEC 60529) (AHM36) IP 66 / IP 67 on shaft side (acc. to IEC 60529) (AHM36)	IP 67 (AFM60) IP 66 / IP 67 on housing side (acc. to IEC 60529) (AHM36) IP 66 / IP 67 on shaft side (acc. to IEC 60529) (AHM36)		
CANopen	IP 66 / IP 67 on housing side (acc. to IEC 60529) (AHM36) IP 66 / IP 67 on shaft side (acc. to IEC 60529) (AHM36)	IP 67 (ATM60) IP 66 / IP 67 on housing side (acc. to IEC 60529) (AHM36) IP 66 / IP 67 on shaft side (acc. to IEC 60529) (AHM36)		
DeviceNet	–	IP 67		
PROFIBUS	–	IP 67		
EtherNet/IP	–	IP 67		
PROFINET	–	IP 67		
EtherCAT®	–	IP 67		
Enclosure rating (mechanism)	IP 50			

	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
Resistance to shocks (according to EN 60068-2-27)				
Analog	50 g, 6 ms			
SSI	100 g, 6 ms (AHM36)	50 g, 6 ms (AFM60E) 70 g, 6 ms (AFM60B) 100 g, 6 ms (AHM36)		
CANopen	100 g, 6 ms (ATM60, AHM36)			
DeviceNet	–	100 g, 6 ms		
PROFIBUS	–	80 g, 6 ms		
EtherNet/IP	–	100 g, 6 ms		
PROFINET	–	100 g, 6 ms		
EtherCAT®	–	100 g, 6 ms		
Resistance to vibrations (according to EN 60068-2-6)				
SSI	20 g, 10 Hz ... 2,000 Hz (AHM36)	20 g, 10 Hz ... 2,000 Hz (AFM60E, AHM36) 30 g, 10 Hz ... 2,000 Hz (AFM60B)		
CANopen	20 g, 10 Hz ... 2,000 Hz			
DeviceNet	–	20 g, 10 Hz ... 2,000 Hz		
PROFIBUS	–	30 g, 10 Hz ... 2,000 Hz		
EtherNet/IP	–	30 g, 10 Hz ... 2,000 Hz		
PROFINET	–	30 g, 10 Hz ... 2,000 Hz		
EtherCAT®	–	30 g, 10 Hz ... 2,000 Hz		
Analog	4 g, sine 5 Hz ... 100 Hz (acc. to EN 60068-2-6)			
Operating temperature range (encoder)				
Analog	–30 °C ... +80 °C			
SSI	–40 °C ... +100 °C (AHM36)	0 °C ... +85 °C (AFM60E) –30 °C ... +100 °C (AFM60B) –40 °C ... +100 °C (AHM36)		
CANopen	–40 °C ... +85 °C (AHM36)	–20 °C ... +85 °C (ATM60) –40 °C ... +85 °C (AHM36)		
DeviceNet	–	–20 °C ... +85 °C		
PROFIBUS	–	–10 °C ... +70 °C		
EtherNet/IP	–	–30 °C ... +85 °C		
PROFINET	–	–30 °C ... +85 °C		
EtherCAT®	–	–30 °C ... +85 °C		
Operating temperature range (mechanism)	–30 °C ... +70 °C			
Operating temperature range (combination)				
Analog	–30 °C ... +70 °C			
SSI	–30 °C ... +70 °C (AHM36)	0 °C ... +70 °C (AFM60E) –30 °C ... +70 °C (AFM60B, AHM36)		
CANopen	–30 °C ... +70 °C	–20 °C ... +70 °C (ATM60) –30 °C ... +70 °C (AHM36)		
DeviceNet	–	–20 °C ... +70 °C		
PROFIBUS	–	–10 °C ... +70 °C		
EtherNet/IP	–	–30 °C ... +70 °C		
PROFINET	–	–30 °C ... +70 °C		
EtherCAT®	–	–30 °C ... +70 °C		

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	BCG05 0 m ... 1.25 m	BCG08 0 m ... 3 m	BCG13 0 m ... 5 m	BCG19 0 m ... 10 m
Relative humidity/condensation				
SSI	90% (AHM36) [1]	90% (AFM60, AHM36) [1]		
CANopen	90% (AHM36) [1]	98% (ATM60) [1] 90% (AHM36) [1]		
DeviceNet	–	98% [1]		
PROFIBUS	–	95% [1]		
EtherNet/IP	–	90% [1]		
PROFINET	–	90% [1]		
EtherCAT®	–	90% [1]		

[1] Condensation of optical surfaces not permitted

PFG

Performance

	PFG05 0 m ... 1.25 m	PFG08 0 m ... 3 m	PFG13 0 m ... 5 m	PFG19 0 m ... 10 m
Measuring range	0 m ... 1.25 m	0 m ... 3 m	0 m ... 5 m	0 m ... 10 m
Repeatability [1]	Max. 0.2 mm [2]	Max. 0.3 mm [2]	Max. 0.5 mm [2]	Max. 1 mm [2]
Linearity [3]	Max. ± 2 mm [2]		Max. ± 3 mm [2]	Max. ± 6 mm [2]
Hysteresis [4]	Max. 0.5 mm [2]	Max. 1.2 mm [2]	Max. 1.5 mm [2]	Max. 3 mm [2]
Resolution (wire draw mechanism + encoder)	0.06 mm [5] [6]	0.014 mm [5] [6]	0.023 mm [5] [6]	0.034 mm [5] [6]

[1] Repeatability or repeat accuracy is defined as the maximum distribution from consecutive positioning movements to one point from one direction, carried out under identical conditions.

[2] Value applies to wire draw mechanism.

[3] The accuracy of wire draw encoders is primarily described by the linearity. This indicates the maximum deviation for the measurement of a defined measurement distance. In contrast to repeatability, this relates to the measuring range covered and not to a positioning point.

[4] Hysteresis is defined as the maximum distribution from consecutive positioning movements to one point from various directions, carried out under identical conditions.

[5] The values shown have been rounded.

[6] Example calculation based on the PFG08 with HTL/push pull: 230 mm (wire draw length per revolution – see mechanical data): 16,384 (pulses per revolution) = 0.014 mm (resolution of the wire draw mechanism + encoder combination)

Interfaces

Encoder	Incremental encoders
Electrical interface	See type code
Connection type	See type code

Electrical data

	PFG05 0 m ... 1.25 m	PFG08 0 m ... 3 m	PFG13 0 m ... 5 m	PFG19 0 m ... 10 m
Maximum output frequency	≤ 300 kHz	≤ 800 kHz		
Reference signal, position	90° electric, logically gated with A and B	90° electric, logically gated with A and B/sine and cosine		
Reference signal, number	Electric, logically gated with A and B	1		
Maximum load current	≤ 30 mA			
Initialization time	≤ 3 ms [1]	≤ 32 ms, 30 ms, under mechanical zero pulse width [1]		
Supply voltage	7 V ... 30 V	4.5 V ... 32 V		
Power consumption	0.5 W	0.7 W		
MTTFd: mean time to dangerous failure	600 years [2] [3]	300 years [2] [3]		

[1] Valid positional data can be measured once this time has elapsed.

[2] This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of devices, average ambient temperature 40 °C, frequency of use 8,760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

[3] This value relates to the connected encoder only.

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Mechanical data

	PFG05 0 m ... 1.25 m	PFG08 0 m ... 3 m	PFG13 0 m ... 5 m	PFG19 0 m ... 10 m
Mass (incl. encoder)	230 g	550 g	1.1 kg	2.2 kg
Mass (mechanism)	80 g	250 g	800 g	1.9 kg
Measuring wire material	Highly flexible stranded steel 1.4401 stainless steel V4A / PA12-sheathed	Highly flexible stranded steel 1.4401 stainless steel V4A		
Mass (measuring wire)	0.58 g/m	1.2 g/m		
Material, wire draw mechanism housing	Plastic, Noryl			
Wire draw lengths per revolution	150 mm	230 mm	385 mm	555 mm
Spring return force	1 N ... 1.4 N [1]	5 N ... 6.3 N [1]	4.5 N ... 7 N [1]	9 N ... 12 N [1]
Service life of wire draw mechanism	1 million cycles [2]			
Actual wire draw length	1.45 m	3.2 m	5.2 m	10.2 m
Measuring wire diameter	0.45 mm	0.55 mm		
Wire acceleration	10 m/s²		4 m/s²	8 m/s²
Adjustment speed	4 m/s			
Connected encoder	DBS36 Core	DFS60		
Pulses per revolution				
Programmable	–	65,536		
Non-programmable	2,500	16,384		
Part number (encoder)				
TTL/RS422	1064245	1037566 1037565		
HTL/push pull	1064246	1037616 1037615		
TTL/HTL programmable	–	1036761 1036760		
Connected mechanism	MRA-G055-101D4	MRA-G080-103D3	MRA-G130-105D3	MRA-G190-110D3
Part number (mechanism)	5324019	5322778	5322779	5326242

[1] These values were measured at an ambient temperature of 25 °C. There may be variations at other temperatures.

[2] The wire is drawn out and drawn in once per cycle.

Ambient data

	PFG05 0 m ... 1.25 m	PFG08 0 m ... 3 m	PFG13 0 m ... 5 m	PFG19 0 m ... 10 m
EMC	According to EN 61000-6-2 and EN 61000-6-3 (class A)	According to EN 61000-6-2 and EN 61000-6-3		
Enclosure rating (encoder)	IP 65	IP 67		
Enclosure rating (mechanism)	IP 50			
Resistance to shocks (according to EN 60068-2-27)	100 g, 6 ms	60 g, 6 ms		
Resistance to vibrations (according to EN 60068-2-6)	20 g, 10 Hz ... 2,000 Hz			
Operating temperature range (encoder)				
TTL/RS422	–20 °C ... +85 °C	–40 °C ... +100 °C		
HTL/push pull	–20 °C ... +85 °C	–40 °C ... +100 °C		
TTL/HTL programmable	–	–40 °C ... +100 °C		
Operating temperature range (mechanism)	–30 °C ... +70 °C			
Operating temperature range (combination)				
TTL/RS422	–20 °C ... +70 °C	–30 °C ... +70 °C		
HTL/push pull	–20 °C ... +70 °C	–30 °C ... +70 °C		
TTL/HTL programmable	–	–30 °C ... +70 °C		
Relative humidity/condensation	90% [1]			

[1] Condensation of optical surfaces not permitted

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Type code

EcoLine absolute

Size

0	5	55 mm (only in combination with measuring length 01)
0	8	80 mm (only in combination with measuring length 03)
1	3	130 mm (only in combination with measuring length 05)
1	9	190 mm (only in combination with measuring length 10)

Electrical interface

A	SSI
C	CANopen [1]
D	DeviceNet [1]
E	EtherCAT®
H	HIPERFACE® (on request)
K	SSI + SinCos (on request)
L	SSI + incremental HTL (on request)
I	EtherNet/IP
N	PROFINET
P	PROFIBUS
R	SSI + incrementally programmable (on request)
S	SSI + SinCos programmable (on request)
T	SSI + incremental TTL (on request)

Connection type

A	M23 male connector, 12-pin, radial (only in combination with interface A and sizes 08, 13, and 19)
B	Male connector, 3 x M12, axial (only in combination with the electrical interfaces E, I, N, and P with axial outlet in sizes 08, 13, and 19)
C	M12 male connector, 8-pin, radial (only in combination with interface A and sizes 08, 13, and 19)
H	Male connector for field bus adapter (in combination with the electrical interfaces C and D with radial outlet in sizes 08, 13, and 19) [1]
K	Cable, 8-wire universal, 1.5 m (on request)
L	Cable, 8-wire universal, 3.0 m (on request)
M	Cable, 8-wire universal, 5.0 m (on request)
N	Male connector, 1 x M12, 8-pin, universal (only in combination with interface A)
Q	Male connector, 1 x M12, 5-pin, universal (only in combination with interface C)

Measuring length

0	1	1.25 meters
0	3	3 meters
0	5	5 meters
1	0	10 meters

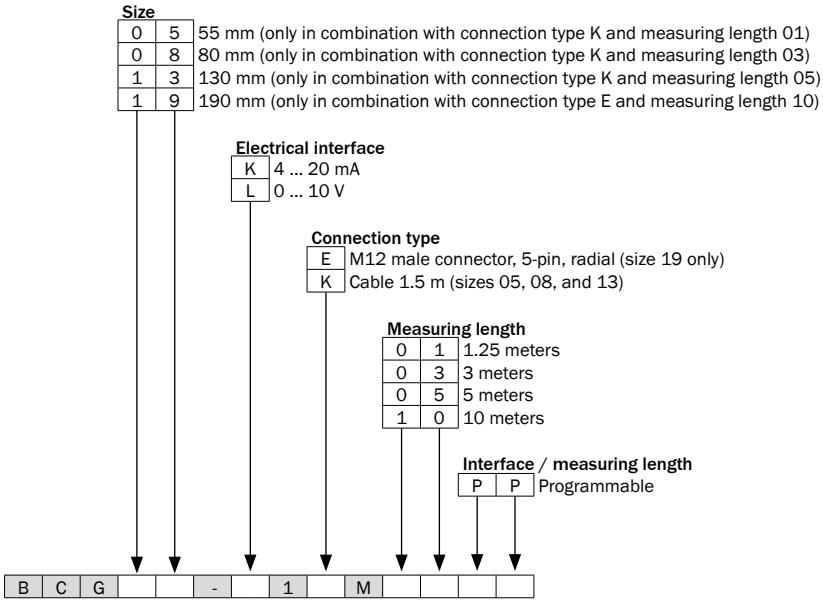
Resolution coefficient

5	5	A = SSI singleturn resolution 8,192 steps / measuring length 1.25 m
1	8	A = SSI singleturn resolution 4,096 steps / measuring length 3 m
3	6	A = SSI singleturn resolution 8,192 steps / measuring length 3 m
1	1	A = SSI singleturn resolution 4,096 steps/measuring length 5 m
2	1	A = SSI singleturn resolution 8,192 steps / measuring length 5 m
0	7	A = SSI singleturn resolution 4,096 steps / measuring length 10 m
1	5	A = SSI singleturn resolution 8,192 steps / measuring length 10 m
3	6	C = CANopen with connection type H; D = DeviceNet; P = PROFIBUS / measuring length 3 m
2	1	C = CANopen with connection type H; D = DeviceNet; P = PROFIBUS / measuring length 5 m
1	5	C = CANopen with connection type H; D = DeviceNet; P = PROFIBUS / measuring length 10 m
9	9	C = CANopen with connection type Q / measuring length 1.25 m
7	1	C = CANopen with connection type Q / measuring length 3 m
4	3	C = CANopen with connection type Q / measuring length 5 m
2	9	C = CANopen with connection type Q / measuring length 10 m
9	9	I = EtherNet/IP; E = EtherCAT®; N = PROFINET / measuring length 3 m
9	9	I = EtherNet/IP; E = EtherCAT®; N = PROFINET / measuring length 5 m
9	9	I = EtherNet/IP; E = EtherCAT®; N = PROFINET / measuring length 10 m

B	C	G			-		1		M				

[1] Field bus adapter for CANopen and DeviceNet with radial outlet – please order separately.

EcoLine analog



Ordering information

Measuring range	Electrical interface	Connection type	Type	Part no.
0 m ... 1.25 m	4 mA ... 20 mA, analog	Cable, 3-wire radial, 1.5 m	BCG05-K1KM01PP	6039745
	0 V ... 10 V, analog		BCG05-L1KM01PP	6039746
	SSI	Male connector, 1 x M12, 8-pin, universal	BCG05-A1NM0155	1068864
	CANopen	Male connector, 1 x M12, 5-pin, universal [2]	BCG05-C1QM0199	1068865
0 m ... 3 m	4 mA ... 20 mA, analog	Cable, 3-wire radial, 1.5 m	BCG08-K1KM03PP	6039747
	0 V ... 10 V, analog		BCG08-L1KM03PP	6039748
	SSI	M12 male connector, 8-pin, radial	BCG08-A1CM0318	1054129
			BCG08-A1CM0336	1054131
		M23 male connector, 12-pin, radial	BCG08-A1AM0318	1061025
		Male connector, 1 x M12, 8-pin, universal	BCG08-A1NM0336	1068866
	CANopen	Male connector, 1 x M12, 5-pin, universal [2]	BCG08-C1QM0371	1068867
		Bus adapter with cable glands or round connectors [1]	BCG08-C1HM0336	1061026
	DeviceNet	Bus adapter with cable glands or round connectors [1]	BCG08-D1HM0336	1061027
	PROFIBUS	Male connector, 3 x M12, 5-pin, axial	BCG08-P1BM0336	1052618
	PROFINET	Male connector, 3 x M12, 4-pin, axial	BCG08-N1BM0399	1061028
	EtherNet/IP		BCG08-I1BM0399	1061029
	EtherCAT®		BCG08-E1BM0399	1061030
0 m ... 5 m	4 mA ... 20 mA, analog	Cable, 3-wire radial, 1.5 m	BCG13-K1KM05PP	6039749
	0 V ... 10 V, analog		BCG13-L1KM05PP	6039750
	SSI	M12 male connector, 8-pin, radial	BCG13-A1CM0511	1061031
			BCG13-A1CM0521	1061032
		M23 male connector, 12-pin, radial	BCG13-A1AM0511	1061033
		Male connector, 1 x M12, 8-pin, universal	BCG13-A1NM0521	1068868
	CANopen	Male connector, 1 x M12, 5-pin, universal [2]	BCG13-C1QM0543	1068869
		Bus adapter with cable glands or round connectors [1]	BCG13-C1HM0521	1061034
	DeviceNet	Bus adapter with cable glands or round connectors [1]	BCG13-D1HM0521	1061035
	PROFIBUS	Male connector, 3 x M12, 5-pin, axial	BCG13-P1BM0521	1052619
	PROFINET	Male connector, 3 x M12, 4-pin, axial	BCG13-N1BM0599	1061036
	EtherNet/IP		BCG13-I1BM0599	1061037
	EtherCAT®		BCG13-E1BM0599	1061038

[1] Please order the connection adapter separately.

[2] Only in combination with AHM36 CANopen.

Measuring range	Electrical interface	Connection type	Type	Part no.
0 m ... 10 m	4 mA ... 20 mA, analog	Male connector, 1 x M12, 5-pin, radial	BCG19-K1EM10PP	6048294
	0 V ... 10 V, analog		BCG19-L1EM10PP	6048295
	SSI	M12 male connector, 8-pin, radial	BCG19-A1CM1007	1061039
			BCG19-A1CM1015	1061040
		Male connector, 1 x M12, 8-pin, universal	BCG19-A1NM1015	1068870
	CANopen	Male connector, 1 x M12, 5-pin, universal [2]	BCG19-C1QM1029	1068871
		Bus adapter with cable glands or round connectors [1]	BCG19-C1HM1015	1061041
	DeviceNet	Bus adapter with cable glands or round connectors [1]	BCG19-D1HM1015	1061042
	PROFIBUS	Male connector, 3 x M12, 5-pin, axial	BCG19-P1BM1015	1052620
	PROFINET	Male connector, 3 x M12, 4-pin, axial	BCG19-N1BM1099	1061043
	EtherNet/IP		BCG19-I1BM1099	1061044
	EtherCAT®		BCG19-E1BM1099	1061045

[1] Please order the connection adapter separately.

[2] Only in combination with AHM36 CANopen.

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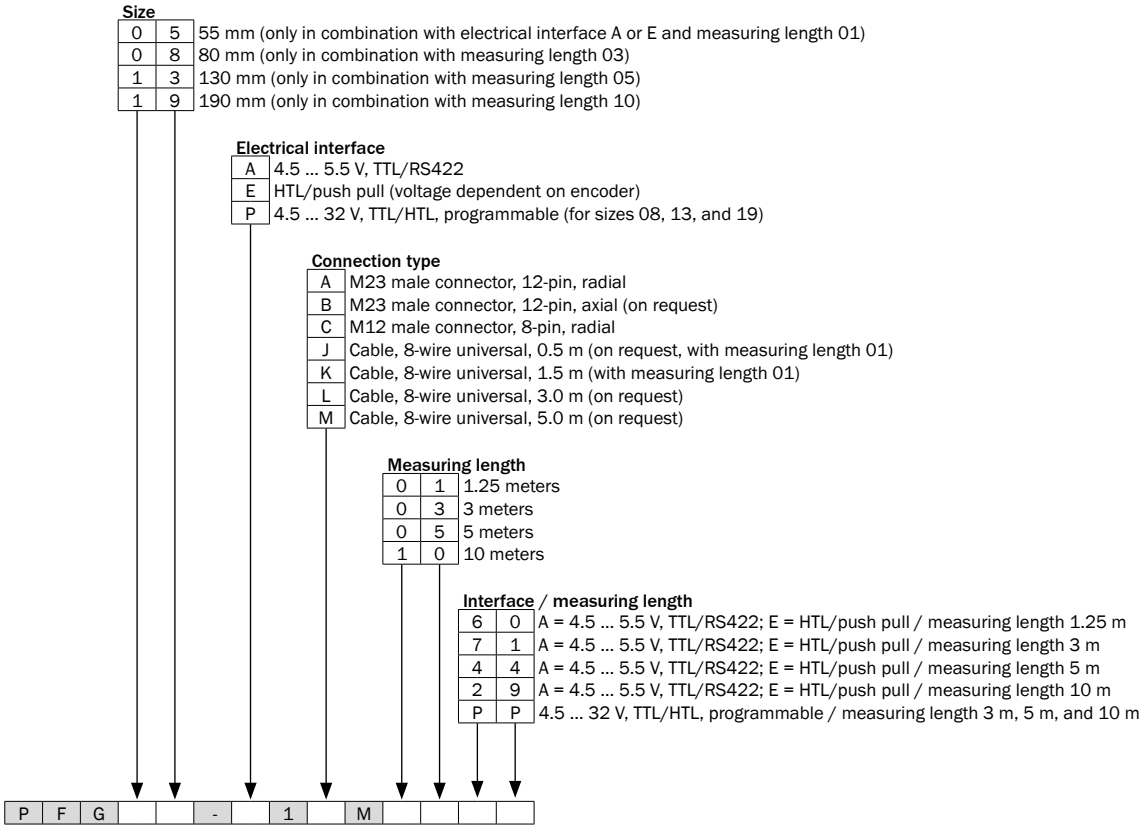
EcoLine incremental

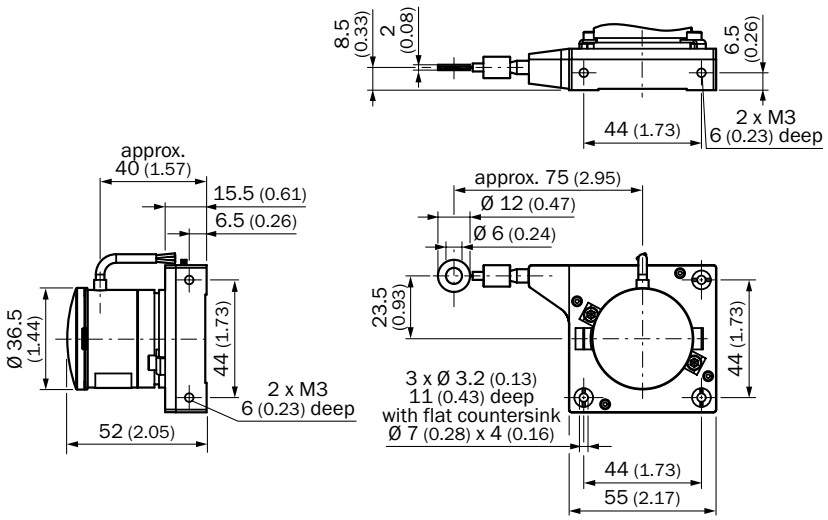


Measuring range	Electrical interface	Connection type	Type	Part no.
0 m ... 1.25 m	4.5 V ... 5.5 V, TTL/RS422	Cable, 8-wire, universal, 1.5 m	PFG05-A1KM0160	1060972
	HTL/push pull		PFG05-E1KM0160	1060971
0 m ... 3 m	4.5 V ... 5.5 V, TTL/RS422	M12 male connector, 8-pin, radial	PFG08-A1CM0371	1060974
		M23 male connector, 12-pin, radial	PFG08-A1AM0371	1060977
	HTL/push pull	M12 male connector, 8-pin, radial	PFG08-E1CM0371	1060979
		M23 male connector, 12-pin, radial	PFG08-E1AM0371	1060981
	TTL/HTL, programmable	M12 male connector, 8-pin, radial	PFG08-P1CM03PP	1060984
		M23 male connector, 12-pin, radial	PFG08-P1AM03PP	1075495
0 m ... 5 m	4.5 V ... 5.5 V, TTL/RS422	M12 male connector, 8-pin, radial	PFG13-A1CM0544	1061015
		M23 male connector, 12-pin, radial	PFG13-A1AM0544	1061016
	HTL/push pull	M12 male connector, 8-pin, radial	PFG13-E1CM0544	1061017
		M23 male connector, 12-pin, radial	PFG13-E1AM0544	1061018
	TTL/HTL, programmable	M12 male connector, 8-pin, radial	PFG13-P1CM05PP	1061019
		M23 male connector, 12-pin, radial	PFG13-P1AM05PP	1075498

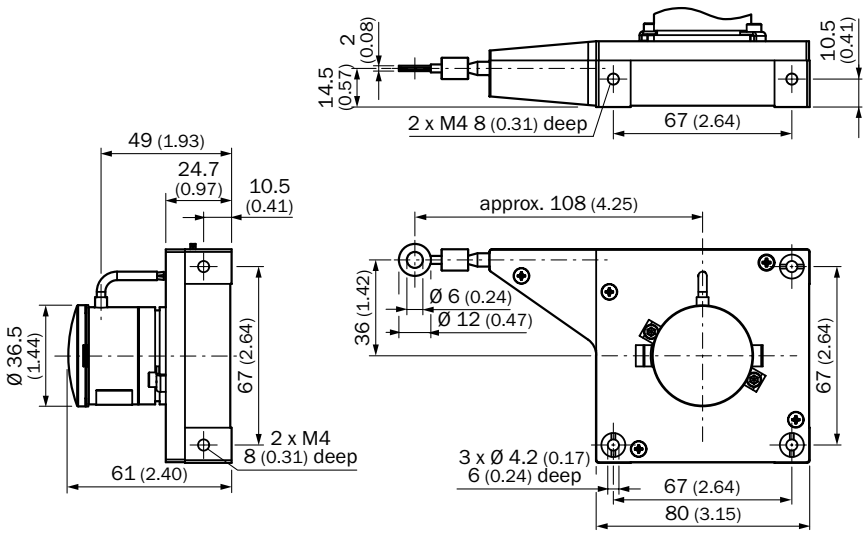
Measuring range	Electrical interface	Connection type	Type	Part no.
0 m ... 10 m	4.5 V ... 5.5 V, TTL/RS422	M12 male connector, 8-pin, radial	PFG19-A1CM1029	1061020
		M23 male connector, 12-pin, radial	PFG19-A1AM1029	1061021
	HTL/push pull	M12 male connector, 8-pin, radial	PFG19-E1CM1029	1061022
		M23 male connector, 12-pin, radial	PFG19-E1AM1029	1061023
	TTL/HTL, programmable	M12 male connector, 8-pin, radial	PFG19-P1CM10PP	1061024
		M23 male connector, 12-pin, radial	PFG19-P1AM10PP	1075581

Dimensional drawings (dimensions in mm)

BCG05 analog



BCG08 analog



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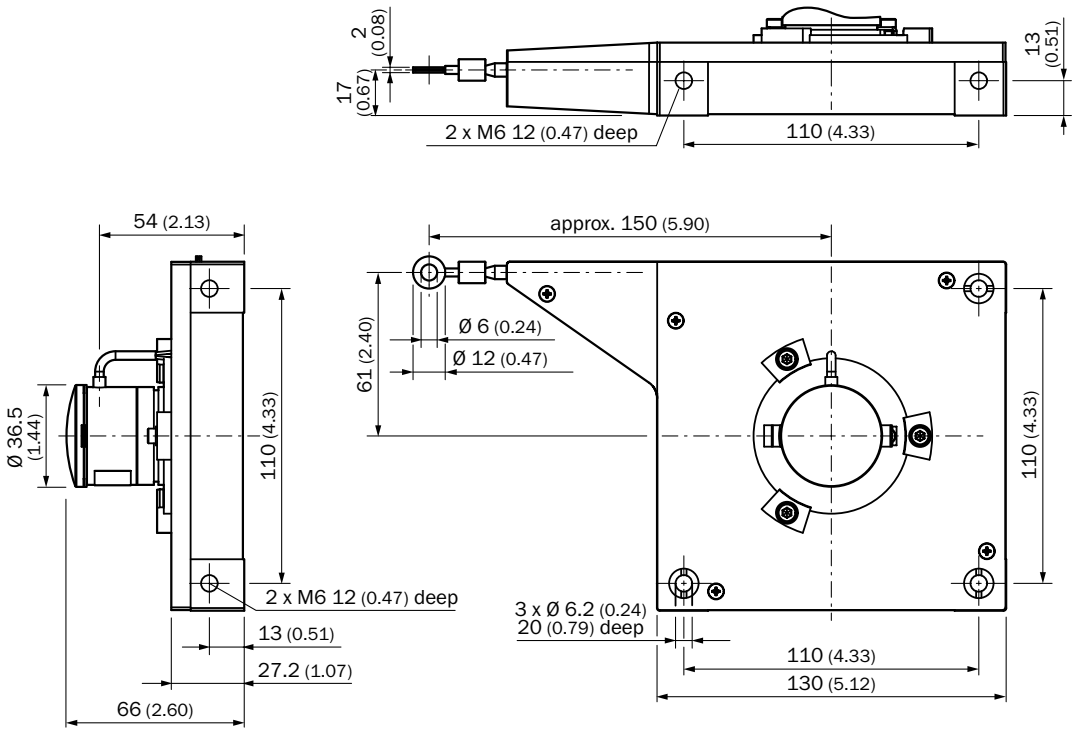
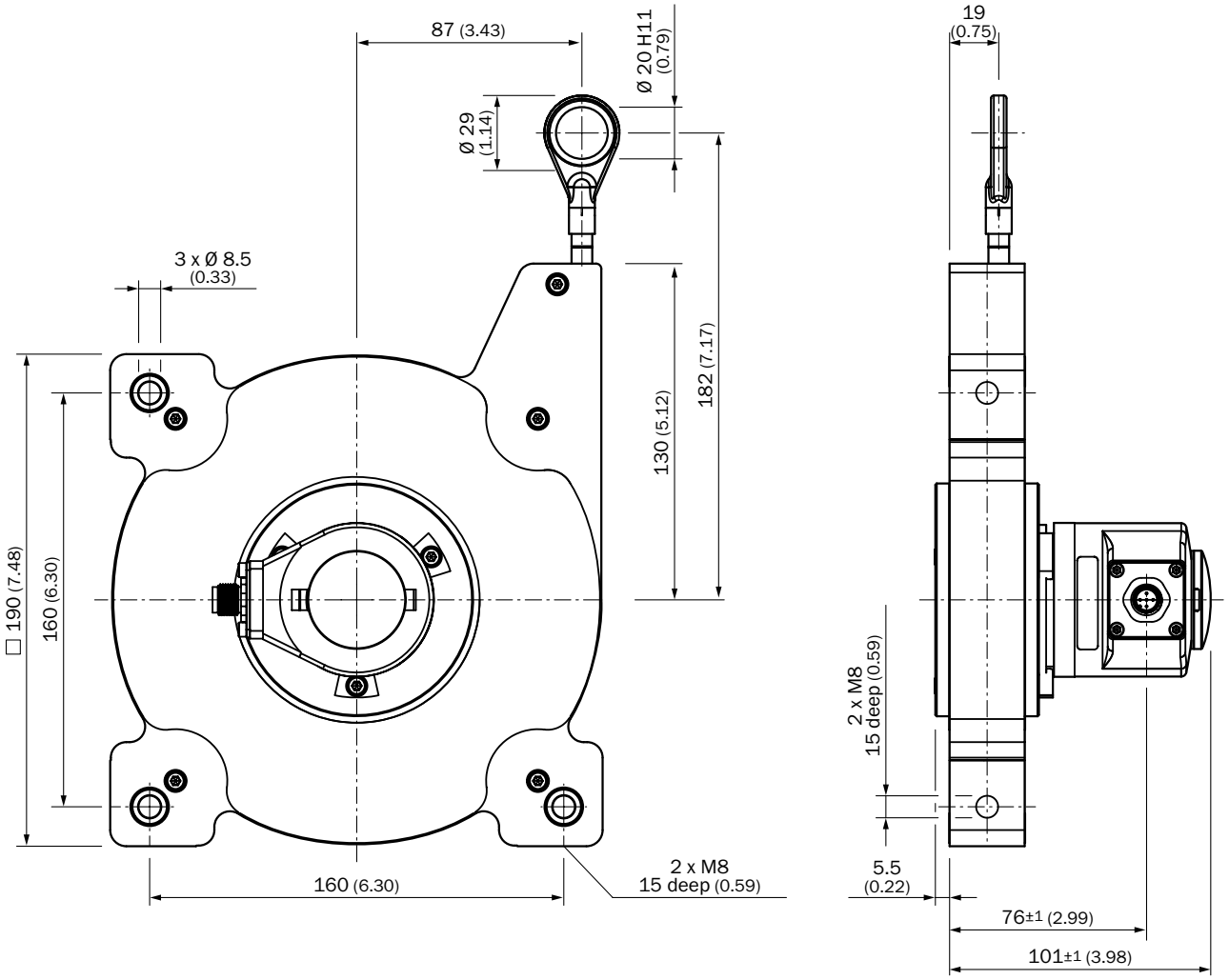
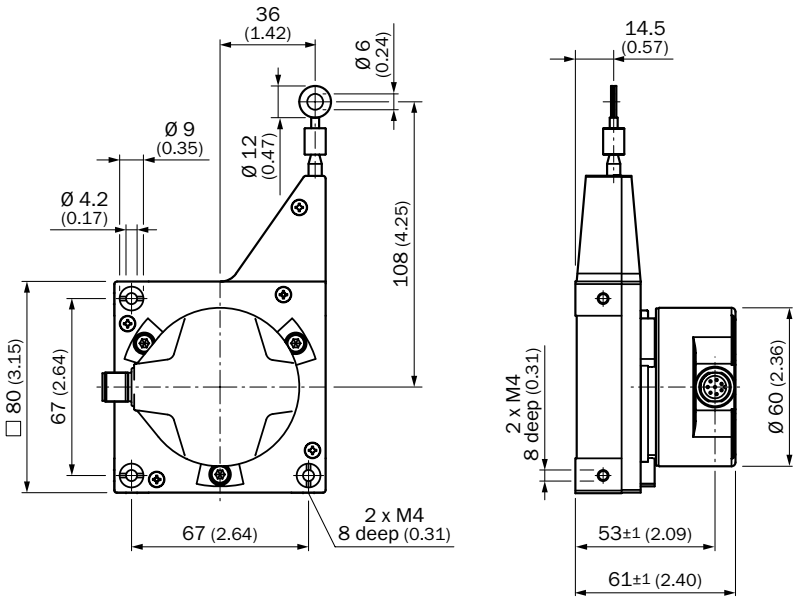
BCG13 analog



BCG19 analog (M12 connector outlet)



BCG08 SSI (M12 connector outlet)



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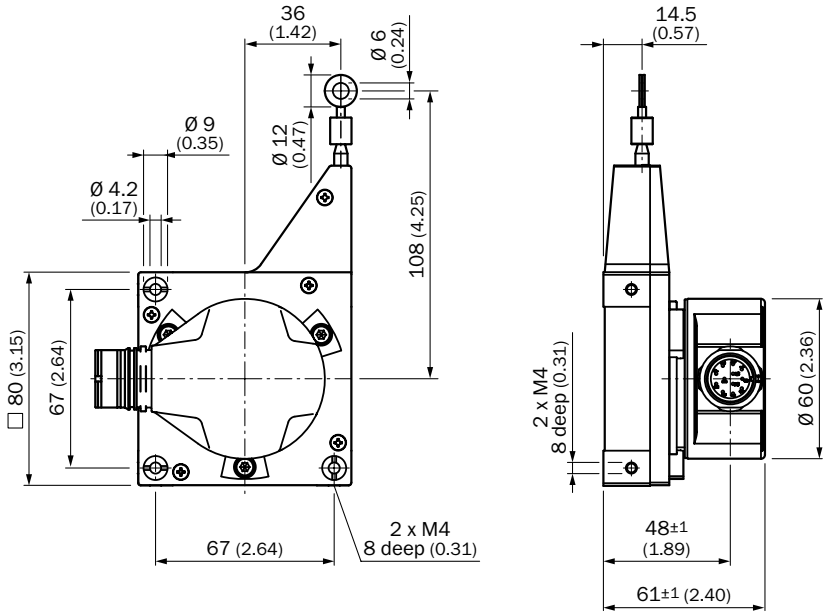
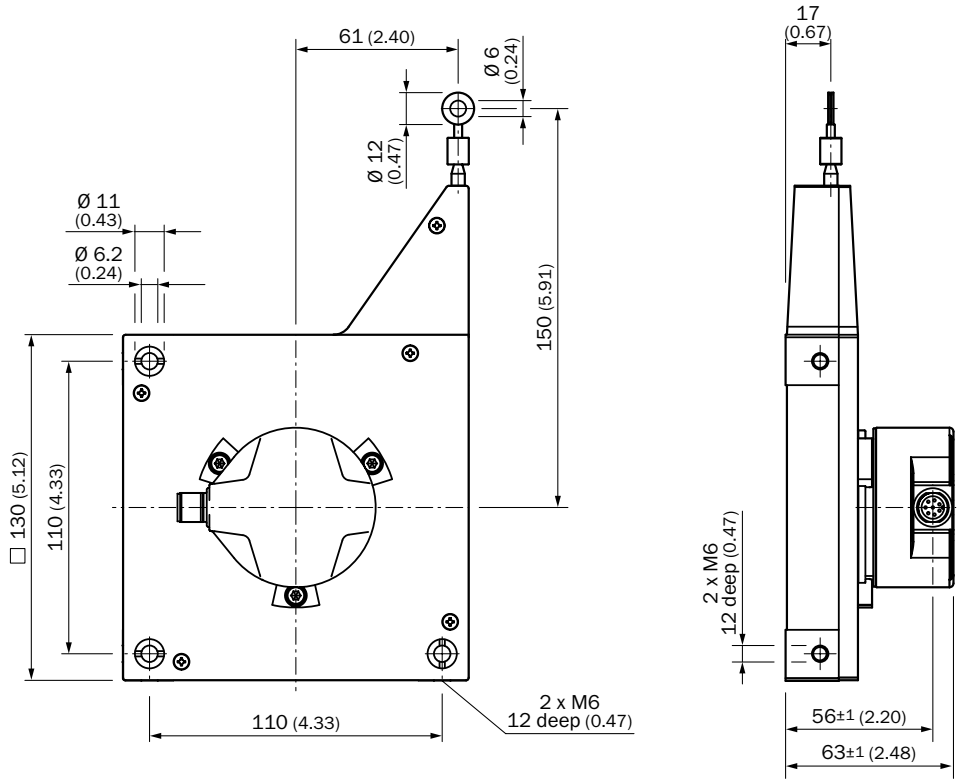
Subject to change without notice

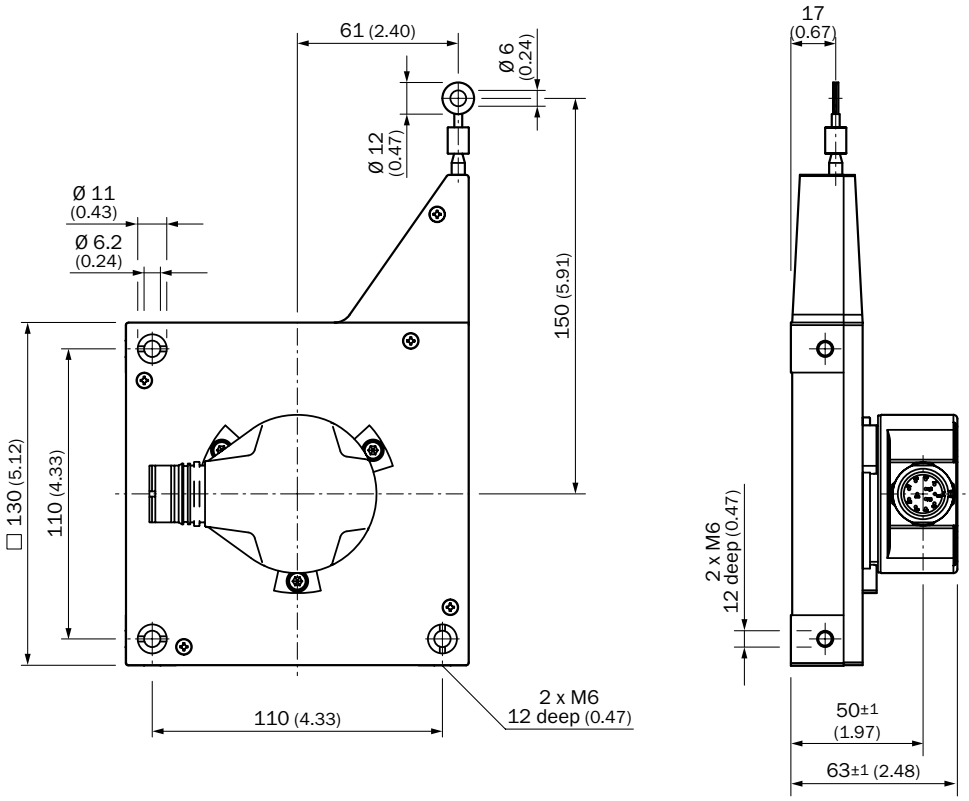
BCG08 SSI (M23 connector outlet)



BCG13 SSI (M12 connector outlet)



BCG13 SSI (M23 connector outlet)



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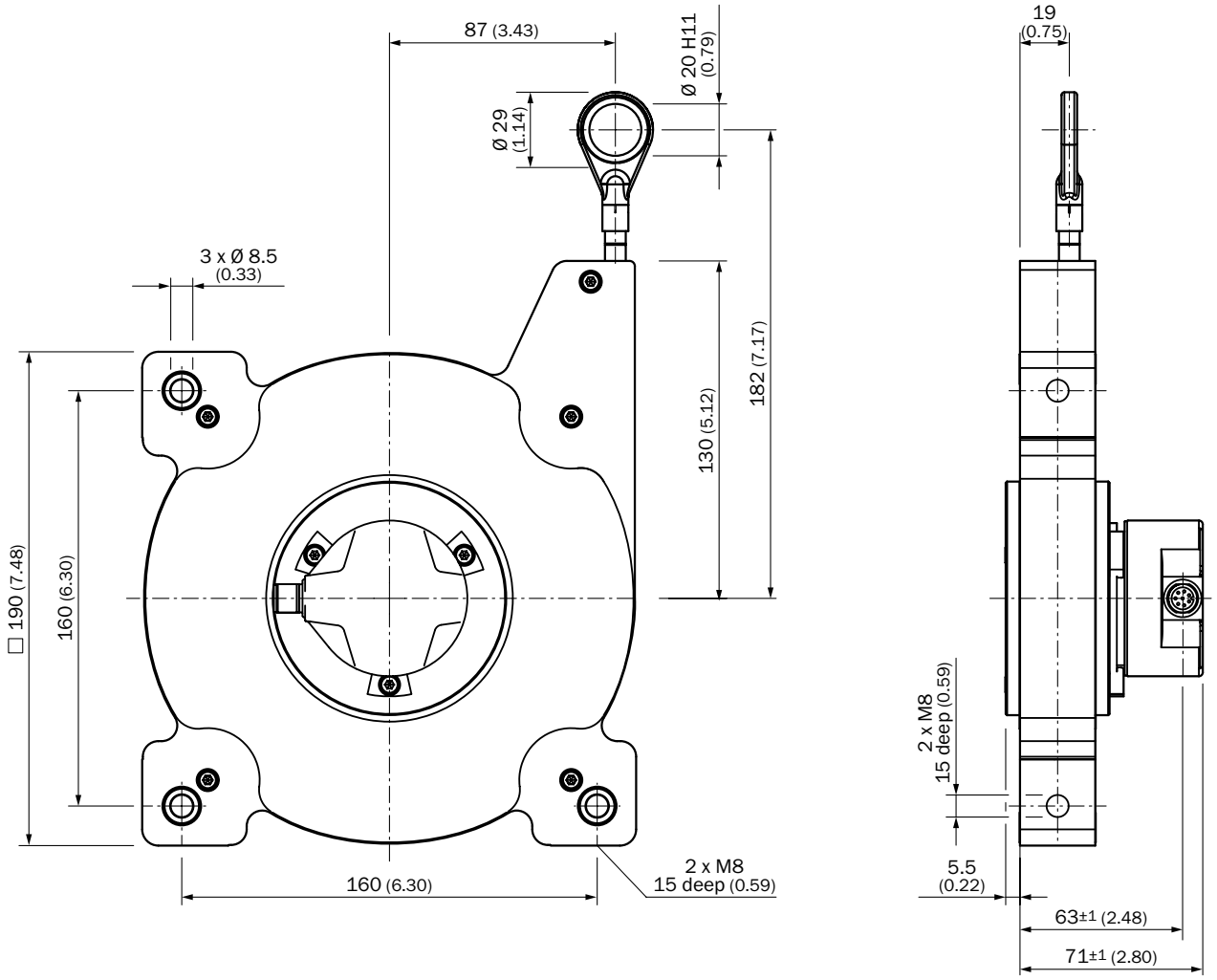
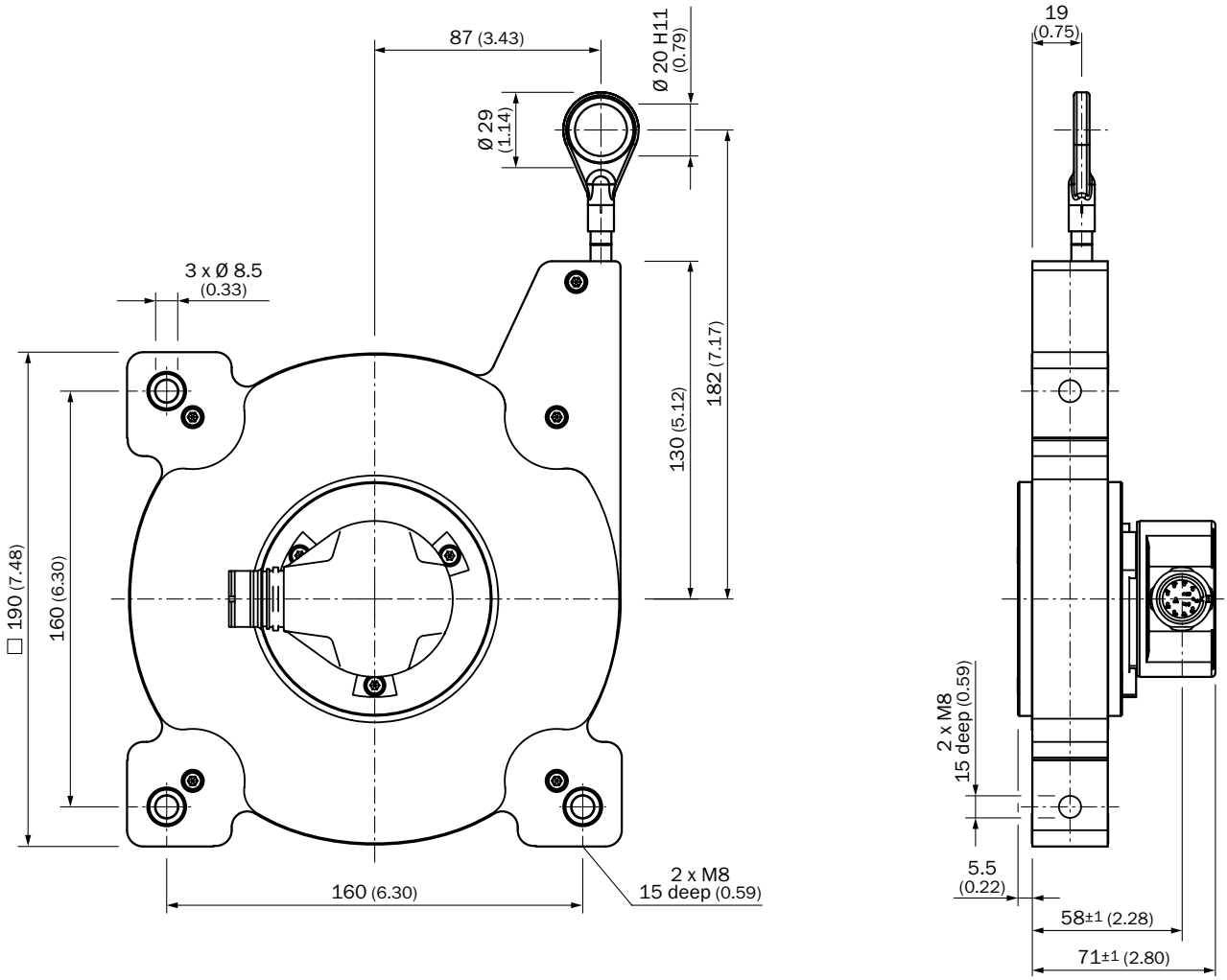
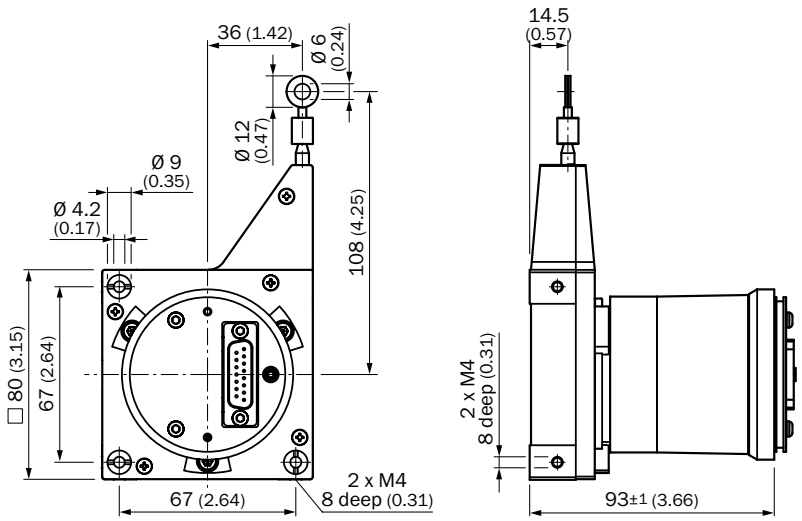
BCG19 SSI (M12 connector outlet)



BCG19 SSI (M23 connector outlet)



BCG08 CANopen, DeviceNet



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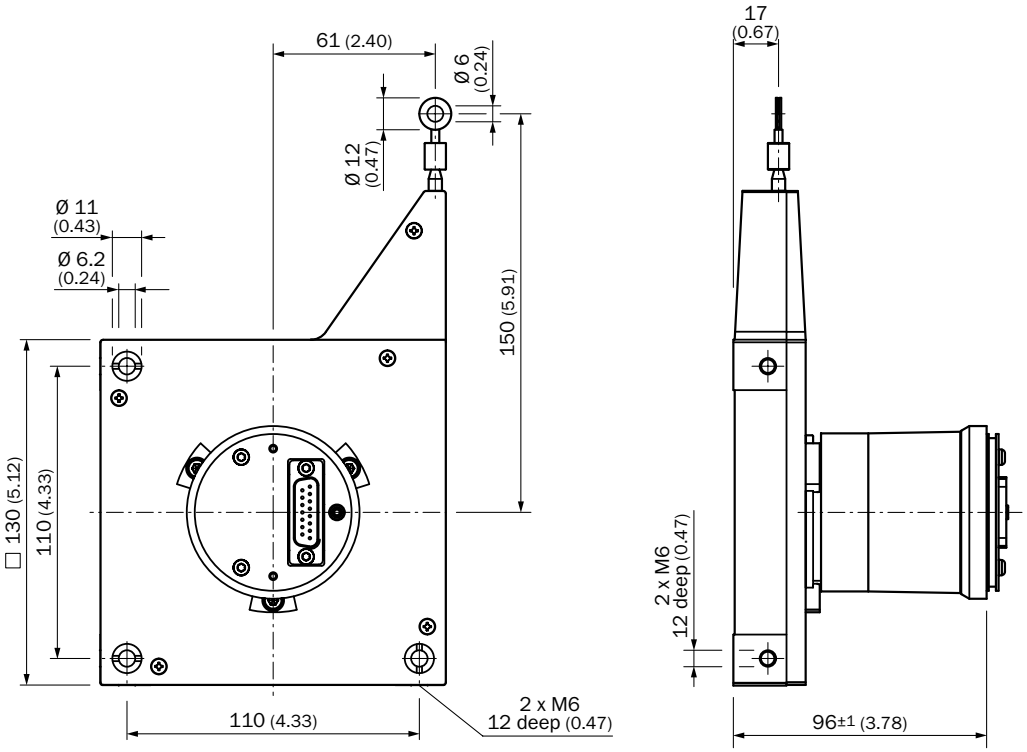
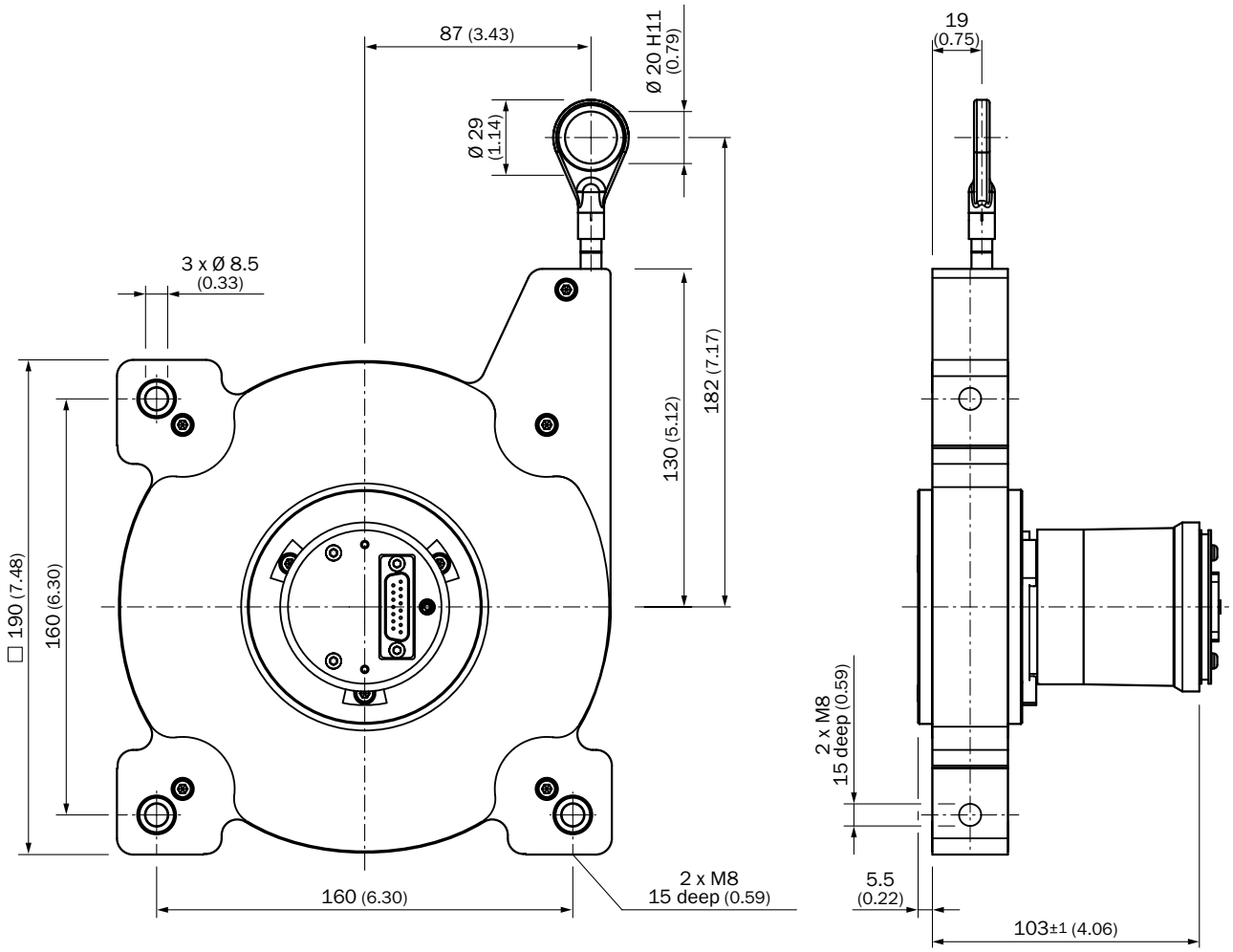
BCG13 CANopen, DeviceNet



BCG19 CANopen, DeviceNet



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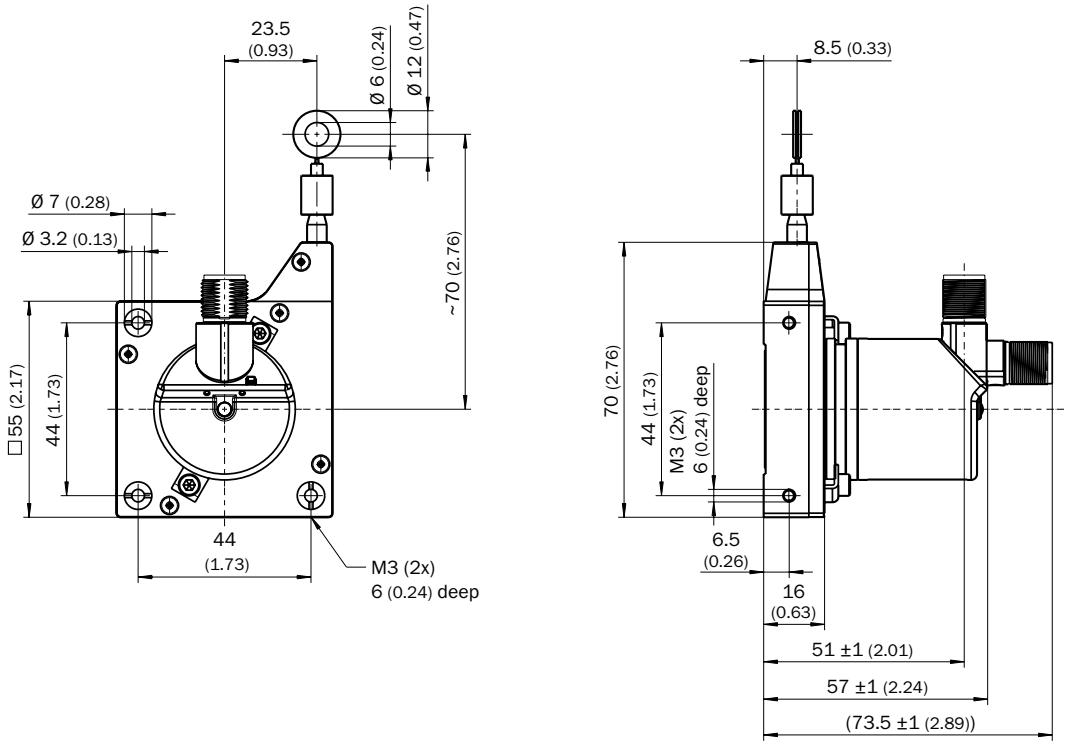
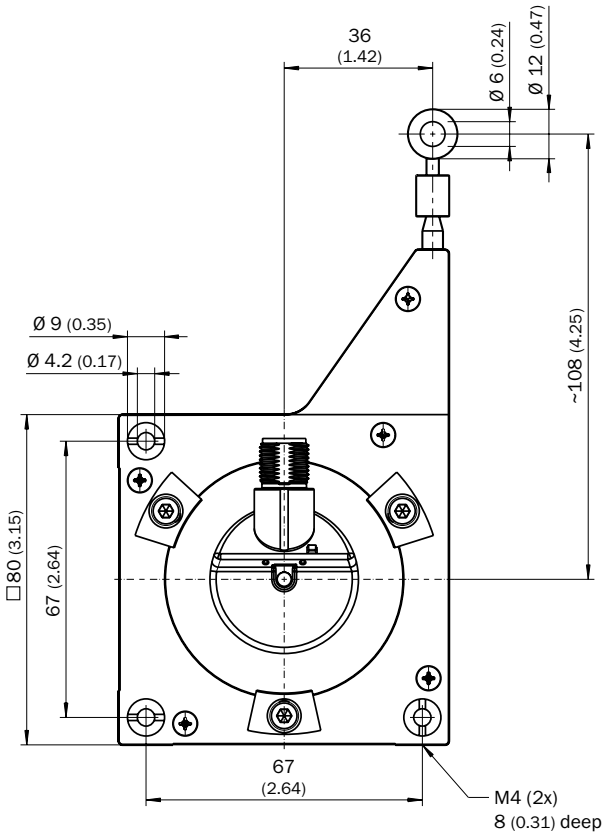
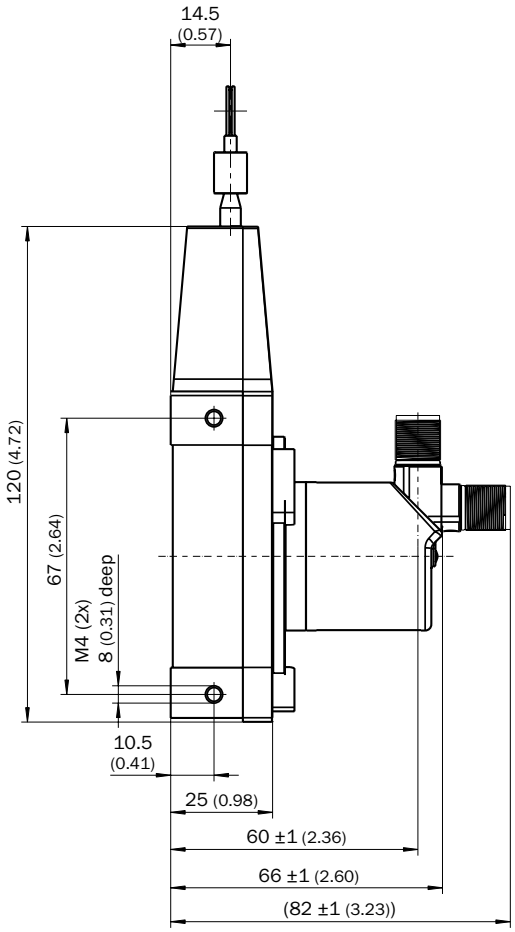
BCG05 SSI, CANopen



BCG08 SSI, CANopen





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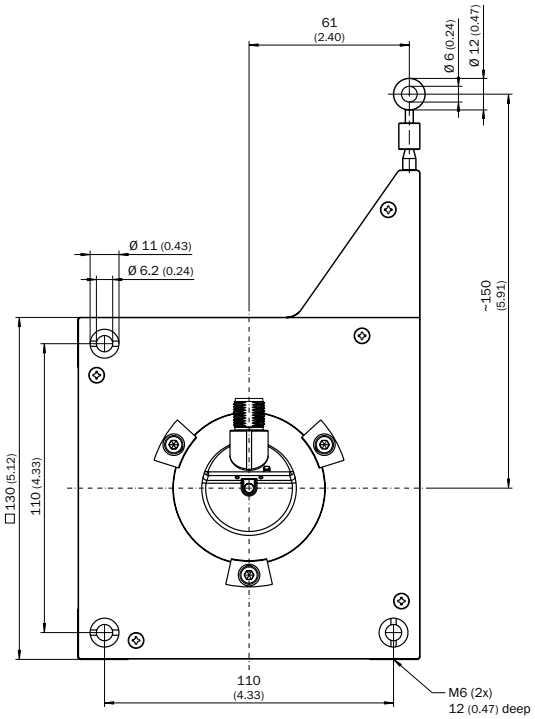
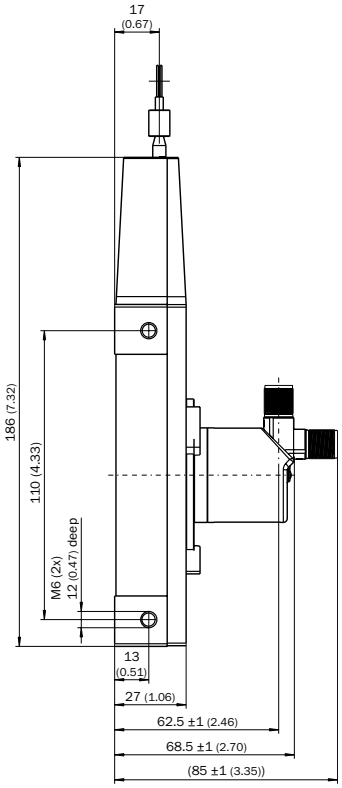
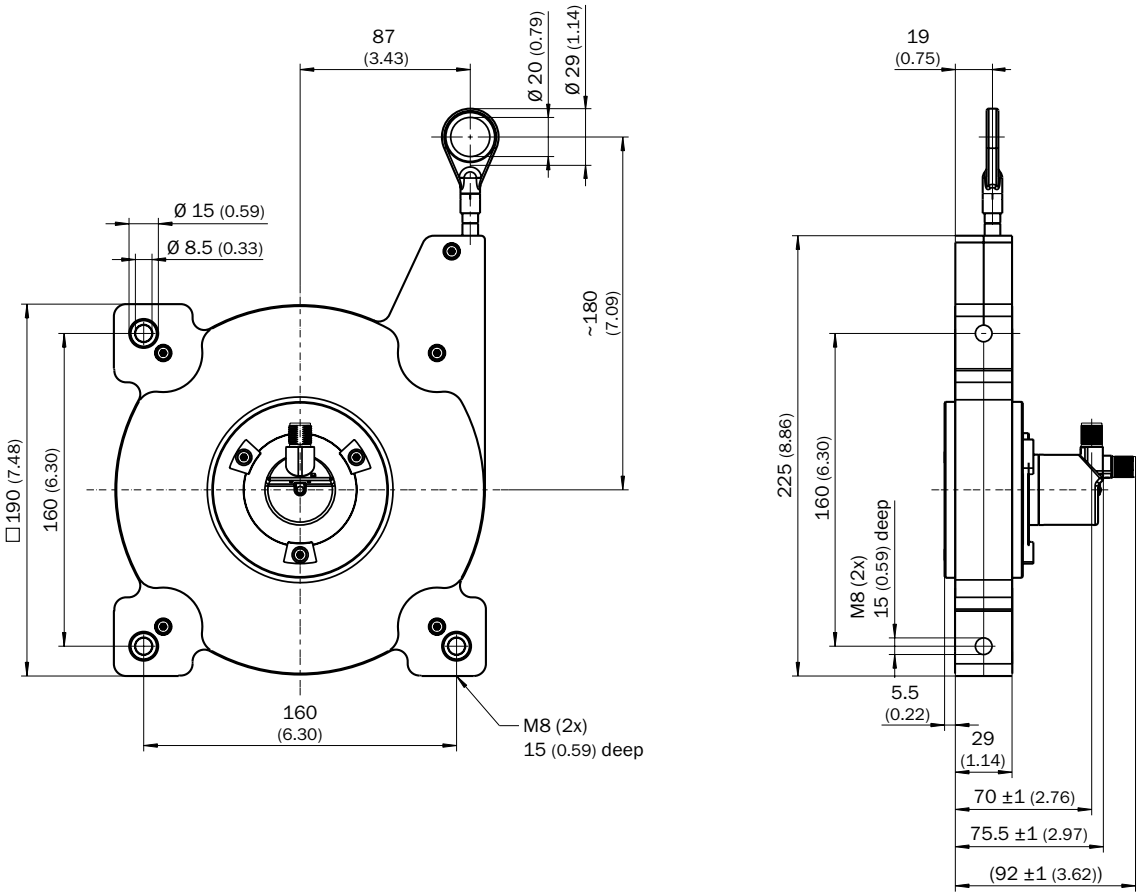
BCG13 SSI, CANopen

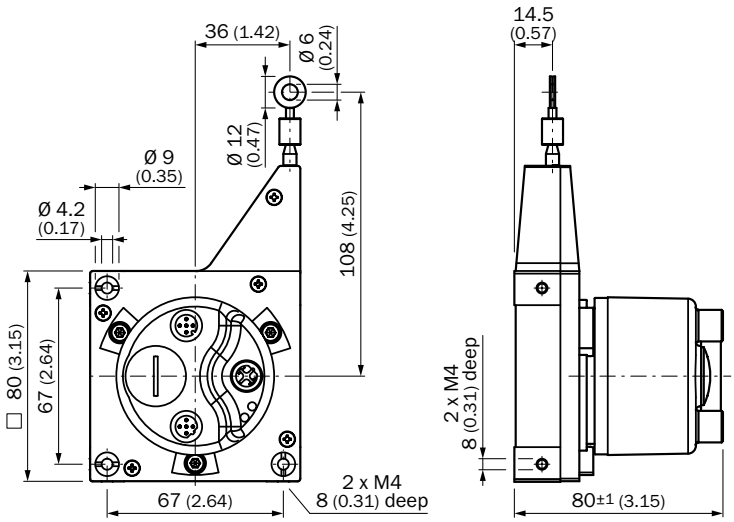




BCG19 SSI, CANopen



BCG08 PROFIBUS



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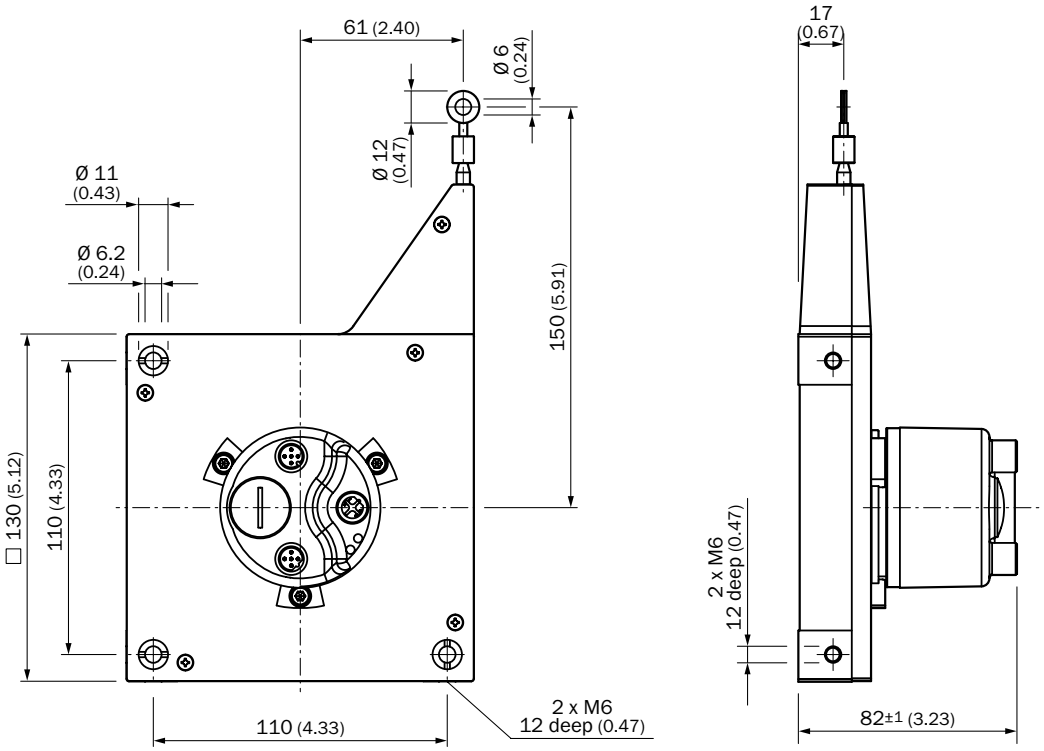
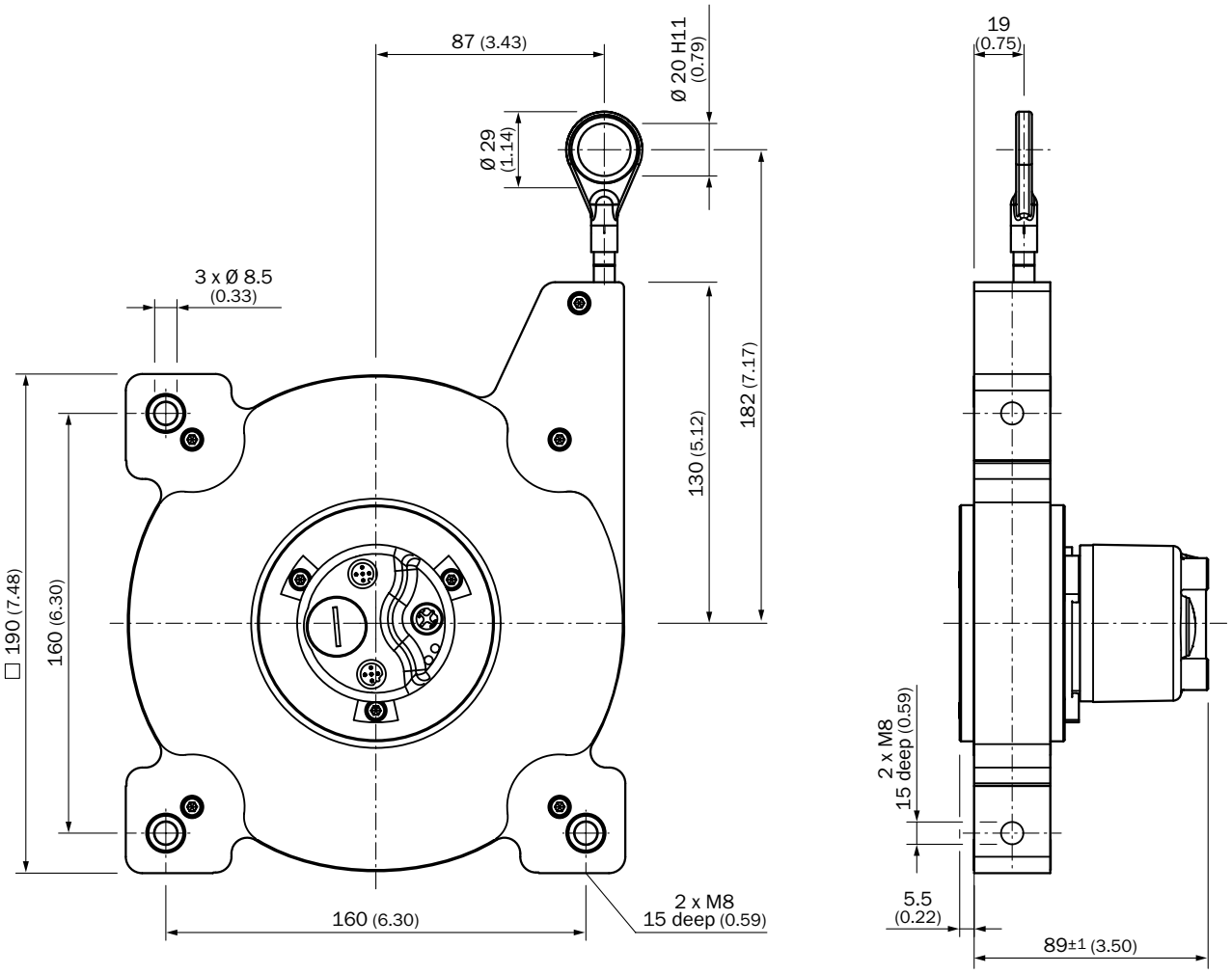
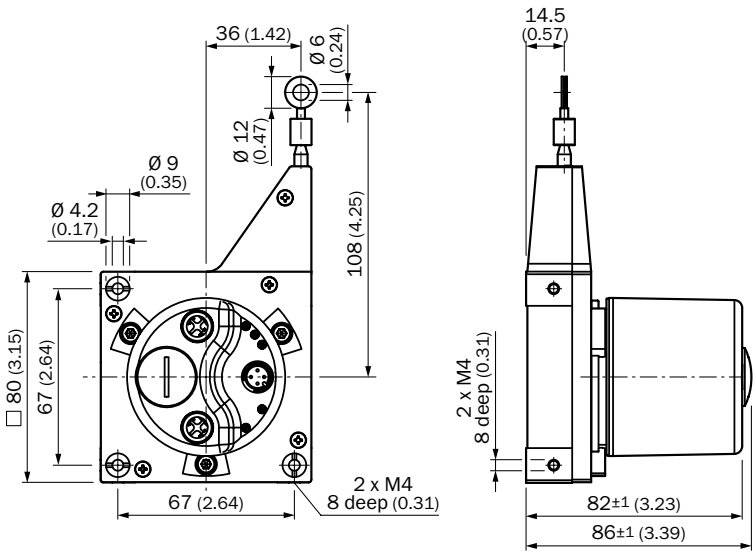
BCG013 PROFIBUS



BCG19 PROFIBUS



BCG08 EtherNet/IP, EtherCAT®, PROFINET



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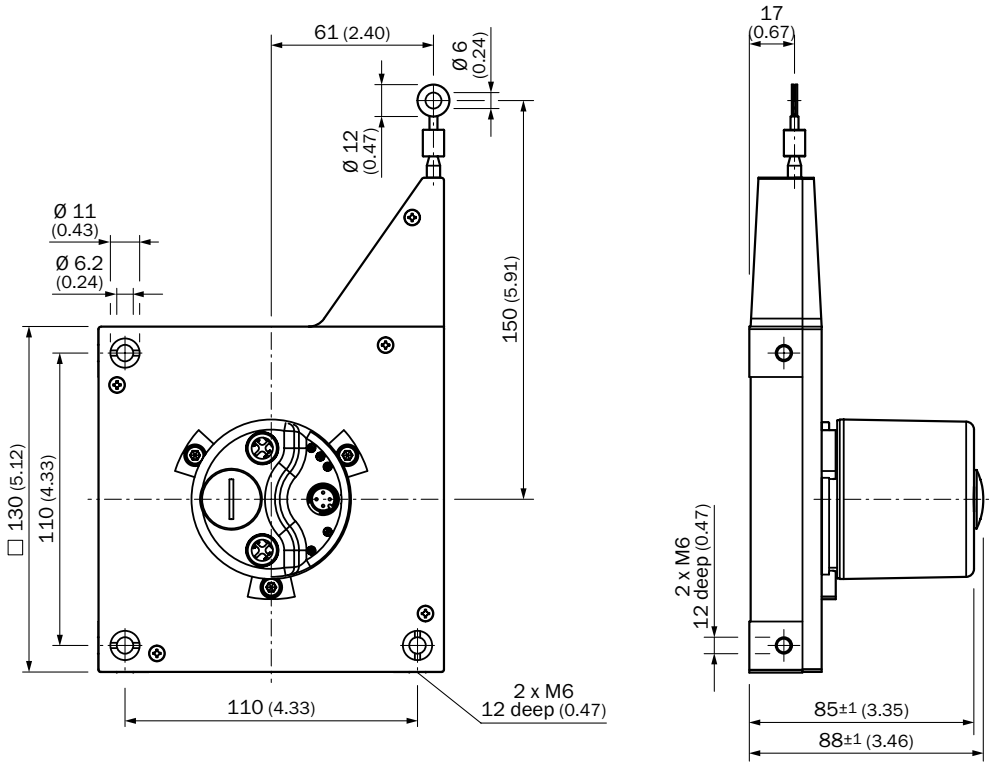
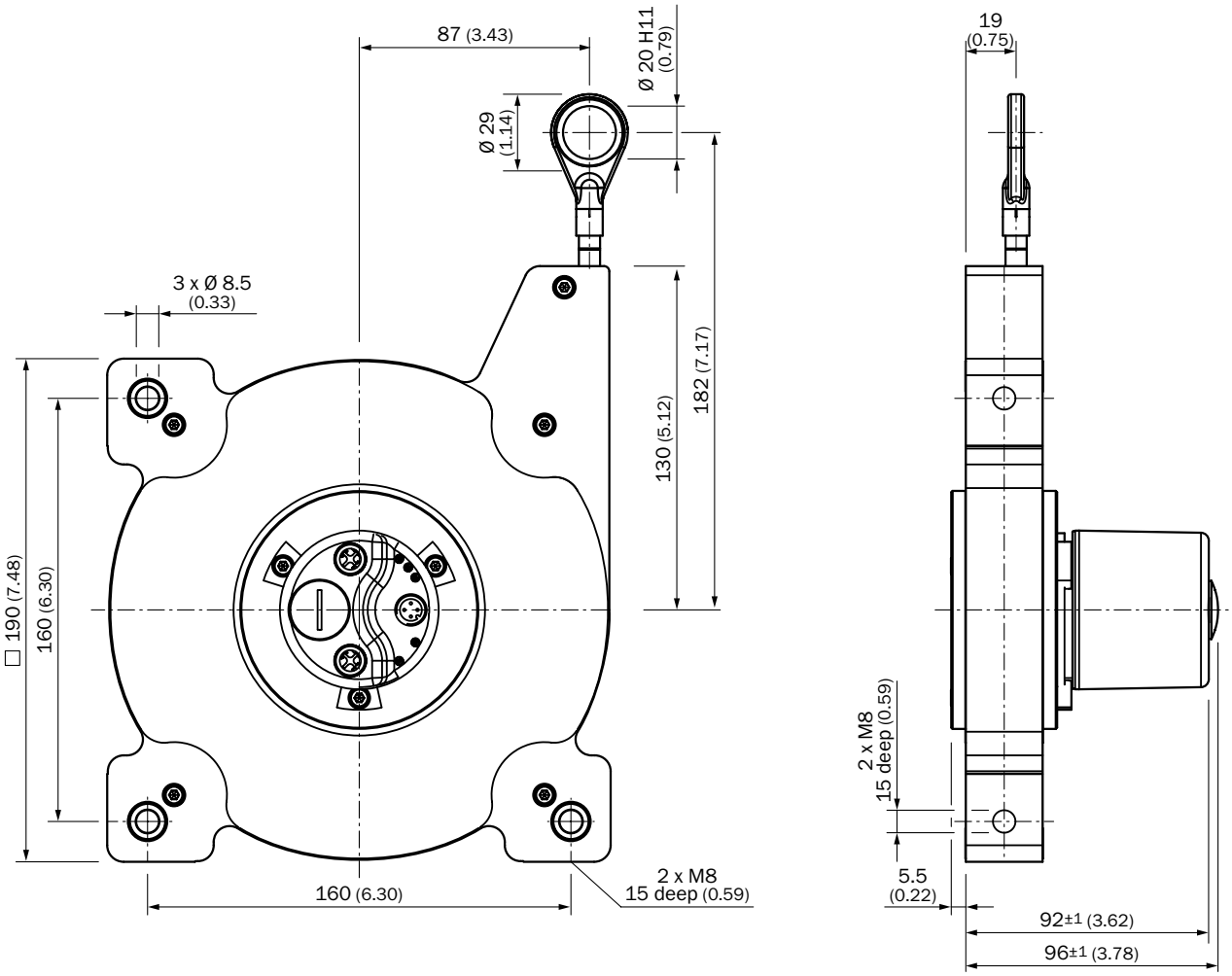
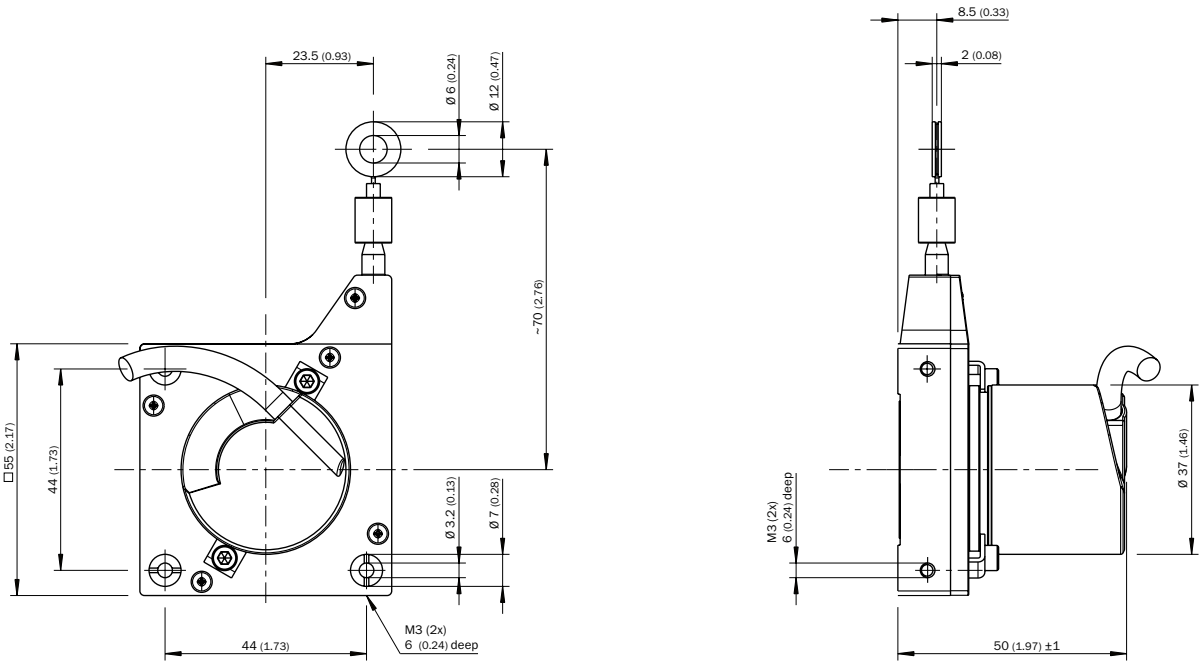
BCG13 EtherNet/IP, EtherCAT®, PROFINET



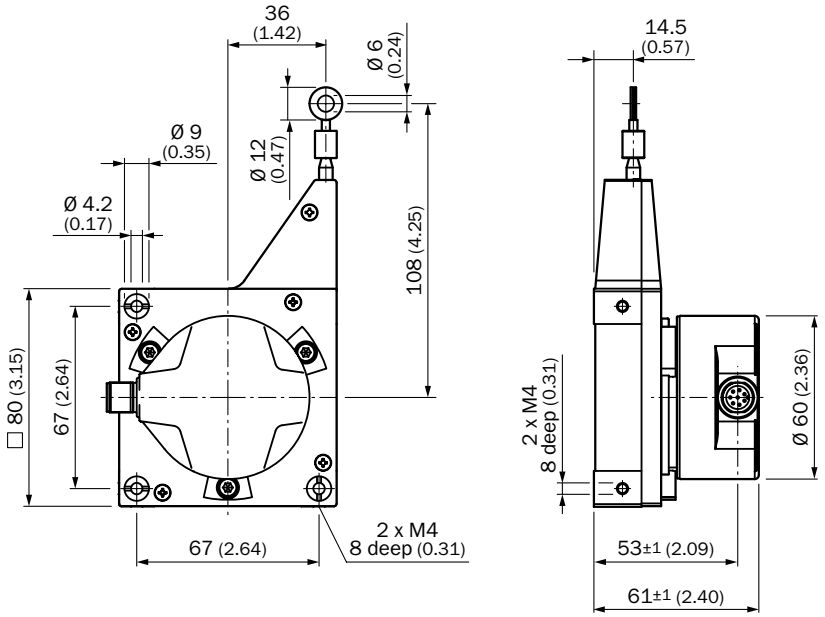
BCG19 EtherNet/IP, EtherCAT®, PROFINET



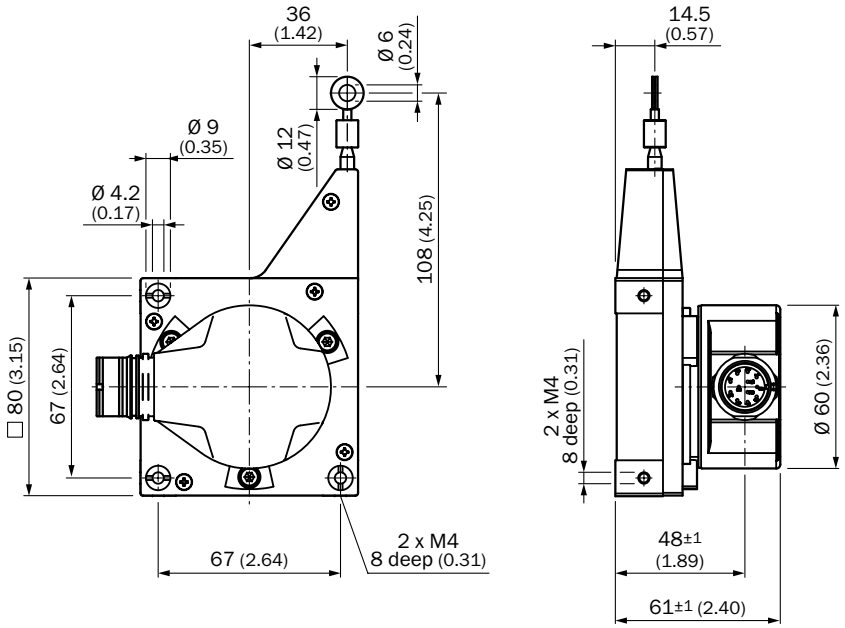
PFG05



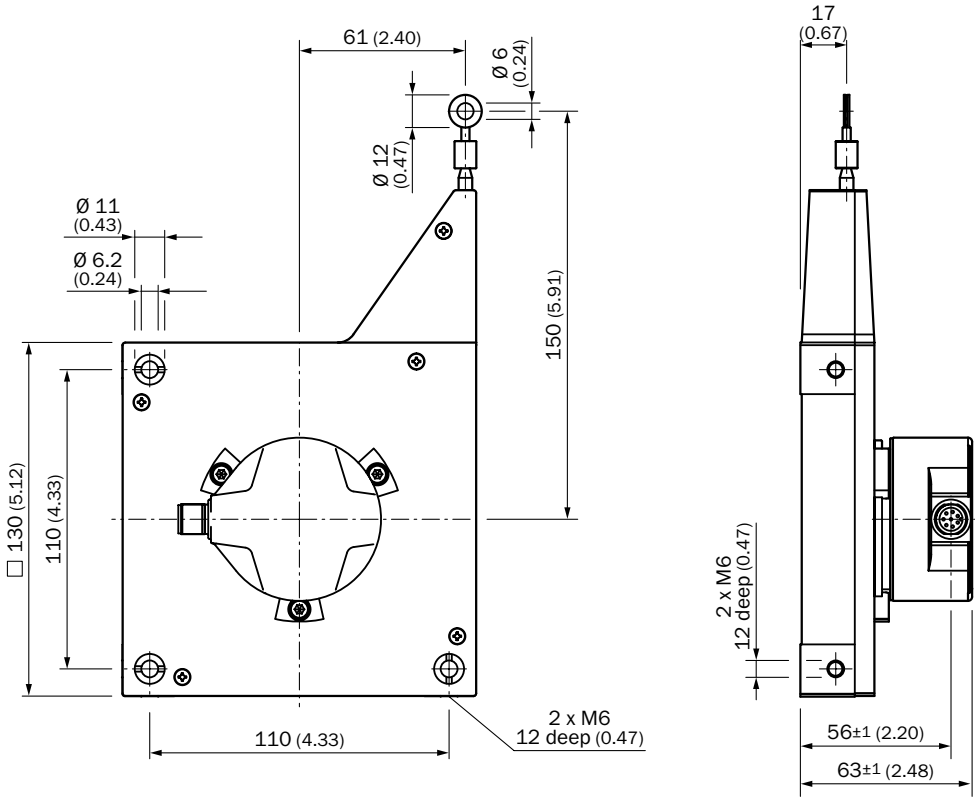
PFG08 (M12 connector outlet)



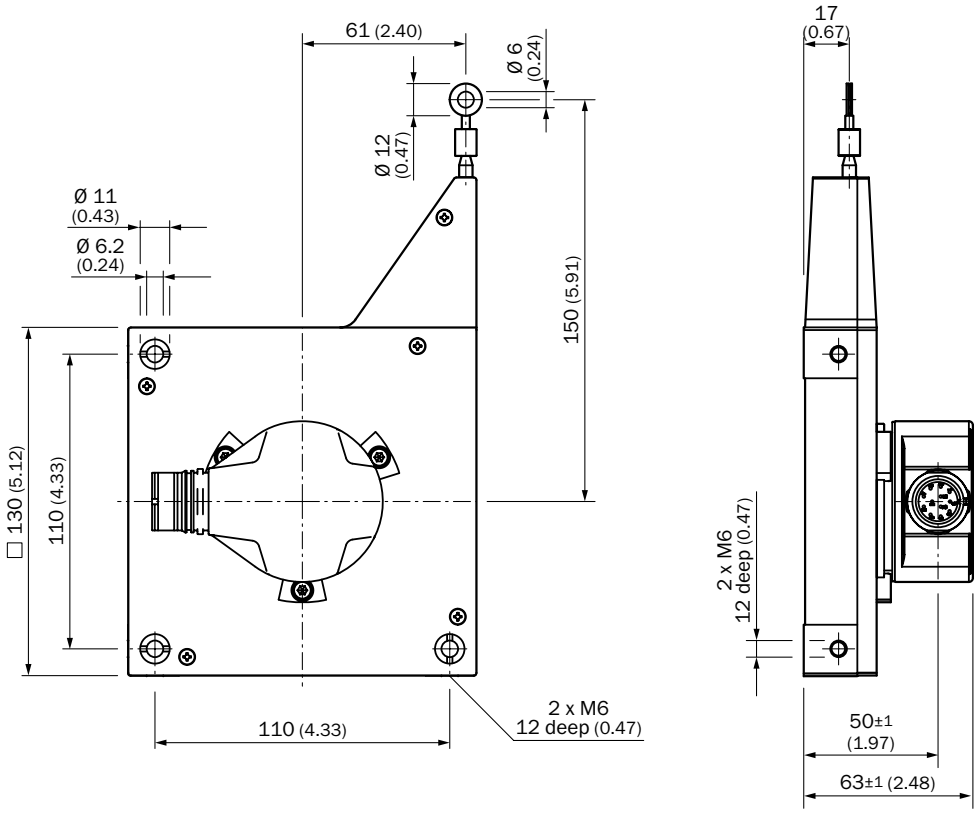
PFG08 (M23 connector outlet)



PFG13 (M12 connector outlet)



PFG13 (M23 connector outlet)



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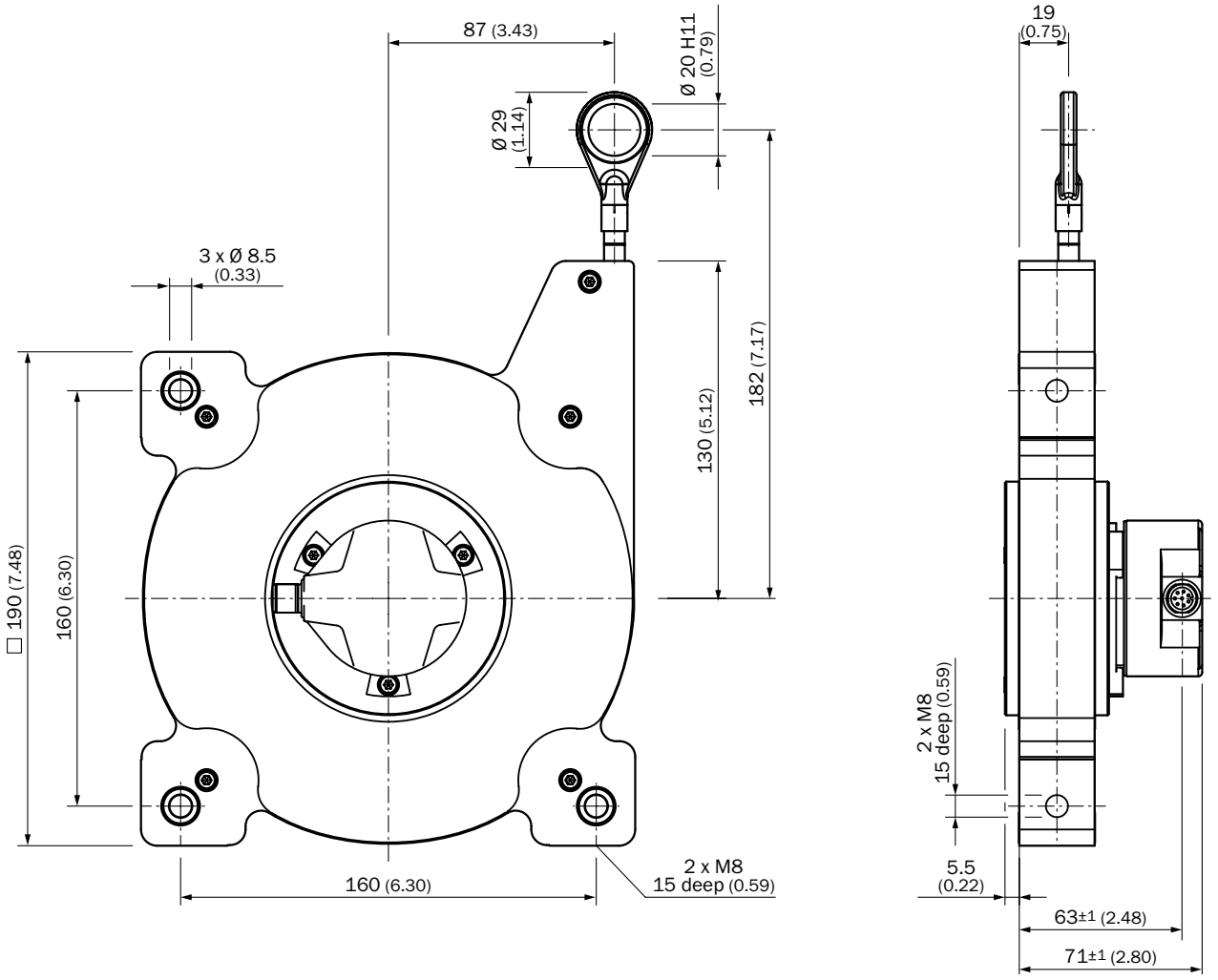
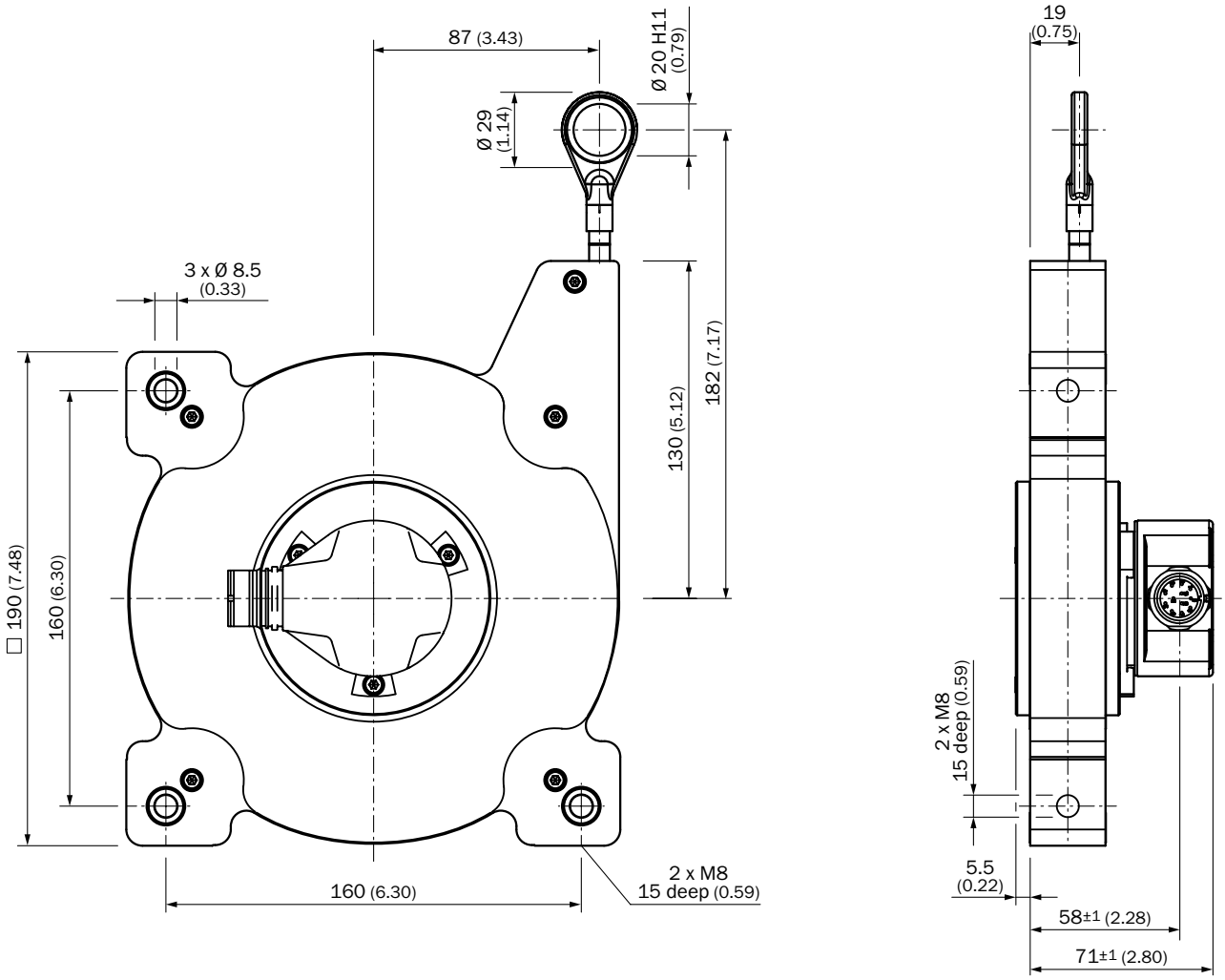
PFG12 (M12 connector outlet)



PFG08 (M23 connector outlet)



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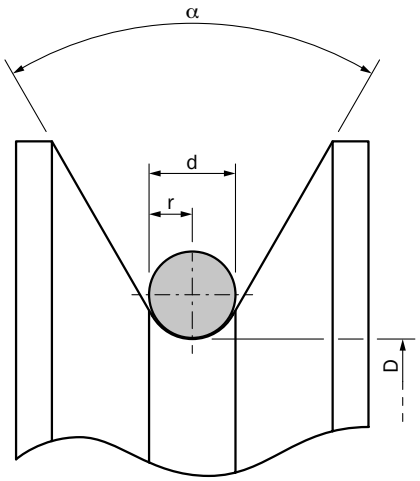
Deflection roller design

With the aid of deflection rollers, it is possible to guide the measuring wire of wire draw encoders over edges and around corners without significantly affecting the life time of the wire draw encoder. In this case, it must be considered that the designs of the deflection roller and of the measuring wire must be compatible in order to avoid damage to the system.



D = groove base diameter.
d = diameter of the wire cable incl. sheath.
r = groove radius = 0.53 x d
α = groove opening angle = 60°

- The groove radius should not be too small – **recommendation: 0.53 x diameter of the wire cable**
- The groove opening angle should be neither too small nor too large – **recommendation: 60°**
- In order to ensure the longest possible system life, the deflection roller material should be neither too soft nor too hard – **recommended material: polyamide**
- The groove base diameter of the deflection roller should not be too small – **see table for recommendations**

EcoLine

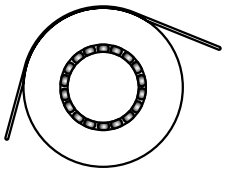
Length	Measuring wire, PA-sheathed	Diameter of the measuring wire	Structure of the measuring wire (strands x cords)	Min. groove base diameter
1.25 m	PA12	0.45 mm	7 x 7	25 mm
3 m	–	0.55 mm	1 x 19	40 mm
5 m	–	0.55 mm	1 x 19	40 mm
10 m	–	0.55 mm	1 x 19	40 mm

HighLine

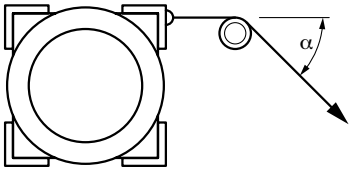
Length	Measuring wire, PA-sheathed	Diameter of the measuring wire	Structure of the measuring wire (strands x cords)	Min. groove base diameter
2 m	–	1.35 mm	7 x 19	35 mm
3 m	–	1.35 mm	7 x 19	35 mm
5 m	–	1.35 mm	7 x 19	35 mm
10 m	–	1.35 mm	7 x 19	35 mm
20 m		0.81 mm	7 x 7	35 mm
30 m		0.81 mm	7 x 7	35 mm
50 m		1.35 mm	7 x 19	35 mm

Installation of deflection rollers

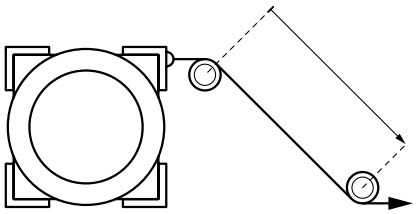
General notes on the installation of deflection rollers



The deflection roller should always be installed in a way which ensures that running is smooth. The deflection roller should ideally have an integrated ball bearing.



The smaller the deflection angle (α) achieved by a deflection roller, the less wear will appear on the measuring wire and therefore the longer the service life of the wire draw mechanism.



If two or more deflection rollers are needed, then the deflection rollers should always be installed at some distance from one another. The requisite distance between the deflection rollers must be accurately defined on site, accounting for specific customer requirements.

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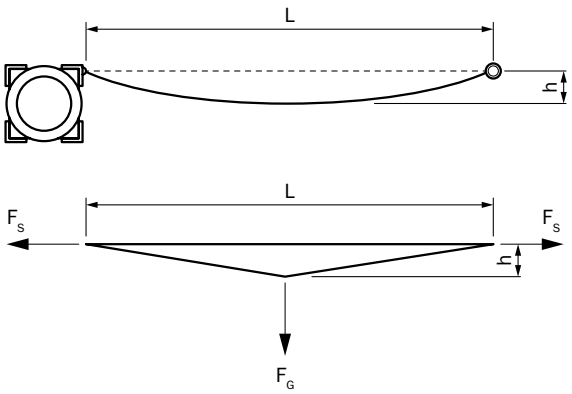
Wire sag

If the measuring wire is pulled out in a horizontal direction, this creates sag that becomes more pronounced as the wire length increases. This has particular implications for applications with obstacles that could get in the way of the moving measuring wire. However, the change in length that results from the sag, and the measurement error this leads to, are negligible.

Calculating the wire sag

The mass of the free-hanging measuring wire creates weight-related force, and this causes the wire to bend into a hyperbola-shaped line. The tension force in the measuring wire acts against the sag. As the measurement length increases, so too does the tension force as a result of the spring drive. We can imagine the hyperbola shape in a simplified format that looks approximately like a triangle.



The weight-related force of the measuring wire can be calculated using **Formula A**.
The spring rate of the spring drive is calculated using **Formula B**.
Formula C determines the sag of the measuring wire (the results of Formula A and Formula B are required in order to calculate the wire sag).
Formula D is used for calculating the measurement error.
The values found in real life will differ from the theoretical values that are calculated, as the measuring wire itself demonstrates a certain amount of resistance against the sag.

Formula A

$$F_G = 0.5 \times m_L \times g \times L$$

F_G = weight-related force of the measuring wire [N]
m_L = length-related mass of the measuring wire [Kg/m]
g = gravitational acceleration 9.81 [m/s²]
L = free length of the measuring wire [m]

Formula B

$$c = \frac{F_{S\,max} - F_{S\,min}}{L_{max}}$$

c = spring rate of the spring drive [N/m]
$F_{S\,max}$ = maximum tensile force in the wire [N]
$F_{S\,min}$ = minimum tensile force in the wire [N]

Formula C

$$h = \frac{L^2 \times g \times m_L}{8 \times (c \times L + F_{min})}$$

h = wire sag [mm]
c = spring rate of the spring drive [N/m]
$F_{S\,min}$ = minimum tensile force in the measuring wire [N]
g = gravitational acceleration 9.81 [m/s²]
m_L = length-related mass of the measuring wire [Kg/m]
L = free length of the measuring wire [m]

Formula D

$$f = \sqrt{L^2 + 4h^2} - L$$

f = measurement error [m]
h = wire sag [m]
L = free length of the measuring wire [m]

Recommended accessories

Mounting systems

Flanges

Flange plate

Figure	Brief description	Type	Part no.
	Flange adapter for EcoLine wire draw mechanisms, adapts face mount flange with 20 mm centering collar to 50 mm servo flange	BEF-FA-020-050-007	2073774

Other mounting accessories

Figure	Brief description	Type	Part no.
	Joint ball for insertion in wire end ring with 20 mm diameter	Joint ball for BTF/ PRF/MRA wire draw mechanism	5318683

Wire draw mechanism

Wire draw mechanism for servo flange encoder

Figure	Brief description	Mea-suring length	Type	Part no.
	EcoLine wire draw mechanism for 36 series servo flange with 6 mm shaft	1.25 m	MRA-G055-101D4	5324019
	EcoLine wire draw mechanism for 60 series servo flange with 6 mm shaft	3.0 m	MRA-G080-103D3	5322778
		5.0 m	MRA-G130-105D3	5322779
		10.0 m	MRA-G190-110D3	5326242

Connectivity

Adapters and distributors

T-distributor

Figure	Brief description	Type	Part no.
	CANopen, T-distributor	DSC-1205T000025KM0	6030664

Plug connectors and cables

Connecting cables with female connector

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 5-pin, angled Head B: cable Cable: for power supply, PUR, halogen-free, shielded, 3 x 0.34 mm², Ø 4.2 mm	5 m	DOL-1202-W05MC	6042067
		10 m	DOL-1202-W10MC	6042068

[1] Warning! Only in combination with electrical interfaces A, C, E, and P.

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Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 4-pin, straight Head B: cable Cable: for power supply, suitable for drag chain, PUR, halogen-free, unshielded, 4 x 0.34 mm², Ø 4.7 mm	2 m	DOL-1204-G02MC	6025900
		5 m	DOL-1204-G05MC	6025901
		10 m	DOL-1204-G10MC	6025902
		25 m	DOL-1204-G25MC	6034751
	Head A: female connector, M12, 4-pin, angled Head B: cable Cable: for power supply, suitable for drag chain, PUR, halogen-free, unshielded, 4 x 0.34 mm², Ø 4.7 mm	2 m	DOL-1204-W02MC	6025903
		5 m	DOL-1204-W05MC	6025904
		10 m	DOL-1204-W10MC	6025905
		25 m	DOL-1204-W25MC	6034754
	Head A: female connector, M12, 5-pin, straight Head B: cable Cable: for power supply, suitable for drag chain, PUR, halogen-free, shielded, 5 x 0.34 mm², Ø 5.9 mm	5 m	DOL-1205-G05MAC	6036384
		10 m	DOL-1205-G10MAC	6036385
		20 m	DOL-1205-G20MAC	6036386
	Head A: female connector, M12, 5-pin, straight, A-coded Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 5 x 0.34 mm², Ø 5.9 mm	1.5 m	DOL-1205-G1M5ACS-C0	6049451
		3 m	DOL-1205-G03MACS-C0	6049452
		5 m	DOL-1205-G05MACS-C0	6049453
		10 m	DOL-1205-G10MACS-C0	6049454
	Head A: female connector, M12, 5-pin, angled, A-coded Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 5 x 0.34 mm², Ø 5.9 mm	1.5 m	DOL-1205-W1M5ACSC0	6049455
		3 m	DOL-1205-W03MACSC0	6049456
		5 m	DOL-1205-W05MACSC0	6049457
		10 m	DOL-1205-W10MACSC0	6049458
	Head A: female connector, M23, 12-pin, straight Head B: cable Cable: SSI, suitable for drag chain, PVC, shielded, 4 x 2 x 0.15 mm², Ø 5.6 mm	0.5 m	DOL-2308-G0M5AA6	2048595
		1.5 m	DOL-2308-G1M5AA6	2048596
		3 m	DOL-2308-G03MAA6	2048597
		5 m	DOL-2308-G05MAA6	2048598
		10 m	DOL-2308-G10MAA6	2048599
	Head A: female connector, M12, 5-pin, straight Head B: cable Cable: PROFIBUS, suitable for drag chain, PUR, halogen-free, shielded, 2 x 0.34 mm², Ø 8.0 mm	5 m	DOL-1205-G05MQ	6026006
		10 m	DOL-1205-G10MQ	6026008
		12 m	DOL-1205-G12MQ	6032636
		15 m	DOL-1205-G15MQ	6032637
		20 m	DOL-1205-G20MQ	6032638
		30 m	DOL-1205-G30MQ	6032639
		50 m	DOL-1205-G50MQ	6032861
	Head A: female connector, M12, 5-pin, angled, B-coded Head B: cable Cable: PROFIBUS, suitable for drag chain, PUR, shielded, 2 x 0.64 mm², Ø 7.8 mm	5 m	DOL-1205-W05MQ	6041423
		10 m	DOL-1205-W10MQ	6041425
	Head A: female connector, M12, 5-pin, straight Head B: cable Cable: CANopen, suitable for drag chain, shielded, 2 x 0.34 mm² + 2 x 0.25 mm² + 1 x 0.34 mm², Ø 6.7 mm A-coded	2 m	DOL-1205-G02MY	6053041
		5 m	DOL-1205-G05MY	6053042
		10 m	DOL-1205-G10MY	6053043

[1] Warning! Only in combination with electrical interfaces A, C, E, and P.

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 8-pin, straight Head B: cable Cable: incremental, suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm², Ø 7.0 mm	2 m	DOL-1208-G02MAC1	6032866
		5 m	DOL-1208-G05MAC1	6032867
		10 m	DOL-1208-G10MAC1	6032868
		20 m	DOL-1208-G20MAC1	6032869
	Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm [1]	2 m	DOL-2312-G02MLA3	2030682
		7 m	DOL-2312-G07MLA3	2030685
		10 m	DOL-2312-G10MLA3	2030688
		15 m	DOL-2312-G15MLA3	2030692
		20 m	DOL-2312-G20MLA3	2030695
		25 m	DOL-2312-G25MLA3	2030699
		30 m	DOL-2312-G30MLA3	2030702
	Head A: female connector, M23, 12-pin, straight Head B: cable Cable: incremental, suitable for drag chain, PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.8 mm [1]	1.5 m	DOL-2312-G1M5MA3	2029212
		3 m	DOL-2312-G03MMA3	2029213
		5 m	DOL-2312-G05MMA3	2029214
		10 m	DOL-2312-G10MMA3	2029215
		20 m	DOL-2312-G20MMA3	2029216
		30 m	DOL-2312-G30MMA3	2029217

[1] Warning! Only in combination with electrical interfaces A, C, E, and P.

Connecting cables with male connector

Figure	Brief description	Length of cable	Type	Part no.
	Head A: male connector, M12, 5-pin, straight, B-coded Head B: cable Cable: PROFIBUS, suitable for drag chain, PUR, halogen-free, shielded, 2 x 0.34 mm², Ø 8.0 mm Wire shielding AL-PT foil, overall shield C-shield tin-coated	5 m	STL-1205-G05MQ	6026005
		10 m	STL-1205-G10MQ	6026007
		12 m	STL-1205-G12MQ	6032635
	Head A: male connector, M12, 5-pin, angled, B-coded Head B: cable Cable: PROFIBUS, suitable for drag chain, PUR, shielded, 2 x 0.64 mm², Ø 7.8 mm	5 m	STL-1205-W05MQ	6041426
		10 m	STL-1205-W10MQ	6041427
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: cable Cable: EtherNet/IP, PUR, halogen-free, shielded, 2 x 2 x 0.14 mm², Ø 6.4 mm	2 m	STL-1204-G02ME90	6045284
		5 m	STL-1204-G05ME90	6045285
		10 m	STL-1204-G10ME90	6045286
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: cable Cable: EtherNet/IP, PUR, halogen-free, shielded, 2 x 2 x 0.14 mm², Ø 6.4 mm	2 m	STL-1204-W02ME90	6047912
		5 m	STL-1204-W05ME90	6047913
		10 m	STL-1204-W10ME90	6047914
		25 m	STL-1204-W20ME90	6047915
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: cable Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm², Ø 6.5 mm	2 m	STL-1204-G02MZ90	6048247
		5 m	STL-1204-G05MZ90	6048248
		10 m	STL-1204-G10MZ90	6048249
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: cable Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm², Ø 6.5 mm	2 m	STL-1204-W02MZ90	6048256
		5 m	STL-1204-W05MZ90	6048257
		10 m	STL-1204-W10MZ90	6048258
		25 m	STL-1204-W25MZ90	6048259

Female connectors (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: female connector, M12, 4-pin, straight, unshielded, for power supply, for cable diameter 4 mm ... 6 mm Head B: -	DOS-1204-G	6007302
	Head A: female connector, M12, 5-pin, straight, unshielded, for cable diameter 4 mm ... 6 mm Head B: -	DOS-1205-G	6009719
	Head A: female connector, M12, 4-pin, angled, unshielded, for power supply, for cable diameter 3 mm ... 6.5 mm Head B: -	DOS-1204-W	6007303
	Head A: female connector, M12, 8-pin, straight, A-coded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: –40 °C ... +85 °C	DOS-1208-GA01	6045001
	Head A: female connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: –20 °C ... +130 °C	DOS-2312-G	6027538
	Head A: female connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: –40 °C ... +125 °C	DOS-2312-G02	2077057
	Head A: female connector, M23, 12-pin, angled, shielded, for cable diameter 4.2 mm ... 6.6 mm Head B: - Operating temperature: –20 °C ... +130 °C	DOS-2312-W01	2072580
	Head A: female connector, M12, 5-pin, straight, B-coded, shielded, PROFIBUS, for cable diameter 4 mm ... 9 mm Head B: -	DOS-1205-GQ	6021353
	Head A: female connector, M12, 5-pin, angled, B-coded, shielded, PROFIBUS, for cable diameter 4 mm ... 8 mm Head B: -	DOS-1205-WQ	6041429
	Head A: female connector, M12, 5-pin, straight, shielded, CANopen, DeviceNet, for cable diameter 4.5 mm ... 7 mm Head B: -	DOS-1205-GA	6027534
	Head A: female connector, M12, 4-pin, straight, D-coded, shielded, EtherNet/IP, for cable diameter 4 mm ... 8 mm Head B: -	DOS-1204-GE	6048153
	Head A: female connector, M12, 4-pin, angled, D-coded, shielded, EtherNet/IP, for cable diameter 4 mm ... 8 mm Head B: -	DOS-1204-WE	6048154
	Head A: female connector, M12, 4-pin, straight, D-coded, shielded, PROFINET, EtherCAT, for cable diameter 4 mm ... 8 mm	DOS-1204-GZ	6048263
	Head A: female connector, M12, 4-pin, angled, D-coded, shielded, PROFINET, EtherCAT, for cable diameter 4 mm ... 8 mm	DOS-1204-WZ	6048264

Cables (ready to assemble)

Figure	Brief description	Length of cable	Type	Part no.
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, shielded, 2 x 0.25 mm², Ø 8.0 mm	By the meter	LTG-2102-MW	6021355
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm², Ø 5.6 mm		LTG-2308-MWENC	6027529
	Head A: cable Head B: cable Cable: PUR, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 1 x 0.14 mm², Ø 7.5 mm		LTG-2411-MW	6027530
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 2 x 0.14 mm², Ø 7.8 mm		LTG-2512-MW	6027531
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, resistant to UV and salt water, 4 x 2 x 0.25 mm² + 2 x 0.5 mm² + 2 x 0.14 mm², Ø 7.8 mm		LTG-2612-MW	6028516

Other plug connectors and cables

Figure	Brief description	Type	Part no.
	A3M60 accessory sales set comprising: Female cable connector supply voltage M12 angled (6007303) Female cable connector M12 angled (6041429) Male cable connector M12 angled (6041428)	DOS-3XM12-W	2058177
	Head A: female connector, M12, 4-pin, D-coded Head B: female connector, RJ45, 8-pin Cable: shielded Switch cabinet feedthrough	Feedthrough female connector Ethernet RJ45	6048180
	Head A: male connector, M12, 4-pin, straight, B-coded Cable: PROFIBUS terminator	STE-END-Q	6021156

Male connectors (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: male connector, M12, 5-pin, straight, unshielded, for cable diameter 4 mm ... 6 mm Head B: -	STE-1205-G	6022083
	Head A: male connector, M12, 5-pin, straight, B-coded, shielded, for cable diameter 4 mm ... 9 mm Head B: -	STE-1205-GQ	6021354
	Head A: male connector, M12, 8-pin, straight, A-coded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: –40 °C ... +85 °C	STE-1208-GA01	6044892
	Head A: male connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: –20 °C ... +130 °C	STE-2312-G	6027537
	Head A: male connector, M23, 12-pin, straight, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: –40 °C ... +125 °C	STE-2312-G01	2077273
	Head A: male connector, M12, 5-pin, angled, B-coded, shielded, PROFIBUS, for cable diameter 4 mm ... 8 mm Head B: -	STE-1205-WQ	6041428

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Figure	Brief description	Type	Part no.
	Head A: male connector, M12, 5-pin, straight, A-coded, shielded, CANopen, DeviceNet, for cable diameter 4 mm ... 8 mm Head B: -	STE-1205-GA	6027533
	Head A: male connector, M12, 5-pin, straight, shielded Cable: CANopen terminator	STE-1205-GKEND	6037193
	Head A: male connector, RJ45, 8-pin, straight, shielded, EtherNet/IP, for cable diameter 4.5 mm ... 8 mm Head B: -	STE-0J08-GE	6048150
	Head A: male connector, M12, 4-pin, straight, D-coded, shielded, EtherNet/IP, for cable diameter 4 mm ... 8 mm Head B: -	STE-1204-GE01	6048151
	Head A: male connector, M12, 4-pin, angled, D-coded, shielded, EtherNet/IP, for cable diameter 4 mm ... 8 mm Head B: -	STE-1204-WE	6048152
	Head A: male connector, RJ45, 4-pin, straight, shielded, PROFINET, EtherCAT, or cable diameter 4.5 mm ... 8 mm	STE-0J04-GZ	6048260
	Head A: male connector, M12, 4-pin, straight, D-coded, shielded, PROFINET, EtherCAT, for cable diameter 4 mm ... 8 mm	STE-1204-GZ	6048261
	Head A: male connector, M12, 4-pin, angled, D-coded, shielded, PROFINET, EtherCAT, for cable diameter 4 mm ... 8 mm	STE-1204-WZ	6048262

Connection cables with female and male connector

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M23, 12-pin, straight Head B: male connector, D-Sub, 9-pin, straight Cable: shielded, 4 x 2 x 0.08 mm²	0.5 m	DSL-3D08-G0M5AC3	2046580
	Head A: female connector, M12, 5-pin, straight Head B: male connector, M12, 5-pin, straight Cable: CANopen, suitable for drag chain, PUR, halogen-free, shielded, 2 x 0.34 mm² + 2 x 0.25 mm² + 1 x 0.34 mm², Ø 6.7 mm, A-coded	2 m	DSL-1205-G02MY	6053044
		5 m	DSL-1205-G05MY	6053045
		10 m	DSL-1205-G10MY	6053046

Connection cables with male and male connector

Figure	Brief description		Type	Part no.
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: male connector, M12, 4-pin, straight, D-coded Cable: EtherNet/IP, PUR, halogen-free, shielded, 2 x 2 x 0.14 mm², Ø 6.4 mm	2 m	SSL-1204-G02ME90	6045222
		5 m	SSL-1204-G05ME90	6045277
		10 m	SSL-1204-G10ME90	6045279
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: male connector, M12, 4-pin, straight, D-coded Cable: EtherNet/IP, PUR, halogen-free, shielded, 2 x 2 x 0.14 mm², Ø 6.4 mm	2 m	SSL-1204-H02ME90	6047908
		5 m	SSL-1204-H05ME90	6047909
		10 m	SSL-1204-H10ME90	6047910
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: male connector, RJ45, 8-pin, straight Cable: EtherNet/IP, PUR, halogen-free, shielded, 2 x 2 x 0.14 mm², Ø 6.4 mm	2 m	SSL-2J04-G02ME60	6047916
		5 m	SSL-2J04-G05ME60	6047917
		10 m	SSL-2J04-G10ME60	6047918
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: male connector, RJ45, 8-pin, straight Cable: EtherNet/IP, PUR, halogen-free, shielded, 2 x 2 x 0.14 mm², Ø 6.4 mm	2 m	SSL-2J04-H02ME	6047911
		5 m	SSL-2J04-H05ME	6045287
		10 m	SSL-2J04-H10ME	6045288
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: male connector, M12, 4-pin, straight Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm², Ø 6.5 mm	2 m	SSL-1204-F02MZ90	6048250
		5 m	SSL-1204-F05MZ90	6048251
		10 m	SSL-1204-F10MZ90	6048252

Figure	Brief description		Type	Part no.
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: male connector, M12, 4-pin, straight Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm², Ø 6.5 mm	2 m	SSL-1204-G02MZ90	6048241
		5 m	SSL-1204-G05MZ90	6048242
		10 m	SSL-1204-G10MZ90	6048243
	Head A: male connector, RJ45, 4-pin, straight, D-coded Head B: male connector, M12, 4-pin, angled Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm², Ø 6.5 mm	2 m	SSL-2J04-F02MZ	6048253
		5 m	SSL-2J04-F05MZ	6048254
		10 m	SSL-2J04-F10MZ	6048255
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: male connector, RJ45, 4-pin, straight Cable: PROFINET, EtherCAT, PVC, shielded, 4 x 0.34 mm², Ø 6.5 mm	2 m	SSL-2J04-G02MZ60	6048244
		5 m	SSL-2J04-G05MZ60	6048245
		10 m	SSL-2J04-G10MZ60	6048246

Additional accessories

Spare parts

Figure	Brief description	Type	Part no.
	Spare mounting set for MRA-G190 (10 m EcoLine)	BEF-MK-MRA-G01	5326294

Programming and configuration tools

Figure	Brief description	Type	Part no.
	Programming unit [1] USB, for programmable SICK AFS60, AFM60, DFS60, VFS60, DFV60 encoders, and wire draw encoders with programmable encoders.	PGT-08-S	1036616
	Programming unit display for programmable SICK DFS60, VFS60, DFV60, AFS/AFM60, AHS/AHM36 encoders, and wire draw encoders with DFS60, AFS/AFM60, and AHS/AHM36. Compact dimensions, low weight, and intuitive operation.	PGT-10-Pro	1072254

[1] Can be used with programmable incremental and absolute encoders in combination with the designated adapter cable.

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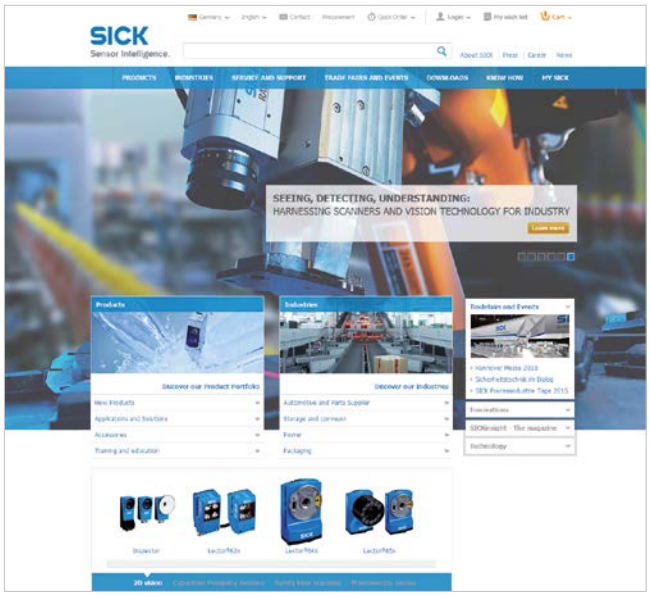

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