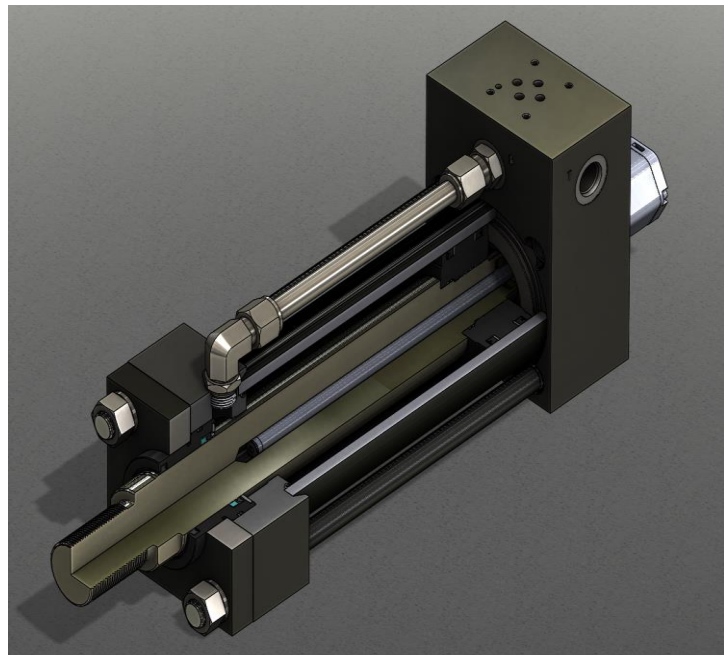




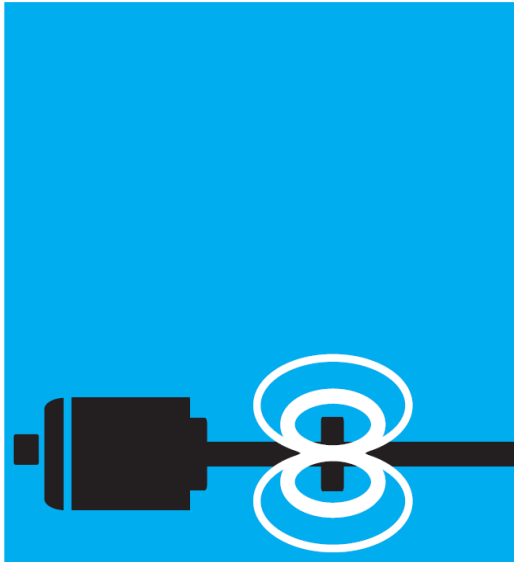
# Peninsular and Balluff Partnered for Performance





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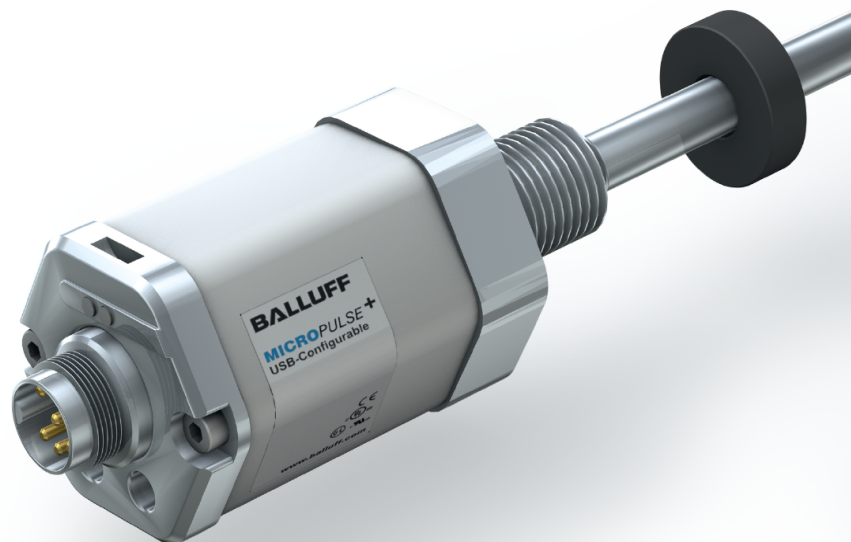
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# Micropulse Transducers

## Rod

Rod style transducers are mainly used in hydraulic cylinder applications. When installed in the pressure section of the hydraulic cylinder, the displacement sensor requires the same pressure rating as the actual hydraulic cylinder. In practice, the sensor must be able to withstand pressures up to 1000 bar. The electronics are integrated in an aluminum or stainless steel housing and the waveguide in a pressure-resistant tube made from nonmagnetic stainless steel that is sealed off at the front end with a welded plug. An O-ring seal in the flange at the opposite end seals off the high-pressure section. An magnet ring with magnets slides over the tube or rod with internal waveguide to mark the position prior to detection.



Rod BTL7  
General data

# Stroke lengths up to 7620 mm

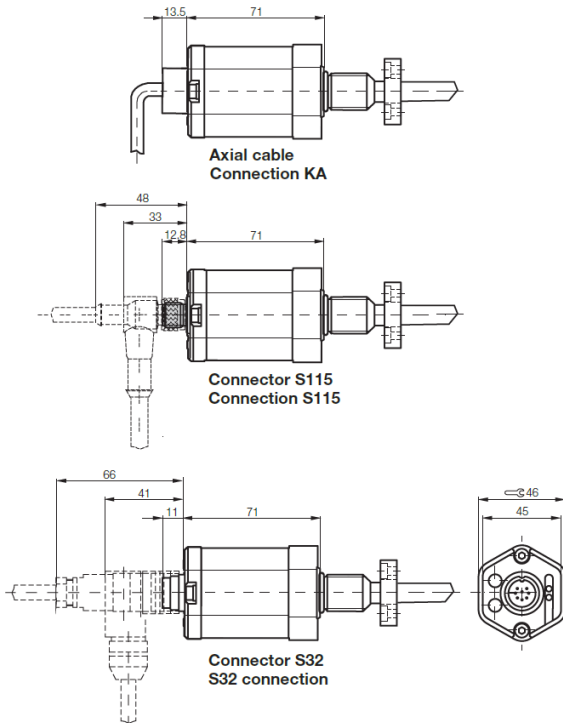
**Pressure-resistant to 600 bar (8700 psi), high repeatability, non-contact, robust**

The Micropulse BTL7 Transducer is a robust position feedback system for measuring ranges between 25 and 7620 mm as well as for use under extreme ambient conditions.

The actual measurement section is protected inside a high-pressure resistant stainless steel tube. The system is ideal for use in hydraulic cylinders for position feedback or as a level monitor with aggressive media in the food and chemical industries.

Series	Rod BTL7
Shock load	150 g/6 ms as per EN 60068-2-27
Vibration	20 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	yes
Overvoltage protected	TransZorb protection diodes
Dielectric strength	500 V AC (GND to housing)
Degree of protection as per IEC 60529	IP 68 with cable outlet, IP 67 with screwed-on connector BKS-S...
Housing material	Anodized aluminum/1.4571 stainless steel outer tube, 1.3952 stainless steel cast flange
Fasteners	Style B thread M18x1.5, style Z 3/4"-16UNF
Pressure rating	
with 10.2 mm protective tube	600 bar (8700 psi) with installation in hydraulic cylinder
with 8 mm protective tube	250 bar (3600 psi) installed in hydraulic cylinder
Connection	Connector or cable connection
EMC testing	
Radio interference emission	EN 55016-2-3 (Industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Rapid, transient electrical pulses (burst)	IEC 61000-4-4 Severity level 3
Surge voltage	EN 61000-4-5 Severity level 2
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Magnetic fields	EN 61000-4-8 Severity level 4
Standard nominal strokes [mm] with 8 mm outer tube, the max. nominal stroke is 1016 mm	0025...7520 mm in 1 mm increments

Please order separately:  
USB communication box, page 150



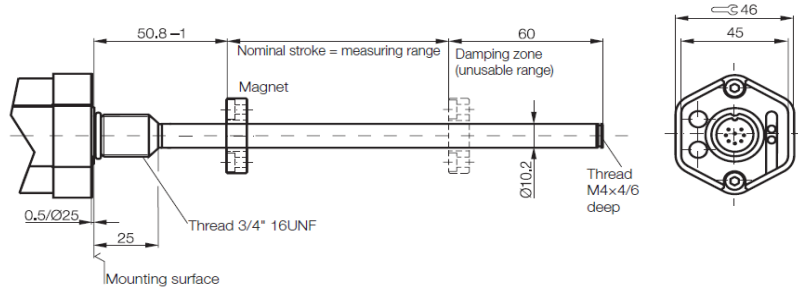
**Rod BTL7**  
**General data**

**Style Z**

(standard design)

BTL7-----Z-----

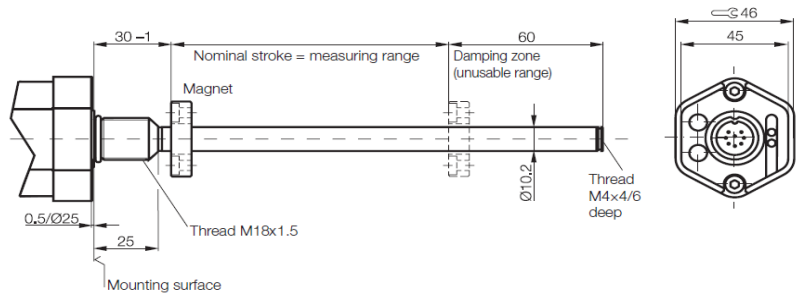
3/4" UNF mounting thread



**Style B**

BTL7-----B-----

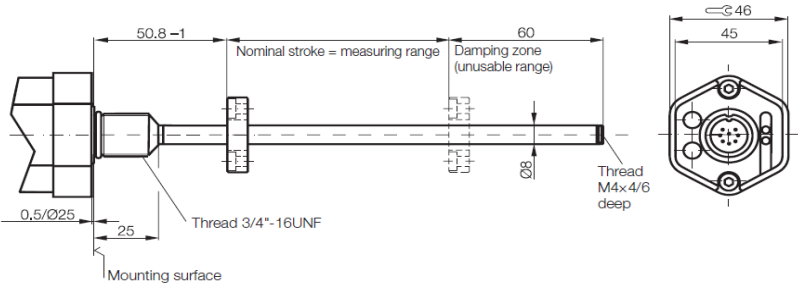
Metric mounting thread M18x1.5



**Style Z8**

BTL7-----Z8-----

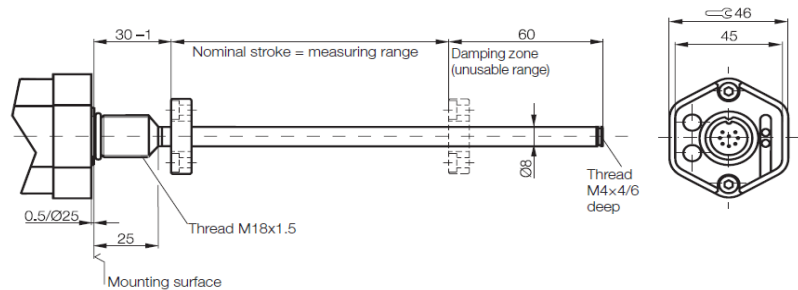
3/4" UNF mounting thread  
 8 mm protective tube  
 Max. 1016 mm nominal stroke



**Style B8**

BTL7-----B8-----

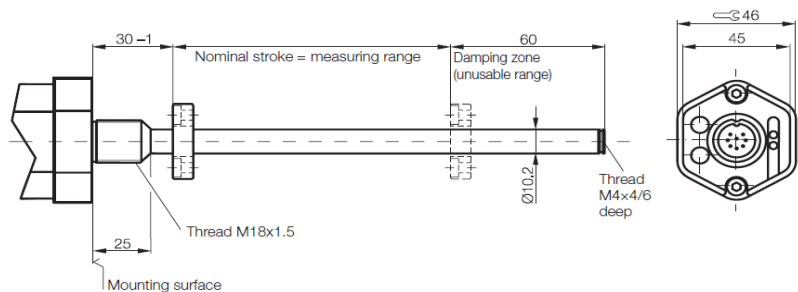
Metric mounting thread M18x1.5  
 8 mm protective tube  
 Max. 1016 mm nominal stroke



**Style A**

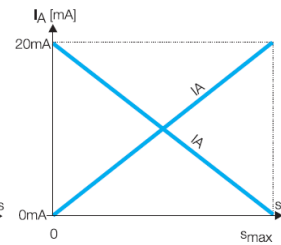
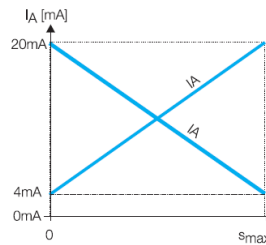
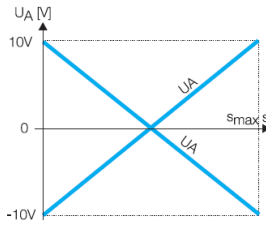
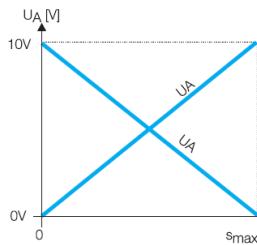
BTL7-----A-----

Metric mounting thread M18x1.5  
 Flange without  
 0.5/Ø 25 mm mounting surface



# Rod BTL7 Analog interface

Rod BTL7 Analog <b>A</b> Analog BTL7-A510-M_----- 0...10 V and 10...0 V	Rod BTL7 Analog <b>G</b> Analog BTL7-G510-M_----- -10...10 V and 10...-10 V	Rod BTL7 Analog <b>E</b> Analog BTL7-E5_0-M_----- 4...20 mA or 20...4 mA	Rod BTL7 Analog <b>C</b> Analog BTL7-C5_0-M_----- 0...20 mA or 20...0 mA
Max. 5 mA ≤ 5 mV <sub>pp</sub>	Max. 5 mA ≤ 5 mV <sub>pp</sub>		
≤ 0.33 mV ≤ 5 μm	≤ 0.33 mV ≤ 5 μm	≤ 500 ohms ≤ 0.66 μA ≤ 5 μm	≤ 500 ohms ≤ 0.66 μA ≤ 5 μm
System resolution/min. 2 μm Max. 4 kHz	System resolution/min. 2 μm Max. 4 kHz	System resolution/min. 2 μm Max. 4 kHz	System resolution/min. 2 μm Max. 4 kHz
±50 μm to ≤ 500 mm nominal stroke ±0.01% 501...5500 mm nominal stroke ±0.02% FS > 5500 mm nominal stroke ≤ 30 ppm/K	±50 μm to ≤ 500 mm nominal stroke ±0.01% 501...5500 mm nominal stroke ±0.02% FS > 5500 mm nominal stroke ≤ 30 ppm/K	±50 μm to ≤ 500 mm nominal stroke ±0.01% 501...5500 mm nominal stroke ±0.02% FS > 5500 mm nominal stroke ≤ 30 ppm/K	±50 μm to ≤ 500 mm nominal stroke ±0.01% 501...5500 mm nominal stroke ±0.02% FS > 5500 mm nominal stroke ≤ 30 ppm/K
20...28 V DC ≤ 150 mA	20...28 V DC ≤ 150 mA	20...28 V DC ≤ 150 mA	20...28 V DC ≤ 150 mA
yes yes	yes yes	yes yes	yes yes
500 V AC (ground to housing) -40...+85 °C	500 V AC (ground to housing) -40...+85 °C	500 V AC (ground to housing) -40...+85 °C	500 V AC (ground to housing) -40...+85 °C



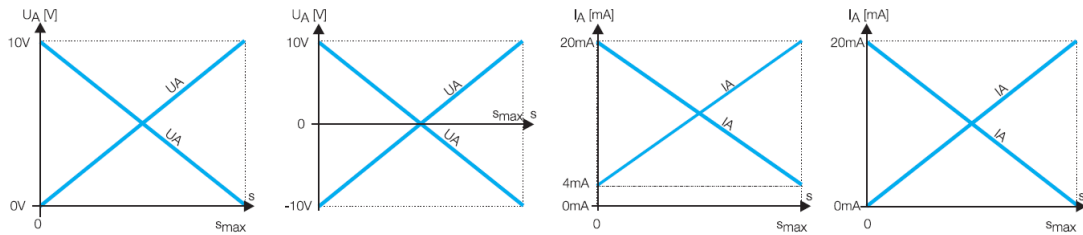
### Ordering example:

BTL7- 0-M\_-----

	Output signal	Operating voltage	Characteristic	Standard nominal stroke [mm]	Design	Connection
A	0...10 V and 10...0 V	5 10...30 V	1 rising and falling (output types A and G only)	0025...7620 in 1 mm increments	Z = Standard, 3/4"-16 UNF mounting threads ZM = Standard, Rapid Replacement Module (RRM) option. See page 148	S115 Connector 8-Pin M12 S32 Connector 8-Pin M16 (DIN)
G	-10...10 V and 10...-10 V		0 rising (output types C and E only)		B = Metric, M18x1.5 mounting threads BM = Metric, Rapid Replacement Module (RRM) option. See page 148	KA02 PUR cable 2 m KA05 PUR cable 5 m KA10 PUR cable 10 m KA15 PUR cable 15 m
E	4...20 mA or 20...4 mA		7 falling (output types C and E only)			
C	0...20 mA or 20...0 mA				Additional designs on page 139	

**MICROPULSE** + Rod BTL7  
Analog interface

Rod BTL7	Rod BTL7
Analog	Analog
<b>A</b>	<b>E</b>
Analog	Analog
BTL7-A501-M_ _ _ _ _	BTL7-E501-M_ _ _ _ _
0...10 V and 10...0 V	4...20 mA and 20...4 mA
-10...10 V and 10...-10 V	0...20 mA and 20...0 mA
Max. 5 mA	
$\leq 5$ mV <sub>pp</sub>	
	$\leq 500$ ohms
$\leq 0.33$ mV	$\leq 0.66$ $\mu$ A
$\leq 150$ mA	$\leq 180$ mA
$\leq 5$ $\mu$ m	$\leq 5$ $\mu$ m
System resolution/min. 2 $\mu$ m	System resolution/min. 2 $\mu$ m
Max. 4 kHz	Max. 4 kHz
$\pm 50$ $\mu$ m to $\leq 500$ mm nominal stroke	$\pm 50$ $\mu$ m to $\leq 500$ mm nominal stroke
$\pm 0.01\%$ FS > 500...5500 mm nominal stroke	$\pm 0.01\%$ FS > 500... $\leq 5500$ mm nominal stroke
$\pm 0.02\%$ FS > 5500 mm nominal stroke	$\pm 0.02\%$ FS > 5500 mm nominal stroke
$\leq 30$ ppm/K	$\leq 30$ ppm/K
10...30 V DC	10...30 V DC
yes	yes
yes	yes
500 V AC (ground to housing)	500 V AC (ground to housing)
-40...+85 °C	-40...+85 °C



**Ordering example:**

**BTL7-501-M\_ \_ \_ \_ \_**

	Output signal	Standard nominal stroke [mm]	Design	Connection
A	0...10 V and 10...0 V	0025...7620 in 1 mm increments	Z = Standard, 3/4"-16 UNF mounting threads	S115 Connector 8-Pin M12
E	4...20 mA and 20...4 mA		ZM = Standard, Rapid Replacement Module (RRM) option. See page 148	S32 Connector 8-Pin M16 (DIN)
			B = Metric, M18x1.5 mounting threads	KA02 PUR cable 2 m
			BM = Metric, Rapid Replacement Module (RRM) option. See page 148	KA05 PUR cable 5 m
				KA10 PUR cable 10 m
				KA15 PUR cable 15 m

## USB configuration

### System requirements

- Standard PC
- Operating system: Windows 2000/XP/Vista/7
- Screen resolution at least 1024 × 768 pixels
- 10 MB available hard disk space
- Install Java Runtime Environment (JRE) Version 1.4.2 or higher  
<http://java.com/getjava>
- USB port

### Start, end value setting and configuration via USB

The Micropulse Configuration Tool software allows the quick and easy configuration of Balluff transducers of type BTL7-A/E501... on a PC. The most important features include:

- Online display of the current position of the magnet
- Graphic support for setting the functions and characteristics
- Display of information about the connected transducers
- Selectable number formats and units for display
- Reset to factory settings possible
- Demo mode without having a transducer connected

### Connecting the USB communication box

For models BTL7-A/E501-M...-P-S32 and -S115 transducers, the communication box can be switched between the transducer and the controller. The communication box is connected to the PC using a USB cable.

### USB communication box

#### BTL7-A-CB01-USB-S32,

for BTL7-A/E501... with S32 connector

#### BTL7-A-CB01-USB-S115,

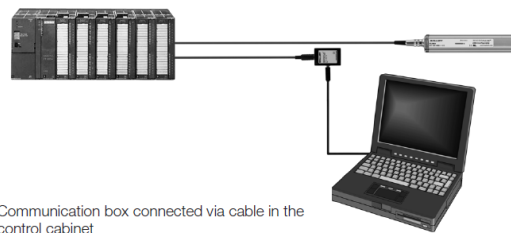
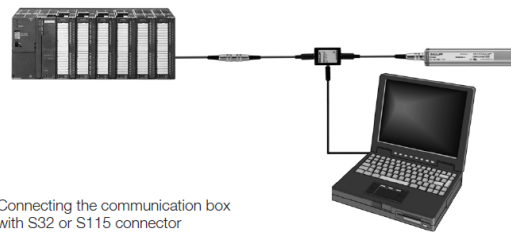
for BTL7-A/E501... with Connector S115

#### BTL7-A-CB01-USB-KA,

for BTL7-A/E501... with cable connection

### Scope of delivery

- USB communication box
- Cable set
- Quick start instructions





Rod BTL7  
Analog interface (USB configurable version)

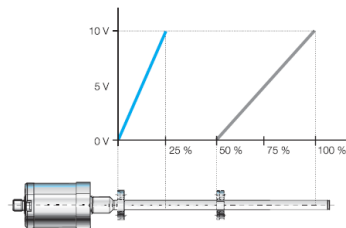
Field-programmable

**Position and velocity**

Two outputs can be assigned any position value and velocity signal using the USB interface.

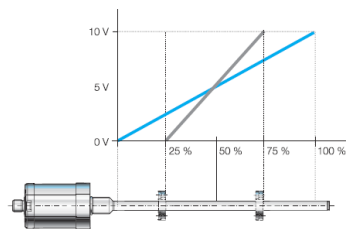
**Mode examples:**

**Double magnet**



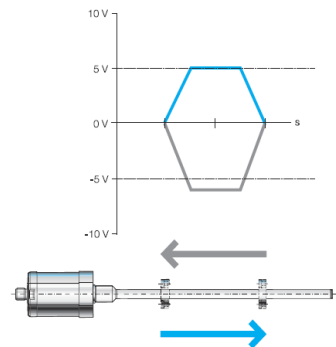
2 magnets, 2 movements, 2 output signals

**Differential**



Differential signal between 2 magnets, position and difference possible

**Velocity**



Velocity output

Series	
Output signal	
Transducer interface	
Position signal interface, customer device	
Part number	
Output signal default setting	
Output signal can be adjusted via Configurable USB	
Load current	
Max. residual ripple	
Load resistance	
System resolution	
Current consumption at 24 V DC	
Hysteresis	
Repeat accuracy	
Sampling rate, length-dependent	
Max. linearity deviation	
Temperature coefficient	
Supply voltage	
Polarity reversal protected	
Overvoltage protected	
Dielectric strength	
Operating temperature	

**Micropulse® USB configurable BTL7-A/E501**

- Simple configuration and adjustment of the start and end point via the USB interface, quick startup
- "Easy Setup" for manual adjustment on-site
- Configurable dual output functions, position and speed
- Increased operating reliability with status LEDs for indicating the operating status and diagnostic information
- Extended application range due to high degree of protection IP 68 (cable version)
- Compact housing
- Error signals, no magnet within measuring range

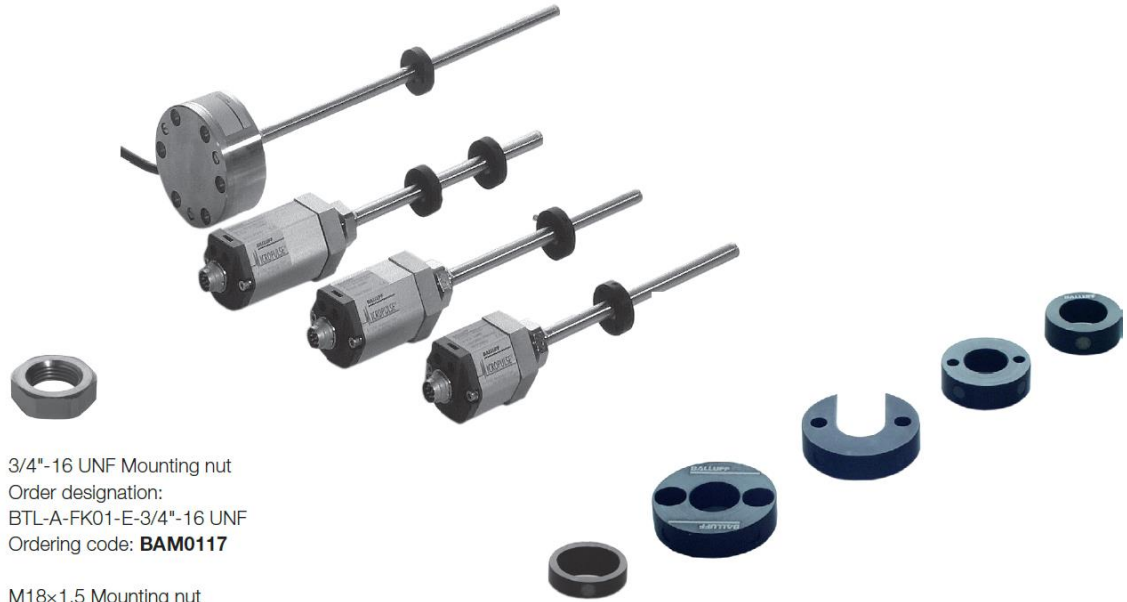
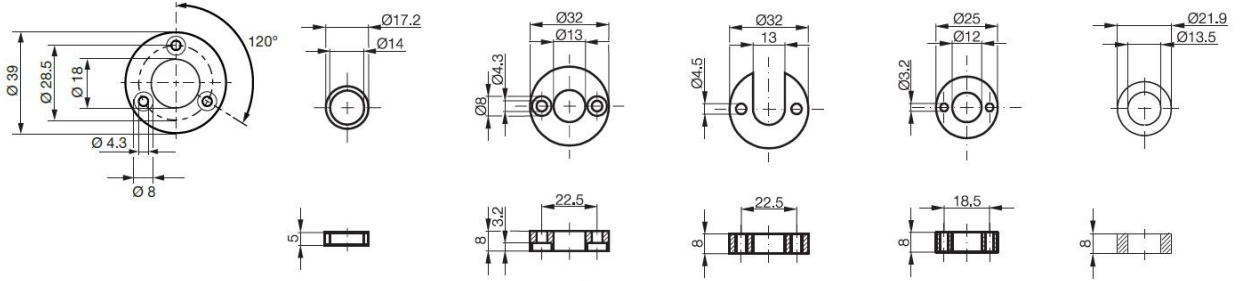
Please enter code for output signal, nominal stroke, design and connection in the part number.

**Scope of delivery**

- Transducer
- Calibration device
- Quick start instructions

Please order separately:  
 USB communication box, page 145  
 Magnets/floats, page 166  
 Mounting nuts, page 167  
 Connectors, page 236

<b>Magnet</b>
BTL rod
<b>BAM013L</b>
BTL-P-1013-4R
Aluminum
approx. 12 g
any
-40...+100 °C
<b>BAM013M</b>
BTL-P-1013-4R-PA
PA 60 glass fiber reinforced
approx. 10 g
any
-40...+100 °C

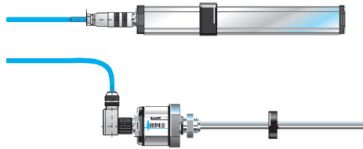


3/4"-16 UNF Mounting nut  
 Order designation:  
 BTL-A-FK01-E-3/4"-16 UNF  
 Ordering code: **BAM0117**

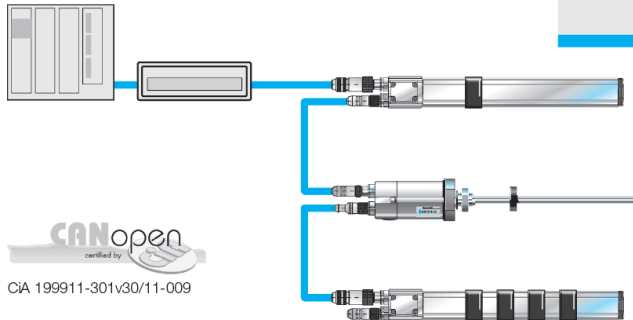
M18x1,5 Mounting nut  
 Order designation:  
 BTL-A-FK01-E-M18x1,5  
 Ordering code: **BAM0118**

Accessories  
Connectors

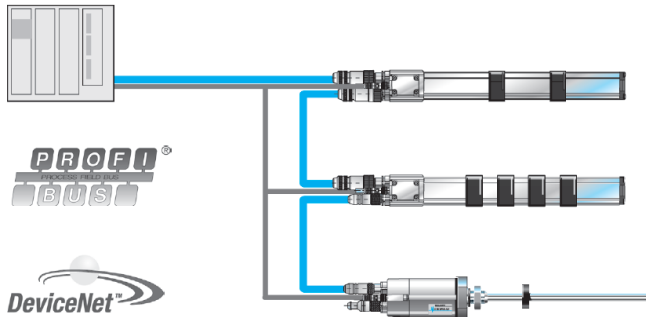
Connector for analog,  
pulse and SSI interfaces



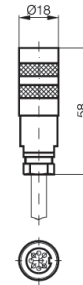
Connectors  
for CANopen interfaces



Connectors for Profibus DP and  
DeviceNet interfaces



Connectors for Series	<b>BKS-S 32M-</b> _ _ BTL_...-S 32 soldered contacts																			
Design	M16, Straight, female																			
Part number	BKS-S 32M- _ _																			
Crimped contacts																				
Solder connection	max. 0.75 mm <sup>2</sup>																			
Housing material	Nickel-plated CuZn																			
Contact	CuZn																			
Contact surface	0.8 µm Au																			
Cable strain relief	PG 9																			
Cable diameter	6...8 mm																			
Cable	LiF9Y-FC-11Y- 0																			
Number of conductors x conductor cross-section	8x0,25 mm <sup>2</sup>																			
Degree of protection as per IEC 60529	IP 67 (when screwed into place)																			
View of female solder side	<table border="1"> <thead> <tr> <th>PIN</th> <th>Color</th> </tr> </thead> <tbody> <tr><td>1</td><td>YE</td></tr> <tr><td>2</td><td>GY</td></tr> <tr><td>3</td><td>PK</td></tr> <tr><td>4</td><td>RD</td></tr> <tr><td>5</td><td>GN</td></tr> <tr><td>6</td><td>BU</td></tr> <tr><td>7</td><td>BN</td></tr> <tr><td>8</td><td>WH</td></tr> </tbody> </table>	PIN	Color	1	YE	2	GY	3	PK	4	RD	5	GN	6	BU	7	BN	8	WH	
PIN	Color																			
1	YE																			
2	GY																			
3	PK																			
4	RD																			
5	GN																			
6	BU																			
7	BN																			
8	WH																			



**BKS-S 33M-\_\_**

BTL\_-...-S 32

soldered contacts

M16, Angled, female

**BKS-S 33M-\_\_**

max. 0.75 mm<sup>2</sup>

Nickel plated ZnAlCu1

CuZn

0.8 μm Au

PG 9

6...8 mm

Lif9Y-FC-11Y- 0

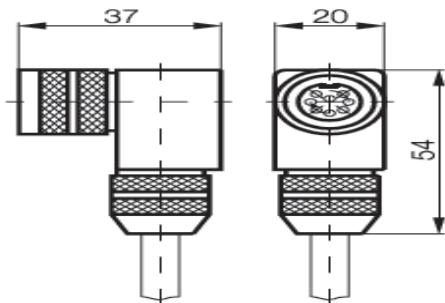
8×0.25 mm<sup>2</sup>

IP 67

(when screwed into place)



PIN	Color
1	YE
2	GY
3	PK
4	RD
5	GN
6	BU
7	BN
8	WH

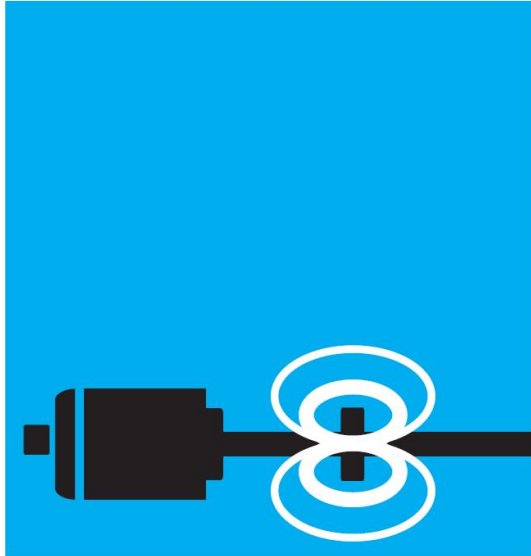


Please include the cable length with the part number.

Code 00 for user-assembly

(please use shielded cable).

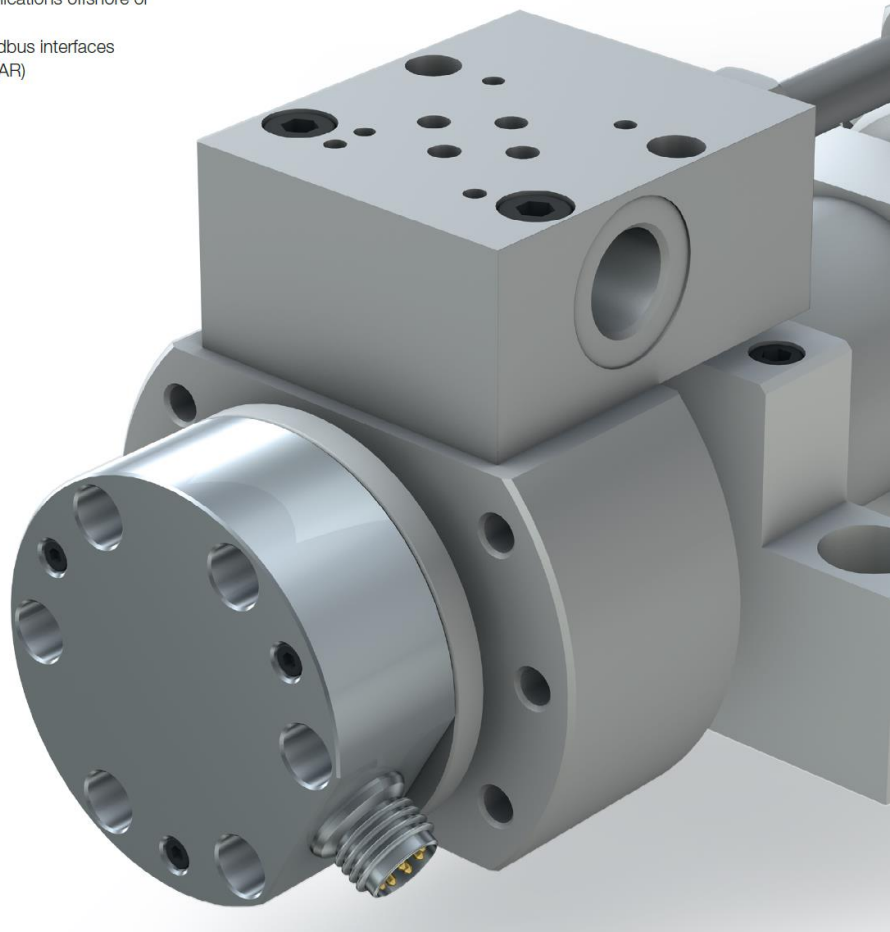
Code 05, 10, 15, 20, 25, 30 m for finished cable assembly.



# Micropulse Transducers

## Compact Rod and AR Rod

- Compact housing saves valuable space in and around the cylinder
- Rugged stainless steel housing
- Shock and vibration-secure with IP 67/68 degree of protection
- Pressure-resistant housing, for extreme applications offshore or under water
- Available with analog signals, digital and fieldbus interfaces
- Complete integration in hydraulic cylinders (AR)



## K BTL7 Compact Rod General data

## Rugged and compact

### Pressure rated to 600 bar (8700 psi), high repeatability, non-contact, robust

The BTL Micropulse Transducer is a robust position feedback system for measuring ranges between 25 and 7620 mm under extreme ambient conditions.

The actual measurement section is protected inside a high-pressure resistant stainless steel tube.

The system is ideal for use in hydraulic cylinders for position feedback or as a level monitor with aggressive media in the food and chemical industries.

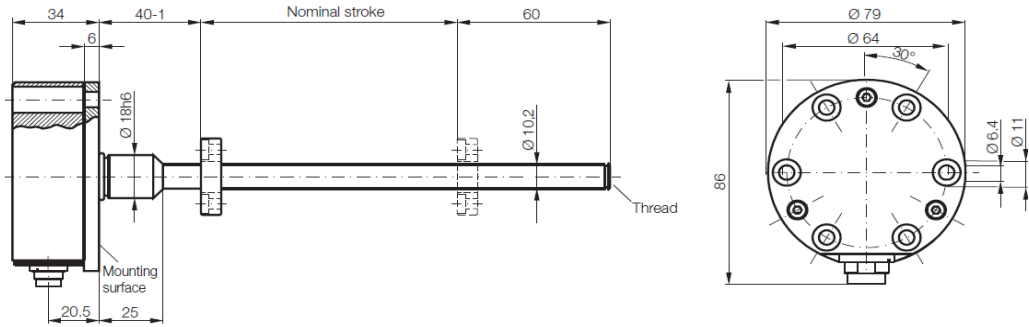
Series	<b>K BTL7 compact rod</b>
Shock load	150 g/6 ms as per EN 60068-2-27
Vibration	20 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	to 36 V
Overvoltage protection	to 36 V
Dielectric strength	500 V AC (GND to housing)
Degree of protection as per IEC 60529	IP 68 with cable outlet, IP 67 with screwed-on connector BKS-S...
Housing material	1.4571 stainless steel outer tube, 1.3952 stainless steel cast flange
Fasteners	Design K, 18h6 with 6 cylinder head screws
Pressure rating	
at 10.2 mm, protective tube	600 bar with installation in hydraulic cylinder
at 8 mm, protective tube	250 bar when installed in hydraulic cylinder
Connection	Connector or cable connection
EMC testing	
Radio interference emission	EN 55016-2-3 (Industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Fast transient interference pulses (BURST)	EN 61000-4-4 Severity level 3
Surge voltage	EN 61000-4-5 Severity level 2
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Magnetic fields	EN 61000-4-8 Severity level 4
Standard nominal strokes [mm] with an 8 mm outer tube, the max. nominal stroke is 1016 mm	0025...7620 mm in 1 mm increments



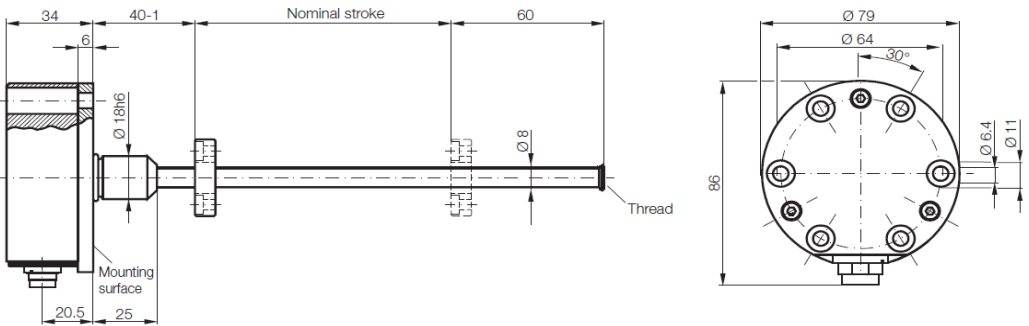
- Bolt-in design
- Stainless steel

**K BTL7 Compact Rod**  
**General data**

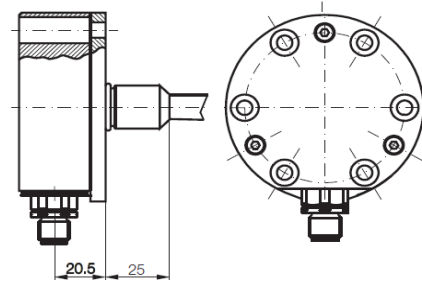
**Design K,  
 BTL7-...-K-SR32**



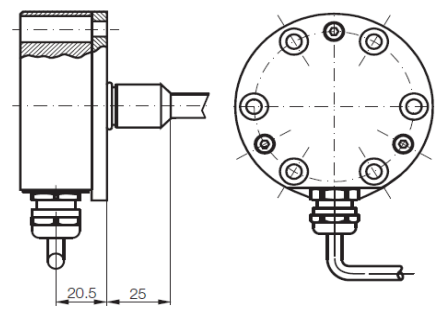
**Design K8,  
 BTL7-...-K8-SR32**



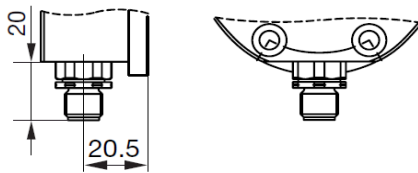
**Design K,  
 BTL7-...-K-SR115**



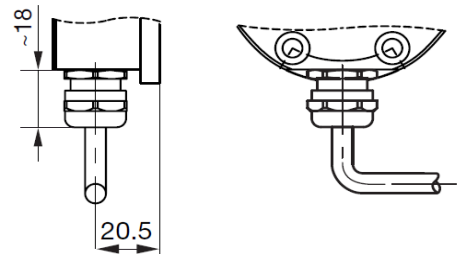
**Design K, BTL7-...-K-K \_\_, radial cable outlet**



**BTL7-...-K-SR115**



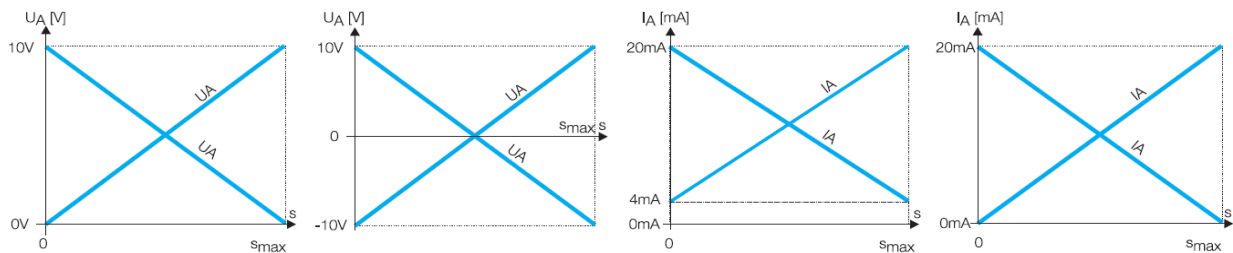
**BTL7...-K-K \_\_**



# Rod Compact BTL7

## General data

Rod Compact BTL7	Rod Compact BTL7	Rod Compact BTL7	Rod Compact BTL7
analog	analog	analog	analog
<b>A</b>	<b>G</b>	<b>E</b>	<b>C</b>
analog	analog	analog	analog
BTL7-A510-M_ _ _ _ _	BTL7-G510-M_ _ _ _ _	BTL5-E5_0-M_ _ _ _ _	BTL7-C5_0-M_ _ _ _ _
0...10 V and 10...0 V	-10...10 V and 10...-10 V	4...20 mA or 20...4 mA	0...20 mA or 20...0 mA
Max. 5 mA	Max. 5 mA		
≤ 0.33 mV	≤ 0.33 mV	≤ 500 ohms	≤ 500 ohms
System resolution/min. 2 μm	System resolution/min. 2 μm	≤ 0.66 μA	≤ 0.66 μA
Max. 4 kHz	Max. 4 kHz	System resolution/min. 2 μm	System resolution/min. 2 μm
±50 μm to ≤ 500 mm nominal stroke	±50 μm to ≤ 500 mm nominal stroke	Max. 4 kHz	Max. 4 kHz
±0.01% FS > 5500 mm nominal stroke	±0.01% FS > 5500 mm nominal stroke	±50 μm to ≤ 500 mm nominal stroke	±50 μm to ≤ 500 mm nominal stroke
±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke	±0.01% FS > 5500 mm nominal stroke	±0.01% FS > 5500 mm nominal stroke
≤ 30 ppm/K	≤ 30 ppm/K	±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke
10...30 V DC	10...30 V DC	≤ 30 ppm/K	≤ 30 ppm/K
≤ 150 mA	≤ 150 mA	10...30 V DC	10...30 V DC
to 36 V	to 36 V	≤ 150 mA	≤ 150 mA
to 36 V	to 36 V	to 36 V	to 36 V
500 V AC (ground to housing)	500 V AC (ground to housing)	to 36 V	to 36 V
-40...+85 °C	-40...+85 °C	500 V AC (ground to housing)	500 V AC (ground to housing)
		-40...+85 °C	-40...+85 °C



### Ordering example:

**BTL7- 5 0-M** \_ \_ \_ \_ \_

Output signal	Characteristic	Commonly specified stroke lengths:	Design	Connection
A 0...10 V and 10...0 V	1 rising and falling (output types A and G)	mm inches mm inches	K bolt-in design 10.2 mm Ø pressure tube 40 mm null point	K-radial design K02 PUR cable 2 m K05 PUR cable 5 m K10 PUR cable 10 m K15 PUR cable 15 m SR32 Connector, 8-pole, M16 SR115 Connector, 8-pole, M12
G -10...10 V and 10...-10 V	0 Rising (output types C and E)	0102 4 3048 120	K8 bolt-in design 8 mm Ø pressure tube 40 mm null point (max. stroke length = 1016 mm)	
E 4...20 mA or 20...4 mA	7 Falling (output types C and E)	0152 6 3353 132	W 3/4"-16 UNF thread-in design 10.2 mm Ø pressure tube 50.8 mm (2") null point	H/W radial design K02 PUR cable 2 m K05 PUR cable 5 m K10 PUR cable 10 m K15 PUR cable 15 m
C 0...20 mA or 20...0 mA		0203 8 3658 144	W8 3/4"-16 UNF thread-in design 8 mm Ø diameter pressure tube 50.8 mm (2") null point (max. stroke length = 1016 mm)	H/W design, axial KA02 PUR cable 2 m KA05 PUR cable 5 m KA10 PUR cable 10 m KA15 PUR cable 15 m S32 Connector, 8-pole, M16 S115 Connector, 8-pole, M12
		0254 10 3962 156		
		0305 12 4267 168		
		0407 16 4572 180		
		0508 20 4877 192		
		0610 24 5182 204		
		0762 30 5486 216		
		0914 36 5791 228		
		1067 42 6096 240		
		1220 48 6401 252		
		1372 54 6706 264		
		1524 60 7010 276	H M18 x 1.5 thread-in design 10.2 mm Ø pressure tube 30 mm null point	
		1829 72 7315 288		
		2134 84 7620 300	H8 M18 x 1.5 thread-in design 8 mm Ø diameter pressure tube 30 mm null point (max. stroke length = 1016 mm)	
		2438 96		

Additional stroke lengths available  
Inch to millimeter conversion:  
Inches x 25.4 = millimeters



**Protection type "n"  
designated "EEx n"**

Devices in this category are intended for use in areas where an explosive atmosphere is not expected. The probability is extremely small. Even if it were to occur, it would be only for a short time. Several methods of flameproofing are combined under the designation.

**Rod series**, analog interface, see page 138/139

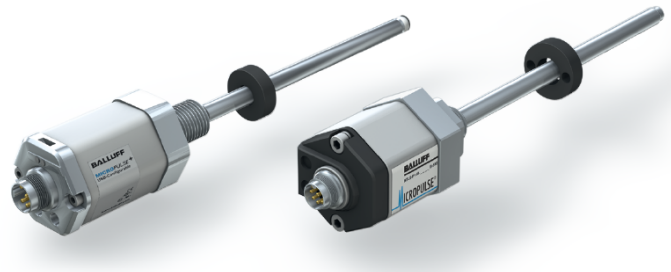
**Ordering example:**

BTL7- -M - -NEX-

	Output signal	Standard nominal stroke [mm]	Design	Connection
A510	0...10 V and 10...0 V	0025...0500 mm	B M18×1.5	S32 with connector plug
E500	4...20 mA, rising	in 1-mm increments	Z 3/4" 16 UNF	S115 with connector plug
E570	20...4 mA, falling		CD M22×1.5	KA05 PUR cable 5 m
C500	0...20 mA, rising		high-pressure resistant	
C570	20...0 mA, falling			

Please enter code for output signal, nominal stroke, design and connection in the part number.

Please order separately:  
Magnet, page 217  
Float, page 216  
Connector, page 236



**ATEX**

II 3 G Ex nA IIC T4 Gc  
II 2 D Ex tb IIIC T135°C Db IP 6x

**IECEX**

Ex nA IIC T4 Gc  
Ex tb IIIC T135°C Db IP6x



**U.S.**

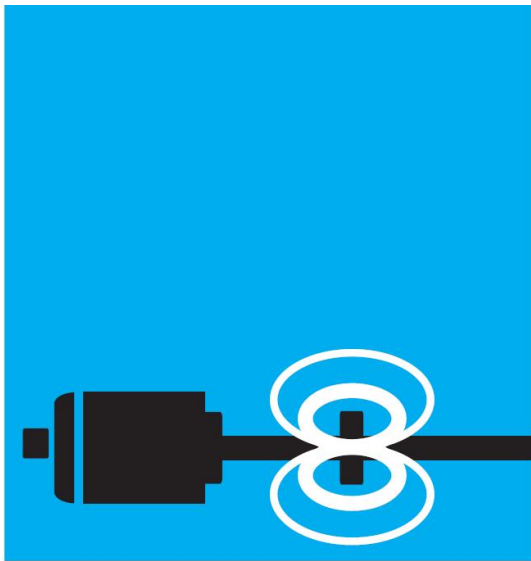
Zone 2, AEx nA IIC Gc T4  
AEx tb IIIC Db T135°C

**Canada**

Class I, Zone 2, Ex nA IIC T4  
Ex tb IIIC T135°C

**NI (non-incendive)**

Class I, Division 2, Groups ABCD  
Class II, Division 2, Groups EFG; T4



# Micropulse Transducers

## Rod EX

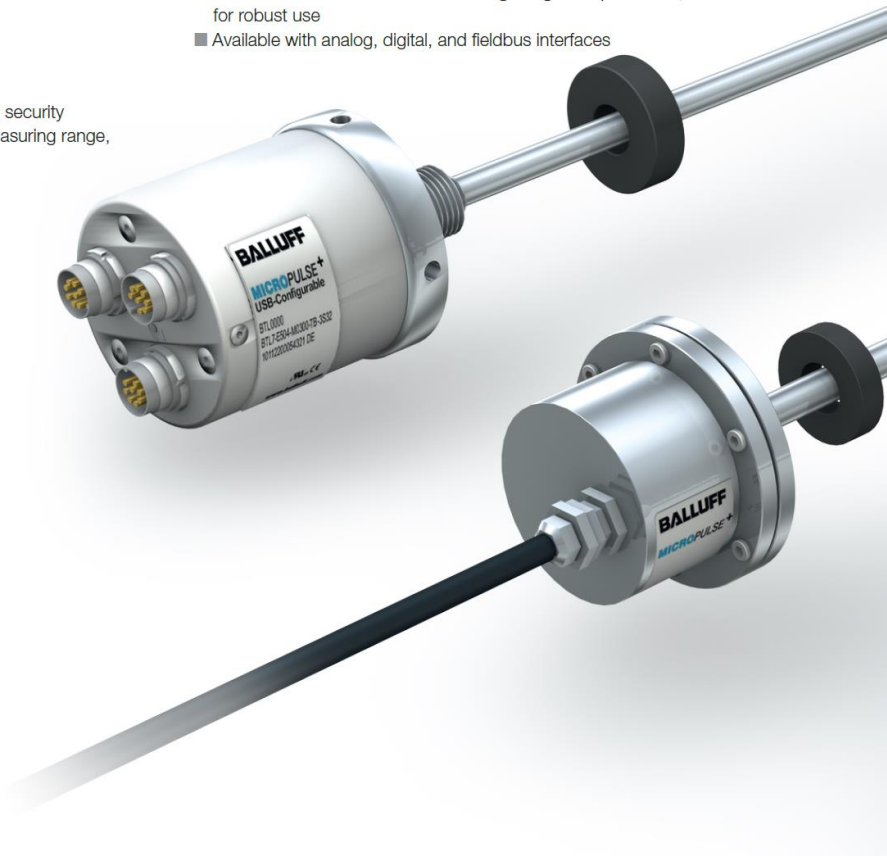
- For use in a potentially explosive environment
- Worldwide approvals:
  - ATEX
  - IECEX
  - North American NEC (TA12 version only)
- With robust stainless steel design
- Can also be used as a filling level sensor

## Rod CD

- Pressure-resistant up to 1000 bar – the sensor for high-pressure hydraulic units
- M22x1.5 mounting thread with 12.7 mm pressure tube
- Measuring lengths up to 2000 mm in 1 mm increments
- Shock- and vibration-resistant with high degree of protection, for robust use
- Available with analog, digital, and fieldbus interfaces

## Rod T Redundant

- 2 or 3 times redundant design for increased security
- Universally programmable via USB – set measuring range, invert signal, configure system, document and transmit configuration
- Mount with M18x1.5 or UNF 3/4" thread or via adapter with connecting flange and 6 cheese head screws



# BTL7 Compact Rod

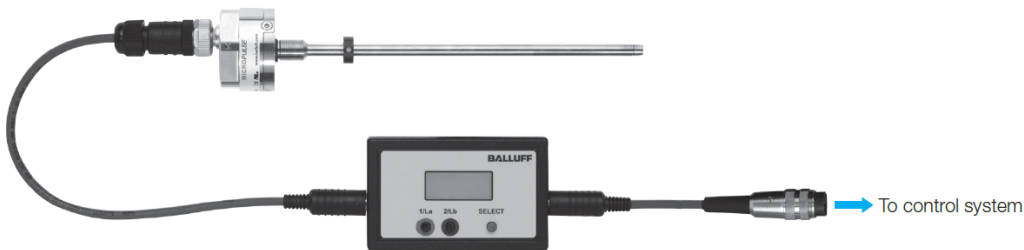
## General data

# Easy field set-up

### Calibration box

Calibration boxes with cable sets	
Part number	Cable set
BTL7-A-CB02	Cable connection
BTL7-A-CB02-S115	Connector S115
BTL7-A-CB02-S32	Connector S32

### Micropulse Transducer BTL7 Rod Compact with "Calibration box" BTL-A-CB02



Set the output characteristic with the calibration box.  
Zero and end point, measuring range, rising or falling characteristic.

### Teach-in

The factory-set zero and end points are replaced by new zero and end points. The zero and end points can be set independently of each other, and the characteristic slope changes.

### Inverting (only with BTL7-C/E)

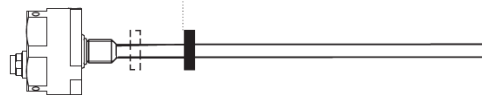
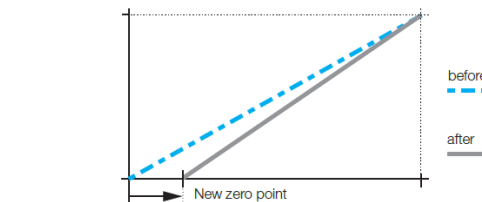
The slope of the current output can be inverted by activating the programming inputs. For example, the rising characteristic of the output becomes a falling characteristic. The voltage outputs are not inverted.

### Adjusting

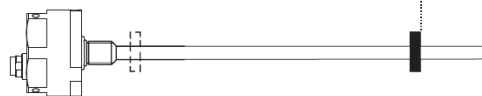
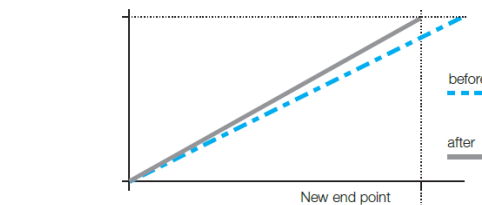
Setting and adjusting the characteristic with stopped magnet. The factory-set zero and end points can be replaced by a new start and end points, and the associated output values can be adjusted. The start and end values can be adjusted as desired to the limits. Adjustment is possible from serial number 120615000xxxx xx.

### Reset

Restoring the transducer to its factory default settings.



Read in new zero point



Read in new end point

## Inductive Sensors with Special Properties Strokemaster sensors

**STROKE**MASTER

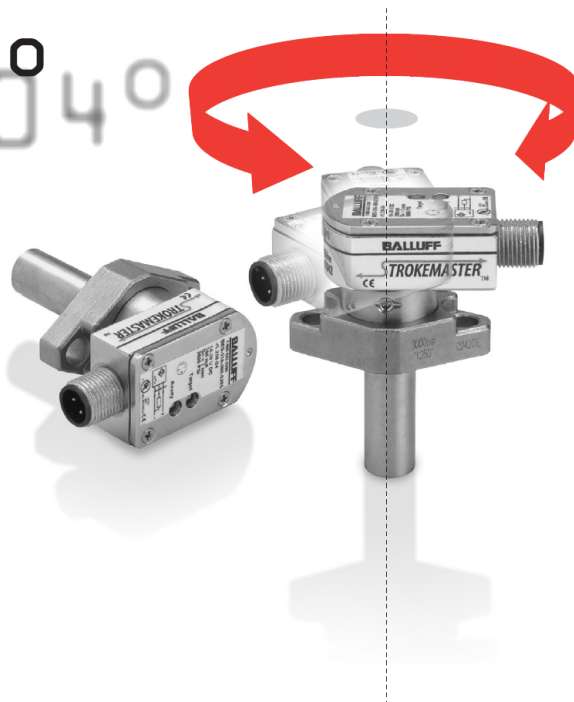
### Strokemaster® Inductive Cylinder Sensors

Balluff's Strokemaster® cylinder-position sensors provide precision end-of-stroke sensing for hydraulic cylinders. The sensor body allows 304° of rotation to eliminate the hassle of post-installation cable management, which in some competitive designs requires unbolting the flange and breaking the hydraulic seal.

A high-pressure, inductive proximity sensor, the Strokemaster provides a 2mm (0.08") sensing range to detect the "spud" of hydraulic/pneumatic cylinders and indicate fully retracted or extended position. It mounts with two socket-head cap screws and seals with a Viton O-ring. Withstanding cylinder pressures up to 3000 PSI (207 bar), the embeddable design keeps most of the switch protected within the cylinder, with only a 0.62" (16 mm) high housing exposed outside.

Strokemaster sensors are available in 3-wire DC and 2-wire AC/DC versions, both with mini or micro connectors. Switching frequency is 50 Hz for the AC/DC versions. All units are weld-field immune, short-circuit, and reverse-polarity protected. They fit popular cylinder designs with standard available probe lengths of 0.912" - 4.560" (23.165mm - 115.8mm). Custom probe lengths can be achieved by using factory spacer kits. Probes are made of stainless steel with a high-strength ceramic face. Both DC and AC/DC sensors have all-metal housings. The Strokemaster sensor is CE-certified, and its housing is sealed to IP67 requirements.

304°



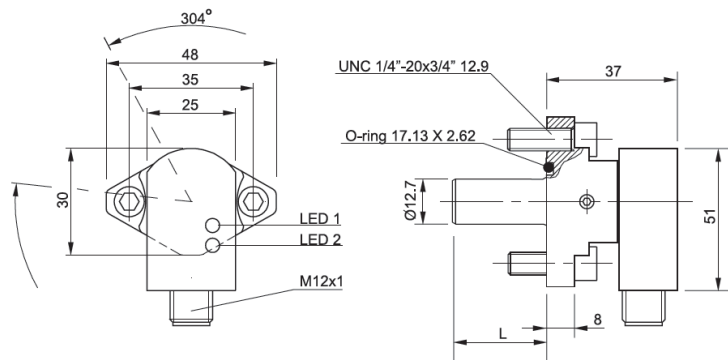
# Inductive Sensors with Special Properties

## Strokemaster DC sensors



Housing size		
Installation type (observe instructions in the Basic Information chapter)		Flush
Rated switching distance $s_n$		<b>2 mm</b>
Assured switching distance $s_a$		0...1.6 mm
PNP, NO	<b>Ordering code</b>	
	Part number	BES 516-300-S 295/0.912"...4.560"-S4
Rated operational voltage $U_e$		24 V DC
Supply voltage $U_B$		10...30 V DC
Voltage drop $U_d$ at $I_e$ max.		$\leq 2.5$ V
Rated insulation voltage $U_i$		75 V DC
Rated operating current $I_e$		200 mA
No-load supply current $I_0$ damped/undamped		$\leq 18$ mA / $\leq 10$ mA
Off-state current $I_r$		$\leq 80$ $\mu$ A
Protected against polarity reversal		Yes
Short circuit/overload protected		Yes/Yes
Load capacitance		$\leq 1.0$ $\mu$ F
Repeat accuracy R		$\leq 5$ %
High pressure rated up to		207 bar (3000 PSI)
Ambient temperature $T_a$		-25...+70 °C
Operating frequency f		10 Hz
Utilization categories		DC 13
Function/Operating voltage indication		Yes/Yes
Degree of protection as per IEC 60529		IP 67
Approvals		cULus
Material	Housing	stainless steel/aluminum
	Sensing surface	ceramic
Connection		M12 connector 4-pin BCC M415-0000-IA-003-EX44T2-020

For wiring diagram see page 958.



# Inductive Sensors with Special Properties

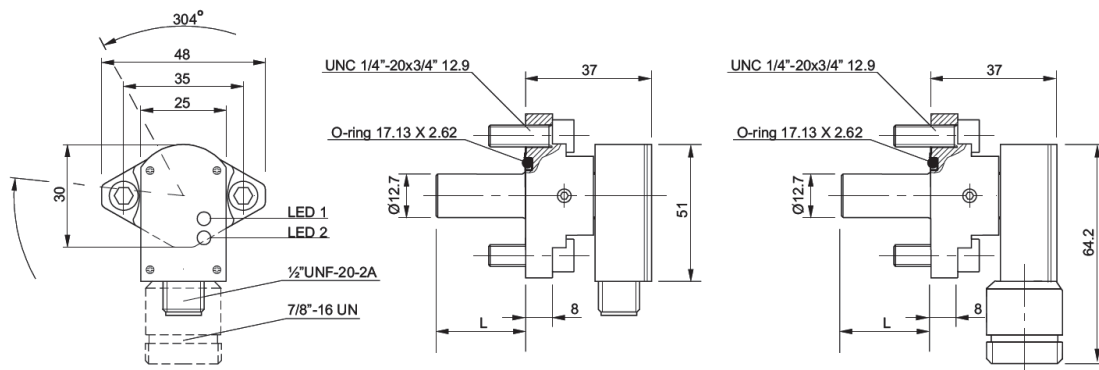
## Strokemaster AC/DC sensors

**STROKEMASTER**



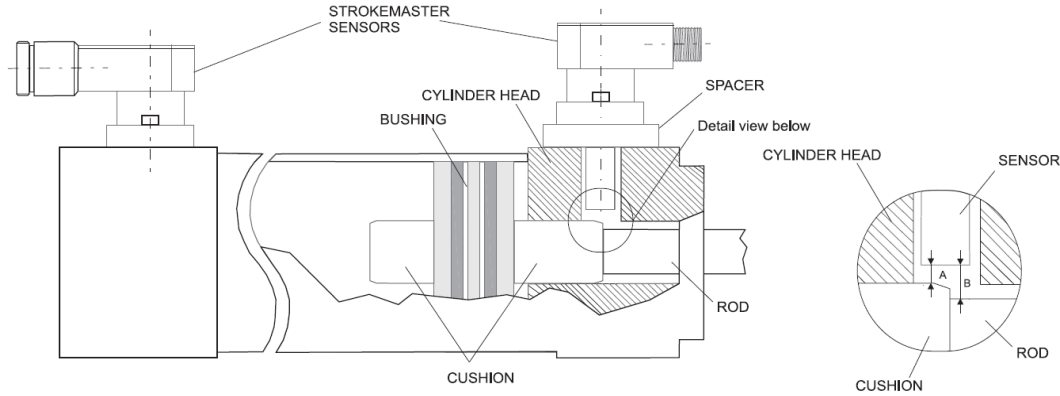
Housing size			
Installation type		Flush	Flush
Rated switching distance $s_n$		<b>2 mm</b>	<b>2 mm</b>
Assured switching distance $s_a$		0...1.6 mm	0...1.6 mm
PNP, NO	<b>Ordering code</b>		
	Part number	BES 516-200-S 2/0.912"...4.560"-S 21	BES 516-200-S 2/0.912"...4.560"-S5
Rated operational voltage $U_e$		110 V AC	110 V AC
Supply voltage $U_B$		20...250 V AC/V DC	20...250 V AC/V DC
Voltage drop $U_d$ at $I_e$		$\leq 6$ V	$\leq 6$ V
Rated insulation voltage $U_i$		250 V AC	250 V AC
Rated operating current $I_e$		500 mA	500 mA
Minimum operational current $I_m$		5 mA	5 mA
Off-state current $I_r$		$\leq 1.7$ mA at 110 V AC	$\leq 1.7$ mA at 110 V AC
Inrush current $I_k$ ( $t = 20$ ms)		3 A max./1Hz	3 A max./1Hz
Protected against polarity reversal		Yes	Yes
Short circuit protected		Yes	Yes
Repeat accuracy R		$\leq 5$ %	$\leq 5$ %
High pressure rated up to		207 bar (3000 PSI)	207 bar (3000 PSI)
Ambient temperature $T_a$		-25...+70 °C	-25...+70 °C
Operating frequency f		$\leq 50$ Hz	$\leq 50$ Hz
Utilization categories		AC 140/DC 13	AC 140/DC 13
Function/Operating voltage indication		Yes/Yes	Yes/Yes
Degree of protection as per IEC 60529		IP 67	IP 67
Approvals		cULus	cULus
Material	Housing	stainless steel/aluminum	stainless steel/aluminum
	Sensing surface	ceramic	ceramic
Connection		1/2" 20 UNF-2A plug connector, 3-pin C21-AE3-00-TY-060F	7/8" 16 UN plug connector, 5-pin BCC A314-0000-IO-003-EX44W6-020

For wiring diagram see page 958.



# Inductive Sensors with Special Properties

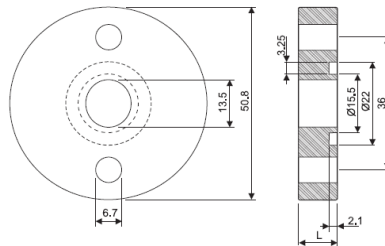
## Strokemaster installation and spacers



Note: Spacer may be required to elevate cylinder sensor to position sensing face in optimal position. Balluff recommends the following guidelines when mounting our Strokemaster® sensors:

### Strokemaster® Spacers

- A - Recommended to allow for mechanical wear (0.025" to 0.047")
- B - This dimension must be large enough to allow the sensor to turn off when the rod is present (0.110" to 0.118")



Below is a table to help you pick out a spacer for custom lengths needed with Strokemaster® sensors:

	Z/Spacers (inches)												
	0.180	0.188	0.225	0.307	0.372	0.375	0.500	0.562	0.600	0.684	0.712	0.810	0.937
<b>0.912</b>	0.732	0.724	0.687	0.605	0.540	0.537	0.412	0.350	0.312	0.228	0.200	0.102	—
<b>1.025</b>	0.845	0.837	0.800	0.718	0.653	0.650	0.525	0.463	0.425	0.341	0.313	0.215	0.088
<b>1.25</b>	1.07	1.062	1.025	0.943	0.878	0.875	0.750	0.688	0.650	0.566	0.538	0.440	0.313
<b>1.35</b>	1.17	1.162	1.125	1.043	0.978	0.975	0.850	0.788	0.750	0.666	0.638	0.540	0.413
<b>1.5</b>	1.32	1.312	1.275	1.193	1.128	1.125	1.000	0.938	0.900	0.816	0.788	0.690	0.563
<b>1.75</b>	1.57	1.562	1.525	1.443	1.378	1.375	1.250	1.188	1.150	1.066	1.038	0.940	0.813
<b>1.875</b>	1.695	1.687	1.650	1.568	1.503	1.500	1.375	1.313	1.275	1.191	1.163	1.065	0.938
<b>2.062</b>	1.882	1.874	1.837	1.755	1.690	1.687	1.562	1.500	1.462	1.378	1.350	1.252	1.125
<b>2.375</b>	2.195	2.187	2.150	2.068	2.003	2.000	1.875	1.813	1.775	1.691	1.663	1.565	1.438
<b>2.775</b>	2.595	2.587	2.550	2.468	2.403	2.400	2.275	2.213	2.175	2.091	2.063	1.965	1.838
<b>2.875</b>	2.695	2.687	2.650	2.568	2.503	2.500	2.375	2.313	2.275	2.191	2.163	2.065	1.938
<b>3.775</b>	3.595	3.587	3.550	3.468	3.403	3.400	3.275	3.213	3.175	3.091	3.063	2.965	2.838
<b>4.56</b>	4.38	4.372	4.335	4.253	4.188	4.185	4.060	3.998	3.960	3.876	3.848	3.750	3.623

Example: Need probe length of 1.125" combine sensor BES-516-200-S2-1.35-S21 with a 0.225" spacer.  
 (1.35" tube length - 0.225" spacer = 1.125" adjusted length)

Note: A difference of 0.005" will still have to be carefully considered when sizing a spacer and sensor to the cylinder.

- Spacer kits include a spacer, "O" ring, and appropriate mounting screws.
- Other spacer kits may be available: consult factory.

To order a spacer kit:

Use part number BESA-516-200-KIT-\* (X.XXX) \*measured in inches  
 (For both DC and AC/DC devices - there is no difference in flange dimensions)

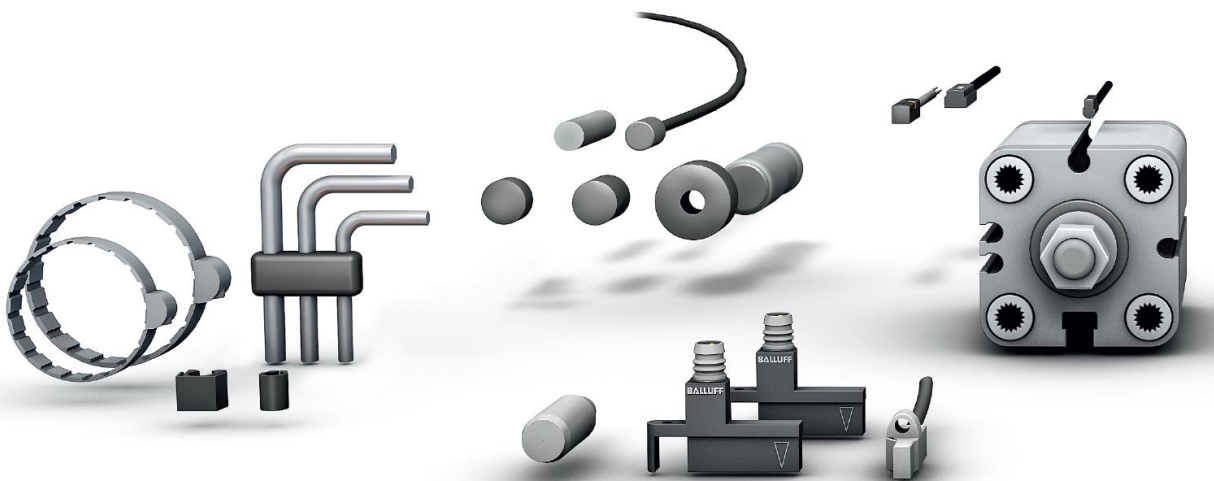


# Magnetic Cylinder Sensors

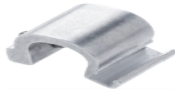
## Magnetic cylinder sensors for object detection

The primary application for magnetic sensors is to provide end of stroke and position detection on pneumatic cylinders.

- Lifetime warranty
- Low hysteresis, precise switch points
- Long service life due to lack of contact and wear
- Shock and vibration-resistant
- Compact sizes; perfect for short stroke cylinders







**BMF 235,  
307, 315**

**BMF 235,  
307, 315**

Profile/tie rod

Profile/tie rod

**BAM01M9**

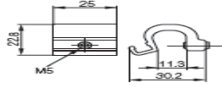
**BAM01MA**

BMF 235-HW-109

BMF 235-HW-110

For profile/tie  
rod cylinders  
5...11 mm

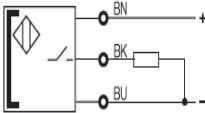
For profile/tie  
rod cylinders  
9...15 mm



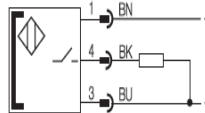
### Wiring diagrams

NO

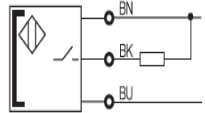
PNP cable



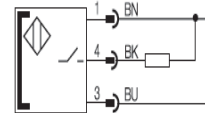
PNP connector



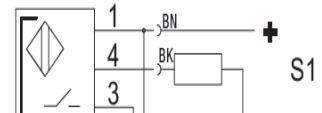
NPN cable



NPN connector

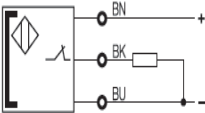


V-Twin PNP connector

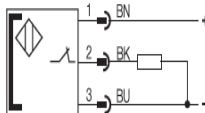


NC contact

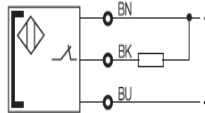
PNP cable



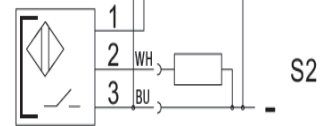
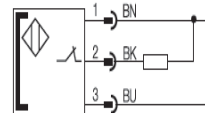
PNP connector



NPN cable



NPN connector



Series	Properties
PNP, NO	<b>Ordering code</b> Part number
PNP, NC	<b>Ordering code</b> Part number
NPN, NO	<b>Ordering code</b> Part number
NPN, NC	<b>Ordering code</b> Part number
Supply voltage $U_B$	
Voltage drop $U_D$	
Rated insulation voltage $U_i$	
Rated operating current $I_o$	
No-load supply current $I_o$ max.	
Polarity reversal protected/transposition protected/short-circuit protected	
Rated switching field strength $I_H, I$	
Assured switching field strength $I_H, I$	
Temperature drift of switch-on point of $I_H, I$	
On/off delay	
Ambient temperature $T_a$	
Degree of protection as per IEC 60529	
Approval	
Housing material	
Cable	
Suggested mating cable	
Installation	
Slot	

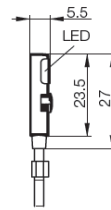
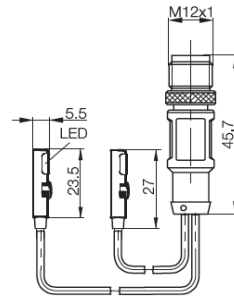
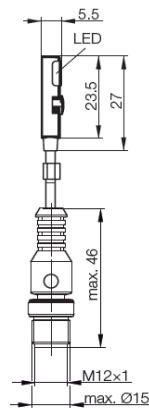
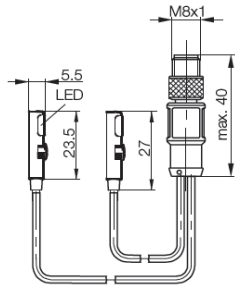
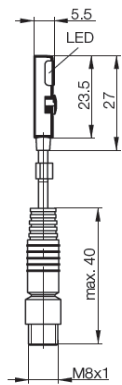


## Magnetic Cylinder Sensors with a Compact Design

### BMF 235 Global



<b>BMF 235</b> The new standard for every T-slot with M8 connector	<b>BMF 235</b> The new standard for every T-slot V-Twin with M8 connector	<b>BMF 235</b> The new standard for every T-slot with M12 connector	<b>BMF 235</b> The new standard for every T-slot V-Twin with M12 connector	<b>BMF 235</b> The new standard for every T-slot with direct PUR cable
<b>BMF00C4</b> BMF 235K-PS-C-2A-SA2-S49-00,3	<b>BMF00CA</b> BMF 235K-PS-C-2A-SA95-S75-00,3	<b>BMF00C5</b> BMF 235K-PS-C-2A-SA2-S4-00,3	<b>BMF00C9</b> BMF 235K-PS-C-2A-SA95-S4-00,3	<b>BMF00AR</b> BMF 235K-PS-C-2A-PU-02
<b>BMF00C6</b> BMF 235K-PO-C-2A-SA2-S49-00,3				<b>BMF00AT</b> BMF 235K-PO-C-2A-PU-02
<b>BMF00C2</b> BMF 235K-NS-C-2A-SA2-S49-00,3				<b>BMF00AU</b> BMF 235K-NS-C-2A-PU-02
<b>BMF00C3</b> BMF 235K-NO-C-2A-SA2-S49-00,3				<b>BMF00AW</b> BMF 235K-NO-C-2A-PU-02
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
100 mA	100 mA	100 mA	100 mA	100 mA
6 mA	6 mA	6 mA	6 mA	6 mA
Yes/No/Yes	Yes/No/Yes	Yes/No/Yes	Yes/No/Yes	Yes/No/Yes
1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
≤ 0.1 ms/≤ 0.1 ms	≤ 0.1 ms/≤ 0.1 ms	≤ 0.1 ms/≤ 0.1 ms	≤ 0.1 ms/≤ 0.1 ms	≤ 0.1 ms/≤ 0.1 ms
-25...+85 °C	-25...+85 °C	-25...+85 °C	-25...+85 °C	-25...+85 °C
IP 67	IP 67	IP 67	IP 67	IP 67
CE, cULus	CE, cULus	CE, cULus	CE, cULus	CE, cULus
PA12	PA12	PA12	PA12	PA12
0.3 m PUR cable with M8 connector, 3-pin	0.3 m PUR cable with M8 connector, 4-pin	0.3 m PUR cable with M12 connector, 4-pin	0.3 m PUR cable with M12 connector, 4-pin	2 m PUR cable
BCC M313-0000-10-001-VX43T2-050-C013	BCC M314-0000-10-003-VX43T2-050-C013	BCC M415-0000-1A-003-VX44T2-050-C013	BCC M415-0000-1A-003-VX44T2-050-C013	28 AWG
Drop-in	Drop-in	Drop-in	Drop-in	Drop-in
┌┐ T-slot	┌┐ T-slot	┌┐ T-slot	┌┐ T-slot	┌┐ T-slot



**Recommended accessories**  
(please order separately)

