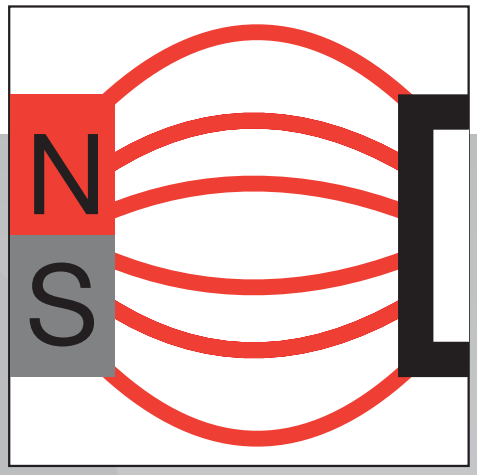
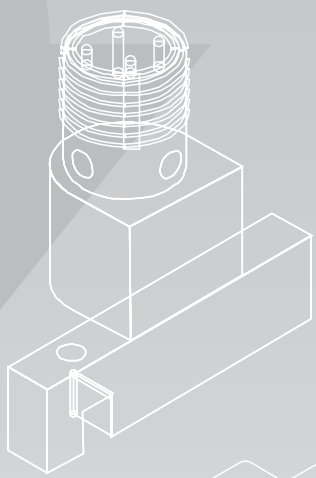
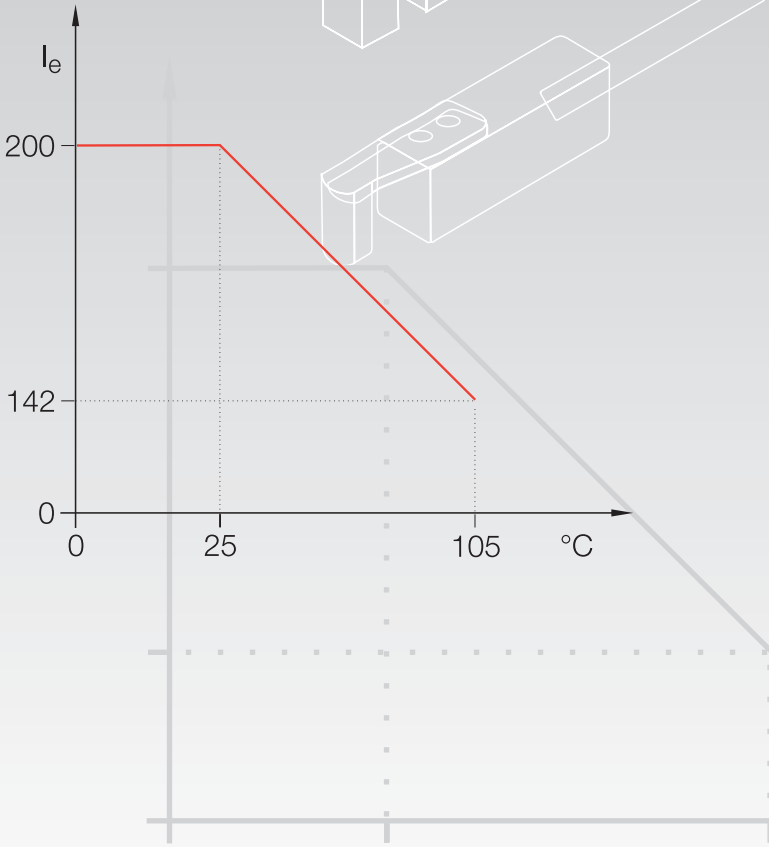






Cylinder & Valve Sensors

Cylinder sensors are used to provide end-of-stroke and position detection for hydraulic and pneumatic cylinder applications.

Hydraulic cylinder walls are typically made of steel. Since inductive and magnetic field sensors cannot "see" through the steel cylinder wall to detect the piston inside, hydraulic cylinders use pressure-rated inductive sensors that can handle direct exposure to pressurized hydraulic fluid in the cylinder to provide end-of-stroke detection. A specialized inductive sensor is bolted or threaded into the cylinder end cap. The sensing face of the inductive sensor directly detects the cylinder rod or cushion as it reaches its end of travel.

For non-contact, wear-free position detection of pneumatic cylinder piston position, Balluff magnetic field sensors use magneto-resistive technology to detect the piston magnet through the aluminum wall of the cylinder. Typically two sensors are employed to provide end-of-stroke detection in both directions, or can be placed anywhere along the length of the cylinder to detect cylinder position.

Advantages of Balluff magnetic field sensors include universal compatibility with either "Hall Effect" or "Reed Switch" cylinder magnet polarizations, reduction or elimination of double switch points, higher noise immunity, and elimination of electrical contact wear and sticking. Magnetic field sensors are available in a variety of cylinder-friendly mounting configurations, as well as with special features like weld field immunity.

Selection Guide





Series	BMF 103	BMF 273	BMF 303	BMF 305K	BMF 305M	
	Compact	C-Slot	Miniature Slot	Universal	Universal Metal	
Cylinder Type						
C-Slot	HW-41/42	■	HW-28/30/31/62	HW-32 (Norgren)	HW-32 (Norgren)	
T-Slot	HW-43/63/65/79/81		HW-33/40/51/60/66	HW-17/20/22/23/26/37/50/52/53/58/64/67/82	HW-17/20/22/23/26	
Dove Tail	HW-68/75/78		HW-44/69	HW-35/36/38/39/45/46/47	HW-35/36/38/39/45/46/47	
Trapezoidal			HW-80	HW-25/27	HW-25/27	
Round			HW-34/59/61/80	HW-24	HW-24	
Tie Round	HW-74			HW-21 & HW-8/HW-21 & HW-10 HW-70/71/72/76/77	HW-21 & HW-8/HW-21 & HW-10 HW-70/71/72/76/77	
Duo Rail						
Flush Mount		■	■			
Bracketless		■				
Connection						
Integral Connector						
Pigtail Connector	M5 and M8	M8	M5 and M8	M8 and M12		
Prewired Cable	■	■	■	■		
Outputs						
PNP N.O. 3-Wire	10...30 V	10...30 V	10...30 V	10...30 V	10...30 V	
PNP N.C. 3-Wire	10...30 V	10...30 V	10...30 V	10...30 V		
NPN N.O. 3-Wire	10...30 V	10...30 V	10...30 V	10...30 V		
NPN N.C. 3-Wire		10...30 V	10...30 V	10...30 V		
PNP N.O. Weld Field Immune 3-Wire				10...30 V	10...30 V	
NPN N.O. Weld Field Immune 3-Wire						
PNP N.O. Reed 3-Wire				10...30 V		
AC/DC Reed 2-Wire				6...240 V AC/DC		
Housing						
Plastic	LCP	PBT	LCP	LCP		
Metal					AL	
Attributes						
Short Circuit Protection	■	■	■	■	■	
Reverse Polarity Protection	■	■	■	■	■	
Temperature Range Up to 85°C				■	■	
Temperature Range Up to 105°C					■	
CE	■	■	■	■	■	
UL	■	■	■	■	■	
Features	Optimized for short-stroke cylinders, very compact size, perpendicular mounting, interchangeable brackets	Bracketless type designed for drop in installation into C slot	Miniature type for flush mounting in narrow channels, interchangeable brackets	Universal sensor designed for most applications; wide variety of outputs, connections, mounting options; plastic housing	Universal sensor designed for most applications; wide variety of outputs, connections, mounting options; metal housing; weld immune extended temperature range	
Pages	**5.5**	**5.8**	**5.9**	**5.12 & 5.15**	**5.14**	

Selection Guide






	BMF 307	BMF 315K	BMF 315M	BMF 21	BMF 32	BMF 7M, 8M, 12M
	T-Slot	Drop In T-Slot	Drop In T-Slot Metal	Tie-Rod	Rugged Duty	Prox Style
	■	■	■			
					HW-12/14/18	
	HW-73	HW-73	HW-73	HW-11	HW-73	
	HW-86			HW-8/10/10E	HW-13/15/34	
				HW-8		
	■	■	■			
	■	■	■			
				M8	M8 and M12	M12
	M8	M8	M8 and M12			M8
	■	■	■	■		■
	10...30 V	10...30 V	10...30 V	10...30 V	10...30 V	10...30 V
	10...30 V	10...30 V				
	10...30 V	10...30 V		10...30 V	10...30 V	10...30 V
	10...30 V	10...30 V				
			10...30 V		10...30 V	
					10...30 V	
	4...30 V AC/DC					
	LCP	PA 66		PBT		
			AL		AL	CuZn
	■	■	■	■	■	
	■	■	■	■	■	
	■	■	■	■	■	
			■			
	■	■	■	■	■	■
	■	■	■	■	■	■
	Bracketless type for flush installation into T-slot channels	Bracketless type designed for drop in replacement into T-slot channels, plastic housing	Bracketless type designed for drop in replacement into T-slot channels, metal housing, weld immune extended temperature range	Cost-effective, optimized for mounting on tie rod cylinders	Rugged metal housing for the most demanding applications, tie rod mounting, available in weld immune	Designed for long range target sensing, extremely high switching speeds, suitable for tachometer applications, available in 7, 8, and 12 mm diameters
	5.22	**5.24**	**5.25**	**5.27**	**5.29**	**5.32**

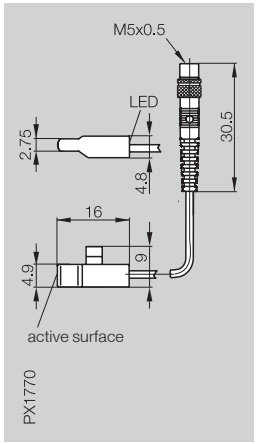
Selection Guide

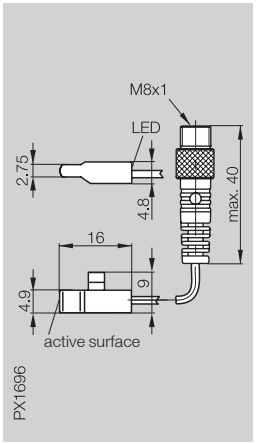
Series	BIL	Strokemaster	High Pressure	Power Clamp
Pressure Rated		■	■	
Bracket Required	■			
Connection				
Integral Connector	M8	M12, Mini	M8, M12, M18	M12
Pigtail Connector			M12	
Cable			■	
Outputs				
PNP N.O.		10...30 V	10...30 V 9.6...55 V	10...30 V
PNP N.C.			10...30 V 9.6...55 V	
NPN N.O.			10...30 V	
NPN N.C.				
PNP N.O. Weld Field Immune				
AC/DC		20...250 V AC/DC		
0...10 V	■			
4...20 mA	■			
Housing				
Plastic	PA			■
Metal		SS/AL	SS, SS430F	
Attributes				
Overload Protection				■
Short Circuit Protection	■	■		■
Reverse Polarity Protection	■	■	■	■
Temperature Range	Up to 75°C	Up to 70°C	Up to 120°C	Up to 70°C
Pressure Range		3000 PSI	Up to 7250 PSI	
CE	■	■	■	■
UL		■		■
Features	Non-contact position feedback, ideal for short and medium stroke length applications; 10 to 160 mm stroke length	Weld field immune, pressure rated to 3000 psi, sealed directly at flange, connector can be oriented after installation, various lengths available	Pressure rated as high as 7250 psi, corrosion resistant stainless steel housing, wide variety of housing diameters and thread lengths	Designed for use in power clamp and gripper applications, incorporates two sensors into one unit to detect open or closed position, weld field immune
Pages	**5.36**	**5.41**	**5.45**	**5.52**

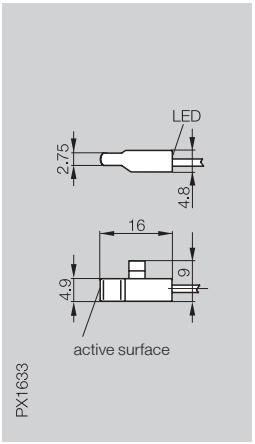
Series	BMF 103	BMF 103	BMF 103
Connection Type	Cable + M05 Pico Connector (S26)	Cable + M08 DC Nano Connector (S49) Rotating Threaded Connector	PuFlex Cable

BMF 103

To create the compact BMF 103 magnetic field sensor, Balluff engineers employed GMR (giant magnetoresistive) technology to shrink the length of the sensor housing.
The perpendicular cable exit and extremely short sensing face allow two BMF 103's to be placed as close together as 5mm in a single channel. The BMF 103 is the perfect solution for cramped spaces and today's short-stroke, compact pneumatic cylinders and actuators.







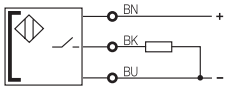
PNP	Normally-open	BMF 103K-PS-C-2A-S26-**	BMF 103K-PS-C-2A-SA2-S49-**	BMF 103K-PS-C-2A-PU-*
	Normally-closed		BMF 103K-P0-C-2A-SA2-S49-**	BMF 103K-P0-C-2A-PU-*
NPN	Normally-open		BMF 103K-NS-C-2A-SA2-S49-**	BMF 103K-NS-C-2A-PU-*
Rated operating field strength H_n		1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength H_a		≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
Hysteresis of H_n		≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of H_n		≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Turn-off delay		≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Supply voltage U_B		10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d		≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i		75 Vdc	75 Vdc	75 Vdc
Rated operating current I_e		100 mA	100 mA	100 mA
No-load supply current I_0 max.		≤ 5 mA	≤ 5 mA	≤ 5 mA
Off-state current I_r		≤ 80 µA	≤ 80 µA	≤ 80 µA
Protected against polarity reversal		yes	yes	yes
Short circuit protected		yes	yes	yes
Load capacitance		≤ 1 µF	≤ 1 µF	≤ 1 µF
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C
LED		yes	yes	yes
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Housing material		LCP	LCP	LCP
Connection		M5 pigtail connector	M8 pigtail connector	cable, PUR
No. of wires × gauge				3 × 30 AWG
Approval		CE, cULus	CE, cULus	CE, cULus
Recommended connector		BKS-B 25-3-PU-05	C49 ANE-00-VY-050M	

* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

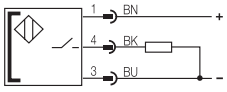
** Please specify length for the pigtail connector. Standard lengths are as follows: 00.2 = 0.2 m, 00.5 = 0.5 m. Consult the factory for other cable length options.

Wiring diagrams

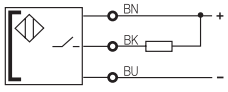
PNP/Cable



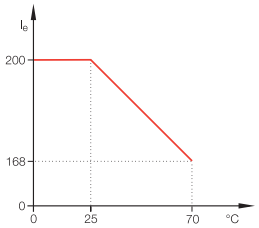
PNP/Connector



NPN/Cable



Output current temperature curves



Typical Mounting

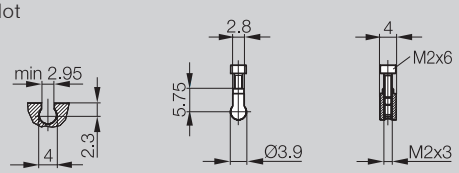
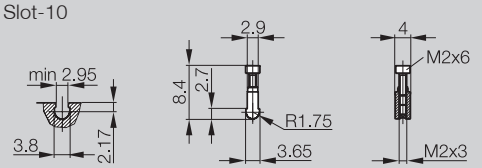
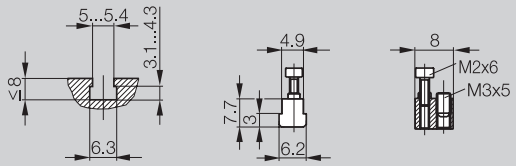
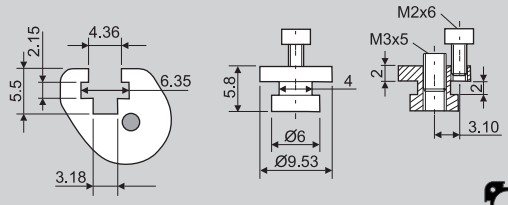
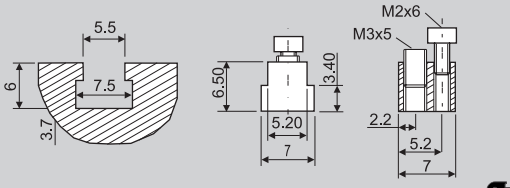
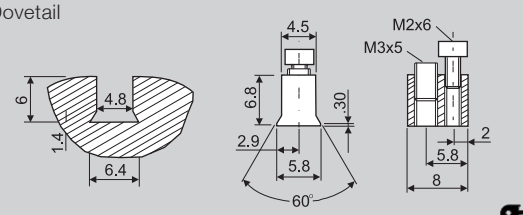
Advantages

Adjust switchpoint in seconds! Turn screw one revolution, adjust position, tighten.

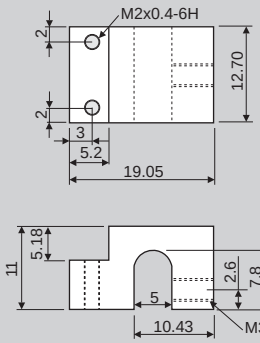
Switchpoint can't be lost. Even if you replace the sensor, the adjusted switchpoint is retained by the mounting bracket.

Can be inserted into slot from above.

To order a combo kit of sensor with mounting bracket, include the bracket code in the part number.
Example :
BMF 103K/**HW41**-PS-C-2-PU-03

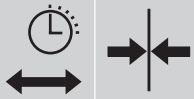
Ordering Code	Advantages	Cylinder channel	Mounting bracket
BMF 103-HW-41 		C-slot  e.g. SMC, Bimba Internal Set Screw	
BMF 103-HW-42 		C-slot Festo Slot-10  Internal Set Screw	
BMF 103-HW-43 	 	T-slot  e.g. Festo Slot-8, Bosch, SMC External Set Screw	
BMF 103-HW-63 		T-slot  e.g. Bimba Flat 1	
BMF 103-HW-65 	 	T-slot  e.g. Parker P1M	
BMF 103-HW-68 	 	Dovetail  e.g. Fabco Pancake	

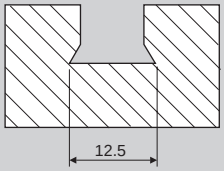
Ordering Code	Advantages	Cylinder channel	Mounting bracket
BMF 103-HW-74		Tie Rod	

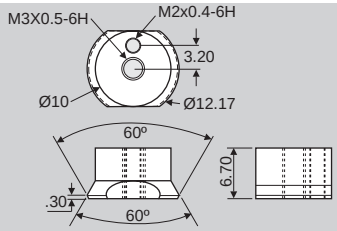


e.g. PHD

Ordering Code	Advantages	Cylinder channel	Mounting bracket
BMF 103-HW-75		Dove Tail	

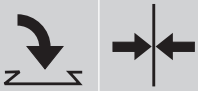


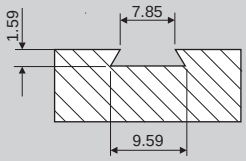


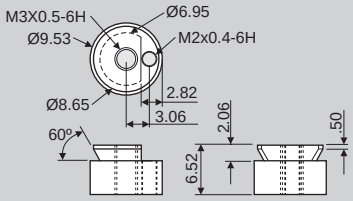


e.g. Numatics

Ordering Code	Advantages	Cylinder channel	Mounting bracket
BMF 103-HW-78		Dove Tail 60°	

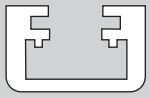


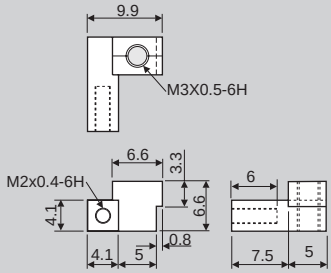




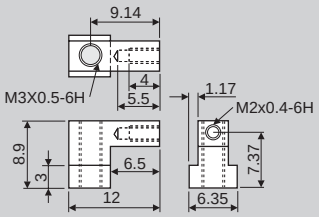
e.g. Norgren 46000 Small Bore

Ordering Code	Advantages	Cylinder channel	Mounting bracket
BMF 103-HW-79		Rexroth PSK Rail	





Ordering Code	Advantages	Cylinder channel	Mounting bracket
BMF 103-HW-81		Rexroth CKK Rail	



BMF 273 – The compact sensor for pneumatic cylinders with C-slot

The C-slot is becoming increasingly common in pneumatic cylinders and grippers. Installation from above into the slot is a requirement for fast and simple installation. The BMF 273 meets all these requirements while also offering reliable switching characteristics.

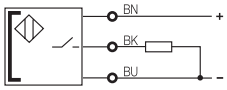
Features

- Can be installed from above into the C-slot
- Disappears into the slot
- Proven electronics from the BMF line: Low hysteresis, precise switching point
- Rugged, compact low profile housing
- Hold-down screw protected from over-tightening, uses standard screw driver
- Cable clip for ease of cable routing and securing
- Install without a mounting bracket, for cylinders with C-slot, e.g. Festo (Slot 10), SMC, Parker and Sommer Automatik

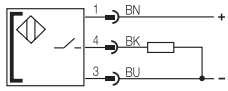
Wiring diagrams

N.O.

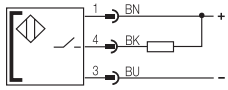
PNP/cable



PNP/connector

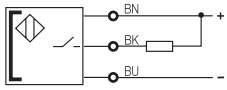


NPN/connector

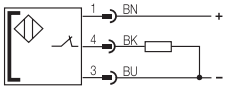


N.C.

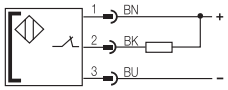
NPN/cable



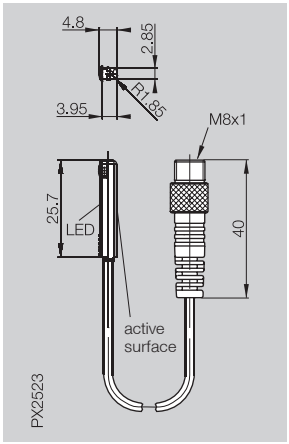
PNP/connector

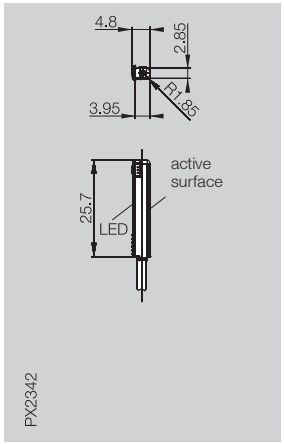


NPN/connector



Series	BMF 273	BMF 273
Connection Type	Cable and M08 DC nano connector (S49)	PuFlex Cable





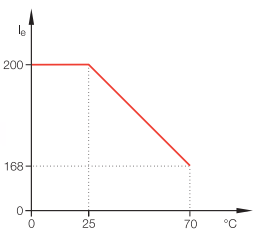
PNP	Normally-open	BMF 273K-PS-C-2A-SA2-S49-**	BMF 273K-PS-C-2A-PU-*
	Normally-closed	BMF 273K-PO-C-2A-SA2-S49-**	
NPN	Normally-open	BMF 273K-NS-C-2A-SA2-S49-**	BMF 273K-NS-C-2A-PU-*
	Normally-closed	BMF 273K-NO-C-2A-SA2-S49-**	

Rated switching field strength I H_n I	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured switching field strength I H_a I	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
Hysteresis of I H_n I	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay	≤ 0.07 ms	≤ 0.07 ms
Turn-off delay	≤ 0.07 ms	≤ 0.07 ms
Supply voltage U_S	10...30 Vdc	10...30 Vdc
Voltage drop U_d	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i	75 Vdc	75 Vdc
Rated operational current I_e	100 mA	100 mA
No-load supply current I_0 max.	≤ 8 mA	≤ 8 mA
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C
LED	yes	yes
Protection per IEC 60529	IP 67	IP 67
Housing material	PBT	PBT
Connection type	M8 pigtail connector	Cable, PUR
No. of wires × gauge		3 × 26 AWG
Approval	CE, cULus	CE, cULus
Recommended connector	C49 ANE-00-VY-050M	

* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

** Please specify length for the pigtail connector. Standard lengths are as follows: 00.2 = 0.2 m, 00.5 = 0.5 m. Consult the factory for other cable length options.

Output current temperature curves



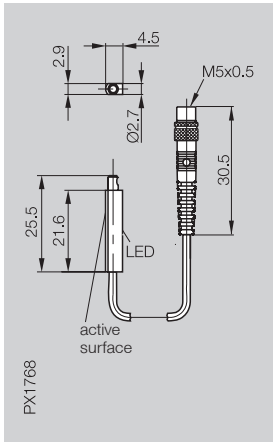
Series	BMF 303	BMF 303	BMF 303
Connection Type	Cable + M05 Pico Connector (S26)	Cable + M08 DC Nano Connector (S49) Rotating Threaded Connector	PuFlex Cable

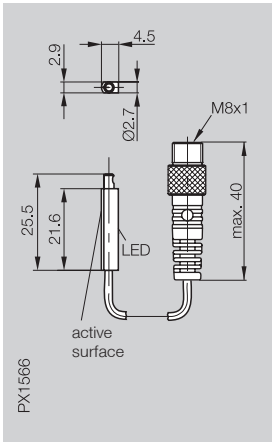
BMF 303

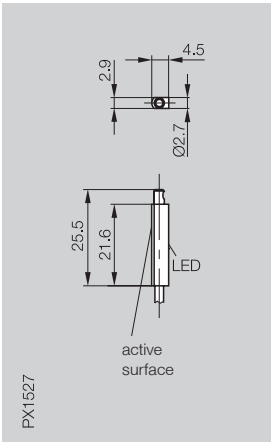
The BMF 303 is flush mounted in the cylinder slot. So small it disappears completely. Nothing to stick out—nothing in the way!

Features

- Non-contact, wear-free position sensing
- Can be installed on any standard cylinder using specific mounting brackets
- No "double switch points"
- Insensitive to contamination







PNP	Normally-open	BMF 303K-PS-C-2A-S26-**	BMF 303K-PS-C-2A-SA2-S49-**	BMF 303K-PS-C-2A-PU-*
	Normally-closed		BMF 303K-PO-C-2A-SA2-S49-**	BMF 303K-PO-C-2A-PU-*
NPN	Normally-open	BMF 303K-NS-C-2A-S26-**	BMF 303K-NS-C-2A-SA2-S49-**	BMF 303K-NS-C-2A-PU-*
	Normally-closed		BMF 303K-NO-C-2A-SA2-S49-**	BMF 303K-NO-C-2A-PU-*
Rated operating field strength H_n I		1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength I H_a I		≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
Hysteresis of I H_n I		≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I		≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Turn-off delay		≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Supply voltage U_B		10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d		≤ 2 V	≤ 2 V	≤ 2 V
Rated insulation voltage U_i		75 Vdc	75 Vdc	75 Vdc
Rated operating current I_e		100 mA	100 mA	100 mA
No-load supply current I_0 max.		≤ 5 mA	≤ 5 mA	≤ 5 mA
Off-state current I_r		≤ 80 µA	≤ 80 µA	≤ 80 µA
Protected against polarity reversal		yes	yes	yes
Short circuit protected		yes	yes	yes
Load capacitance		≤ 1 µF	≤ 1 µF	≤ 1 µF
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C
LED		yes	yes	yes
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Housing material		LCP	LCP	LCP
Connection		M5 pigtail connector	M8 pigtail connector	cable, PUR
No. of wires × gauge				3 × 30 AWG
Approval		CE, cULus	CE, cULus	CE, cULus
Recommended connector		BKS-B 25-3-PU-05	C49 ANE-00-VY-050M	

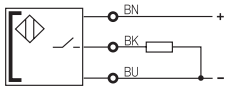
* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

** Please specify length for the pigtail connector. Standard lengths are as follows: 00.2 = 0.2 m, 00.5 = 0.5 m. Consult the factory for other cable length options.

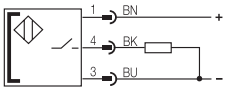
Typical Mounting

Wiring diagrams

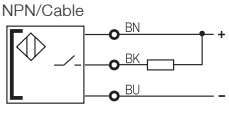
PNP/Cable



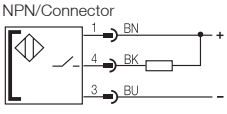
PNP/Connector



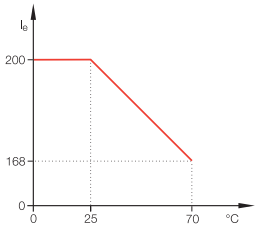
NPN/Cable



NPN/Connector



Output current temperature curves



Advantages

Sensor disappears in the slot!

Can be inserted into slot from above.

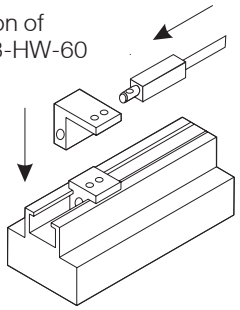
Adjust switchpoint in seconds! Turn screw one revolution, adjust position, tighten.

Switchpoint can't be lost. Even if you replace the sensor, the adjusted switchpoint is retained by the mounting bracket.

Other bracket solutions are available. Contact factory for details.

To order a combination kit of sensor with mounting bracket, include the bracket code in the part number. Example: BMF 303K/**HW30**-PS-C-2-PU-03

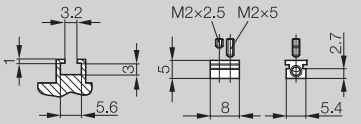
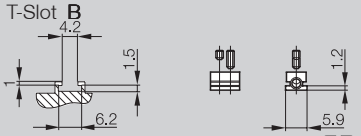
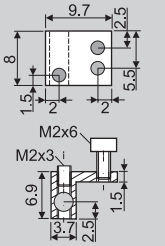
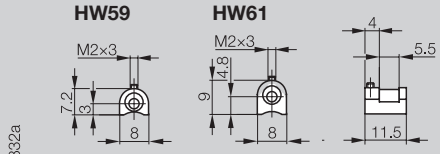
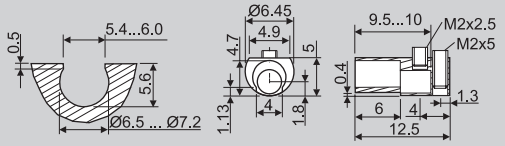
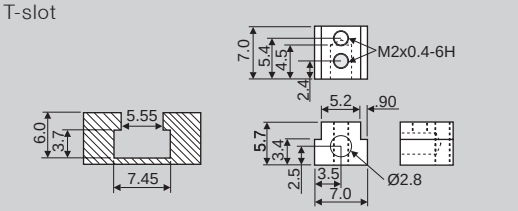
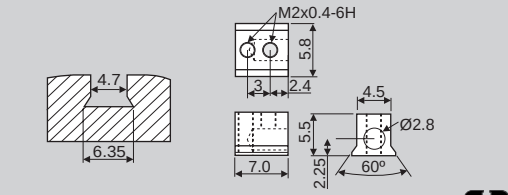
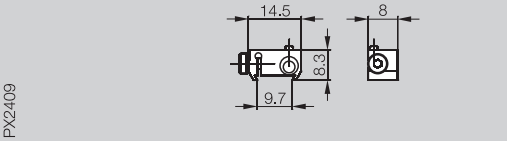
Installation of BMF 303-HW-60



Tube cuffs
for BMF 303-HW-59/61
SCHLAUCHSCHELLE BMF GR.__

Pneumatic Tube Cuff Sizes		
Tube Cuff Size	Piston Ø	Cylinder Ø
0	<8	7 - 11
1	8...10	11 - 19
2	12...25	18 - 29
3	32	28 - 39
4	40	38 - 49
5	50	48 - 59
6	63	58 - 69
7	80	68 - 79
8	70	78 - 89

Ordering Code	Advantages	Cylinder channel / Mounting bracket
BMF 303-HW-28		C-slot e.g. SMC
BMF 303-HW-30		C-slot Festo Nut-10
BMF 303-HW-31		C-Nut e.g.Festo
BMF 303-HW-33		T-slot e.g. Festo Nut-8, Bosch, SMC
BMF 303-HW-34		Round Cylinders Ø < 8...80 mm
BMF 303-HW-40		T-slot e.g. Festo Nut-8, Bosch, SMC
BMF 303-HW-44		Dovetail 60°/90° e.g. Festo, Bosch, Numatics, Hoerbiger-Origa, Norgren-Martonair

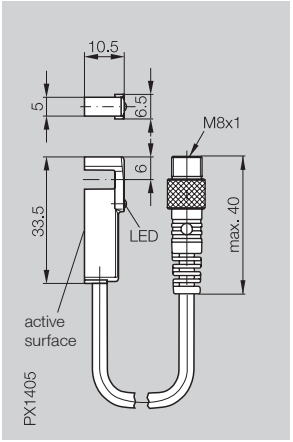
Ordering Code	Advantages	Cylinder channel	Mounting bracket
BMF 303-HW-51  **BMF 303-HW-60** 	 	T-slot **A** **HW51**  T-Slot **B** 	**HW60** 
BMF 303-HW-59  **BMF 303-HW-61** 	 	Round Cylinders Ø 8...80 mm **HW59** **HW61**  PX1832a	
BMF 303-HW-62 	  		
BMF 303-HW-66	 	T-slot  e.g. Parker P1M	
BMF 303-HW-69 	 	Dovetail  e.g. Fabco Pancake	
BMF 303-HW-80 	 	 PX2409 e.g. Bosch	

BMF 305

With its versatile mounting system, the BMF 305 is the most flexible magnetic field sensor available. A wide selection of interchangeable brackets allows the BMF 305 to fit virtually any cylinder type.

Features

- Interchangeable bracket system
- Non-contact and wear-free sensing of piston location
- Insensitive to contamination
- Detects piston position through the cylinder wall
- Can be attached to any standard cylinder size using available mounting brackets
- Eliminates multiple switchpoints
- Brackets for all common cylinder types
- Pre-wired cable or quick disconnect
- Weld-immune version available

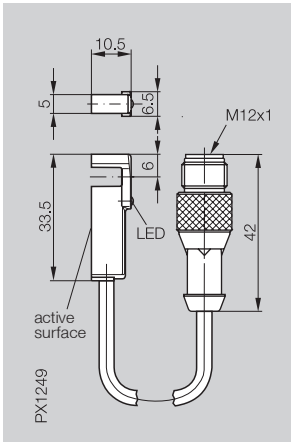
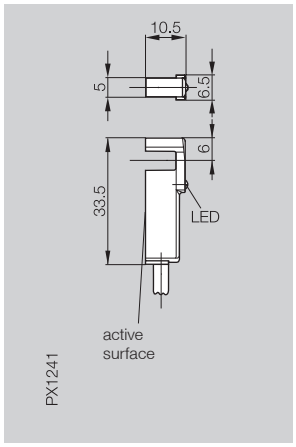
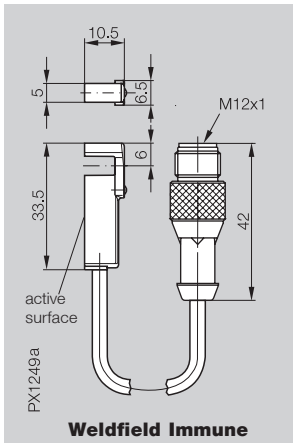


Series	BMF 305
Connection Type	Cable + M08 DC Nano Connector (S49) Rotating Threaded Connector
PNP Normally-open	BMF 305K-PS-C-2-SA2-S49-**
PNP Normally-closed	BMF 305K-PO-C-2-SA2-S49-**
NPN Normally-open	BMF 305K-NS-C-2-SA2-S49-**
NPN Normally-closed	BMF 305K-NO-C-2-SA2-S49-**
Rated operating field strength H_n	1.2 kA/m (15 Gauss)
Assured operating field strength H_a	≥ 2 kA/m (25 Gauss)
Hysteresis of H_n	≤ 45 %
Temperature drift of turn-on point of H_n	≤ 0.3 %/°C
Turn-on delay	≤ 0.05 ms
Turn-off delay	≤ 0.05 ms
Supply voltage U_B	10...30 Vdc
Voltage drop U_d	≤ 3.1 V
Rated insulation voltage U_i	75 Vdc
Rated operating current I_e	200 mA
No-load supply current I_0 max.	≤ 30 mA
Off-state current I_r	≤ 80 µA
Protected against polarity reversal	yes
Short circuit protected	yes
Load capacitance	≤ 1 µF
Ambient temperature range T_a	–25...+85 °C
LED	yes
Degree of protection per IEC 60529	IP 67
Housing material	LCP
Connection	M8 pigtail connector
No. of wires × gauge	
Approval	CE, cULus
Recommended connector	C49 ANE-00-VY-050M

* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

** Please specify length for the pigtail connector. Standard lengths are as follows: 00.2 = 0.2 m, 00.5 = 0.5 m. Consult the factory for other cable length options.

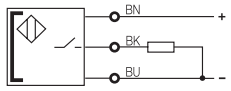
To order a set (sensor and mounting bracket):
Please include the bracket code in the part number
e. g. BMF 305K**/HW20**-PS-C-2-PU-05

BMF 305 Cable + M12 DC Micro Connector (S4)	BMF 305 PuFlex Cable	BMF 305 Cable + M12 DC Micro Connector (S4)
		
BMF 305K-PS-C-2-S4-**	BMF 305K-PS-C-2-PU-* BMF 305K-PO-C-2-PU-*	BMF 305K-PS-W-2-SA3-S4-00.8
	BMF 305K-NS-C-2-PU-* BMF 305K-NO-C-2-PU-*	
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)
≤ 45 %	≤ 45 %	≤ 45 %
≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
10...30 Vdc	10...30 Vdc	10...30 Vdc
≤ 3.1 V	≤ 3.1 V	≤ 4 V
75 Vdc	75 Vdc	75 Vdc
200 mA	200 mA	200 mA
≤ 30 mA	≤ 30 mA	≤ 20 mA
≤ 80 µA	≤ 80 µA	≤ 80 µA
yes	yes	yes
yes	yes	yes
≤ 1 µF	≤ 1 µF	≤ 1 µF
–25...+85 °C	–25...+85 °C	–25...+70 °C
yes	yes	yes
IP 67	IP 67	IP 67
LCP	LCP	LCP
M12 pigtail connector	cable, PUR 3 × 26 AWG	M12 pigtail connector
CE, cULus	CE, cULus	CE, cULus
C04 AEL-00-VY-050M		C04 AEL-00-VY-050M
		

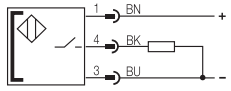
Wiring diagrams

Normally-open

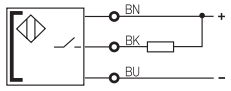
PNP/Cable



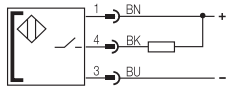
PNP/Connector



NPN/Cable

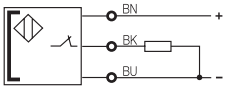


NPN/Connector

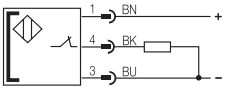


Normally-closed

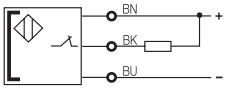
PNP/Cable



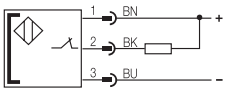
PNP/Connector



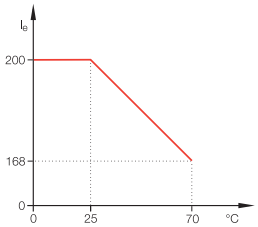
NPN/Cable

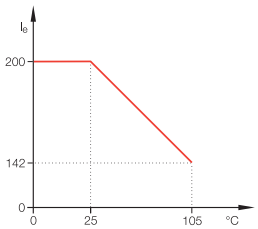


NPN/Connector



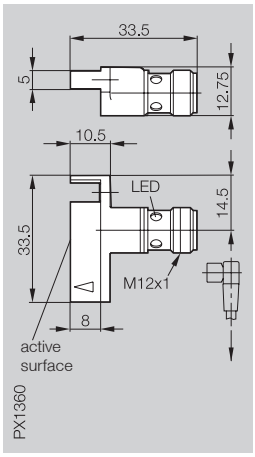
Output current temperature curves

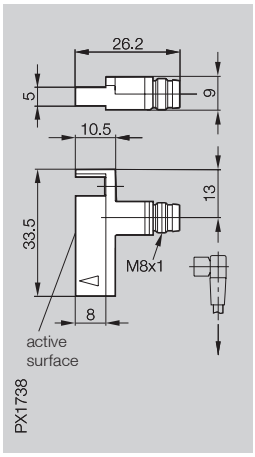


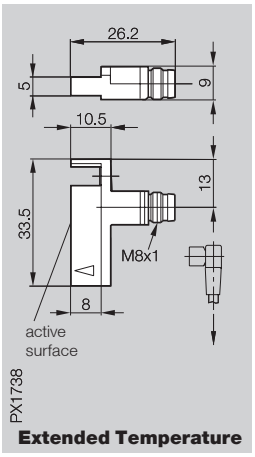


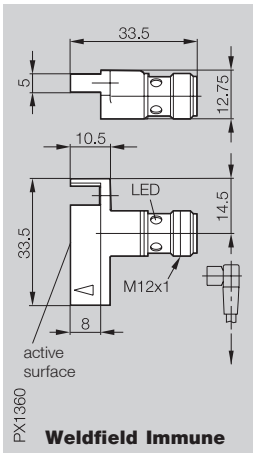
Series	BMF 305	BMF 305	BMF 305	BMF 305
Connection Type	M12 DC Micro Connector (S4)	M08 DC Nano Connector (S49)	M08 DC Nano Connector (S49)	M12 DC Micro Connector (S4)

Welding applications are no problem for the BMF 305M/ series magnetic field sensors. Developed with a heavy-duty weld slag resistant metal housing and a specially tuned output circuit (immunity for weld currents up to 25kA), these sensors perform in even the toughest environments.





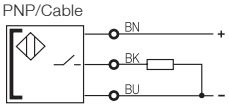




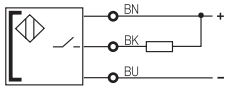
PNP Normally-open	BMF 305M-PS-C-2-S4	BMF 305M-PS-C-2-S49	BMF305M-PS-C-2-SA4-S49	BMF 305M-PS-W-2-S4
Rated operating field strength H_n	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength H_a	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
Hysteresis of H_n	≤ 45 %	≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of H_n	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 3 %/°C	≤ 0.3 %/°C
Turn-on delay	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
Turn-off delay	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B	10...30 Vdc	10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d	≤ 3.1 V	≤ 3.1 V	≤ 3.1 V	≤ 4 V
Rated insulation voltage U_i	75 Vdc	75 Vdc	75 Vdc	75 Vdc
Rated operating current I_e	200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.	≤ 30 mA	≤ 30 mA	≤ 30 mA	≤ 30 mA
Off-state current I_r	≤ 80 µA	≤ 80 µA	≤ 80 µA	≤ 80 µA
Protected against polarity reversal	yes	yes	yes	yes
Short circuit protected	yes	yes	yes	yes
Load capacitance	≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
Ambient temperature range T_a	–25...+85 °C	–25...+85°C	–25...+105 °C	–25...+85 °C
LED	yes	no	no	yes
Degree of protection per IEC 60529	IP 67	IP 67	IP 65	IP 67
Housing material	Al	Al	Al	Al
Connection	connector	connector	connector	connector
No. of wires × gauge				
Approval	CE, cULus	CE, cULus	CE, cULus	CE, cULus
Recommended connector	C04 AEL-00-VY-050M	C49 ANE-00-VY-050M	C49 ANE-00-VY-050M	C04 AEL-00-VY-050M

Wiring diagrams

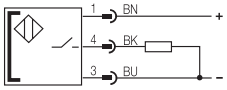
PNP/Cable



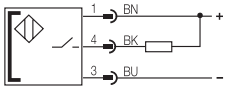
NPN/Cable



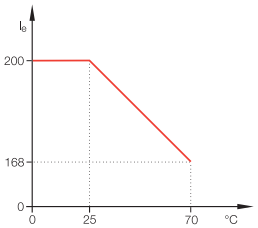
PNP/Connector

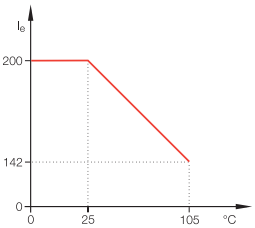


NPN/Connector



Output current temperature curves





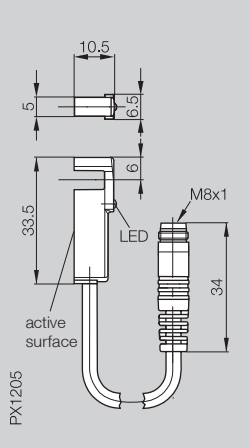
Series	BMF 305	BMF 305	BMF 305
Connection Type	Cable + M08 DC Nano Connector (S49)	PuFlex Cable	PuFlex Cable

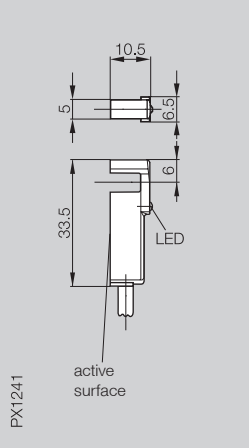
BMF 305
Reed Switch

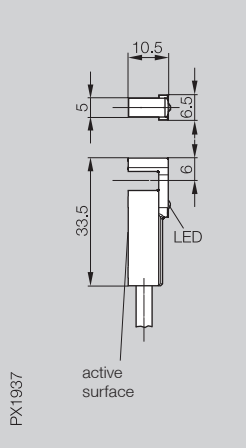
The economical BMF 305K-R reed switch has an LED for function display and as a setup aid.
The recovery diode for switching an inductive load is already integrated.

Features

- Fast and easy to install
- Fits any standard cylinder size using available brackets
- No loss of the setpoint when replacing a switch





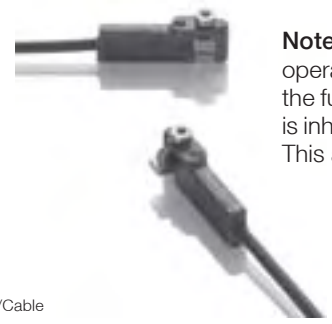


DC PNP, Normally-open	BMF 305K-R-PS-F-3-S49-**	BMF 305K-R-PS-F-3-*	
AC/DC Normally-open			BMF 305K-R-US-L-3-*
Turn-on delay	≤ 0.7 ms	≤ 0.7 ms	≤ 0.7 ms
Turn-off delay	≤ 0.2 ms	≤ 0.2 ms	≤ 0.2 ms
Supply voltage U_B	10...30 Vdc	10...30 Vdc	6...240 Vac/Vdc
Reed contact rating max.	10 W	10 W	10 W
Rated operating current I_e	500 mA	500 mA	128 mA at 24 Vac/Vdc 86 mA at 115 Vac/Vdc 43 mA at 230 Vac/Vdc
Minimum operating current			3 mA
Protected against polarity reversal	no	no	no
Short circuit protected	no	no	no
Load capacitance	≤ 0.5 µF	≤ 0.5 µF	
Ambient temperature range Ta	–20...+70 °C	–20...+70 °C	–20...+70 °C
LED	yes	yes	yes
Degree of protection per IEC 60529	IP 65	IP 65	IP 65
Housing material	LCP	LCP	PA
Connection	M8 pigtail connector	cable, PVC	cable, PVC
No. of wires × gauge		3 × 26 AWG	2 × 26 AWG
Approval	CE, cULus	CE, cULus	CE, cULus
Recommended connector	C49 ANE-00-VY-050M		

* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

** Please specify length for the pigtail connector. Standard lengths are as follows: 00.2 = 0.2 m, 00.5 = 0.5 m. Consult the factory for other cable length options.

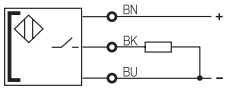
To order a combination kit of sensor with mounting bracket, include the bracket code in the part number. Example: BMF 305K/**HW20**-PS-C-2-PU-05



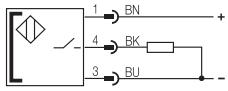
Note: Reed switch is configured for PNP operation with respect to operation of the function LED. The reed switch itself is inherently bi-directional for current. This applies to DC versions only.

Wiring Diagrams

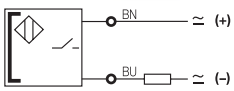
DC/Cable



DC/Connector



AC/DC/Cable



Installation Benefits

Can be inserted into slot from above.

Switchpoint is set in seconds! Turn screw one revolution, adjust position, tighten.

Switchpoint can't be lost. Even if you replace the sensor, the same switch-point remains because the bracket doesn't move.

Ordering Code	Advantages	Cylinder Channel	Mounting Bracket
BMF 305-HW-17		T-slot	
BMF 305-HW-20	without Set screw / with Set screw	T-slot	
BMF 305-HW-21 together with BMF 21-HW-8			
BMF 305-HW-21 together with BMF 21-HW-10			
BMF 305-HW-22		T-slot	
BMF 305-HW-23		T-slot	
BMF 305-HW-24		without slot	
BMF 305-HW-25		trapezoidal slot	

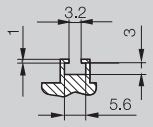
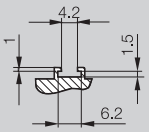
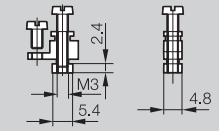
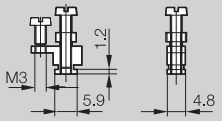
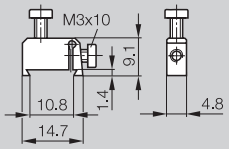
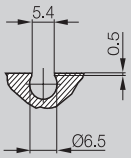
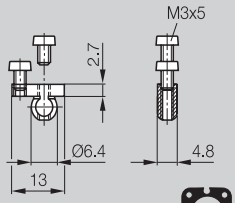
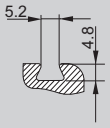
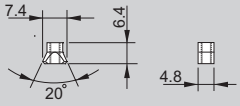
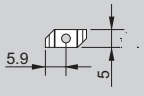
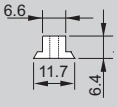
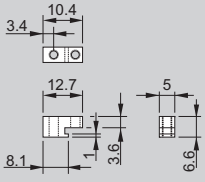
e.g. Festo, SMC

round cylinder with piston diameter < 8...80 mm

Tube Cuffs
for BMF 305-HW-24:
SCHLAUCHSCHELLE BMF GR.__

Pneumatic Tube Cuff Sizes		
Tube Cuff Size	Piston Ø	Cylinder Ø
0	<8	7 - 11
1	8...10	11 - 19
2	12...25	18 - 29
3	32	28 - 39
4	40	38 - 49
5	50	48 - 59
6	63	58 - 69
7	80	68 - 79
8	70	78 - 89

BMF 305

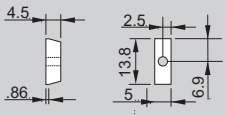
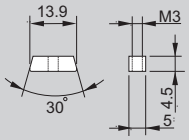
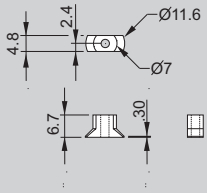
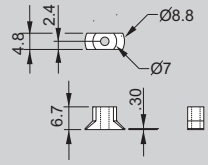
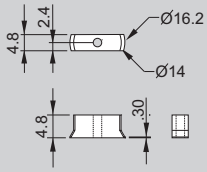
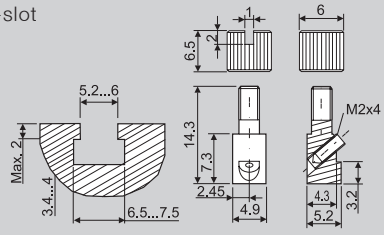
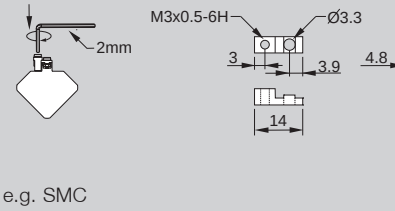
Ordering Code	Advantages	Cylinder Channel	Mounting Bracket
BMF 305-HW-26		T-slot **A**  T-slot **B** 	Position for T-slot **A**  Position for T-slot **B** 
BMF 305-HW-27		Trapezoidal guide  e.g. Bosch	
BMF 305-HW-32		C-slot  e.g. Norgren	
BMF 305-HW-35		Dovetail slot  e.g. Tol-o-matic	
BMF 305-HW-36		Dovetail slot  e.g. Numatics	
BMF 305-HW-37		T-slot e.g. Parker, SST, ER	

Installation Benefits

Can be inserted into slot from above.

Switchpoint is set in seconds! Turn screw one revolution, adjust position, tighten.

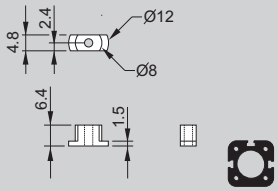
Switchpoint can't be lost. Even if you replace the sensor, the same switch-point remains because the bracket doesn't move.

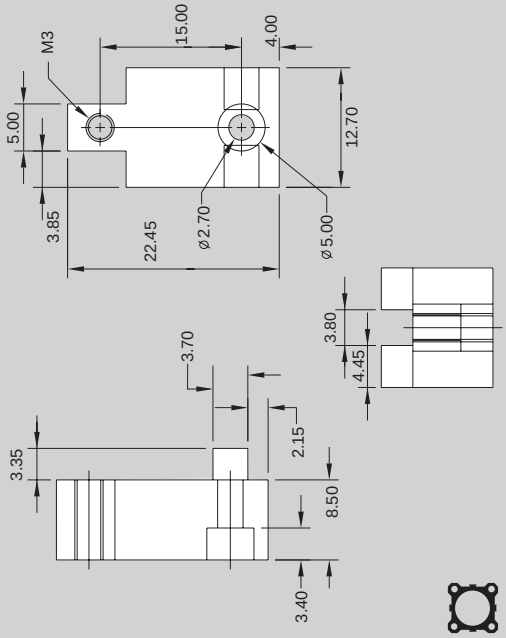
Ordering Code	Advantages	Cylinder Channel	Mounting Bracket
BMF 305-HW-38 		75° 14 mm dovetail e.g. De-Sta-Co	
BMF 305-HW-39 		75° 14.2 mm dovetail e.g. Compact Air	
BMF 305-HW-45 	 	45° 12 mm dovetail e.g. Norgren 92000	
BMF 305-HW-46 	 	60° 9 mm dovetail e.g. Norgren 46000 small bore	
BMF 305-HW-47 	 	60° 16.5 mm dovetail e.g. Norgren 46000 large bore	
BMF 305-HW-50 	 	T-slot	
BMF 305-HW-52 	  	T-Rail e.g. SMC	

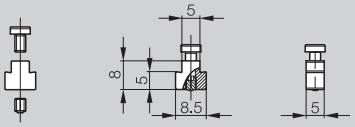
BMF 305

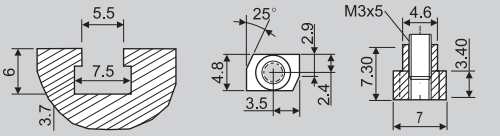
Ordering Code	Advantages	Cylinder Channel	Mounting Bracket
BMF 305-HW-53		T-slot	
BMF 305-HW-58		T-slot	
BMF 305-HW-64		T-slot	
BMF 305-HW-67		T-slot	

e.g. PHD









Installation Benefits

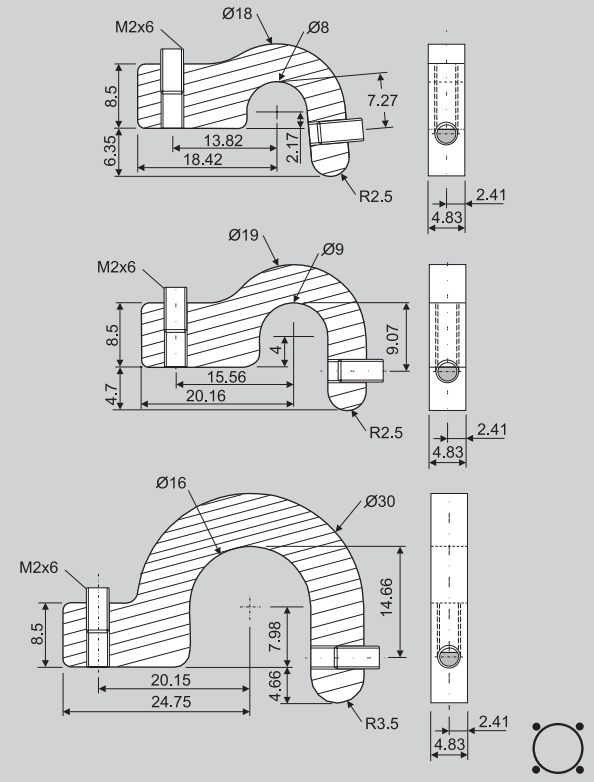
Can be inserted into slot from above.

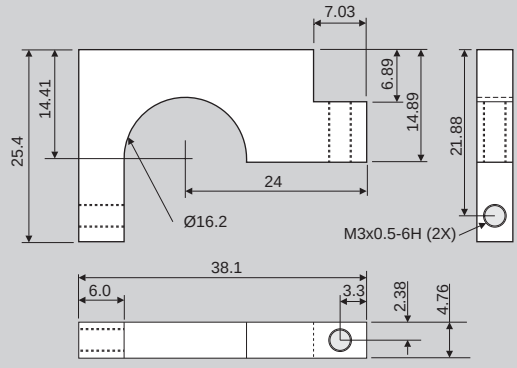
Switchpoint is set in seconds! Turn screw one revolution, adjust position, tighten.

Switchpoint can't be lost. Even if you replace the sensor, the same switch-point remains because the bracket doesn't move.

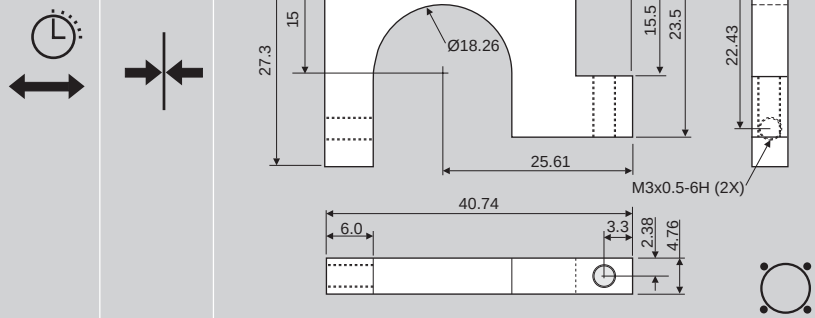
Cylinder Size	Bracket
1.5"	BMF 305-HW-70
2"	BMF 305-HW-70
2.5"	BMF 305-HW-70
3.25"	BMF 305-HW-71
4"	BMF 305-HW-71
5"	BMF 305-HW-72
6"	BMF 305-HW-72
8"	BMF 305-HW-72

Ordering Code	Advantages	Cylinder Channel	Mounting Bracket
BMF 305-HW-70 **BMF 305-HW-71** **BMF 305-HW-72**			
BMF 305-HW-76		Parker 2 MA 3/4"	

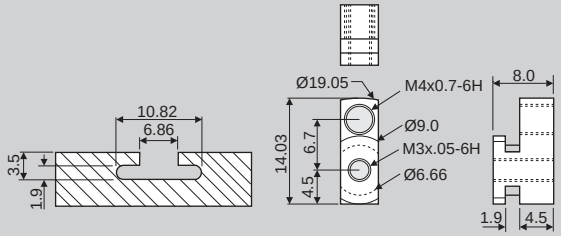




Ordering Code	Advantages	Cylinder Channel	Mounting Bracket
BMF 305-HW-77		Tie rod 3/4"	



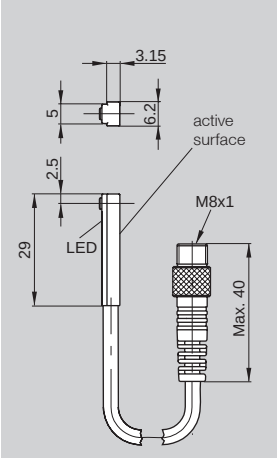
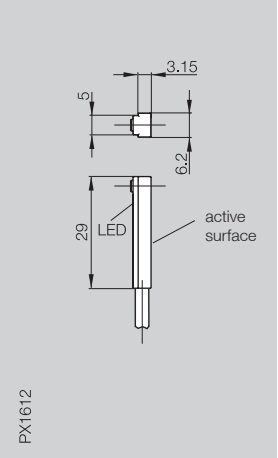
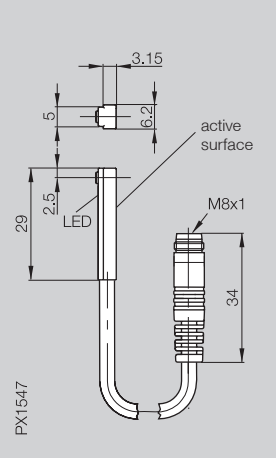
BMF 305-HW-82		T-slot	



e.g. Exlar

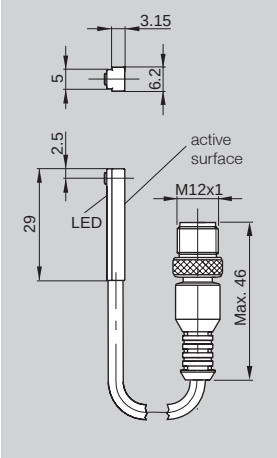
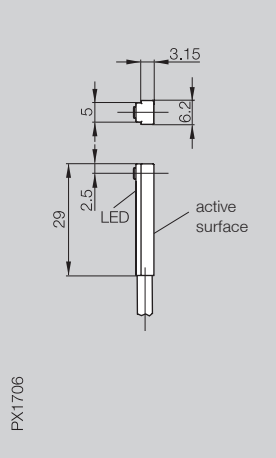
BMF 307

The BMF 307 magnetic field sensor is a T-slot style that fits many popular pneumatic cylinders such as Festo and SMC. The BMF 307 is a bracketless design featuring an integrated set screw in the housing.

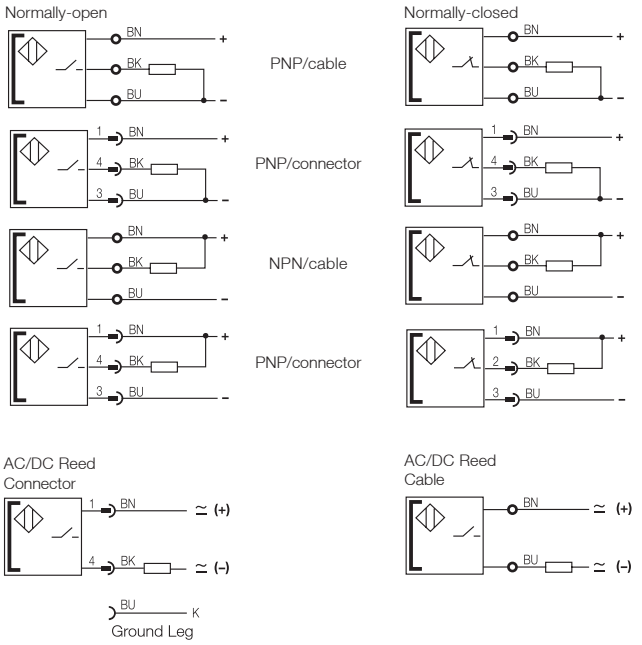
Series	**BMF 307**	**BMF 307**	**BMF 307**
Connection Type	Cable + M08 DC Nano Connector (S49)	PuFlex Cable	Cable + M08 DC Nano Connector (S49)
			
PNP Normally-open	BMF 307K-PS-C-2-SA2-S49-**	BMF 307K-PS-C-2-PU-*	
Normally-closed	BMF 307K-PO-C-2-SA2-S49-**	BMF 307K-PO-C-2-PU-*	
NPN Normally-open	BMF 307K-NS-C-2-SA2-S49-**	BMF 307K-NS-C-2-PU-*	
Normally-closed	BMF 307K-NO-C-2-SA2-S49-**	BMF 307K-NO-C-2-PU-*	
AC/DC			BMF 307K-R-AS-L-3-S49-**
Rated operating field strength H_n I	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	
Assured operating field strength I H_a I	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	
Hysteresis of I H_n I	≤ 45 %	≤ 45 %	
Temperature drift of turn-on point of I H_n I	≤ 0.3 %/°C	≤ 0.3 %/°C	
Turn-on delay	≤ 0.05 ms	≤ 0.05 ms	≤ 0.7 ms
Turn-off delay	≤ 0.05 ms	≤ 0.05 ms	≤ 0.2 ms
Supply voltage U_B	10...30 Vdc	10...30 Vdc	4...30 Vac/Vdc
Voltage drop U_d	≤ 3.1 V	≤ 3.1 V	
Rated insualtion voltage U_i	75 Vdc	75 Vdc	
Rated operating current I_e	200 mA	200 mA	128 mA at 24 Vac/Vdc
No-load supply current I_0 max.	≤ 30 mA	≤ 30 mA	
Off-state current I_r	≤ 80 µA	≤ 80 µA	
Reed contact rating max.			10 W
Minimum operating current			3 mA
Protected against polarity reversal	yes	yes	no
Short circuit protected	yes	yes	no
Load capacitance	≤ 1 µF	≤ 1 µF	≤ 0.5 µF
Ambient temperature range T_a	–25...+85 °C	–25...+85 °C	–20...+70°C
LED	yes	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67	IP 65
Housing material	LCP	LCP	LCP
Connection	M8 pigtail connector	cable, PUR	M8 pigtail connector
No. of wires × gauge		3 × 26 AWG	
Approval	CE, cULus	CE, cULus	CE, cULus
Recommended connector	C49 ANE-00-VY-050M		C49 ANE-00-VY-050M

* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

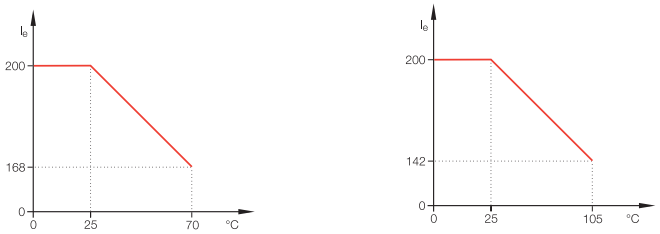
** Please specify length for the pigtail connector. Standard lengths are as follows: 00.2 = 0.2 m, 00.5 = 0.5 m. Consult the factory for other cable length options.

BMF 307 Cable + M12 DC Micro Connector (S4)	BMF 307 PuFlex Cable
	
BMF 307K-PS-C-2-S4-**	
	BMF 307K-R-AS-L-3-*
1.2 kA/m (15 Gauss)	
≥ 2 kA/m (20 Gauss)	
≤ 45 %	
≤ 0.3 %/°C	
≤ 0.05 ms	≤ 0.7 ms
≤ 0.05 ms	≤ 0.2 ms
10...30 Vac/Vdc	4...30 Vac/Vdc
≤ 3.1 V	
75 Vdc	
200 mA	128 mA at 24 Vac/Vdc
≤ 30 mA	
≤ 80 µA	
	10 W
	3 mA
yes	no
yes	no
	≤ 0.5 µF
–20...+70 °C	–20...+70 °C
yes	yes
IP 67	IP 65
LCP	LCP
M12 pigtail connector	cable, PVC
	2 × 26 AWG
CE, cULus	CE, cULus
C04 AEL-00-VY-050M	

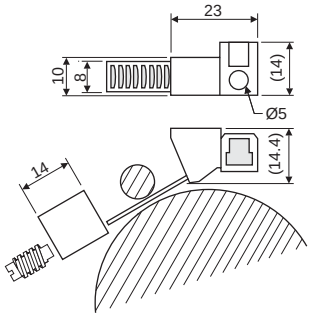
Wiring diagrams



Output current temperature curves



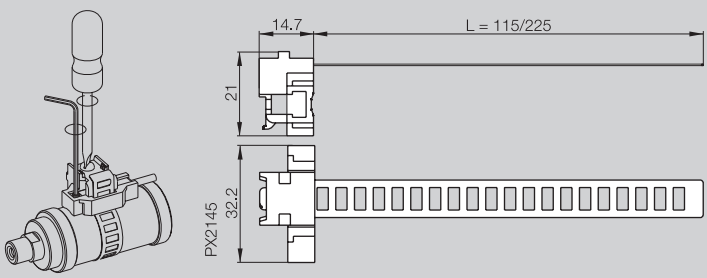
BMF 307-HW-86



Piston Ø	
Inch	mm
1 1/4	32
1 1/2	40
2	50
2 1/2	63
3	80
4	100

BMF 307-HW-73-115
BMF 307-HW-73-255
Tube cuffs

Piston Ø	Cuff Size
8...25	BMF 307-HW-73-115
25...63	BMF 307-HW-73-255



Replacement for T–slots

BMF 315 – The first choice for pneumatic cylinders with T-slot

The T-slot has now become established as the standard slot type for pneumatic cylinders.

To shorten assembly time, the ability to install from above is critical.

The BMF 315 meets every requirement and stands out with its reliable switching characteristics and wide range of sensing performance.

For especially demanding applications you can choose between weld immune or temperature rated versions.

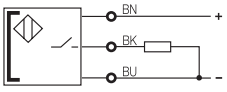
Features

- Proven electronics from the BMF line of sensors
- Can be installed in the T-slot from above
- Rugged, compact, low-profile housing
- Extremely reliable switching behavior

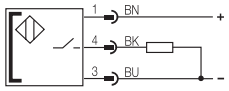
Wiring diagrams

Normally-open

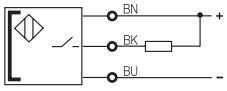
PNP/Cable



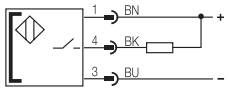
PNP/Connector



NPN/Cable

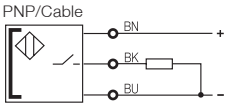


NPN/Connector

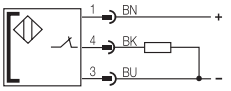


Normally-closed

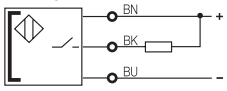
PNP/Cable



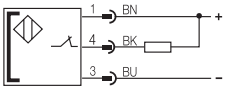
PNP/Connector



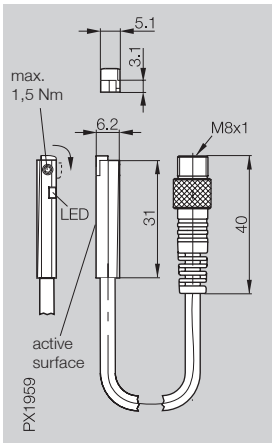
NPN/Cable

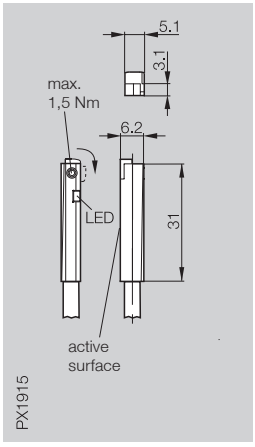


NPN/Connector



Series	BMF 315	BMF 315
Connection Type	Cable + M08 DC Nano Connector (S49) Rotating Threaded Connector	PuFlex Cable





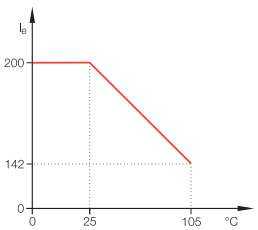
PNP	Normally-open	BMF 315K-PS-C-2-SA2-S49-**	BMF 315K-PS-C-2-PU-*
	Normally-closed	BMF 315K-PO-C-2-SA2-S49-**	BMF 315K-PO-C-2-PU-*
NPN	Normally-open	BMF 315K-NS-C-2-SA2-S49-**	BMF 315K-NS-C-2-PU-*
	Normally-closed	BMF 315K-NO-C-2-SA2-S49-**	BMF 315K-NO-C-2-PU-*

Rated operating field strength H_n	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength H_a	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
Hysteresis of H_n	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of H_n	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay	≤ 0.05 ms	≤ 0.05 ms
Turn-off delay	≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B	10...30 Vdc	10...30 Vdc
Voltage drop U_d	≤ 3.1 V	≤ 3.1 V
Rated insualtion voltage U_i	75 Vdc	75 Vdc
Rated operating current I_e	200 mA	200 mA
No-load supply current I_0 max.	≤ 15 mA	≤ 15 mA
Off-state current I_r	≤ 80 µA	≤ 80 µA
Protected against polarity reversal	yes	yes
Short circuit protected	yes	yes
Load capacitance	≤ 1 µF	≤ 1 µF
Ambient temperature range T_a	–25...+85 °C	–25...+85 °C
LED	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67
Housing material	PA 66	PA 66
Connection	M8 pigtail connector	cable, PUR
No. of wires × gauge		3 × 26 AWG
Approval	cULus	CE, cULus
Recommended connector	C49 ANE-00-VY-050M	

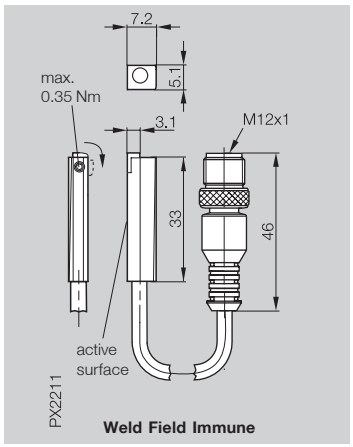
* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

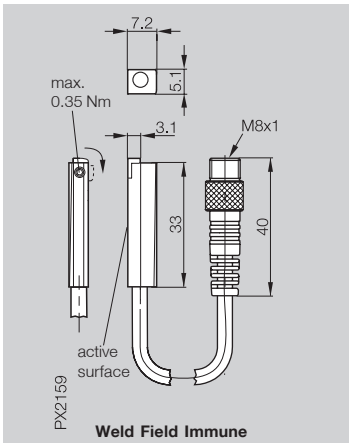
** Please specify length for the pigtail connector. Standard lengths are as follows: 00.2 = 0.2 m, 00.5 = 0.5 m. Consult the factory for other cable length options.

Output current temperature curves



Series	BMF 315M	BMF 315M
Connection Type	Cable + M12 connector (S4) Rotating Threaded Connector	Cable + M8 connector (S49) Rotating Threaded Connector





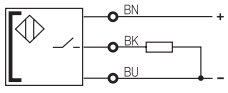
PNP Normally-open	BMF 315M-PS-W-2-S4-00,3	BMF 315M-PS-W-2-S49-00,3
Rated operating field strength I H_n I	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength I H_a I	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
Noise field strength max.	200 kA/m (2500 Gauss)	200 kA/m (2500 Gauss)
Noise field frequency	50...60 Hz	50...60 Hz
Hysteresis of I H_n I	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I	≤ 0.3 %/°C	≤ 0.3 %/°C
On delay	≤ 50 ms	≤ 50 ms
Off delay	≤ 50 ms	≤ 50 ms
Supply voltage U_B	10...30 Vdc	10...30 Vdc
Voltage drop U_d	≤ 4 V	≤ 4 V
Rated insulation voltage U_i	75 Vdc	75 Vdc
Rated operational current I_e	200 mA	200 mA
No-load supply current I_0 max.	≤ 20 mA	≤ 20 mA
Off-state current I_r	≤ 80 µA	≤ 80 µA
Protected against polarity reversal	yes	yes
Short circuit protected	yes	yes
Load capacity	≤ 1 µF	≤ 1 µF
Ambient temperature range T_a	–25...+85 °C	–25...+85 °C
LED	no	no
Degree of protection per IEC 60529	IP 67	IP 67
Housing material	Al	Al
Connection	M12 pigtail connector	M8 pigtail connector
No. of wires × gauge		
Approvals	cULus	cULus
Recommended connector	C04 AEL-00-VY-050M	C49 ANE-00-VY-050M

Other cable length on request.

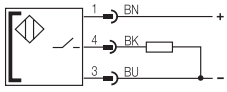
Wiring diagrams

Normally-open

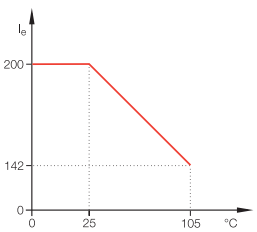
Cable



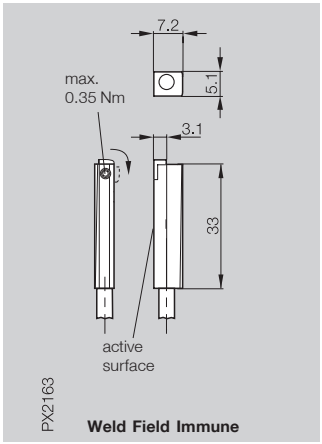
Connector

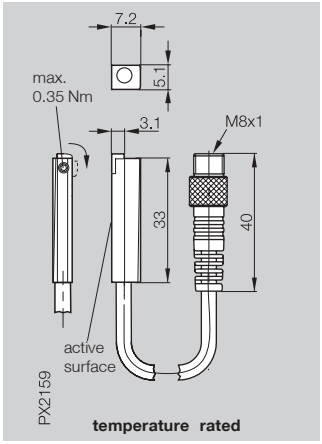


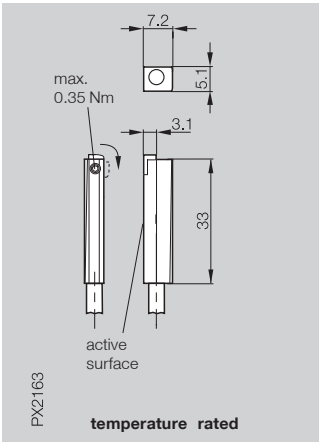
Output current temperature curves



Series	**BMF 315M**	**BMF 315M**	**BMF 315M**
Connection Type	5 meter cable out	Cable + M8 connector (S49) Rotating Threaded Connector	5 meter cable out







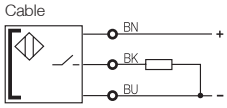
PNP Normally-open	BMF 315M-PS-W-2-PU-05	BMF 315M-PS-D-2-SA3-S49-00,3	BMF 315M-PS-D-2-SA3-PU-05
Rated operating field strength I H_n I	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength I H_a I	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)	≥ 2 kA/m (25 Gauss)
Noise field strength max.	200 kA/m (2500 Gauss)		
Noise field frequency	50...60 Hz		
Hysteresis of I H_n I	≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
On delay	≤ 50 ms	≤ 0.05 ms	≤ 0.05 ms
Off delay	≤ 50 ms	≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B	10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d	≤ 4 V	≤ 3.1 V	≤ 3.1 V
Rated insulation voltage U_i	75 Vdc	75 Vdc	75 Vdc
Rated operational current I_e	200 mA	200 mA	200 mA
No-load supply current I_0 max.	≤ 20 mA	≤ 15 mA	≤ 15 mA
Off-state current I_r	≤ 80 µA	≤ 80 µA	≤ 80 µA
Protected against polarity reversal	yes	yes	yes
Short circuit protected	yes	yes	yes
Load capacity	≤ 1 µF	≤ 1 µF	≤ 1 µF
Ambient temperature range T_a	–25...+85 °C	–25...+105 °C	–25...+105 °C
LED	no	no	no
Degree of protection per IEC 60529	IP 67	IP 67	IP 67
Housing material	Al	Al	Al
Connection	5 m cable, PUR	M8 pigtail connector	5 m cable, PUR
No. of wires × gauge	3×26 AWG	3	3×26 AWG
Approvals	cULus	cULus	cULus
Recommended connector		C49 ANE-00-VY-050M	

Other cable length on request.

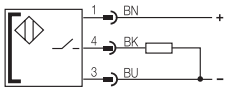
Wiring diagrams

Normally-open

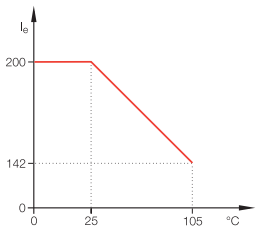
Cable



Connector



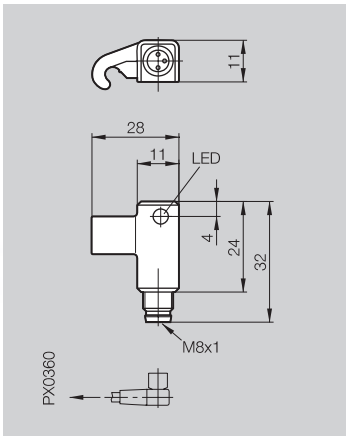
Output current temperature curves

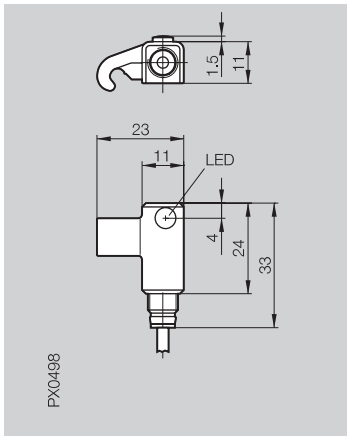


Series	BMF 21	BMF 21
Connection Type	M08 DC Nano Connector (S49)	PuFlex Cable

BMF 21

The BMF 21 is designed with an integral swinging bracket arm that allows it to self-adjust across a wide range of cylinder diameters. This makes the BMF 21 ideal for the tie-rod and external rail profile cylinders.

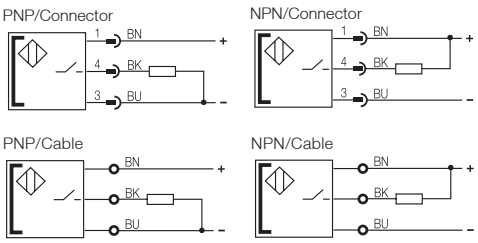




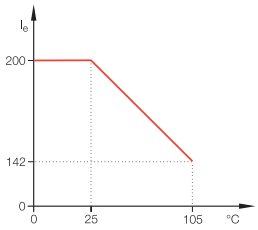
PNP	Normally-open	BMF 21K-PS-C-2-S49	BMF 21K-PS-C-2-PU-*
NPN	Normally-open	BMF 21K-NS-C-2-S49	BMF 21K-NS-C-2-PU-*
Rated operating field strength H_n		1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength H_a		≥2 kA/m (25 Gauss)	≥2 kA/m (25 Gauss)
Hysteresis of H_n		≤45%	≤45%
Temperature drift of turn-on point of H_n		≤0.3%/°C	≤0.3%/°C
Turn-on delay		≤0.5 ms	≤0.5 ms
Turn-off delay		≤0.5 ms	≤0.5 ms
Supply voltage U_B		10...30 Vdc	10...30 Vdc
Voltage drop U_d		≤3.1 V	≤3.1 V
Rated insulation voltage U_i		75 Vdc	75 Vdc
Rated operating current I_e		200 mA	200 mA
No-load supply current I_0 max.		≤30 mA	≤30 mA
Off-state current I_r		≤80 µA	≤80 µA
Protected against polarity reversal		yes	yes
Short circuit protected		yes	yes
Load capacitance		≤1µF	≤1µF
Ambient temperature range T_a		-25°C...+85°C	-25°C...+85°C
LED		yes	yes
Degree of protection per IEC 60529		IP 67	IP 67
Housing material		PBT Hardened	PBT Hardened
Connection		connector	cable, PUR
No. of wires × gauge			3 x 26 AWG
Approval		CE, cULus	CE, cULus
Recommended connector		C49 ANE-00-VY-050M	

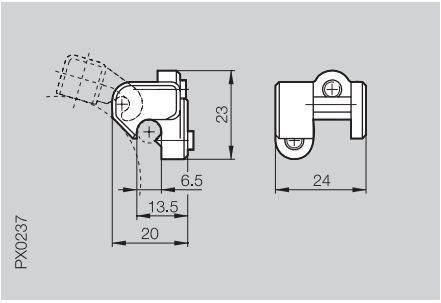
* Please specify the cable length for sensor. Standard lengths are as follows: 03 = 3 m, 05 = 5 m. Consult the factory for other cable length options.

Wiring Diagram



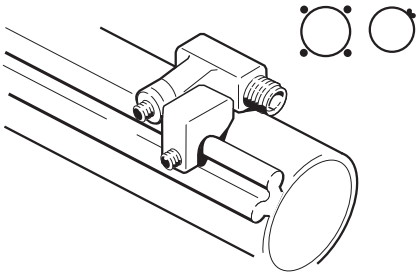
Output current temperature curve

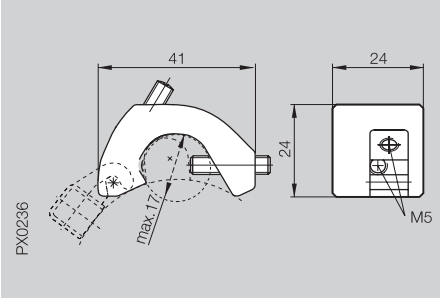




BMF 21-HW-8

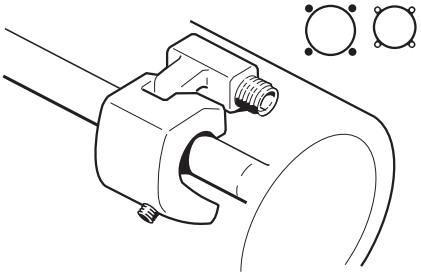
for pneumatic cylinders with tie rods
Piston Ø = any
Tie rod Ø 4.3...6.5 mm
or
Pneumatic cylinders with DUO rail
Piston Ø = any

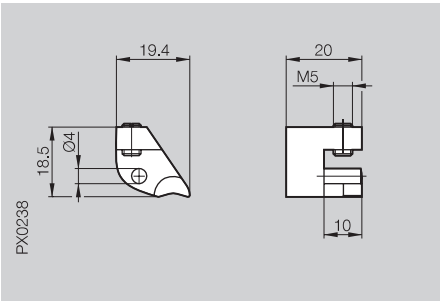




BMF 21-HW-10
BMF 21-HW-10E

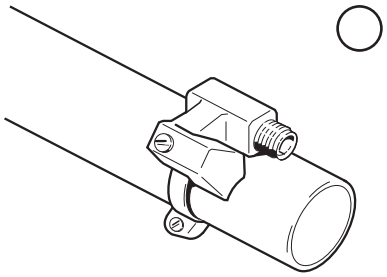
for pneumatic cylinders with tie rods
Piston Ø 32...125mm
Tie rod Ø 4.3...17 mm
or
for pneumatic cylinders
with integral tie rod (profile)
Piston Ø 32...80mm
Profile width 10...17mm





BMF 21-HW-11
+ Tube Cuff
(SCHLAUCHSCHELLE BMF GR.__)

for pneumatic cylinders without tie rods/rail
Tube cuffs sold separately. Tube cuff sizes available for the following cylinder diameters:



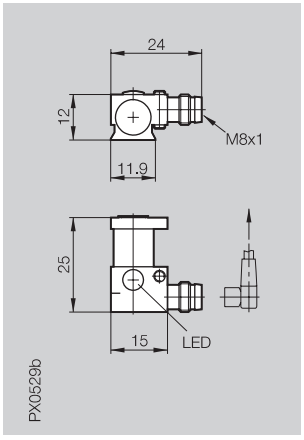
Pneumatic Tube Cuff Sizes		
Tube Cuff Size	Piston Ø	Cylinder Ø
0	<8	7 - 11
1	8...10	11 - 19
2	12...25	18 - 29
3	32	28 - 39
4	40	38 - 49
5	50	48 - 59
6	63	58 - 69
7	80	68 - 79
8	70	78 - 89

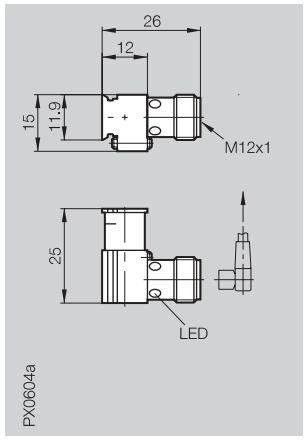
To order a combination kit of sensor with mounting bracket, include the bracket code in the part number.
Example: BMF 21K**/HW10**-PS-2-C-S49

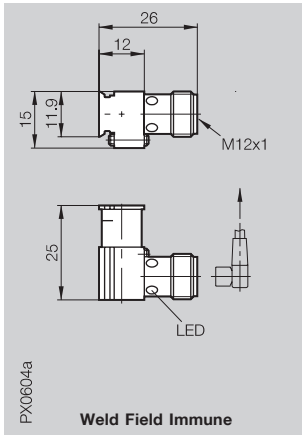
Series	BMF 32	BMF 32	BMF 32
Connection Type	M08 DC Nano Connector (S49)	M12 DC Micro Connector (S4)	M12 DC Micro Connector (S4) ***Weld Field Immune***

BMF 32

The BMF 32's tough aluminum housing, compact size and rugged electronics make it the sensor of choice in tough industrial applications. The BMF 32 will perform where lesser devices call it quits. The BMF 32 is also available with a weld field immune circuit for demanding arc and reisistance welding applications.







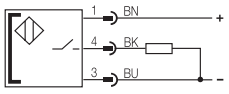
PNP	Normally-open	BMF 32M-PS-C-2-S49	BMF 32M-PS-C-2-S4	BMF 32M-PS-W-2-S4
NPN	Normally-open	BMF 32M-NS-C-2-S49	BMF 32M-NS-C-2-S4	BMF 32M-PS-W-2-S4
Rated operating field strength H_n I		1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)	1.2 kA/m (15 Gauss)
Assured operating field strength I H_a I		≥2 kA/m (25 Gauss)	≥2 kA/m (25 Gauss)	≥2 kA/m (25 Gauss)
Hysteresis of I H_n I		≤45%	≤45%	≤45%
Temperature drift of turn-on point of I H_n I		≤0.3%/°C	≤0.3%/°C	≤0.3%/°C
Turn-on delay		≤0.05 ms	≤0.05 ms	≤0.05 ms
Turn-off delay		≤0.05 ms	≤0.05 ms	≤0.05 ms
Supply voltage U_B		10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d		≤3.1V	≤3.1V	≤ 4 V
Rated insualtion voltage U_i		75 Vdc	75 Vdc	75 Vdc
Rated operating current I_e		200 mA	200 mA	200 mA
No-load supply current I_0 max.		≤30 mA	≤30 mA	≤30 mA
Off-state current I_r		≤ 80 µF	≤ 80 µF	≤ 80 µF
Protected against polarity reversal		yes	yes	yes
Short circuit protected		yes	yes	yes
Load capacitance		≤1µF	≤1µF	≤ 0.15 µF
Ambient temperature range T_a		-25°C...+85°C	-25°C...+85°C	-25°C...+85°C
LED		yes	yes	yes
Degree of protection per IEC 60529		IP67	IP67	IP67
Housing material		Al	Al	Al
Connection		connector	connector	connector
No. of wires × gauge				
Approval		CE, cULus	CE, cULus	CE, cULus
Recommended connector		C49 ANE-00-VY-050M	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M

To order a combination kit of sensor with mounting bracket, include the bracket code in the part number.
Example: BMF 32M/**HW12**-PS-C-2-S49

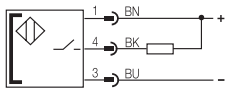
BMF 32 fits 12mm wide, 60° trapezoidal channel or tie rods and rails with optional brackets.
See following page for bracket options.

Wiring Diagrams

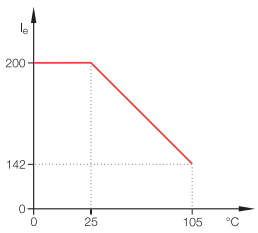
PNP/Connector



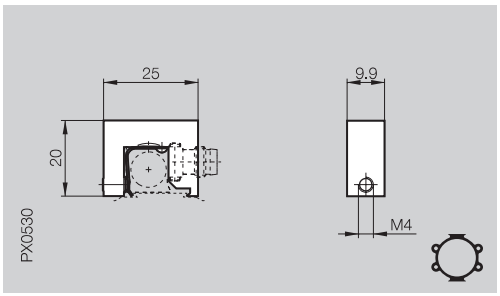
NPN/Connector

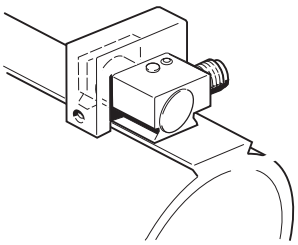


Output current temperature curves

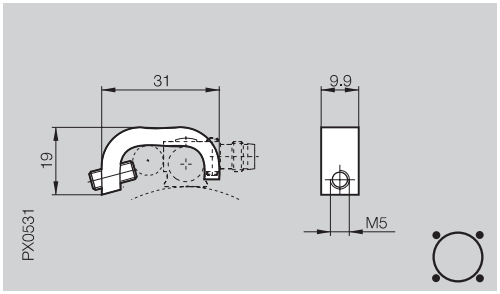


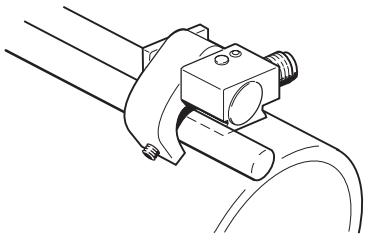
BMF 32-HW-12
for pneumatic cylinders
with trapezoidal rail
Mecman EUROMEC
Piston Ø = any



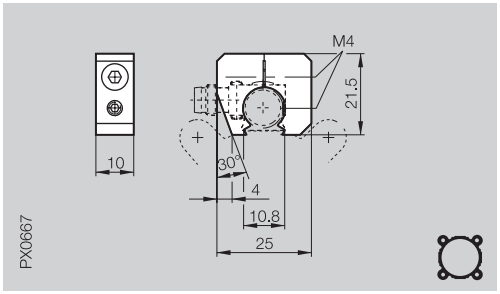


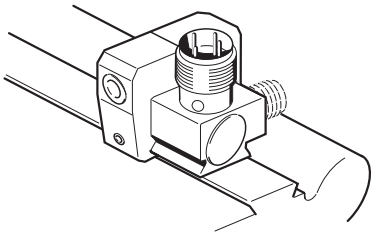
BMF 32-HW-13
for pneumatic cylinders
with tension rod
Piston Ø = any
Tie rod Ø max. 11 mm



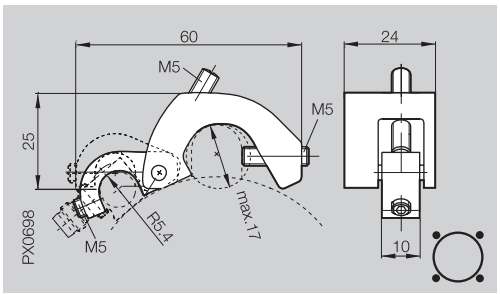


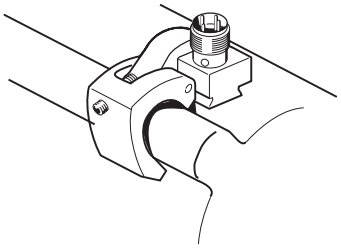
BMF 32-HW-14
for pneumatic cylinders
with trapezoidal rail Bosch
types 0822 350/351/352/353/
354/355
Piston Ø = any



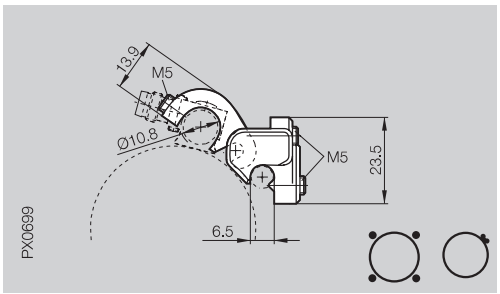


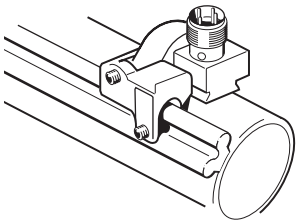
BMF 32-HW-15
for pneumatic cylinders
with tie rods
Piston Ø = any
Tie rod Ø 4...17mm



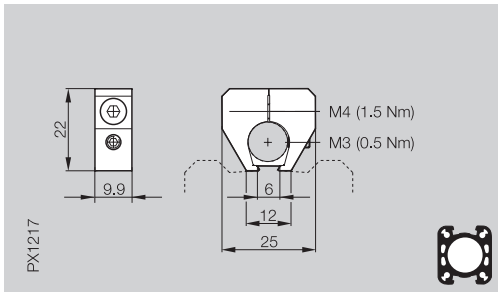


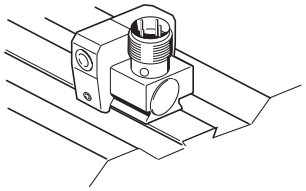
BMF 32-HW-16
for pneumatic cylinders
with duo rail or tie rods
Piston Ø = any





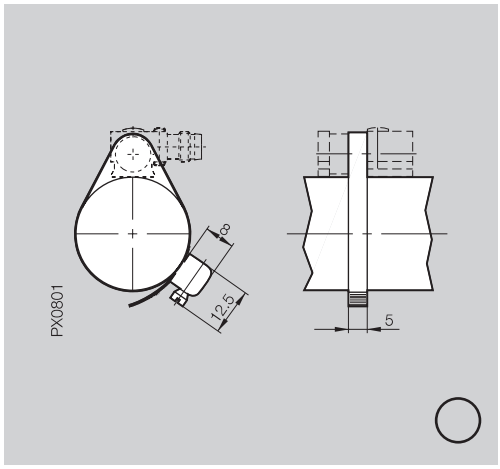
BMF 32-HW-18
for pneumatic cylinders with trapzoidal rail

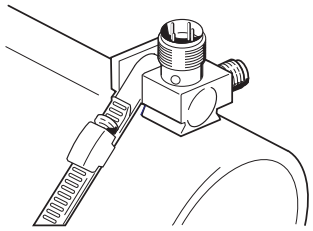




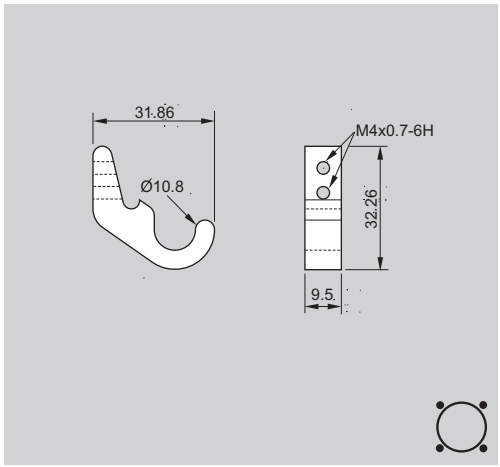
SCHLAUCHSCHELLE BMF GR.__
for pneumatic cylinders without tie rods/rail

Pneumatic Tube Cuff Sizes		
Tube Cuff Size	Piston Ø	Cylinder Ø
0	<8	7 - 11
1	8...10	11 - 19
2	12...25	18 - 29
3	32	28 - 39
4	40	38 - 49
5	50	48 - 59
6	63	58 - 69
7	80	68 - 79
8	70	78 - 89

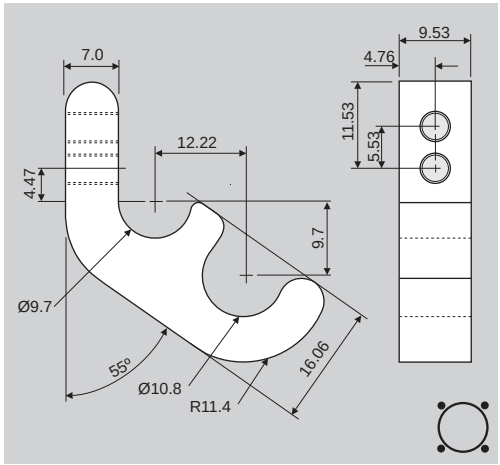




BMF 32-HW-49
for small tie rod cylinders 3/4"-1 1/8" bore e.g. PHD A, AV, HV series
Bracket is secured to tie rod and leverage holds sensor firmly in position

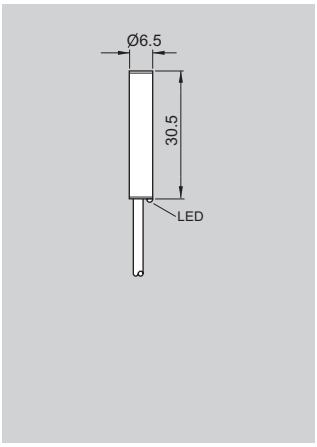


BMF 32-HW-54
for tie rod cylinders up to 10 mm diameter tie rod
Bracket is secured to tie rod and leverage holds sensor firmly in position



Prox Style

Housing type	**BMF 07M**
Connection type	PuFlex-cable
Housing size	∅ 6.5

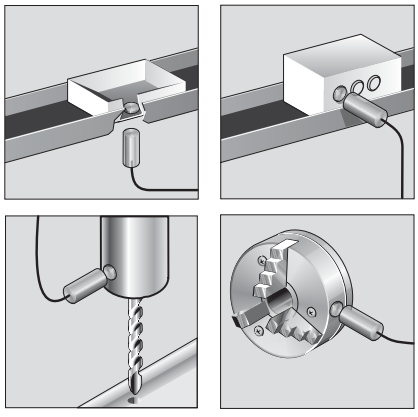


Some advantages of magnetic field sensors in the classic inductive sensor housing:

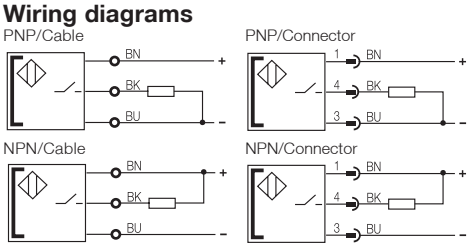
- Large sensing distances with small sizes
- Sensing through walls made of non-ferrous metals like aluminum, without reduced sensing distances
- Reacts only to magnetic fields; no faulty switching by metal shavings or other metal parts
- Magnet can be flush mounted in steel
- Protected against polarity reversal
- Supply voltage 10...30 V
- Reacts to the north or south poles
- Solid-state
- Wear-free
- Vibration insensitive
- Output protected against inductive peaks
- Short circuit protected

PNP	Normally-open	BMF 07M-PS-C-2-KPU-03
NPN	Normally-open	BMF 07M-NS-C-2-KPU-03

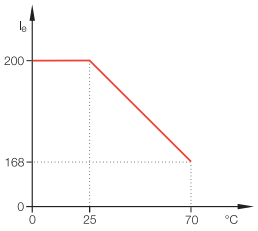
Rated operating field strength H_n	1.2 kA/m (15 Gauss)
Assured operating field strength H_a	≥ 2 kA/m (25 Gauss)
Differential travel	≤ 45 %
Temperature drift	≤ 0.3 %/°C
Switch on response time	≤ 0.05 ms
Switch off response time	≤ 0.05 ms
Supply voltage U_B	10...30 Vdc
Voltage drop U_d at I_e ≤ 100 mA	≤ 3.1 V
Rated insulation voltage U_i	75 Vdc
Rated operational current I_e	200 mA
No-load supply current I_0 d./und.	≤ 22 mA/≤ 10 mA
Off-state current I_r	≤ 80 µA
Protected against polarity reversal	yes
Short circuit protected	yes
Load capacitance	≤ 1 µF
Ambient temperature range T_a	–25...+70 °C
LED	yes
Degree of protection per IEC 529	IP 67
Housing material	nickel plated brass
Connection	cable, PUR
No. of wires × size	3 x 26 AWG
Approvals	CE, cULus
Recommended connector	

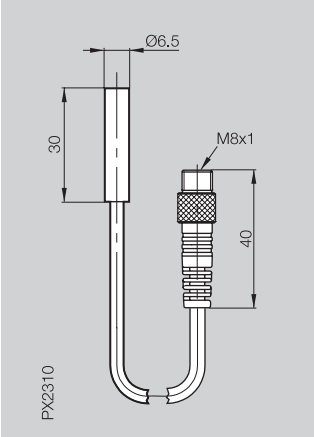
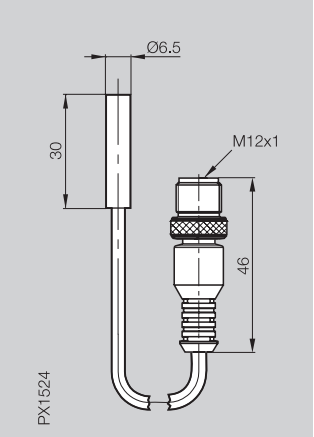
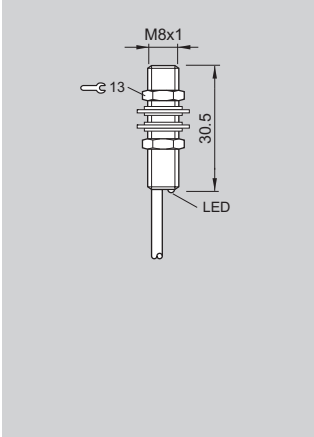
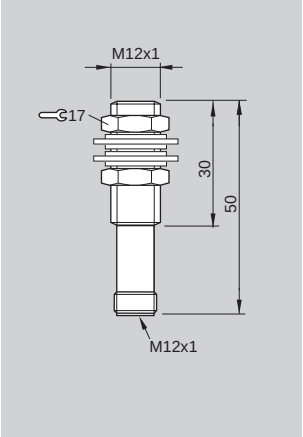


Wiring diagrams



Output current temperature curves



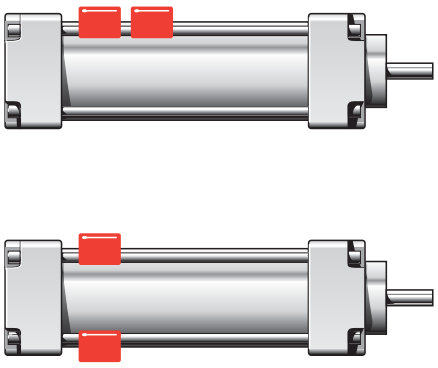
BMF 07M	**BMF 07M**	**BMF 08M**	**BMF 12M**
Cable + M8 connector (S49)	Cable + M12 connector (S4)	PuFlex-cable	M12 DC Micro connector (S4)
Rotating Threaded Connector	Rotating Threaded Connector		
Ø 6.5	Ø 6.5	M8	M12
			
BMF 07M-PS-D-2-SA2-S49-00,3 BMF 07M-NS-D-2-SA2-S49-00,3	BMF 07M-PS-D-2-S4-00,6	BMF 08M-PS-C-2-KPU-03 BMF 08M-NS-C-2-KPU-03	BMF 12M-PS-D-2-S4 BMF 12M-NS-D-2-S4
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)
≤ 45 %	≤ 45 %	≤ 45 %	≤ 45 %
≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
10...30 Vdc	10...30 Vdc	10...30 Vdc	10...30 Vdc
≤ 3.1 V	≤ 3.1 V	≤ 3.1 V	≤ 3.1 V
75 Vdc	75 Vdc	75 Vdc	75 Vdc
200 mA	200 mA	200 mA	200 mA
≤ 30 mA	≤ 30 mA	≤ 30 mA	≤ 12 mA/≤ 10 mA
≤ 80 µA	≤ 80 µA	≤ 80 µA	≤ 80 µA
yes	yes	yes	yes
yes	yes	yes	yes
≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
no	no	yes	no
IP 67	IP 67	IP 67	IP 67
nickel plated brass	nickel plated brass	nickel plated brass	nickel plated brass
cable with connector, PUR	cable with connector, PUR	cable, PUR	connector
		3 × 26 AWG	
cULus	cULus	CE, cULus	CE, cULus
C49 ANE-00-VY-050M	C49 ANE-00-VY-050M		C04 AEL-00-VY-050M

Operating Magnets

Magnet type	Samarium Cobalt	Ferrite	Strontium Ferrite
			
Ordering codes	MAGNET PLATTE 16x12x3	RUNDMAGNET 10.0x10.0	RUNDMAGNET 4.0x5.0
Nominal Dimensions	16 × 12 mm	Ø 10 mm	Ø 4 mm
Thickness	3 mm	10 mm	5 mm
Assured operating distance S_a	28 mm	15 mm	5 mm
Differential travel	8 mm	2 mm	2 mm

Mounting separation

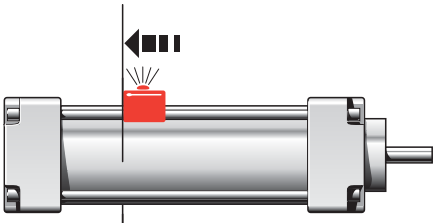
The response travel of a magnetic field sensitive sensor is virtually independent of the field strength of typical piston magnets. Still the sensor does not exhibit false switching. When using more than one of the magnetic field switches, the BMF sensors can be mounted directly next to or beside each other.



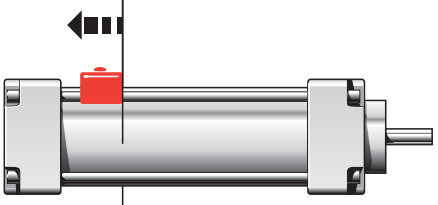
Adjustment and mounting

1. Set piston to end of travel.

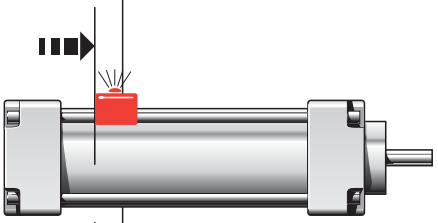
2. Slide sensor (with power on) until the output turns on (LED on). Mark the location of the front edge of the sensor on the cylinder body.



3. Continue to slide the sensor until the output is off (LED off).



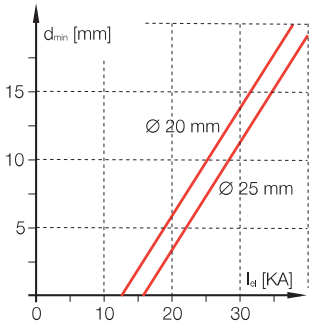
4. Change direction and slide the sensor back towards the other end of the cylinder. When output turns on, mark location of the same sensor edge (original front edge) on the cylinder body.



5. The two marks on the cylinder body define the width of the active zone of the sensor with this cylinder. Determine the midpoint of the two marks and lock down the sensor so the original front edge is located at this midpoint.

Use in weld fields

Weld-immune magnetic field sensors can be operated in external fields up to a field strength of E_{max} = 200 kA/m. This limit is often exceeded in the direct vicinity of high current lines, e. g. welding equipment. The sensor should therefore be mounted at a distance d_{min} from such lines, as shown in the diagram at right showing the relationship between current and conductor diameter.
Weld-immune sensors include:
BMF 32M...W...
BMF 305M...W...
BMF 315M...W...
BMF 305K...W...



	BMF Technology Comparison		
	BALLUFF Magnetoresistive (MR) Giant Magnetoresistive (GMR)	**Hall Effect**	**Reed Switch**
Operating principle	Change of resistance/current	Microvolt signal	Mechanical contact
Solid-state, wear-free operation	Yes	Yes	No
Radio frequency immunity	Moderate	Low	High
Required magnetic field strength	Low to high	High	High
Switching speed	High	High	Low
Contact bounce	No	No	Yes
Susceptibility to damage by AC welding fields	Low	Low	High
Susceptibility to false tripping by AC welding fields	WFI versions, none to low	High	High
Works with magnet type	Hall Effect or Reed Magnet*	Hall Effect Magnet only	Reed Magnet only
Required magnetic polarity orientation	MR Perpendicular or Parallel GMR Parallel	Perpendicular only	Parallel only
Susceptible to double switchpoints	No*	Yes	Yes
Output short circuit protection	Yes	Sometimes	No
Output reverse polarity protection	Yes	Sometimes	Yes (bipolar)
Output overload protection	Yes	Sometimes	No

*Always test in actual application. Some Hall Effect magnets will not trigger sensor reliably; others may cause double switch points.

Know your cylinder? Find your sensor.

It's that easy with Balluff's Pneumatic Cylinder Sensor Resource Center ...

- Over 1000 cylinders cataloged
- Lifetime warranty on all solid state cylinder sensors

www.balluff.com/bmf

Precision in a compact housing

BIL is the compact displacement sensor for position sensing up to 160 mm.

The BIL analog position sensor utilizes non-contact magnetic inductive technology to provide continuous, absolute position feedback.

Features

- Power and magnet indicator LEDs (AMDO & EMDO)
- Magnet missing/out of range max output value indication (AMDO & EMDO)
- Non-contact
- Wear-free
- Suitable for harsh environments with potted sensor and electronics
- Processing electronics integrated, no external components
- Housing cross-section 15×15 mm

Applications

- Robotics/handling
- Clamping cylinders
- Packaging
- Process industry
- Position sensing on grippers

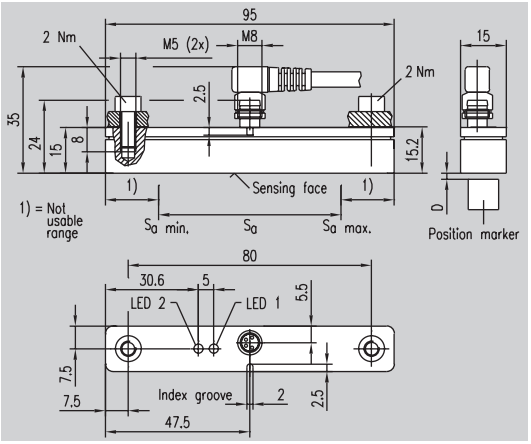
Installation notes

When installing and attaching the BIL and magnet, non-magnetizable materials such as alloys, austenitic steels, plastics, etc. are recommended. This applies both to the sensor as well as the magnet.

Magnetizable materials can affect the geometry and strength of the field coming from the permanent magnet.

Magnetic fields in the area of the BIL can, depending on their orientation and strength, affect the output signal.

Output signal U_a	**Voltage 0...10 V or**
Output signal I_a	**Current 4...20mA**
Working range s_a	0...60 mm
Linear range s_l	5...55 mm

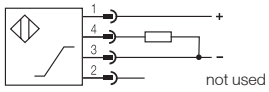


Ordering code	0-10 Vdc	BIL AMD0-T060A-01-S75
	0-10 Vdc / 4-20 mA	BIL EMD0-T060A-01-S75

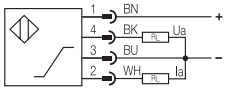
Rated operational voltage U_e	24 Vdc
Supply voltage U_B	15...30 Vdc
Ripple	≤ 10 % of U_e
Rated insulation voltage U_i	75 Vdc
Rated sensing distance s_e	30 mm
Load resistance R_L	at $U_a \geq 2$ kΩ, at $I_a \leq 500$ Ω
No-load supply current I_0 at U_e	≤ 30 mA
Protected against polarity reversal	yes
Short circuit protected	yes
Supply voltage indication	yes (LED 1)
Position marker inside/outside working range	yes (LED 2)
Ambient temperature range T_a	–10...+75 °C
Repeat accuracy R_{BWN}	≤ ±60 µm
Non-linearity	≤ ±1 mm
Limit frequency (–3dB)	1500 Hz
Measuring speed	≤ 5 m/s
Temperature coefficient TK typ.	+5 µm/K
in the optimal range min.	–20 µm/K
from +10...+50 °C max.	+25 µm/K
Degree of protection per IEC 60529	IP 67
Housing material	PA fiberglass reinforced
Connection	connector
Recommended connector	C75A or C75B

Wiring diagrams

BIL AMD0...

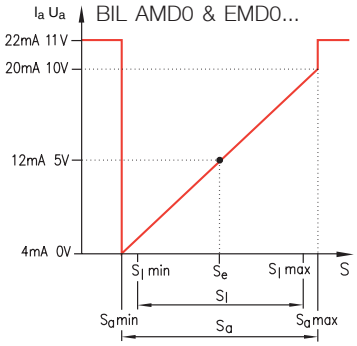


BIL ED0 & EMD0...

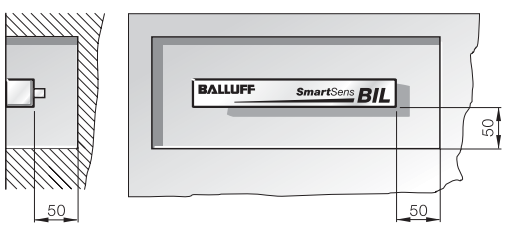


Connect to either voltage or current output.

Output Curve

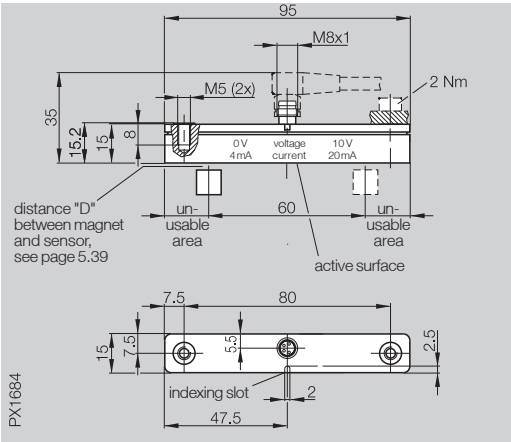


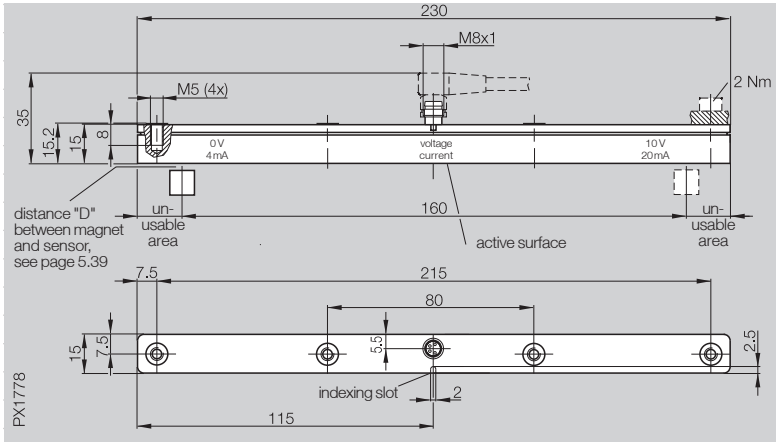
Recommended distances from magnetizable materials (for optimum function)



all data in mm

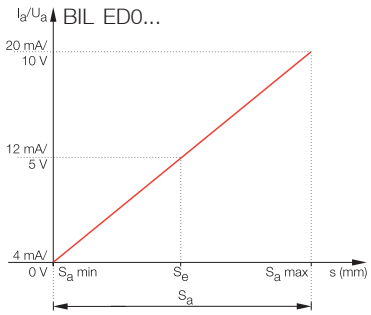
Voltage 0...10 V or Current 4...20 mA	Voltage 0...10 V or Current 4...20 mA
0...60 mm	0...160 mm
5...55 mm	0...160 mm





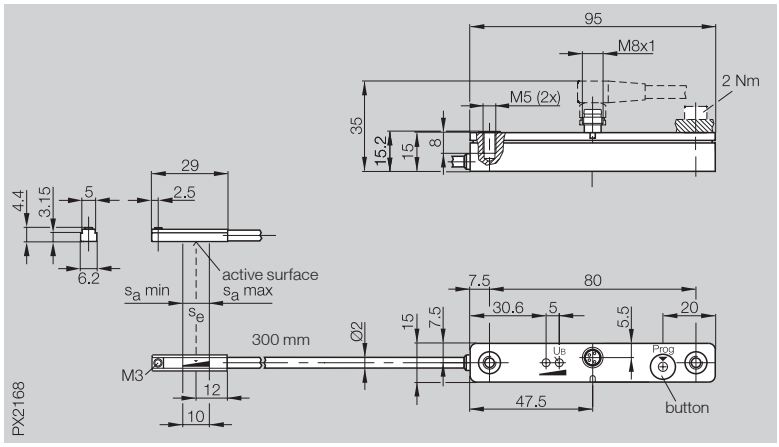
BIL ED0-P060A-01-S75	BIL ED0-P160A-01-S75
24 Vdc	24 Vdc
at U_a 15...30 Vdc, at I_a 10...30 Vdc	at U_a 15...30 Vdc, at I_a 10...30 Vdc
≤ 10 % of U_e	≤ 10 % of U_e
75 Vdc	75 Vdc
30 mm	80 mm
at U_a ≥ 2 kΩ, at I_a ≤ 500 Ω	at U_a ≤ 2 kΩ, at I_a ≤ 500 Ω
≤ 30 mA	≤ 25 mA
yes	yes
yes	yes
no	no
no	no
–10...+75 °C	–10...+75 °C
≤ ±60 µm	≤ ±80 µm
≤ ±0.6 mm	≤ ±2.4 mm
1500 Hz	300 Hz
≤ 5 m/s	≤ 5 m/s
–5 µm/K	–40 µm/K
+15 µm/K	+120 µm/K
–25 µm/K	–200 µm/K
IP 67	IP 67
PA fiberglass reinforced	PA fiberglass reinforced
connector	connector
C75A or C75B	C75A or C75B

Output Curve



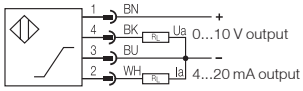
The original bracket and screws are recommended for mounting the BIL. Please order accessories separately. See page 5.39.

Output signal U_a	**Voltage 0...10 V or**
Output signal I_a	**current 4...20 mA**
Working range s_a	0...10 mm
Linear range s_l	0...10 mm



Ordering code	BIL ED0-B010P-02/30-S75
Field strength axial H_n	10 kA/m typical
–3dB width of axial field distribution, typical (axial field strength typ. – parallel to active surface)	2.5 mm
Rated operational voltage U_e	24 Vdc
Supply voltage U_B	at U_a 15...30 Vdc, at I_a 10...30 Vdc
Ripple	≤ 10 % of U_e
Rated insulation voltage U_i	75 Vdc
Rated sensing distance s_e	5 mm
Load resistance R_L	at U_a ≥ 2 kΩ, at I_a ≤ 500 Ω
No-load supply current I_0 at U_e	≤ 30 mA
Protected against polarity reversal	yes
Short circuit protected	yes
Ambient temperature range T_a	–10...+70 °C
Repeat accuracy R_{BWN}	≤ ±30 µm
Non-linearity	≤ ±0.3 mm
Temperature coefficient TK typical	+4 µm/K
in the optimal range min.	+2 µm/K
from 10...+50 °C max.	+10 µm/K
Supply voltage indication	yes
Programming indication	yes
Degree of protection per IEC 60529	IP 67
Housing material	PA fiberglass reinforced
Connection	connector
Recommended connector	C75A or C75B

Wiring diagram

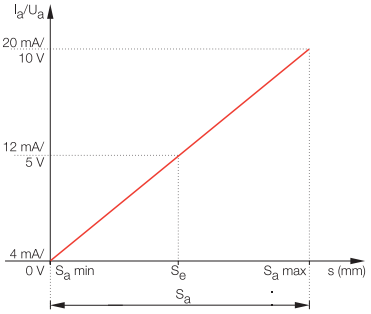


Connect to either voltage or current output.

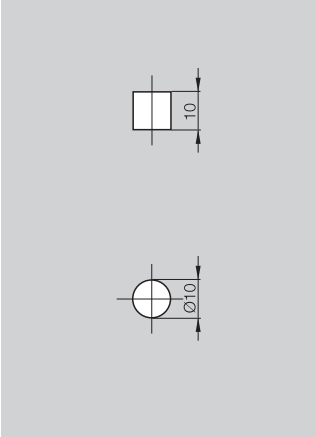
Micro-BIL is the solution for continuous position sensing on pneumatic miniature grippers with T-slot. The analog output signal allows you to sense end-of-travel and intermediate positions of gripper jaws absolutely and without contact.

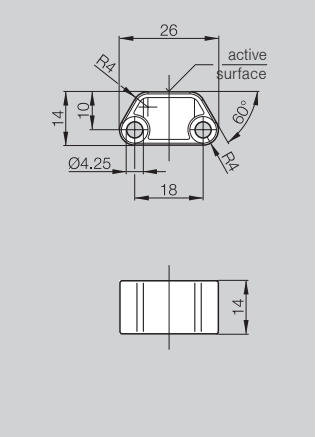
To use the Micro-BIL a magnet is installed in the gripper. A button is provided for calibrating to various magnetic field strengths. The technical data refers to reference measurements. Different grippers with differing magnetic field strengths may affect the technical data.

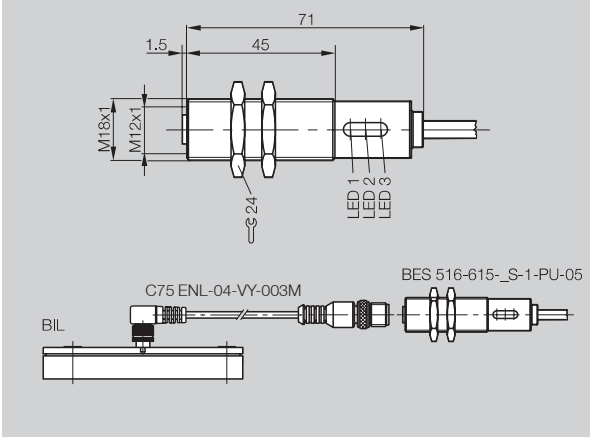
Output curve



Description	Magnet	Magnet	Analog Set Point Controller
Dimensions	∅ 10×10	26×14×14	M18×1
Material	Hard ferrite	PA fiberglass reinforced	CuZn nickel plated
Distance "D"	2 mm	1 mm	



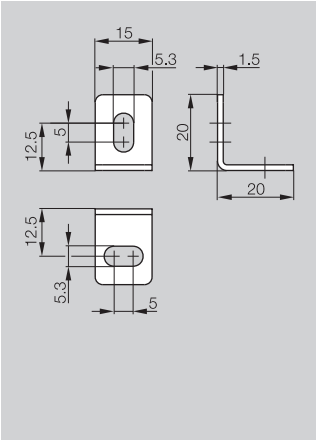


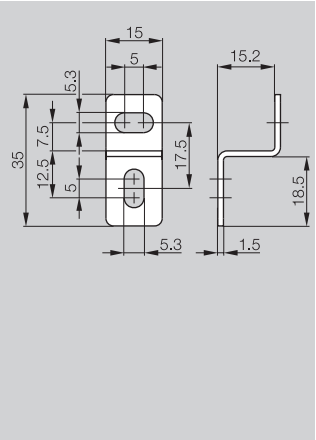


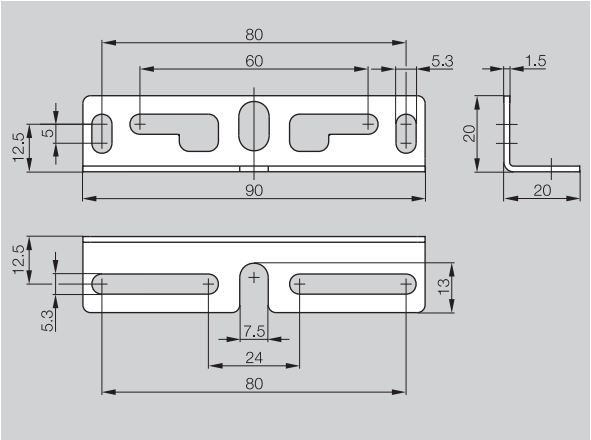
Ordering code	BIL 000-MH-A	BIL 001-MH-A	BES 516-615-_S-1-PU-05

- Analog output
- PNP or NPN normally- open
- Input signal 0...10 V
- Resolution 8 bits
- 3 binary switch points
- Teach-in programming
- See page 7.34 for technical information

Description	Mounting Bracket	Mounting Bracket	Mounting Bracket
Material	stainless steel	stainless steel	stainless steel

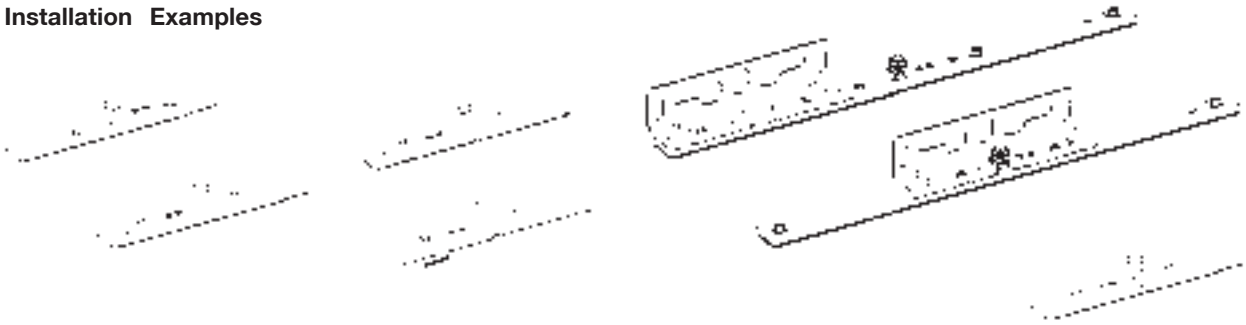


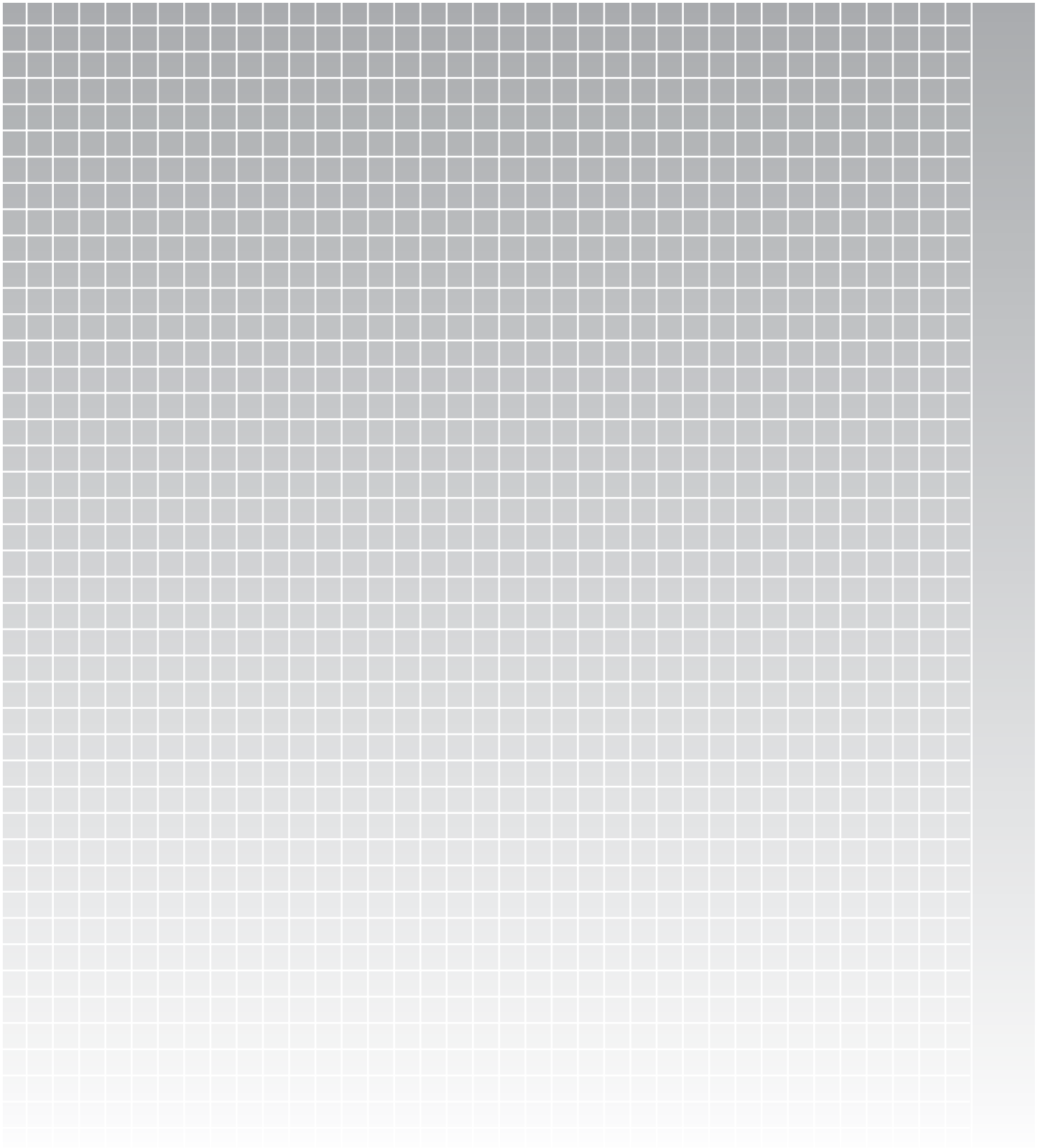


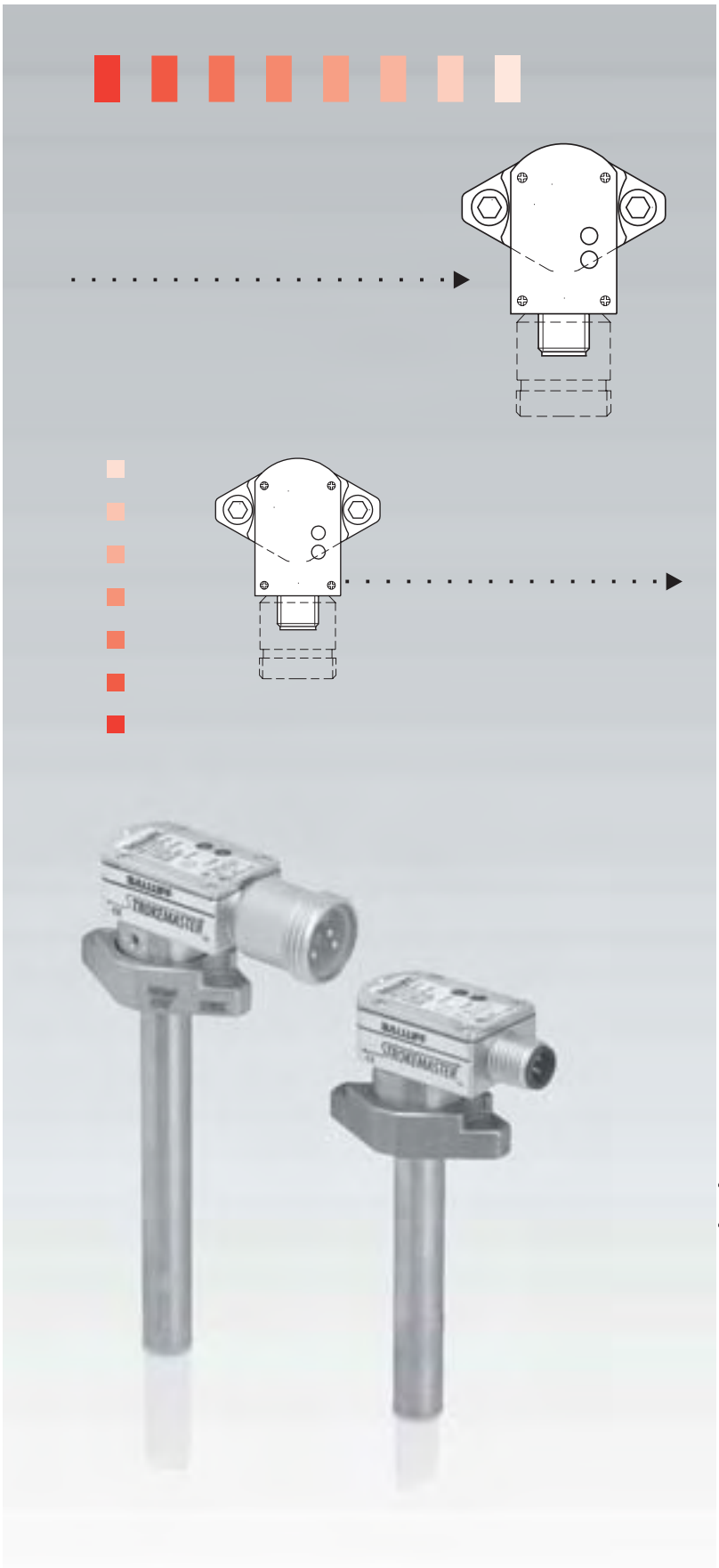


Ordering code	BIL 01-HW-1	BIL 01-HW-2	BIL 01-HW-3

Installation Examples





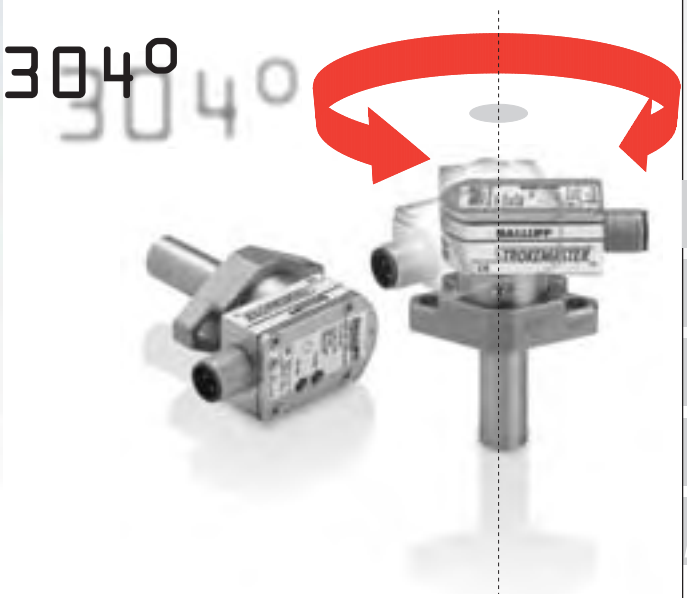


Strokemaster® Inductive Cylinder Sensors

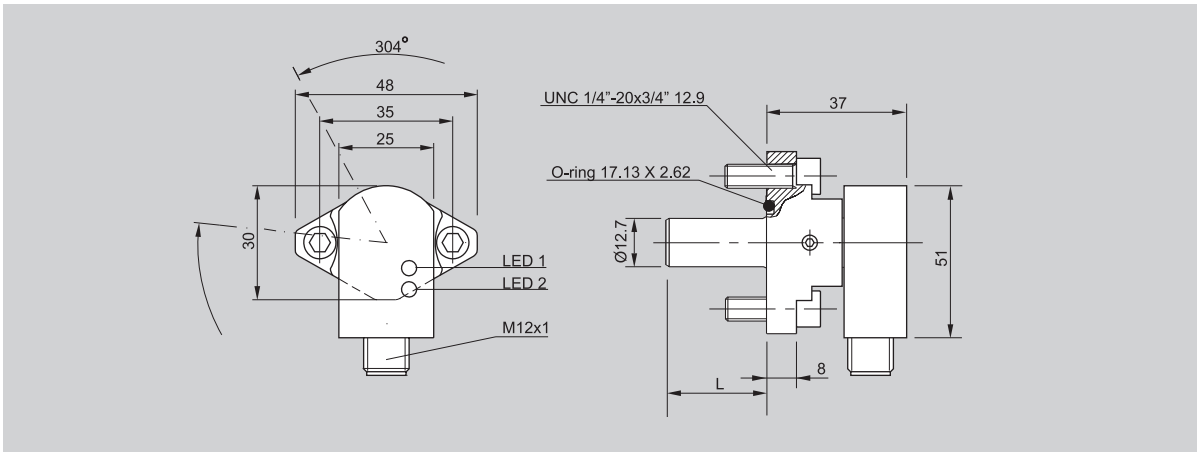
Balluff's Strokemaster® cylinder-position sensors provide precision end-of-stroke sensing for hydraulic cylinders. The sensor body allows 304° of rotation to eliminate the hassle of post-installation cable management, which in some competitive designs requires unbolting the flange and breaking the hydraulic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



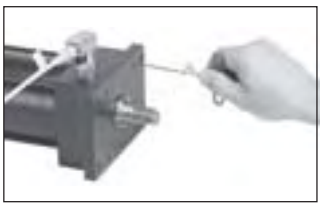
Mounting	Flush
Rated operating distance s_n	**2 mm**
Assured operating distance s_a	0...1.6 mm



PNP Normally-open ①	BES 516-300-S 295/0.912"...4.560"-S4
Rated operational voltage U_e	24 Vdc
Supply voltage U_B	10...30 Vdc
Voltage drop U_d at I_e	≤ 2.5 V
Rated insulation voltage U_i	75 Vdc
Rated operational current I_e	200 mA
No-load supply current I_0 damped/undamped	≤ 18 mA/≤ 10 mA
Off-state current I_r	≤ 80 µA
Protected against polarity reversal	yes
Short circuit/overload protected	yes/yes
Load capacitance	≤ 1.0 µF
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Operating frequency f	10 Hz
Utilization categories	DC 13
Function/Operating voltage indication	yes/yes
Degree of protection per IEC 60529	IP 67
Housing material	stainless steel/aluminum
Material of sensing face	ceramic
Connection	micro connector
Approvals	cULus
High pressure rated up to	**207 bar (3000 psi)**
Standard lengths (L)	see table on page 5.44
Recommended connector	C04 AEL-00-VY-050M

Bolt sensor to cylinder.

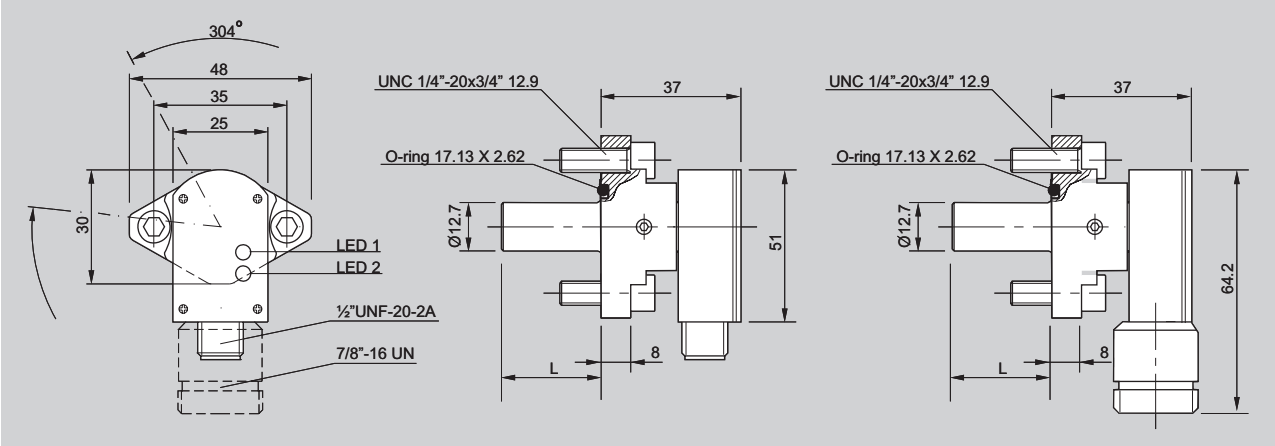
Position cable to desired orientation (even over mounting bolts).



Lock chosen position with one or both of the two integral set screws.

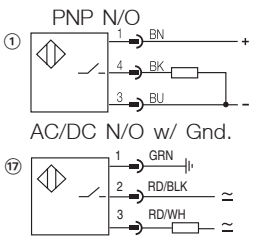
Note: Some DC units are also available with S5 Mini connector.
Consult factory for sensor and cable part numbers.

Mounting	Flush	Flush
Rated operating distance s_n	**2 mm**	**2 mm**
Assured operating distance s_a	0...1.6 mm	0...1.6 mm

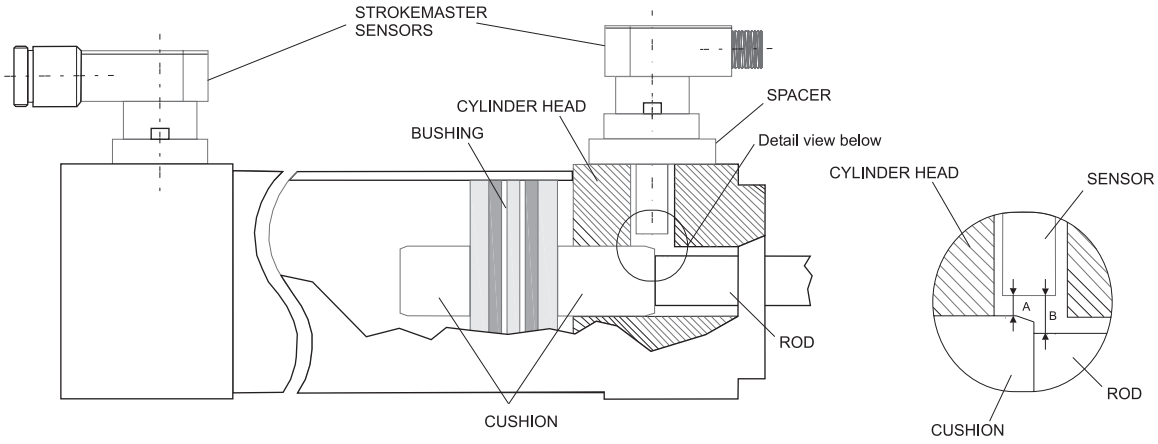


AC/DC Normally-open ⑰	BES 516-200-S 2/0.912"...4.560"-S 21	BES 516-200-S 2/0.912"...4.560"-S5
Rated operational voltage U_e	110 Vac	110 Vac
Supply voltage U_B	20...250 Vac/Vdc	20...250 Vac/Vdc
Voltage drop U_d at I_e	≤ 6 V	≤ 6 V
Rated insulation voltage U_i	250 Vac	250 Vac
Rated operational current I_e	500 mA	500 mA
Minimum operational current I_m	5 mA	5 mA
Off-state current I_r	≤ 1.7 mA at 110 Vac	≤ 1.7 mA at 110 Vac
Inrush current I_k (t = 20 ms)	3 A max./1 Hz	3 A max./1 Hz
Protected against polarity reversal	yes	yes
Short circuit protected	yes	yes
Repeat accuracy R	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C
Operating frequency f	≤ 50 Hz	≤ 50 Hz
Utilization categories	AC 140/DC 13	AC 140/DC 13
Function/Operating voltage indication	yes/yes	yes/yes
Degree of protection per IEC 60529	IP 67	IP 67
Insulation class	1	1
Housing material	stainless steel/aluminum	stainless steel/aluminum
Material of sensing face	ceramic	ceramic
Connection	micro connector	mini connector
Approvals	cULus	cULus
High pressure rated up to	**207 bar (3000 psi)**	**207 bar (3000 psi)**
Standard lengths (L)	see table on page 5.44	see table on page 5.44
Recommended connector	C21 AE3-00-VY-150F	C05 AE1-00-VY-150F

Wiring Diagrams



Strokemaster® Installation

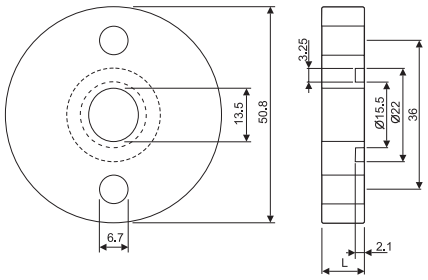


Note: Spacer may be required to elevate cylinder sensor to position sensing face in optimal position. Balluff recommends the following guidelines when mounting our Strokemaster® sensors:

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")

Strokemaster® Spacers



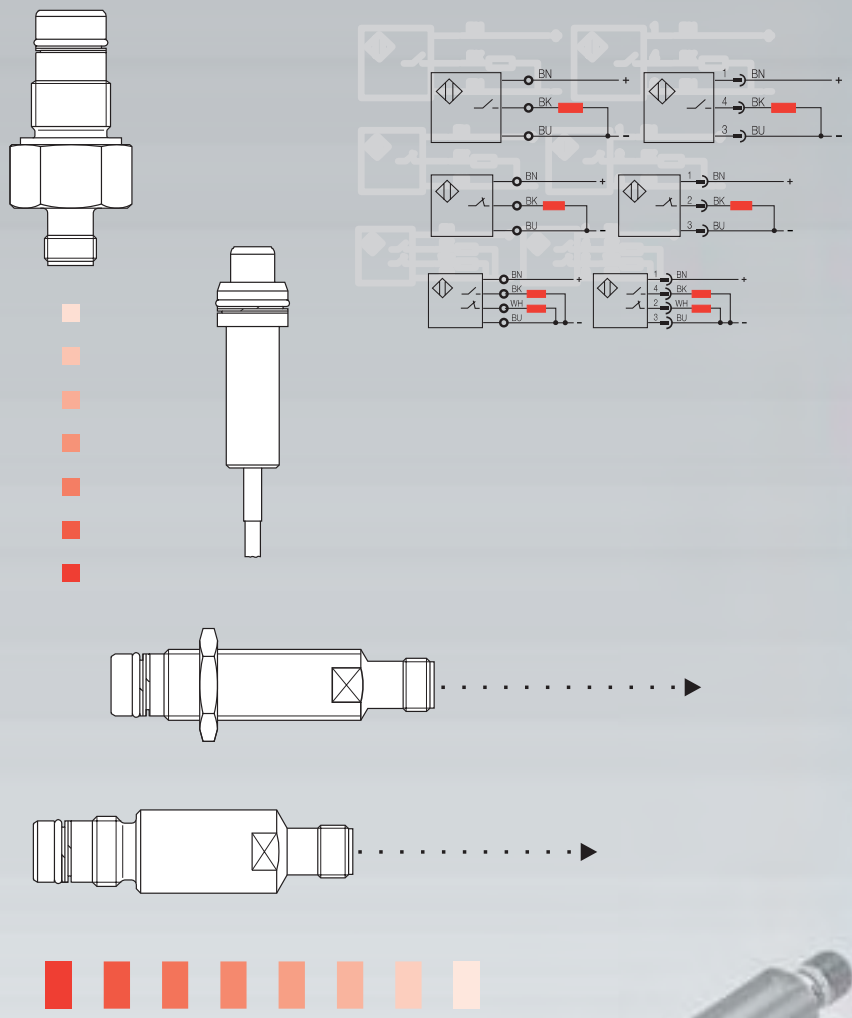
Below is a table to help you pick out a spacer for custom lengths needed with Strokemaster® sensors:

Probe length (inches)	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
0.912	0.732	0.724	0.687	0.605	0.540	0.537	0.412	0.350	0.312	0.228	0.200	0.102	— —
1.025	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
1.25	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
1.35	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
1.5	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
1.75	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
1.875	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
2.062	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
2.375	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
2.775	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
2.875	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
3.775	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
4.56	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)



High Pressure Inductive Cylinder Sensors

Balluff offers a world-class line of pressure-rated inductive cylinder sensors to service high pressure applications. Designed to withstand severe duty, Balluff high pressure sensors deliver reliable switching performance under demanding industrial conditions.

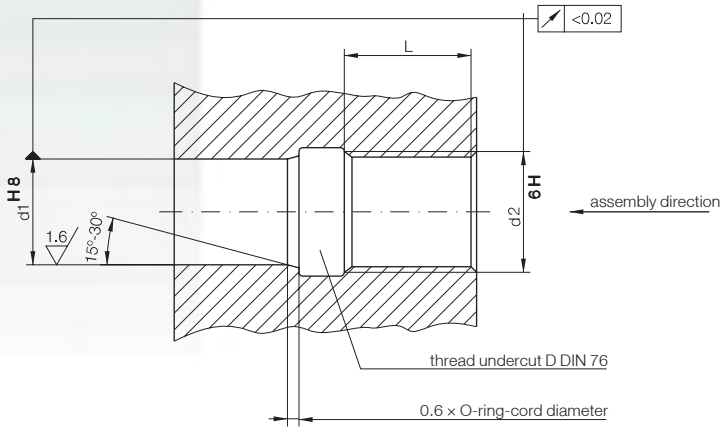
Corrosion-resistant housing materials, high-strength ceramic sensing faces, and special sealing techniques allow dependable service up to 350 bar or 500 bar according to the sensor type.

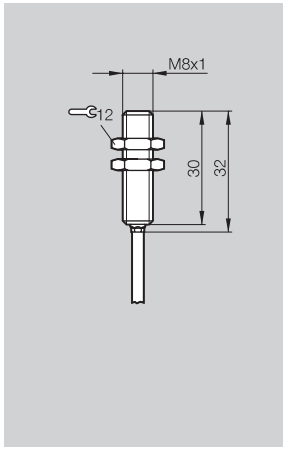
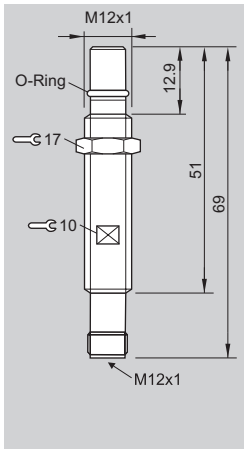
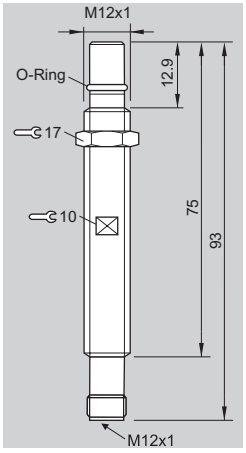
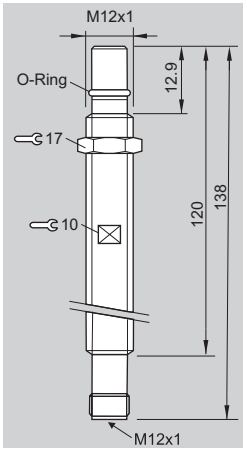
All Balluff high pressure sensors are rated for continuous operation in ambient temperatures up to 90° C, with some versions also high-temperature rated up to 120° C.

Mounting of Pressure Rated Sensors with O-Ring

d1: ∅ of bore for switch head, $\varnothing 10^{H8}=\varnothing 10^{+0.022}$
d2: nominal thread diameter, M12x1 6H
L: recommended insertion depth $L \geq 0.8 \times d_2$

Note: To ensure sealing under extremely high pressure, the sensors are supplied with an O-ring and a PTFE supporting ring. The 15° to 30° chamber is required to avoid damage to the O-ring when the sensor is inserted.

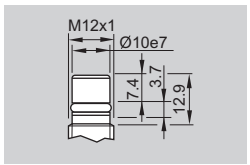


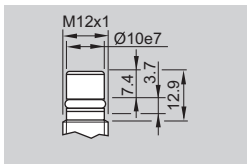
Housing size		**M8×1**	**M12×1**	**M12×1**	**M12×1**
Mounting		flush	flush	flush	flush
Rated operating distance s_n		**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a		0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
PNP	Normally-open ①	BES 516-300-S289-B0-D-PU-05	BES 516-300-S162-S4-D	BES 516-300-S163-S4-D	BES 516-300-S164-S4-D
	Normally-closed ②	BES 516-300-S292-B0-D-PU-05			
NPN	Normally-open ④			BES 516-300-S242-S4-D	
Rated operational voltage U_e		24 Vdc	24 Vdc	24 Vdc	24 Vdc
Supply voltage U_B		9.6...55 Vdc	10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d at I_e		≤ 1 V	≤ 2 V	≤ 1.5 V	≤ 1.5 V
Rated insulation voltage U_i		75 Vdc	75 Vdc	75 Vdc	75 Vdc
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 d./und.		≤ 10 mA	≤ 10 mA/≤ 2 mA	≤ 8 mA/≤ 1 mA	≤ 20 mA/≤ 12 mA
Off-state current I_r		≤ 50 µA	≤ 80 µA	≤ 80 µA	≤ 80 µA
Protected against polarity reversal		yes	yes	yes	yes
Short circuit/overload protected		yes	yes/yes	yes/yes	yes/yes
Load capacitance		≤ 0.2 µF	≤ 1.0 µF	≤ 0.5 µF	≤ 0.5 µF
Repeat accuracy R		1 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a		–25...+70 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
Operating frequency f		6000 Hz	2000 Hz	1000 Hz	1000 Hz
Utilization categories		DC 13	DC 13	DC 13	DC 13
Function indication		no	no	no	no
Degree of protection per IEC 60529		IP 67	IP 68	IP 68	IP 68
Housing material		stainless steel	stainless 430F	stainless 430F	stainless 430F
Material of sensing face		ceramic	EP	EP	EP
Connection		cable	connector	connector	connector
No. of wires × gauge		3 x 26 AWG			
High pressure rated up to		**100 bar (1450 psi)**	**500 bar (7250 psi)**	**500 bar (7250 psi)**	**500 bar (7250 psi)**
Recommended connector			C04 AEL-00-VY-050M	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M

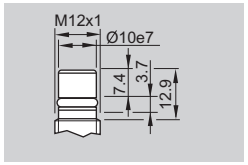
Other cable lengths may be available. Additional models may exist. Replacement o-rings and support rings are also available.

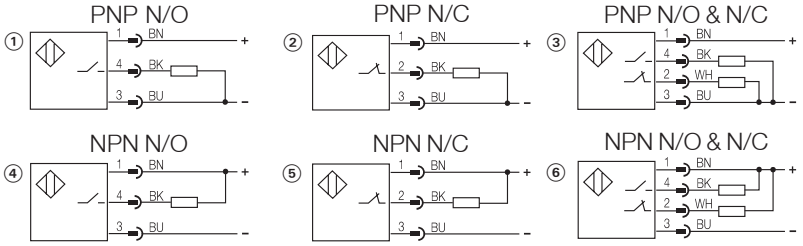
Consult factory or company website for details.

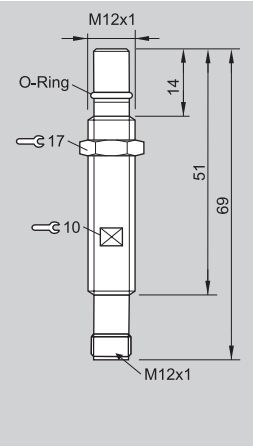
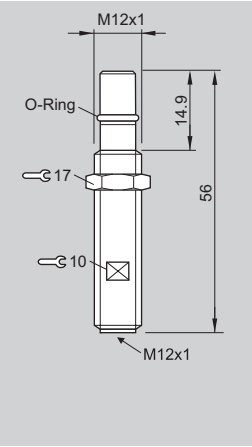
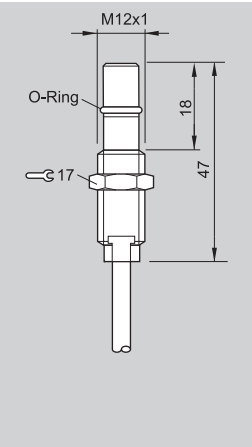
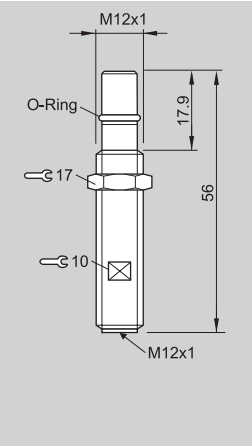
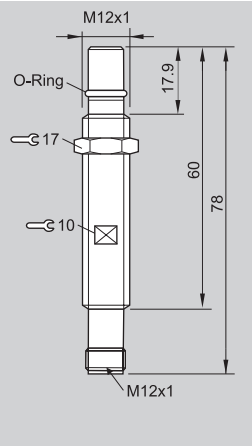
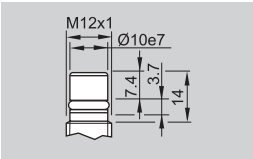
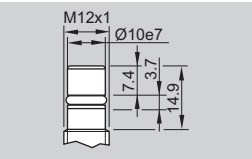
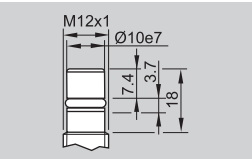
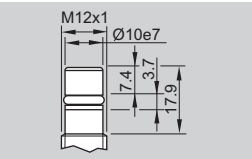
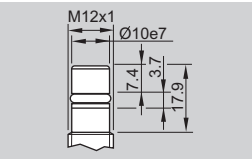
Accessory seal nut:
BES 08-DM-1
(see page 7.13)

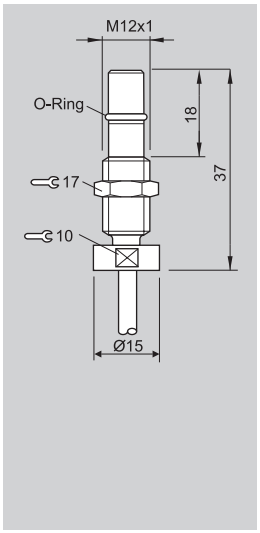
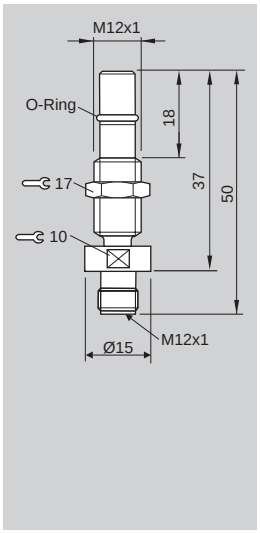
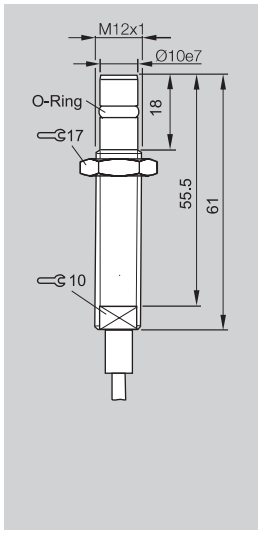
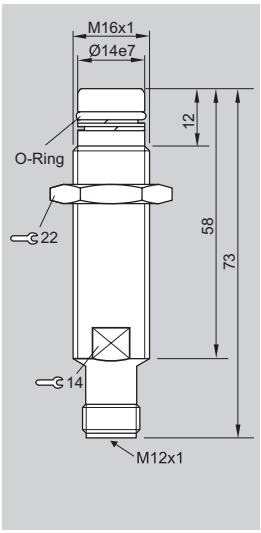
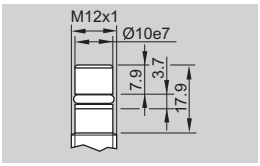
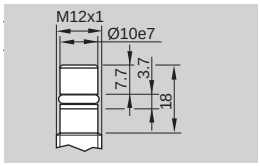
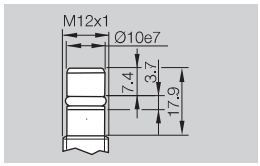
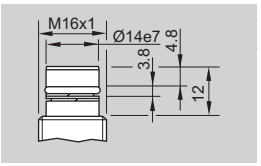






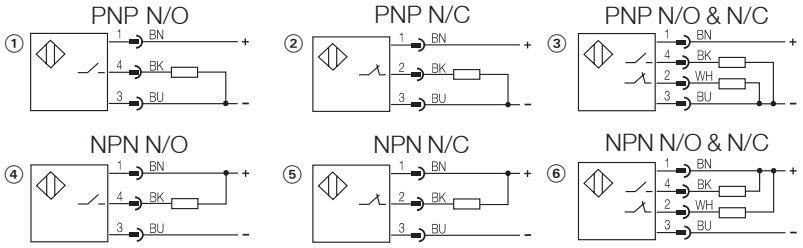


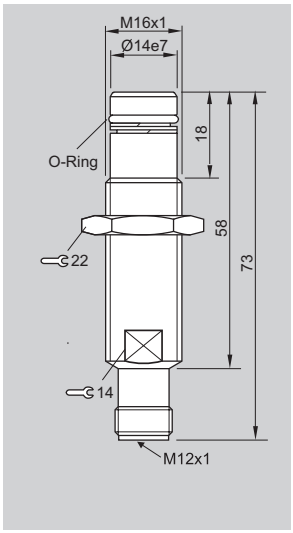
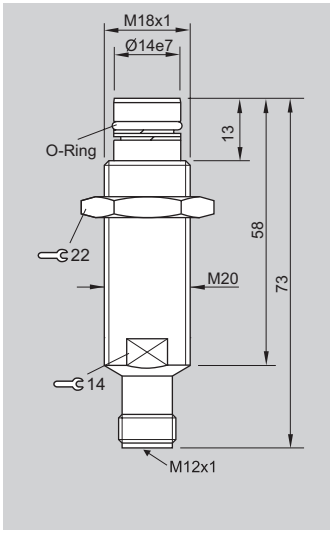
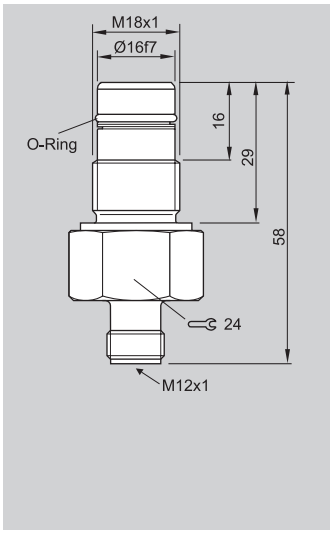
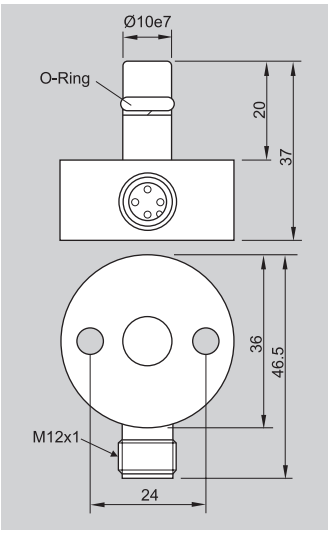
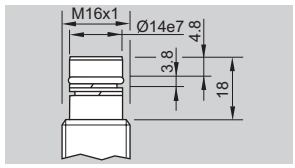
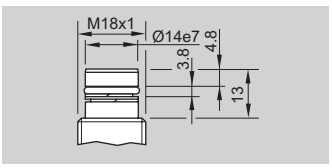
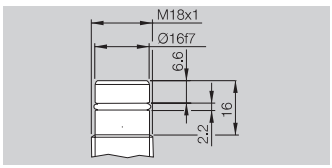
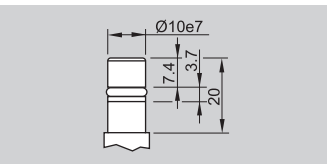
M12×1	M12×1	M12×1	M12×1	M12×1
flush	flush	flush	flush	flush
1.5 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
				
	BES 516-300-S265-S4-D	BES 516-300-S240-D-PU-05 BES 516-300-S241-D-PU-05	BES 516-300-S249-S4-D	BES 516-300-S135-S4-D
BES 516-300-S281-S4-D				
24 Vdc	24 Vdc	24 Vdc	24 Vdc	24 Vdc
10...30 Vdc	10...30 Vdc	10...30 Vdc	10...30 Vdc	10...30 Vdc
≤ 1.5 V	≤ 2.0 V	≤ 2.0 V	≤ 2.0 V	≤ 1.5 V
75 Vdc	75 Vdc	75 Vdc	75 Vdc	75 Vdc
130 mA	200 mA	200 mA	200 mA	200 mA
≤ 25 mA/≤ 15 mA	≤ 10 mA/≤ 2 mA	≤ 20 mA/≤ 12 mA	≤ 10 mA/≤ 2 mA	≤ 10 mA/≤ 1 mA
≤ 80 µA	≤ 80 µA	≤ 10 µA	≤ 10 µA	≤ 10 µA
yes	yes	yes	yes	yes
yes/yes	yes/yes	yes/yes	yes/yes	yes/yes
≤ 1.0 µF	≤ 1.0 µF	≤ 1.0 µF	≤ 1.0 µF	≤ 0.5 µF
≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
1000 Hz	2000 Hz	2000 Hz	2000 Hz	1000 Hz
DC 13	DC 13	DC 13	DC 13	DC 13
no	no	no	no	no
IP 68	IP 68	IP 68	IP 68	IP 68
stainless 430F	stainless 430F	stainless 430F	stainless 430F	stainless 430F
EP	EP	EP	EP	EP
connector	connector	cable	connector	connector
		3 × 24 AWG		
500 bar (7250 psi)	**500 bar (7250 psi)**	**500 bar (7200 psi)**	**500 bar (7250 psi)**	**500 bar (7250 psi)**
C04 AEL-00-VY-050M	C04 AEL-00-VY-050M		C04 AEL-00-VY-050M	C04 AEL-00-VY-050M
				

Housing size		**M12×1**	**M12×1**	**M12×1**	**M16×1**
Mounting		flush	flush	flush	flush
Rated operating distance s_n		**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a		0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
PNP	Normally-open ①	BES 516-300-S205-D-PU-05	BES 516-300-S262-S4-D	BES 516-300-S135-D-PU-05	BES 516-300-S152-S4-D
	Normally-closed ②			BES 516-300-S178-D-PU-05	
Rated operational voltage U_e		24 Vdc	24 Vdc	24 Vdc	24 Vdc
Supply voltage U_B		10...30 Vdc	10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d at I_e		≤ 2.0 V	≤ 2.0 V	≤ 1.5 V	≤ 1.5 V
Rated insulation voltage U_i		75 Vdc	75 Vdc	75 Vdc	75 Vdc
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 d./und.		≤ 10 mA/≤ 2 mA	≤ 10 mA/≤ 2 mA	≤ 10 mA	≤ 8 mA/≤ 1 mA
Off-state current I_r		≤ 10 µA	≤ 10 µA	≤ 10 µA	≤ 10 µA
Protected against polarity reversal		yes	yes	yes	yes
Short circuit/overload protected		yes/yes	yes/yes	yes	no/yes
Load capacitance		≤ 1.0 µF	≤ 1.0 µF	≤ 0.5 µF	≤ 0.5 µF
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a		–25...+80 °C	–25...+90 °C	–25...+80 °C	–25...+80 °C
Operating frequency f		2000 Hz	2000 Hz	1000 Hz	1000 Hz
Utilization categories		DC 13	DC 13	DC 13	DC 13
Function indication		no	no	no	no
Degree of protection per IEC 60529		IP 68	IP 68	IP 68	IP 68
Housing material		stainless 430F	stainless 430F	stainless steel	stainless 430F
Material of sensing face		EP	EP	EP	EP
Connection		cable	connector	cable, PUR	connector
No. of wires×gauge		3 × 24 AWG		3 x 26 AWG	
High pressure rated up to		**350 bar (5000 psi)**	**500 bar (7250 psi)**	**500 bar (7250 psi)**	**350 bar (5000 psi)**
Recommended connector			C04 AEL-00-VY-050M		C04 AEL-00-VY-050M
					

Other cable lengths may be available. Additional models may exist. Replacement o-rings and support rings are also available.

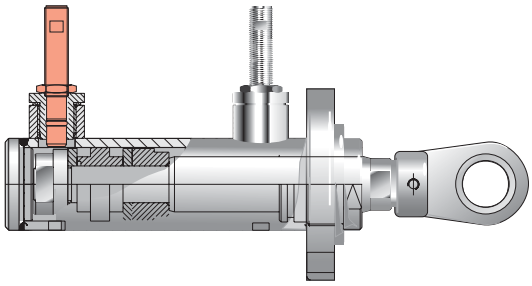
Consult factory or company website for details.

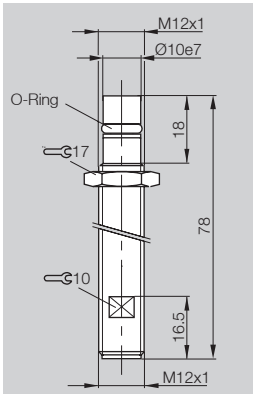


M16×1	**M18×1**	**M18×1**	**Ø 10 mm/Ø 36 mm**
flush	flush	flush	flush
1.5 mm	**1.5 mm**	**3 mm**	**1.5 mm**
0...1.2 mm	0...1.2 mm	0...2.4 mm	0...1.2 mm
			
BES 516-300-S149-S4-D BES 516-300-S156-S4-D	BES 516-300-S144-S4-D	BES 516-300-S190-S4	BES 516-300-S260-S4-D
24 Vdc	24 Vdc	24 Vdc	24 Vdc
10...30 Vdc	10...30 Vdc	10...30 Vdc	10...30 Vdc
≤ 1.5 V	≤ 1.5 V	≤ 3.5 V	≤ 2.0 V
75 Vdc	75 Vdc	75 Vdc	75 Vdc
200 mA	200 mA	130 mA	200 mA
≤ 15 mA/≤ 12 mA	≤ 8 mA/≤ 1 mA	≤ 25 mA/≤ 12 mA	≤ 10 mA/≤ 2 mA
≤ 10 µA	≤ 10 µA	≤ 80 µA	≤ 10 µA
yes	yes	yes	yes
no/yes	yes/yes	yes/yes	yes/yes
≤ 0.5 µF	≤ 0.5 µF	≤ 1.0 µF	≤ 1.0 µF
≤ 5 %	≤ 5 %	≤ 5 %	≤ 5%
–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
1000 Hz	1000 Hz	400 Hz	2000 Hz
DC 13	DC 13	DC 13	DC 13
no	no	no	no
IP 68	IP 68	IP 68	IP 68
stainless 430F	stainless 430F	stainless 430F	stainless 430F
EP	EP	PEEK	EP
connector	connector	connector	connector
350 bar (5000 psi)	**350 bar (5000 psi)**	**500 bar (7250 psi)**	**350 bar (5000 psi)**
C04 AEL-00-VY-050M	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M
			

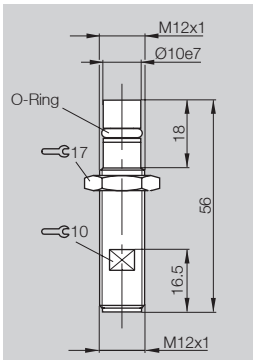
High Pressure Extended Duty

Housing size	**M12×1**	**M12×1**	**M18×1**
Mounting	flush	flush	flush
Rated operating distance s_n	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a	0...1.2 mm	0...1.2 mm	0...1.2 mm

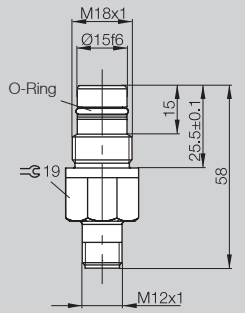




Extended Temperature



Extended Temperature

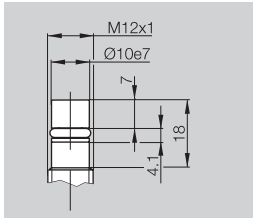


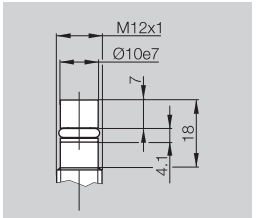
Extended Temperature

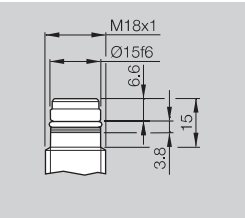
PNP Normally-open ①	BHS B135V-PSD15-S04	BHS B249V-PSD15-S04	BHS E308V-PSD15-S04
Rated operational voltage U_e	24 Vdc	24 Vdc	24 Vdc
Supply voltage U_B	10...30 Vdc	10...30 Vdc	10...30 Vdc
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i	75 Vdc	75 Vdc	75 Vdc
Rated operational current I_e	200 mA	200 mA	200 mA
No-load supply current I_0 d./und.	≤ 8 mA	≤ 8 mA	≤ 8 mA
Off-state current I_r	≤ 10 µA	≤ 10 µA	≤ 10 µA
Protected against polarity reversal	yes	yes	yes
Short circuit/overload protected	yes	yes	yes
Load capacitance	≤ 0.5 µF	≤ 0.5 µF	≤ 0.5 µF
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	**–25...+120 °C**	**–25...+120 °C**	**–25...+120 °C**
Operating frequency f	400 Hz	400 Hz	400 Hz
Utilization categories	DC 13	DC 13	DC 13
Function indication	no	no	no
Degree of protection per IEC 60529	IP 68	IP 68	IP 68
Housing material	stainless steel	stainless steel	stainless steel
Material of sensing face	ceramic	ceramic	ceramic
Connection	connector	connector	connector
No. of wires × gauge			
High pressure rated up to	**500 bar (7250 psi)**	**500 bar (7250 psi)**	**500 bar (7250 psi)**
Recommended connector	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M

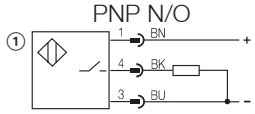
Extended Temperature Models

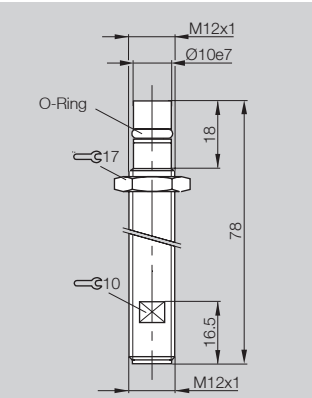
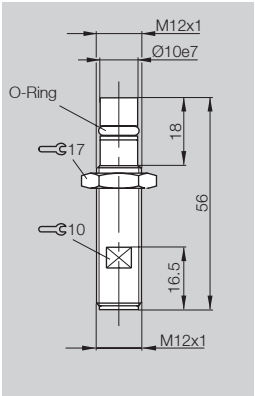
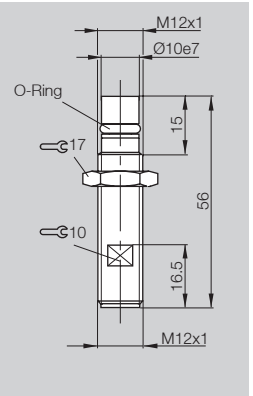
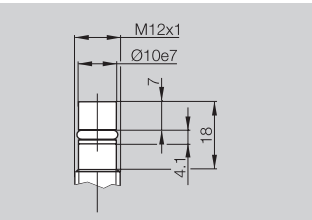
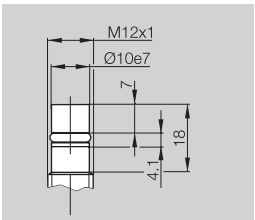
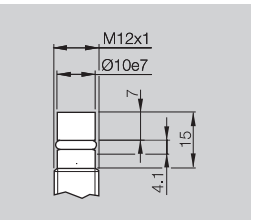
- Provide high pressure rating of 500 bar
- Allow use in higher ambient temperature environments up to 120°C









M12×1	M12×1	M12×1
flush	flush	flush
2.5 mm	**2.5 mm**	**2.5 mm**
0...2 mm	0...2 mm	0...2 mm
		
Extended Range	**Extended Range**	**Extended Range**
BHS B135V-PSD25-S04-003	BHS B249V-PSD25-S04-003	BHS B265V-PSD25-S04-003
24 Vdc	24 Vdc	24 Vdc
10...30 Vdc	10...30 Vdc	10...30 Vdc
≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
75 Vdc	75 Vdc	75 Vdc
200 mA	200 mA	200 mA
≤ 8 mA	≤ 8 mA	≤ 8 mA
≤ 10 µA	≤ 10 µA	≤ 10 µA
yes	yes	yes
yes	yes	yes
≤ 0.5 µF	≤ 0.5 µF	≤ 0.5 µF
≤ 5 %	≤ 5 %	≤ 5 %
–25...+90 °C	**–25...+90 °C**	**–25...+90 °C**
400 Hz	400 Hz	400 Hz
DC 13	DC 13	DC 13
no	no	no
IP 68	IP 68	IP 68
stainless steel	stainless steel	stainless steel
ceramic	ceramic	ceramic
connector	connector	connector
500 bar (7250 psi)	**500 bar (7250 psi)**	**500 bar (7250 psi)**
C04 AEL-00-VY-050M	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M
		

Simulation (FEM method) of the stress distribution under high pressure on housing and ceramic cap

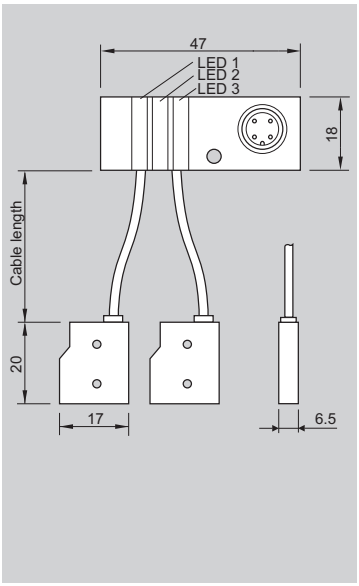
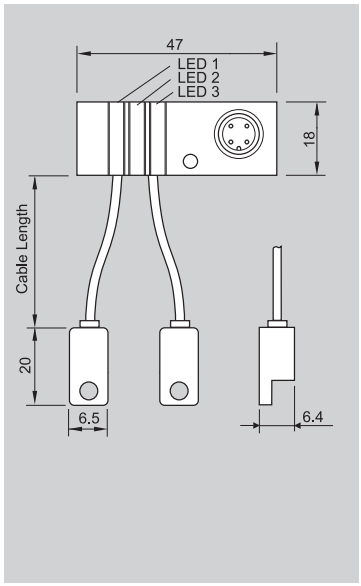
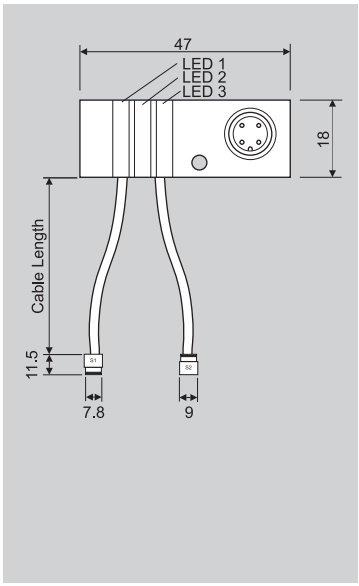
Extended Range Models

- Provide extended sensing ranges of 2.5 mm
- High pressure rated to 500 bar
- Temperature rated to +90°C

The Power Clamp & Gripper

These sensors are specifically designed for use in power clamp and gripper applications. These devices incorporate two sensors into one unit, reducing the number of sensors and connection systems required for applications. Each sensor has two sensing coils (chicklets) that are used to detect whether the clamp/gripper is in the open or closed position.

The base has a compatible mounting configuration for the cartridges used by the major clamp manufacturers.

Description	Large Sensing Coils	Small Sensing Coils	Small Sensing Coils
Rated operating distance s_n	2 mm	2 mm	2 mm
			
PNP N/O	BES Z02KR2-PSC20F-P*-S04-V	BES Z02KR1-PSC20F-P*-S04-V	BES Z02KR3-PSC20F-P100-S04-V
Rated operational voltage	10...30 Vdc	10...30 Vdc	10...30 Vdc
Load current	150 mA	150 mA	150 mA
Leakage current	≤ 10 mA	≤ 10 mA	≤ 10 mA
Voltage drop	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Repeatability	≤ 2 %	≤ 2 %	≤ 2 %
Hysteresis	5%	5%	5%
Pulse protection	yes	yes	yes
Noise protection	yes	yes	yes
Short circuit protection	yes	yes	yes
Overload protection	yes	yes	yes
Weld field immunity	1600 Gauss	1600 Gauss	1600 Gauss
Approvals	cULus, CE	cULus, CE	cULus, CE
Protection class	IP 67	IP 67	IP 67
Housing material	plastic	plastic	plastic
Material of sensing face	plastic	plastic	plastic
Cable material	PUR	PUR	PUR
Operating temperature	-25...+70°C	-25...+70°C	-25...+70°C
LED	Gn = PWR, Org = S1, Rd = S2	Gn = PWR, Org = S1, Rd = S2	Gn = PWR, Org = S1, Rd = S2
Connector	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M	C04 AEL-00-VY-050M

* Cable lengths are:
P100 = 100 mm
P165 = 165 mm
P200 = 200 mm

Features

– Superior LED visibility
– Weld-field immune
– Shielded construction
– Short circuit protection
– Overload protection
– Transient noise protection
– False pulse protection
– Reverse polarity protection
– cULus and CE certified