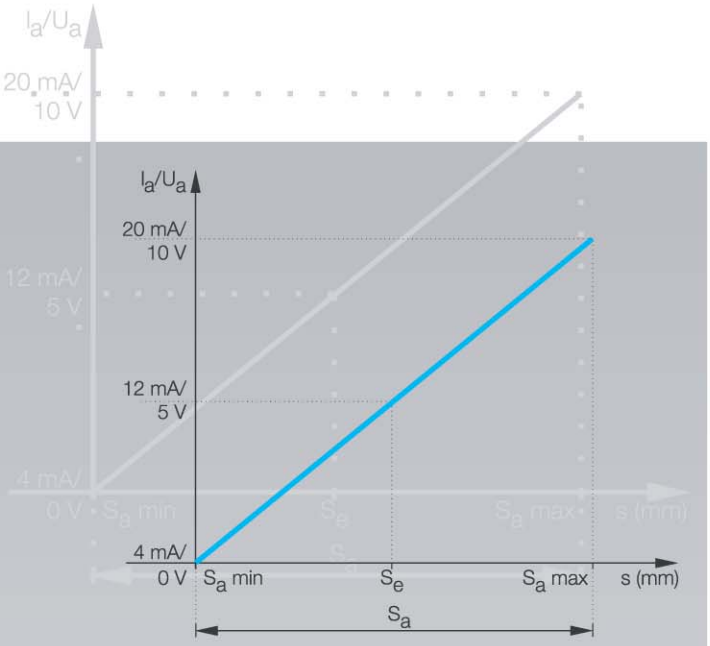


Magneto-inductive

BIL magneto-inductive position sensors are compact distance sensors for detecting positions up to 160 mm.

The magneto-inductive analog position sensor measures without contact and absolutely, using a passive magnetic position marker.

BIL

Connectors, holders ... starting page 81

SMARTSENS

Position sensors with analog output

... are sensors which generate a continually varying output signal which depends on the distance between its sensing face and the location of the magnet relative to the sensor (BIL).

Working range s_a

... is the usable travel for position sensing.

Effective distance s_e

... is the point in the center of the linear range s_l used as a reference point for other specifications.

Linear range s_l

... corresponds to the working range in which the distance sensor is characterized by a defined linearity.

Non-linearity

… indicates the maximum deviation of the output curve from a reference straight line. This value applies to the linear range.

Measuring speed

… indicates the ability to detect the position (for a BIL) of a linear moving object. The direction of movement of the object is assumed to be parallel to its sensing face.

Response time

… is the time which a sensor requires in order to reliably and steadily change the output signal. The specified time, which was determined at maximum measuring speed, includes both the electrical response time of the sensor and the time for the mechanical change in the damping state.

Slope

… is a measure of the sensitivity of the sensor with respect to a distance change. This physical relationship can be calculated for position sensors as follows:

$$\text{Slope S [V/mm]} = \frac{U_a\,\text{max} - U_a\,\text{min}}{s_a\,\text{max} - s_a\,\text{min}}$$

resp.

$$\text{Slope S [mA/mm]} = \frac{I_a\,\text{max} - I_a\,\text{min}}{s_a\,\text{max} - s_a\,\text{min}}$$

Temperature drift

... is the shift which a point experiences on the actual output curve at various temperatures. The temperature drift is described by the temperature coefficient.

Temperature coefficient TK

… describes the deviation of the sensor output signal under the effect of a temperature change, and thus represents a quality criterion for the sensor also.

Tolerance T

... is a variable which defines the manufacturing tolerance band of the output curve, thereby determining the maximum sample deviation.

Repeat accuracy R

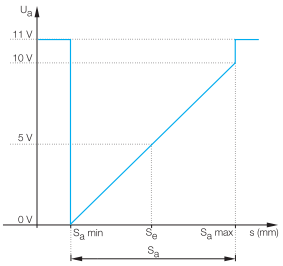
... is the value of the output signal changes under specified conditions, expressed in a percentage of the upper distance. The measurement must be taken in the lower, upper and center area of the linear range. It corresponds to the repeat accuracy R of proximity switches and is determined under the same standardized conditions (EN 60947-5-2). Distance sensors with analog output achieve the value R defined in the standard of ≤ 5 %.

Repeat accuracy R_{BWN}

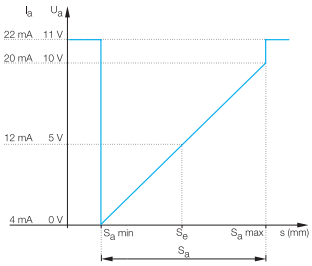
… describes the precision which an analog sensor achieves when approaching the same point multiple times. The value specified on the basis of the Balluff Factory Standard (BWN Pr. 44) describes the maximum deviation from this measuring point.

Output curves

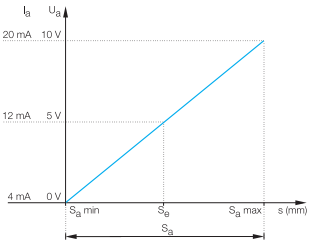
BIL AMD0...



BIL EMD0...



BIL ED0...



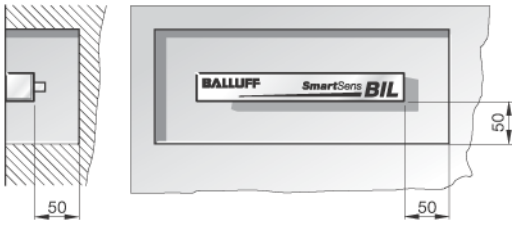
Installation notes

Non-magnetizable materials such as alloys, austenitic steels, plastics, etc. are recommended for mounting. This applies both to the mounting of the sensor as well as the magnet.

Magnetizable materials may affect the geometry and strength of the effective market magnet field.

Magnetic fields near the BIL can affect the output signal depending on their location and strength. This also applies to magnets used with neighboring BIL sensors.

Recommended minimum spacing from magnetizable materials or additional BIL sensors



Units in mm

Connectors, holders ... starting page 81

BIL – Precision in compact form

BIL

Balluff magneto-inductive position sensors detect positions up to 160 mm away. The BIL analog position sensors measure **without contact and absolutely using a passive magnet marker.** The compact design means these sensors can be easily integrated into the application even when mounting space is extremely tight.

BIL features

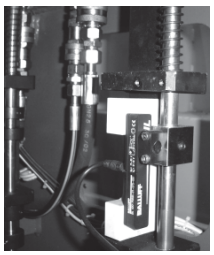
- Wear-free, as the position is detected without contact
- Shock and vibration resistant
- Absolute output signal: Voltage or current (cable break monitoring possible)
- Housing cross-section 15×15 mm
- Simple to install

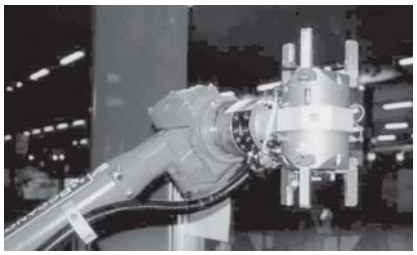
Micro-BIL

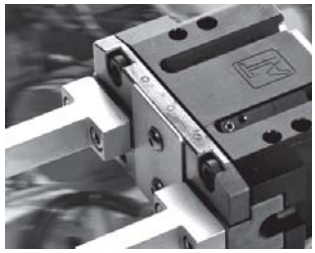
The Micro-BIL detects the absolute position on pneumatic miniature grippers or compact cylinders having integrated permanent magnets; the sensor element can be easily installed in the T-slot. The analog output signal allows you to individually and flexibly detect end-of-travel and intermediate positions on gripper jaws or pistons.

Features of the Micro-BIL

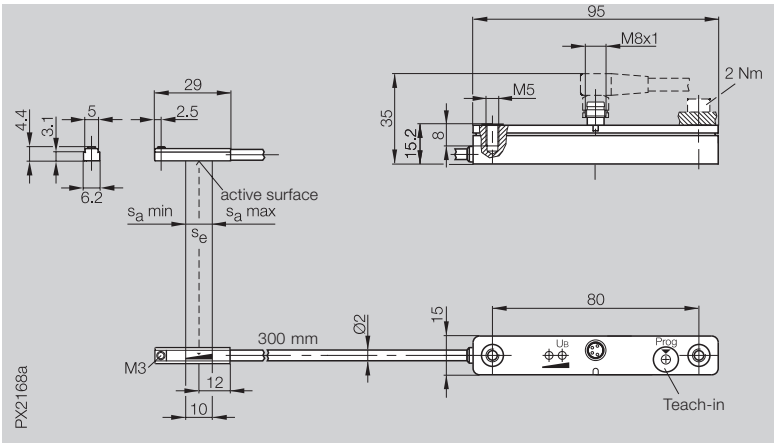
- Wear-free, as the position is detected without contact
- Shock and vibration resistant
- Absolute output signal: Voltage or current (cable break monitoring possible)
- Measuring range and magnetic field strength adjustable
- Easy to install in the T-slot





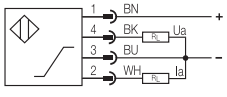


Output signal U_a Output signal I_a	**Voltage 0...10 V or Current 4...20 mA**
Working range s_a	0...10 mm
Linear range s_l	0...10 mm



Ordering code	BIL ED0-B010P-02/30-S75
Supply voltage U_B	for voltage output U_a: U_B = 15...30 V DC, for current output I_a: U_B = 10...30 V DC
Field strength, axial H_n	10 kA/m typical
–3dB width of the axial field distribution, typical (axial field strength typical – parallel to sensing face)	2.5 mm
Ripple	≤ 10 % of U_e
Rated insulation voltage U_i	75 V DC
Effective distance s_e	5 mm
Load resistance R_L	for voltage output U_a: R_L = ≥ 2 kΩ, for current output I_a: R_L =≤ 500 Ω
No-load current I_0 at U_e	≤ 30 mA
Polarity reversal protected	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
Power-on indicator	yes
Programming indicator	yes
Degree of protection per IEC 60529	IP 67
Housing material	PA fiberglass reinforced
Connection	Connectors
Approval	cULus
Recommended connector	BKS-S 74/BKS-S 75

Wiring diagram



Connect either the voltage or current output.

A button is provided for adjustment to varying magnetic field strengths. The technical data refer to reference measurements. Different grippers/cylinders having differing magnetic fields may affect the technical data.

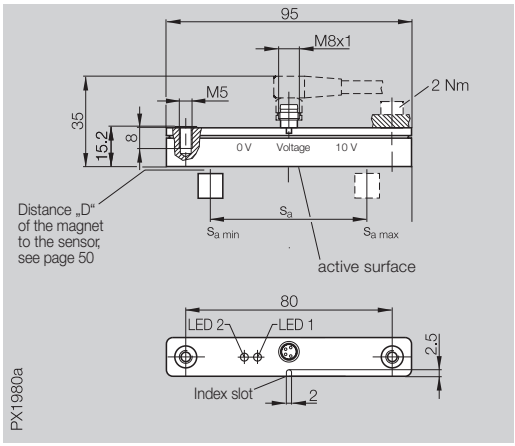
Original mounting brackets and screws are recommended for attaching the Micro-BIL. Please order accessories separately.
See page 50!

BIL

Connectors, holders ... starting page 81

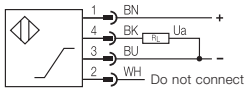
Out-of-range function

Output signal U_a	**Voltage 0...10 V, out-of-range 11 V**
Output signal I_a	
Working range s_a	0...60 mm
Linear range s_l	5...55 mm

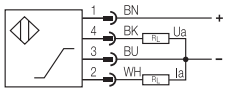


Ordering code	BIL AMD0-T060A-01-S75
Supply voltage U_B	15...30 V DC
Ripple	≤ 10 % of U_e
Rated insulation voltage U_i	75 V DC
Effective distance s_e	30 mm
Load resistance R_L	≥ 2 kΩ
No-load current I_0 at U_e	≤ 30 mA
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–10...+75 °C
Repeat accuracy R_{BWN}	≤ ±60 µm
Linearity	≤±1 mm
Limit frequency (–3 dB)	1500 Hz
Measuring speed	≤ 5 m/s
Temperature coefficient TK typical	+5 µm/K
in the optimal range min.	–20 µm/K
from +10...+50 °C max.	+30 µm/K
Power-on indicator	yes
Out-of-range indicator	yes
Degree of protection per IEC 60529	IP 67
Housing material	PA mod.
Connection	Connectors
Approval	cULus
Recommended connector	BKS-S 74/BKS-S 75

BIL AMD0...



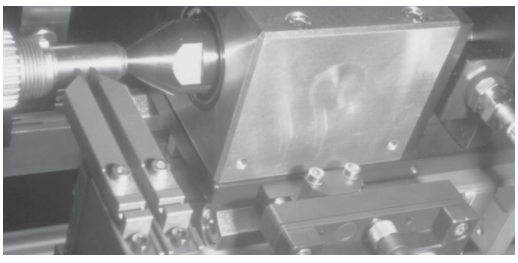
BIL EMD0.../BIL ED0...



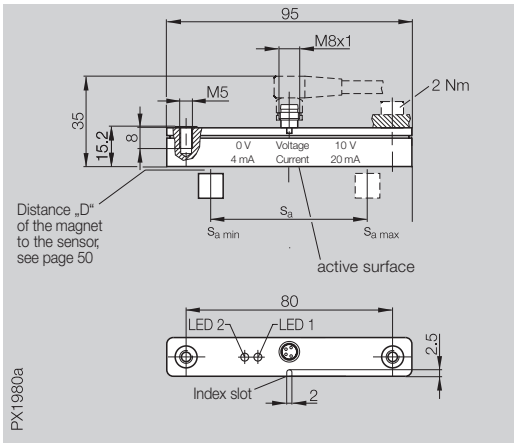
Connect either the voltage or current output.

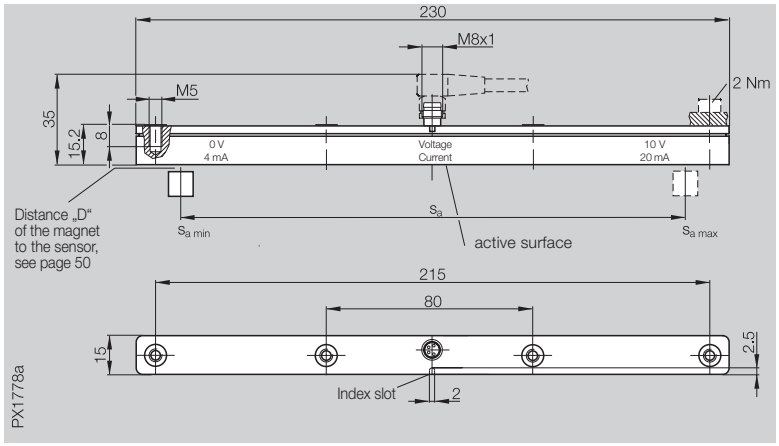
Out-of-range function

Magnet within working range:
– Output voltage 0...10 V
or output current 4...20 mA
– LED not on
Magnet outside the working range:
– Output voltage approx. 11 V
or output current approx. 22 mA
– LED on

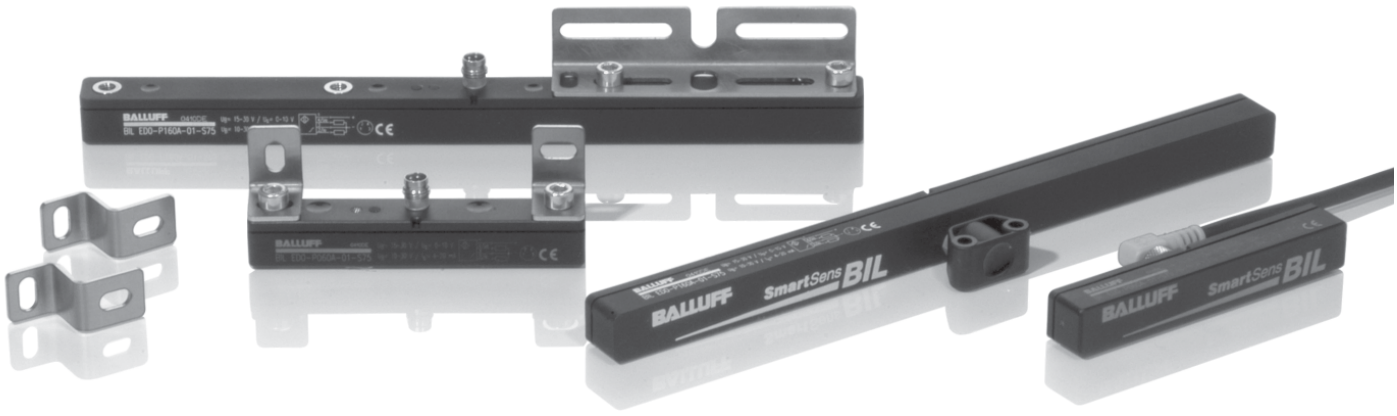


	Voltage 0...10 V, out-of-range 11 V or Current 4...20 mA, out-of-range 22 mA	Voltage 0...10 V or Current 4...20 mA
	0...60 mm	0...160 mm
	5...55 mm	0...160 mm



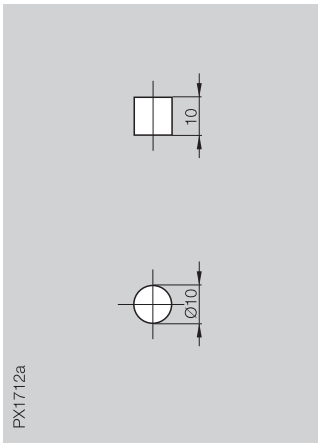
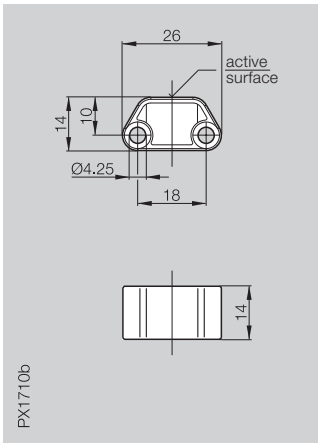


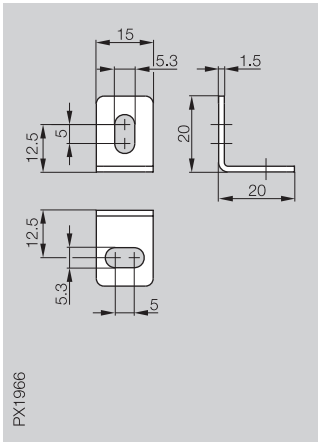
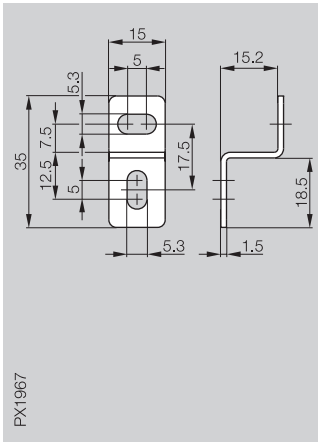
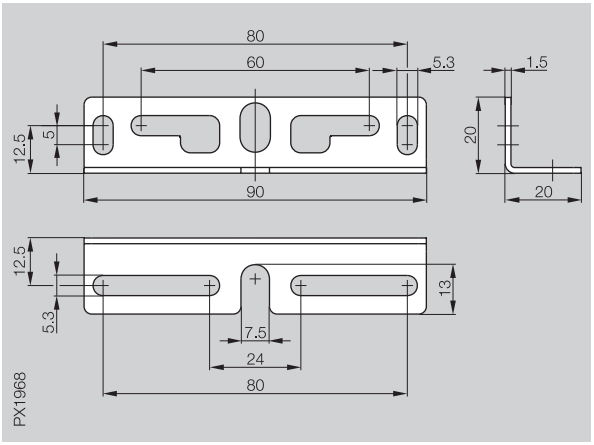
	BIL EMD0-T060A-01-S75	BIL ED0-T160A-01-S75
	for voltage output U_a: U_B = 15...30 V DC, for current output I_a: U_B = 10...30 V DC	for voltage output U_a: U_B = 15...30 V DC, for current output I_a: U_B = 10...30 V DC
	≤ 10 % of U_e	≤ 10 % of U_e
	75 V DC	75 V DC
	30 mm	80 mm
	for voltage output U_a: R_L = ≥ 2 kΩ, for current output I_a: R_L = ≤ 500 Ω	for voltage output U_a: R_L = ≥ 2 kΩ, for current output I_a: R_L = ≤ 500 Ω
	≤ 30 mA	≤ 25 mA
	yes	yes
	yes	yes
	–10...+75 °C	–10...+75 °C
	≤ ±60 µm	≤ ±500 µm
	≤±1 mm	≤ ±2.4 m
	1500 Hz	300 Hz
	≤ 5 m/s	≤ 5 m/s
	+5 µm/K	–40 µm/K
	–20 µm/K	+120 µm/K
	+30 µm/K	–200 µm/K
	yes	no
	yes	no
	IP 67	IP 67
	PA mod.	PA mod.
	Connectors	Connectors
	cULus	cULus
	BKS-S 74/BKS-S 75	BKS-S 74/BKS-S 75



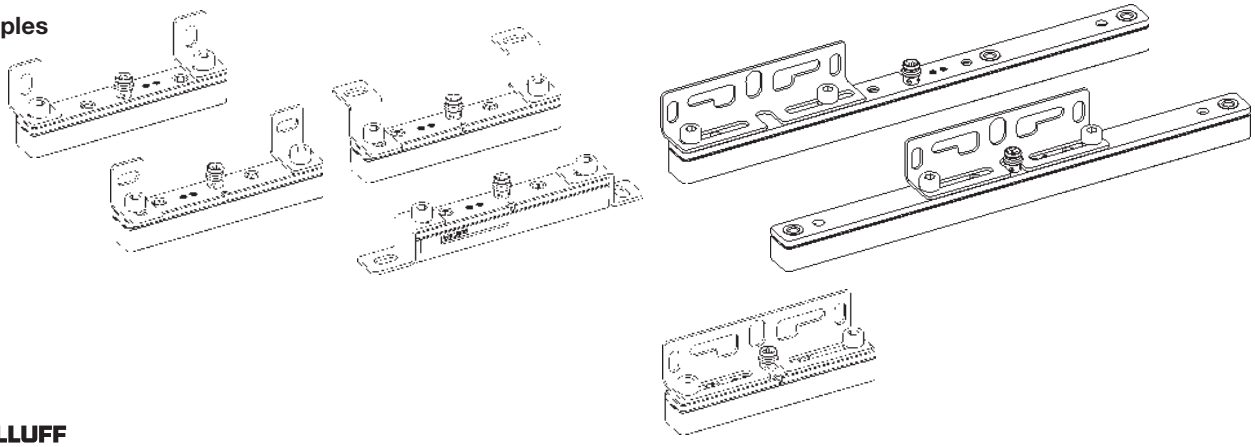
Original mounting brackets and screws are recommended for attaching the BIL. Please order accessories separately see page 50!

BIL
Connectors, holders ... starting page 81

Description	**Magnet**	**Magnet**	
Housing size	**∅ 10×10 mm**	**26×14×14 mm**	
Material	Hard ferrite	PA fiberglass reinforced	
Distance “D”	2 mm	1 mm	
			
Ordering code	BIL 000-MH-A	BIL 001-MH-A	
			

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

Mounting examples



Analog switching amplifiers are available in tubular housing form for direct installation near the sensor, or for installation in a control cabinet.

Analog Switching Amplifiers
BES 516-615-PS/NS-1-PU-05
Analog output and PNP or NPN normally open for connecting an analog sensor with M12 connector.
For technical data see page 85.

Analog switching amplifier
BES 516-611-A-1
for analog current and voltage signals.
For technical data see page 86.

Tester/Programmer
BES 516-4
see page 89

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