

Inductive Sensors with Special Properties

Harsh environment sensors

In the food industry, and medical and pharmaceutical technology, and special requirements are placed on sensors: FDA conformity and testing according to the Ecolab standard.

These sensors fulfill the highest requirements:

- Extended temperature range
- Safe to clean according to Ecolab
- FDA conformity
- Resistant to high-pressure cleaners
- Stainless steel 1.4571 (316Ti equivalent) and 1.4404 (316L equivalent)

Steam jet tested



IP 69K

IP 68
as per BWN

Stainless
steel

H₂O₂
resistant

FDA

ECOLAB



Inductive Sensors with Special Properties

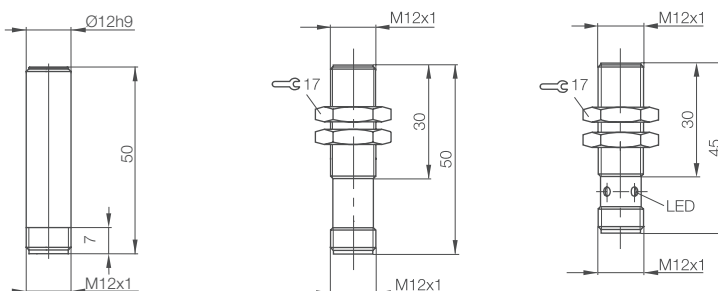
Harsh environment sensors

Ø 12 mm, M12x1

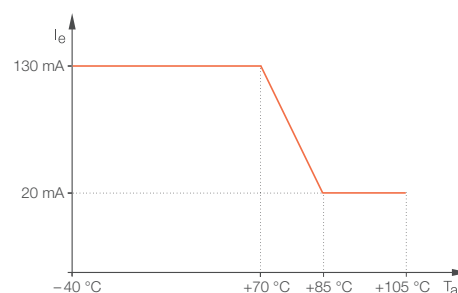


	Ø 12 mm	M12x1	M12x1
Housing size	Ø 12 mm	M12x1	M12x1
Installation type (observe instructions in the Basic Information chapter)	Flush	Flush	Flush
Rated switching distance s_n	2 mm	2 mm	4 mm
Assured switching distance s_a	0...1.6 mm	0...1.6 mm	0...3.2 mm
Sensing distance	1X	1X	1X
PNP, NO	BES0430	BES0444	BES0433
PNP, NC			BES0432
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_a at I_e max.	3.5 V	3.5 V	2 V
Rated insulation voltage U_i (protection class)	75 V DC	75 V DC	250 V AC (I)
Rated operating current I_e	130 mA*	130 mA*	200 mA
Polarity reversal protected/transposition protected/short-circuit protected	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes
Ambient temperature T_a	-40...+105 °C	-40...+105 °C	-25...+85 °C
Switching frequency f max.	800 Hz	800 Hz	2000 Hz
Degree of protection as per IEC 60529	IP 69K and IP 68 as per BWN Pr. 27	IP 69K and IP 68 as per BWN Pr. 27	IP 69K and IP 68 as per BWN Pr. 20
Approvals	CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant
Material	Housing Sensing surface	Stainless steel 1.4571 PEEK	Stainless steel 1.4404 LCP
Connection	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
Suggested mating cable	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020

Additional cable lengths and PUR cable jacket material available on request.



*Current decrease curve



Inductive Sensors with Special Properties

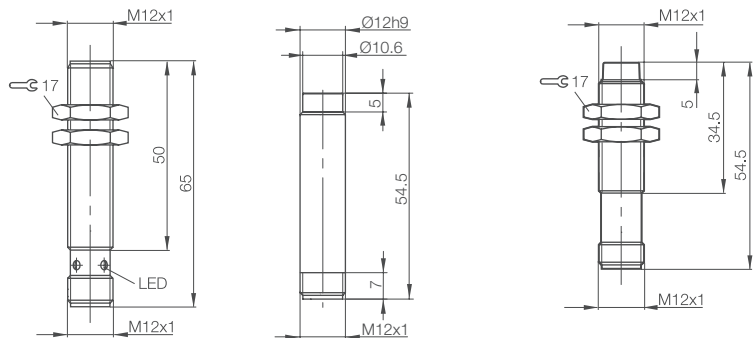
Harsh environment sensors

Ø 12 mm, M12x1

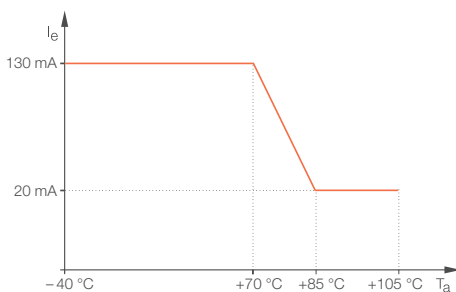


	M12x1	Ø 12 mm	M12x1
Housing size	M12x1	Ø 12 mm	M12x1
Installation type (observe instructions in the Basic Information chapter)	Flush	Non-flush	Non-flush
Rated switching distance s_n	4 mm	4 mm	4 mm
Assured switching distance s_a	0...3.2 mm	0...3.2 mm	0...3.2 mm
Sensing distance	1X	1X	1X
PNP, NO	BES0435	BES0431	BES0443
PNP, NC	BES0434		
NPN, NO	BES0436		
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e max.	2.5 V	3.5 V	3.5 V
Rated insulation voltage U_i (protection class)	250 V AC (I)	75 V DC	75 V DC
Rated operating current I_e	200 mA	130 mA*	130 mA*
Polarity reversal protected/transposition protected/short-circuit protected	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes
Ambient temperature T_a	-25...+85 °C	-40...+105 °C	-40...+105 °C
Switching frequency f max.	1000 Hz	400 Hz	400 Hz
Degree of protection as per IEC 60529	IP 69K and IP 68 as per BWN Pr. 20	IP 68 as per BWN Pr. 27	IP 68 as per BWN Pr. 27
Approvals	CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant
Material	Housing Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4571
	Sensing surface LCP	PEEK	PEEK
Connection	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
Suggested mating cable	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020

Additional cable lengths and PUR cable jacket material available on request.



*Current decrease curve



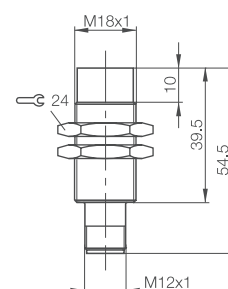
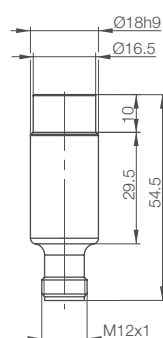
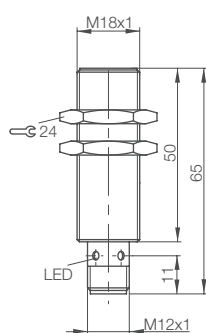
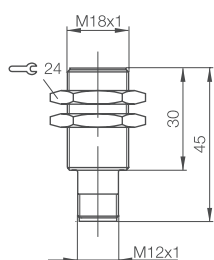
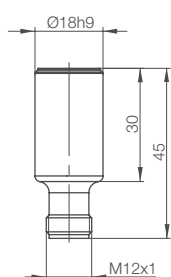
Inductive Sensors with Special Properties

Harsh environment sensors

Ø 18 mm, M18x1



Ø 18 mm	M18x1	M18x1	Ø 18 mm	M18 mm
Flush	Flush	Flush	Non-flush	Non-flush
5 mm	5 mm	8 mm	8 mm	8 mm
0...4 mm	0...4 mm	0...6.4 mm	0...6.4 mm	0...6.4 mm
1X	1X	1X	1X	1X
BES0439	BES0441	BES0437 BES0438	BES043A	BES0442
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
3.5 V	3.5 V	2.5 V	3.5 V	3.5 V
75 V DC	75 V DC	250 V AC (I)	75 V DC	75 V DC
130 mA*	130 mA*	200 mA	130 mA*	130 mA*
Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes
-40...+105 °C	-40...+105 °C	-40...+85 °C	-40...+105 °C	-40...+105 °C
500 Hz	500 Hz	700 Hz	200 Hz	200 Hz
IP 69K and IP 68 as per BWN Pr. 27	IP 69K and IP 68 as per BWN Pr. 27	IP 69K and IP 68 as per BWN Pr. 20	IP 69K and IP 68 as per BWN Pr. 27	IP 69K and IP 68 as per BWN Pr. 27
CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant	CE, cULus, Ecolab, FDA compliant
Stainless steel 1.4571	Stainless steel 1.4571	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4571
PEEK	PEEK	PEEK	PEEK	PEEK
M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020



Inductive Sensors with Special Properties

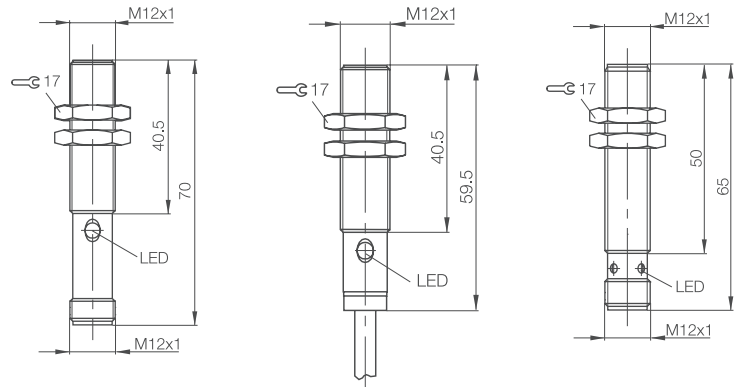
Harsh environment sensors

M12x1 standard



	M12x1	M12x1	M12x1
Housing size	M12x1	M12x1	M12x1
Installation type (observe instructions in the Basic Information chapter)	Flush	Flush	Flush
Rated switching distance s_n	2 mm	2 mm	4 mm
Assured switching distance s_a	0...1.6 mm	0...1.6 mm	0...3.2 mm
Sensing distance	1X	1X	2X
PNP, NO	BES02EL	BES02EH	BES02FU
PNP, NC			BES02FT
NPN, NO			BES02FR
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e max.	1.5 V	1.5 V	1.5 V
Rated insulation voltage U_i (protection class)	250 V AC (I)	250 V AC (I)	250 V AC (I)
Rated operating current I_e	200 mA	200 mA	200 mA
Polarity reversal protected/transposition protected/short-circuit protected	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes
Ambient temperature T_a	-25...+70 °C	-25...+70 °C	-25...+85 °C
Switching frequency f max.	≤ 3 kHz	≤ 3 kHz	≤ 1 kHz
Function indicator	Yellow LED	Yellow LED	Yellow LED
Degree of protection as per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Approvals	CE, cULus	CE, cULus	CE, cULus
Material	Housing: Stainless steel Sensing surface: PA 12	Stainless steel PA 12	Stainless steel LCP
Connection	M12 connector, 4 pin	3 m PUR cable, 22 AWG	M12 connector, 4-pin
Suggested mating cable	BCC M415-0000-1A-003-EX44T2-020		BCC M415-0000-1A-003-EX44T2-020

Additional cable lengths and PUR cable jacket material available on request.



Built tough – stainless steel housing stops aggressive media in its tracks.

Inductive sensors are also used more and more in aggressive environments: in machine tools, in the chemical industry, in packaging machines and the food industry. Balluff harsh environment sensors are ideal for applications where aggressive cleaning agents, in connection with high-pressure cleaning devices are used.

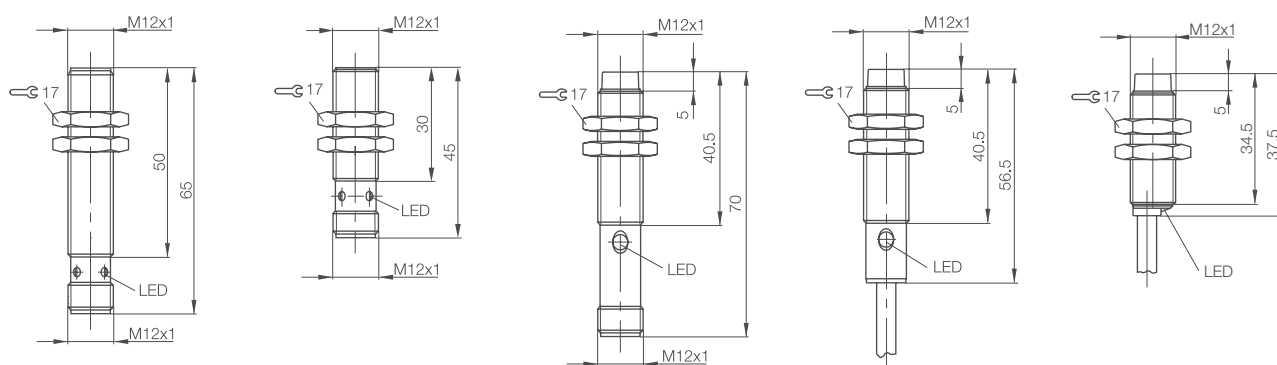
Inductive Sensors with Special Properties

Harsh environment sensors

M12x1 standard



M12x1	M12x1	M12x1	M12x1	M12x1
Flush	Flush	Non-flush	Non-flush	Non-flush
4 mm	4 mm	4 mm	4 mm	4 mm
0...3.2 mm	0...3.2 mm	0...3.2 mm	0...3.2 mm	0...3.2 mm
2X	2X	1X	1X	1X
BES038C	BES014W BES014U	BES02FC	BES02F3	BES02F7
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
2.5 V	2 V	1.5 V	1.5 V	2 V
250 V AC (I)	250 V AC (I)	250 V AC (I)	250 V AC (I)	250 V AC (I)
200 mA	200 mA	200 mA	200 mA	200 mA
Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes
-40...+85 °C	-25...+85 °C	-25...+70 °C	-25...+70 °C	-25...+70 °C
≤ 2 kHz	≤ 2 kHz	≤ 1.5 kHz	≤ 1.5 kHz	≤ 2 kHz
Yellow LED	Yellow LED	Yellow LED	Yellow LED	Yellow LED
IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
CE, cULus	CE, cULus	CE, cULus	CE, cULus	CE, cULus
Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
LCP	LCP	PA 12	PA 12	PBT
M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	3 m PVC cable, 22 AWG	3 m PVC cable, 22 AWG
BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020		



Inductive Sensors with Special Properties

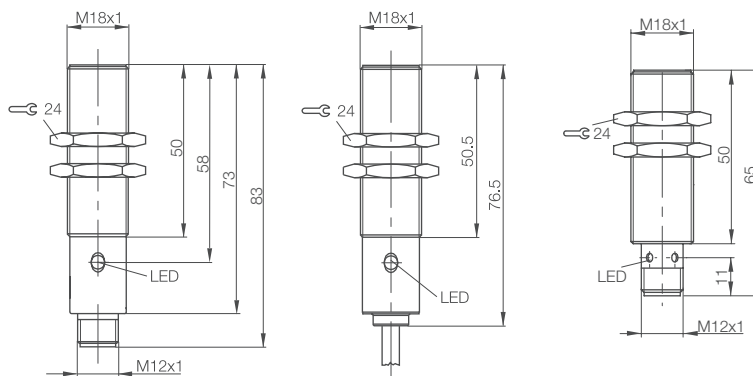
Harsh environment sensors

M18x1



Housing size	M18x1	M18x1	M18x1
Installation type (observe instructions in the Basic Information chapter)	Flush	Flush	Flush
Rated switching distance s_n	5 mm	5 mm	8 mm
Assured switching distance s_a	0...4.1 mm	0...4.1 mm	0...6.5 mm
Sensing distance	1X	1X	2X
PNP, NO	BES02EU	BES02EN	BES02H0
PNP, NC			BES02FZ
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_a at I_e max.	1.5 V	1.5 V	2.5 V
Rated insulation voltage U_i (protection class)	250 V AC (I)	250 V AC (I)	250 V AC (I)
Rated operating current I_e	200 mA	200 mA	200 mA
Polarity reversal protected/transposition protected/short-circuit protected	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes
Ambient temperature T_a	-40...+85 °C	-25...+70 °C	-40...+85 °C
Switching frequency f max.	900 Hz	900 Hz	≤ 700 Hz
Function indicator	Yellow LED	Yellow LED	Yellow LED
Degree of protection as per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Approvals	CE, cULus	CE, cULus	CE, cULus
Material	Housing: Stainless steel	Stainless steel	Stainless steel
	Sensing surface: PA 12	PA 12	PBT
Connection	M12 connector, 4-pin	3 m PUR cable, 22 AWG	M12 connector, 4-pin
Suggested mating cable	BCC M415-0000-1A-003-EX44T2-020		BCC M415-0000-1A-003-EX44T2-020

Additional cable lengths and PUR cable jacket material available on request.



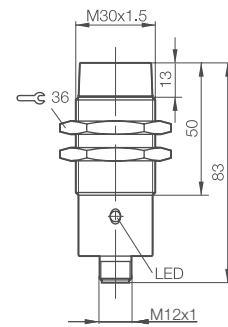
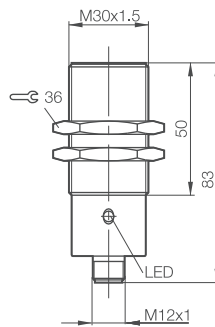
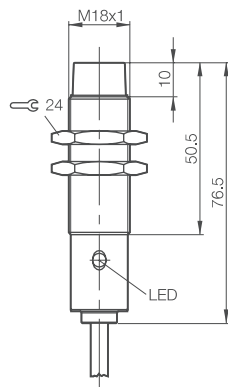
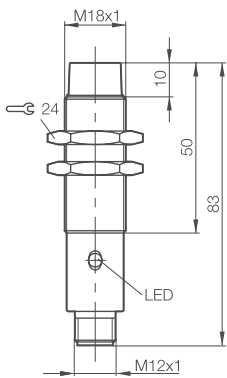
Inductive Sensors with Special Properties

Harsh environment sensors

M18x1, M30x1.5



M18x1	M18x1	M30x1.5	M30x1.5
Non-flush	Non-flush	Flush	Non-flush
8 mm	8 mm	10 mm	15 mm
0...6.5 mm	0...6.5 mm	0...8.1 mm	0...12.2 mm
1X	1X	1X	1X
BES02FL	BES02FH	BES02F1	BES02FN
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
1.5 V	1.5 V	2.5 V	2.5 V
250 V AC (I)	250 V AC (I)	250 V AC (I)	250 V AC (I)
200 mA	200 mA	200 mA	200 mA
Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes	Yes/Yes/Yes
-40...+85 °C	-25...+70 °C	-25...+70 °C	-25...+70 °C
≤ 600 Hz	≤ 600 Hz	≤ 300 Hz	≤ 100 Hz
Yellow LED	Yellow LED	Yellow LED	Yellow LED
IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
CE, cULus	CE, cULus	CE, cULus	CE, cULus
Stainless steel	Stainless steel	Stainless steel	Stainless steel
PA 12	PA 12	PA 12	PA 12
M12 connector, 4-pin	3 m PUR cable, 22 AWG	M12 connector, 4-pin	M12 connector, 4-pin
BCC M415-0000-1A-003-EX44T2-020		BCC M415-0000-1A-003-EX44T2-020	BCC M415-0000-1A-003-EX44T2-020



Inductive Sensors with Special Properties

Harsh environment sensors

Withstand the harshest cleaning processes

In the food and beverage industry, the chemical industry, and even conveying operations, inductive sensors are routinely cleaned with more and more aggressive methods. Whether acids, bases, steam, foaming cleaners or high-pressure cleaners – stainless steel sensors fulfill stringent requirements.

Features

- No function indicator directly on the sensor: The drill hole for the LED is a potential source of danger during cleaning processes and a possible means of entry for bacteria. The function display is completely wrapped in the transparent plastic of the connector.
- Housing made of stainless steel (material 1.4571): This material is common in the food and beverage- industry. The cable plug has to be adapted to different cleaning and- disinfection agents.
- Gold-coated contacts: The difficult installation relationships require gold-coated contacts, so that plug corrosion is prevented.
- Lasered or etched part number: Cleaning- and disinfection processes dissolve type plates. Lasered or etched part numbers are there to stay.
- Additional O-ring-seals for extreme requirements: temperature shocks, triggered by cleaning and disinfection, cause strong, different residual stress on steel housings and potting.

Steam jet tested



Housing size
Installation type (observe instructions in the Basic Information chapter)
Rated switching distance s_n
Assured switching distance s_a
Sensing distance
PNP, NO
Supply voltage U_R
Voltage drop U_d at I_e max.
Rated insulation voltage U_i (protection class)
Rated operating current I_e
Polarity reversal protected/transposition protected/short-circuit protected
Ambient temperature T_a
Ambient temperature T_a at load current ≤ 20 mA
Ambient temperature range T_a short-time 30 min
Switching frequency f max.
Degree of protection as per IEC 60529
Approvals
Material
Housing
Sensing surface
Connection
Suggested mating cable

Additional cable lengths and PUR cable jacket material available on request.

Current reduction as a function of ambient temperature range

