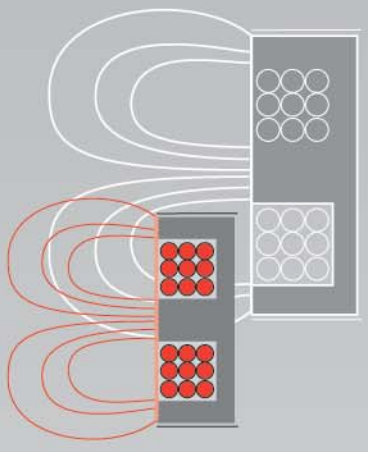
BALLUFF

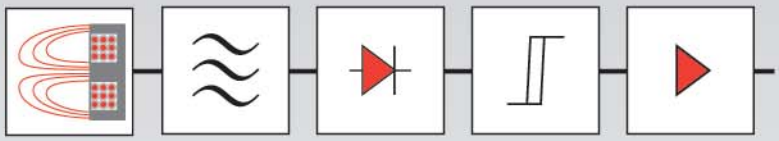
sensors worldwide

Object Detection

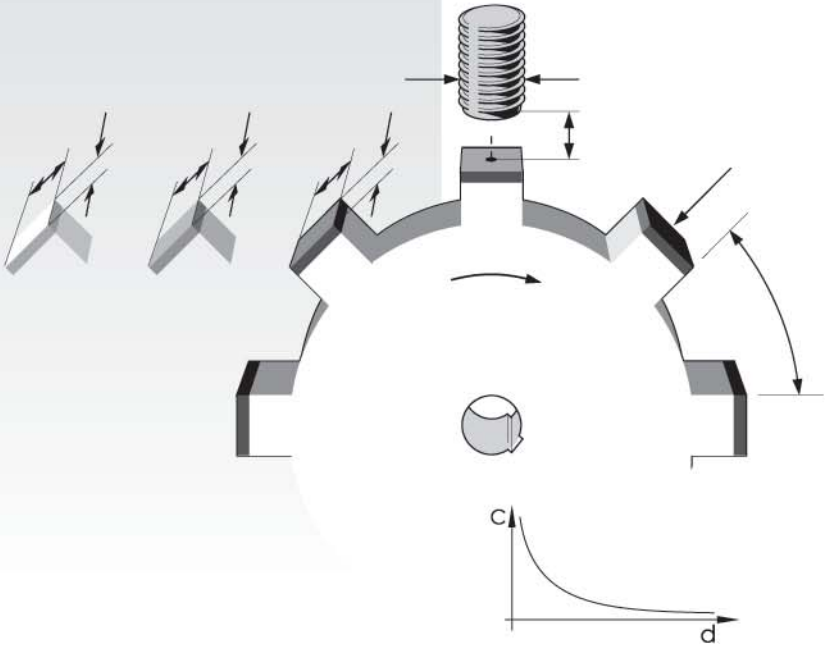
... inductive, photoelectric, magnetic field, capacitive

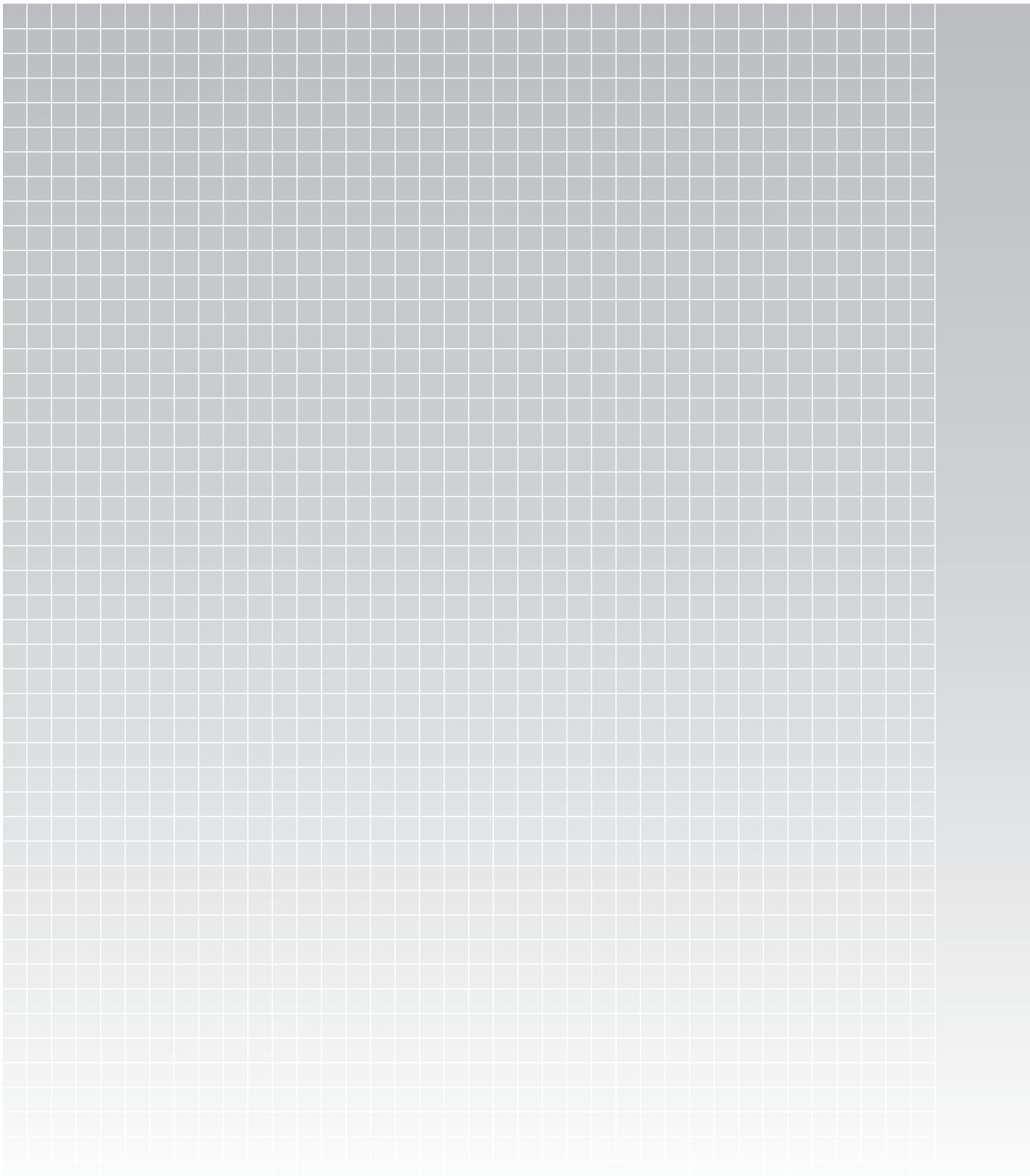
Principles





In this section you will learn about the basic concepts, technical details, application conditions, standards, etc. for the inductive sensor group.





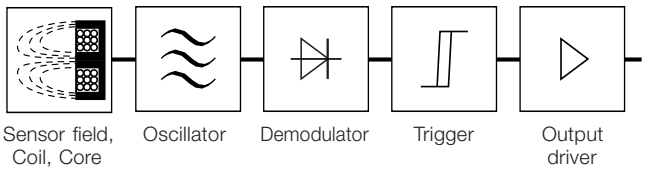
Principle

... of inductive proximity sensors is based on the interaction between metallic conductors and an electromagnetic alternating field.

Eddy currents are induced in the metallic damping material, which removes energy from the field and reduces the height of the oscillation amplitude. This change is processed in the inductive sensor, which changes its output state accordingly.

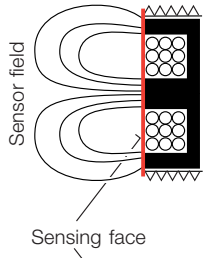
Function groups

... of the Balluff proximity switch are:



Sensing face

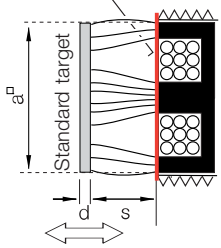
... is the area through which the high-frequency sensor field enters the air space. It is determined primarily by the base of the shell core and corresponds roughly to the surface area of the shell core cap.



Standard target

... is a square plate of Fe 360 (ISO 630), used to define sensing distances per EN 60947-5-2. The thickness is d = 1 mm; and the side length a

corresponds to
- the diameter of the circle of the “sensing face” or
- 3 s_n, if the value is greater than the given diameter.



Correction factor

... gives the reduction in sensing distances for target materials which are not made of Fe 360.

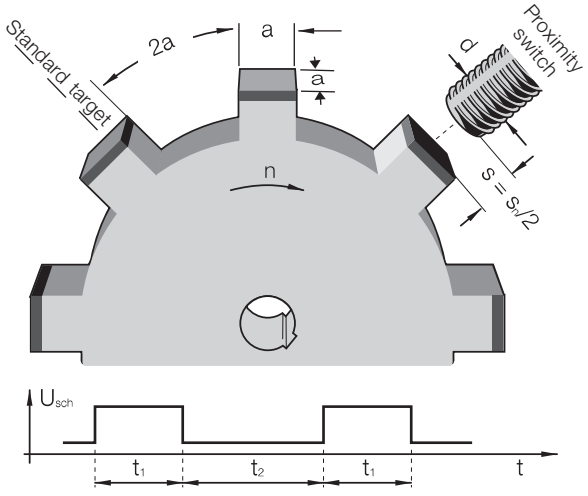
Material	Factor
steel	1.0
copper	0.25...0.45
brass	0.35...0.50
aluminum	0.30...0.45
stainless steel	0.60...1.00
nickel	0.65...0.75
cast iron	0.93...1.05

Switching frequency f

.. refers to the maximum number of switching operations per second.

Damping is per EN 60947-5-2 with standard targets on a rotating, non-conducting disk. The surface area ratio of iron to non-conductor must be 1 : 2.

The rated value of the switching frequency is reached when
- either the turn-on signal t_1 = 50 µs or the
- turn-off signal t_2 = 50 µs.



Delay times

Start-up delay t_v

... is the time from when the supply voltage is applied, and the proximity switch assumes the ready state. This time may not be longer than 300 ms. During this time there must be no fault signal longer than 2 ms.

Temperature effects and limits

Temperature drift

... is the deviation of the effective operating distance with the temperature range of –25 °C ≤ T_a ≤ +70 °C. Per EN 60947-5-2 it is: **$\Delta s_r/s_r \leq 10$ %**

Ambient temperature range T_a

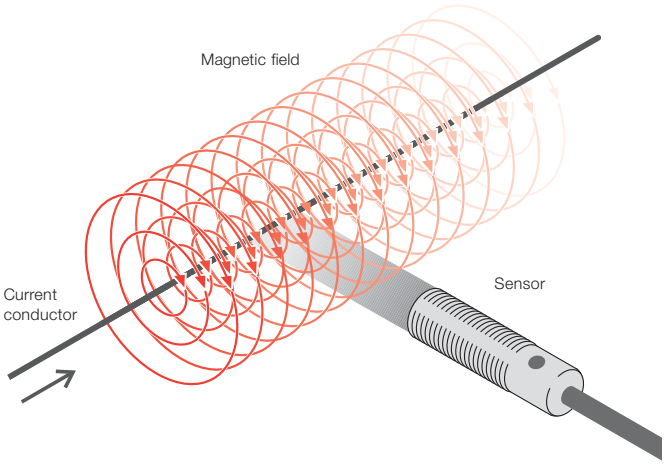
... is the temperature range over which the function of the switch is guaranteed.

Magnetic field immunity

Principle

Error-free function depends on the magnitude of the welding current and the distance of the sensor from the current carrying line.

Design and circuitry techniques ensure that magnetic field immune proximity switches remain unaffected by magnetic fields.



Supply voltage U_B

... is the permissible voltage range in which certain safe operation of the switch is guaranteed (including ripple σ).

Rated operating voltage U_e

... is the supply voltage U_B used for testing without tolerances. To determine the rated and limit values, the sensor must be operated using U_e.

It is
– for DC switches
U_e = 24 V_{DC}
– for AC and AC/DC switches
U_e = 110 V_{AC}

Voltage drop U_d

... is the voltage measured across the load of a closed (conducting) sensor at load current I_e.

Rated insulation voltage U_i

... of a proximity switch is the voltage to which the isolation tests and the creep distances are referenced.

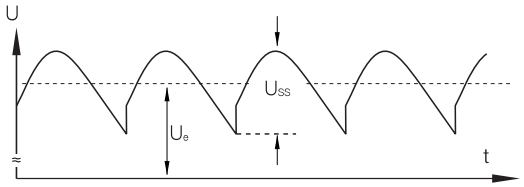
For proximity switches the highest rated operating voltage must be considered as the rated isolation voltage.

Rated supply frequency

... of the power supply for AC devices is 50 to 60 Hz.

Ripple σ (%)

... is the AC voltage (peak-to-peak of U_e) overlaid on the DC voltage U_e given in percent. To operate DC switches a filtered DC voltage having a ripple of max. 15 % (per DIN 41755) is required.



U_e = rated operational voltage
U_{pp} = oscillation width

$$\text{Ripple } \sigma = \frac{U_{pp}}{U_e} \times 100\ [\%]$$

Rated operating current I_e

... is the permissible constant output current that may flow through the load R_l.

Off-state current I_r

... is the residual current flowing through the load when a proximity switch is not conducting (open).

Inrush-capacity I_k

... in the case of alternating current indicates the current I_k (A_{eff}) which is permitted to flow during a given turn-on time t_k (ms) and at a given frequency (Hz).

Short circuit current

... is 100 A, i. e., per EN 60947-5-2 the power supply during testing in short circuit mode must be able to provide at least 100 A for a short duration. This current is prescribed in the standard in order to test the short-circuit strength.

No-load supply current I_0

... is the current, which flows in the switch, without the need for a load to be connected (only with 3- and 4-wire-switches). This current supplies the sensor electronics.

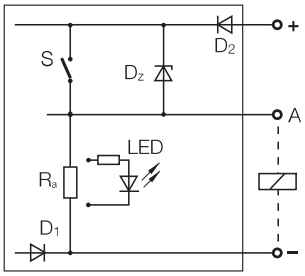
Minimum operating current I_m	... is the smallest load current required for function	of the switch when ON.
Output resistance R_a	... is the resistance between the output and the supply voltage which is built into the	switch; see „Output circuits“.
Load capacitance	... is the permissible total capacitance on the output	of the switch, including line capacitance.

Output circuits

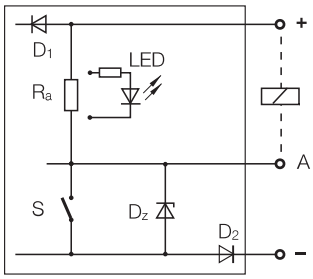
Driver stages

3-wire
DC switches

PNP, sourcing
(current source)



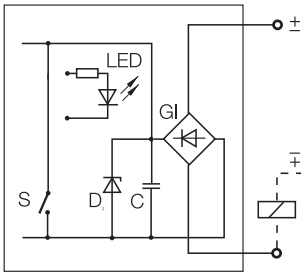
NPN, sinking
(current sink)



S = semiconductor switch
R_a = output resistance
D_z = Z-Diode, limiter
D_1 = pol. rev. protect. diode
D_2 = pol. rev. protect. diode in load current circuit (for short protection types only)
LED = light emitting diode

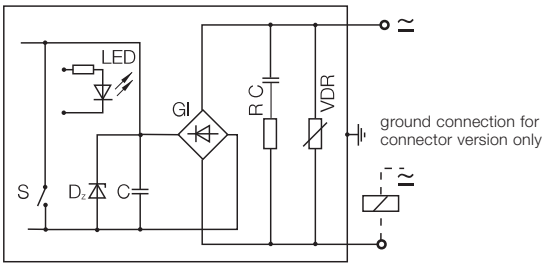
2-wire
DC switches

Non-polarized

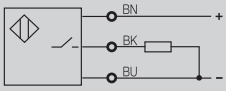
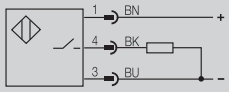
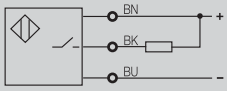
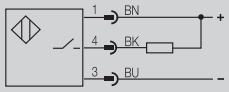
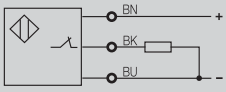
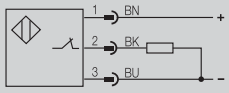
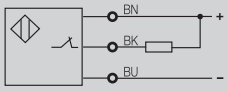
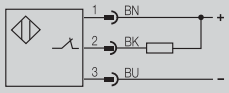
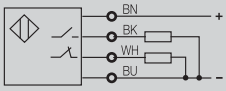
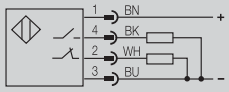
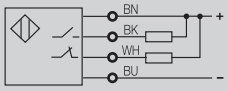
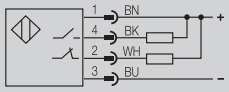
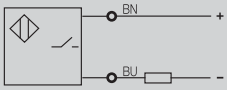
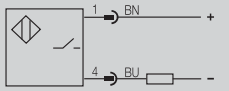
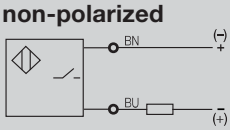
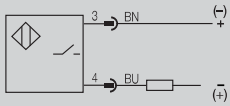
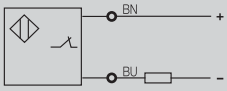
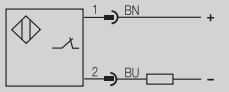
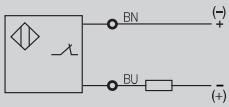
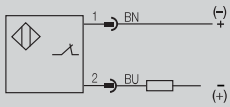
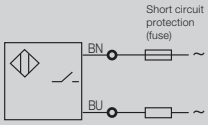
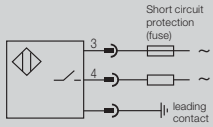
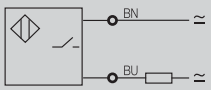
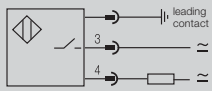
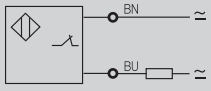
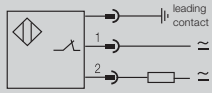
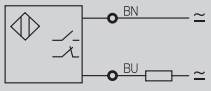


S = semiconductor switch
D_z = Z-Diode, limiter
C = capacitor
GI = bridge rectifier
LED = light emitting diode

2-wire
AC and AC/DC switches
(universal current switches)



S = semiconductor switch
D_z = Z-Diode, limiter
C = filter capacitor
RC = HF-Peak-limiter
GI = bridge rectifier
LED = light emitting diode
VDR = voltage spike limiter

		Cable/terminals	Connector		Cable/terminals	Connector
DC 3-/4-wire		**PNP (+) sourcing**			**NPN (–) sinking**	
Normally-open	①			④		
Normally-closed	②			⑤		
Complementary	③			⑥		
DC 2-wire		**polarized**			**non-polarized**	
Normally-open	⑦			⑨		
Normally-closed	⑧			⑩		
AC-switches		**safety insulated (insulation class II, ⧈)**			**with protection ground (insulation class I)**	
Normally-open	⑪					
AC/DC-switches		**safety insulated (insulation class II, ⧈)**			**with protection ground (insulation class I)**	
Normally-open	⑬			⑯		
Normally-closed	⑭			⑰		
Normally-open/ normally closed programmable	⑮					

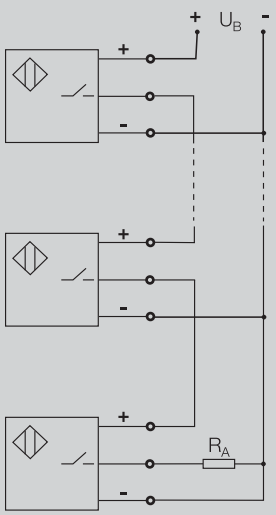
Wire colors
Coding
per DIN IEC 60757

BN	brown
BK	black
BU	blue
WH	white

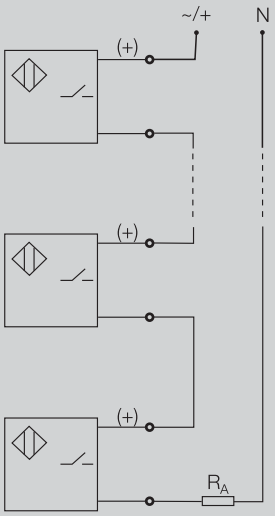
Series connection

... can cause a time delay (e. g. start-up delay). The number of connected proximity switches is limited by the total voltage drop (sum of all U_d).
In the case of 2-wire sensors it is limited by the addition of the minimum supply voltages.
For 3-wire switches, the load capacity of the output stage represents a further limitation, since the current consumption I_0 of all switches is added to the rated current I_e.
The ready delay time t_v is the ready delay of a sensor × (number of sensors n–1).

3-wire DC switch



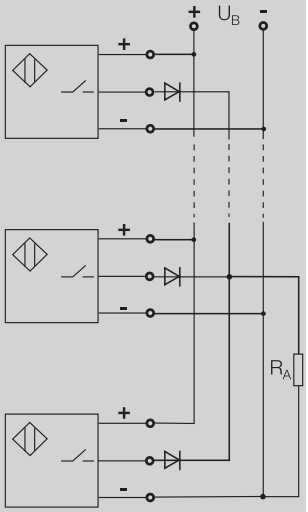
2-wire DC switch (AC/DC)



For parallel connection

... of proximity switches with LED it is recommended that the outputs of the individual switches be decoupled using diodes (as shown).
This prevents all LED's from lighting-up when the output stage of one switch is turned on.

3-wire DC switch



2-wire DC switch

Parallel wiring of 2-wire proximity switches is not recommended, since missed pulses can be caused by the build-uo of oscillations.

Utilization categories

per EN 60947-5-2/
IEC 60947-5-2

Category		Typical load applications
AC 12	AC-switch	resistive and semiconductor loads, optocouplers
AC 140	AC-switch	small electromagnetic load $I_a \leq 0.2$ A; e. g. contactor relay
DC 12	DC-switch	resistive and semiconductor loads, optocouplers
DC 13	DC-switch	electromagnets

Polarity reversal protected

... protected against any possible lead reversal for sensors with short circuit protection.

... against reversal of plus/minus leads for sensors without short circuit protection.

Cable break protection

... in 3-wire sensors prevents improper function. A diode prevents the current from flowing via the output line A.

Short circuit protected
(sensors with a maximum voltage of 60 V DC)

... is achieved in Balluff sensors using pulsing or thermal short circuit protection circuits. The output stage is thereby protected against overload and short circuit. The trigger current for the short circuit protection is higher than the rated operating current I_e. Currents from switching and load capacitances are specified in the sensor data and do not result in triggering, but rather are masked by a short delay in the output circuit.

Short circuit/overload protected
(universal AC/DC sensors)

... AC or AC/DC sensors are often operated with a relay or contactor as the load.
AC switching devices (contactors/relays) create a significantly higher load (6...10 × rated current) when they are first energized as compared with their static operation due to the fact that the core is still open. The static value of the load (current) is not reached until several milliseconds later.

Not until the magnetic field is closed does the max. permissible rated operating current I_e flow through the sensor.
This means that the threshold value for a short circuit condition in these sensors must lie significantly higher and would, if for example the contactor is prevented for mechanical or electrical reasons from fully closing, result in an overload on the sensors. This is where the overload protection comes into play. It is designed as slow-acting (time-delayed). Its trigger threshold lies only slightly above the maximum permissible I_e.

A response (i. e. turn-off) is delayed, depending on the magnitude of the overload, by more than 20 milliseconds. This ensures that properly working relays and contactors can be switched normally, while defective devices will not destroy the Balluff sensor. The short circuit/overload protection is generally of a bi-stable design, which means that it must be reset by turning off the supply voltage to the sensor.

Axial and radial damping

When damping in an **axial direction** the standard target is moved concentric to the system axis.
The switchpoint is thereby determined only by the distance “s” from the sensing face of the sensor.

When damping in the **radial direction**, the location of the switchpoint is additionally affected by the radial distance “r” of the target from the system axis.

The diagram shows the **response curves**, which indicate the dependency of the switchpoint on “s” and “r”.

The primary purpose of this drawing is to show the possibility of damping using a lateral approach and the difference compared with axial approach

Application

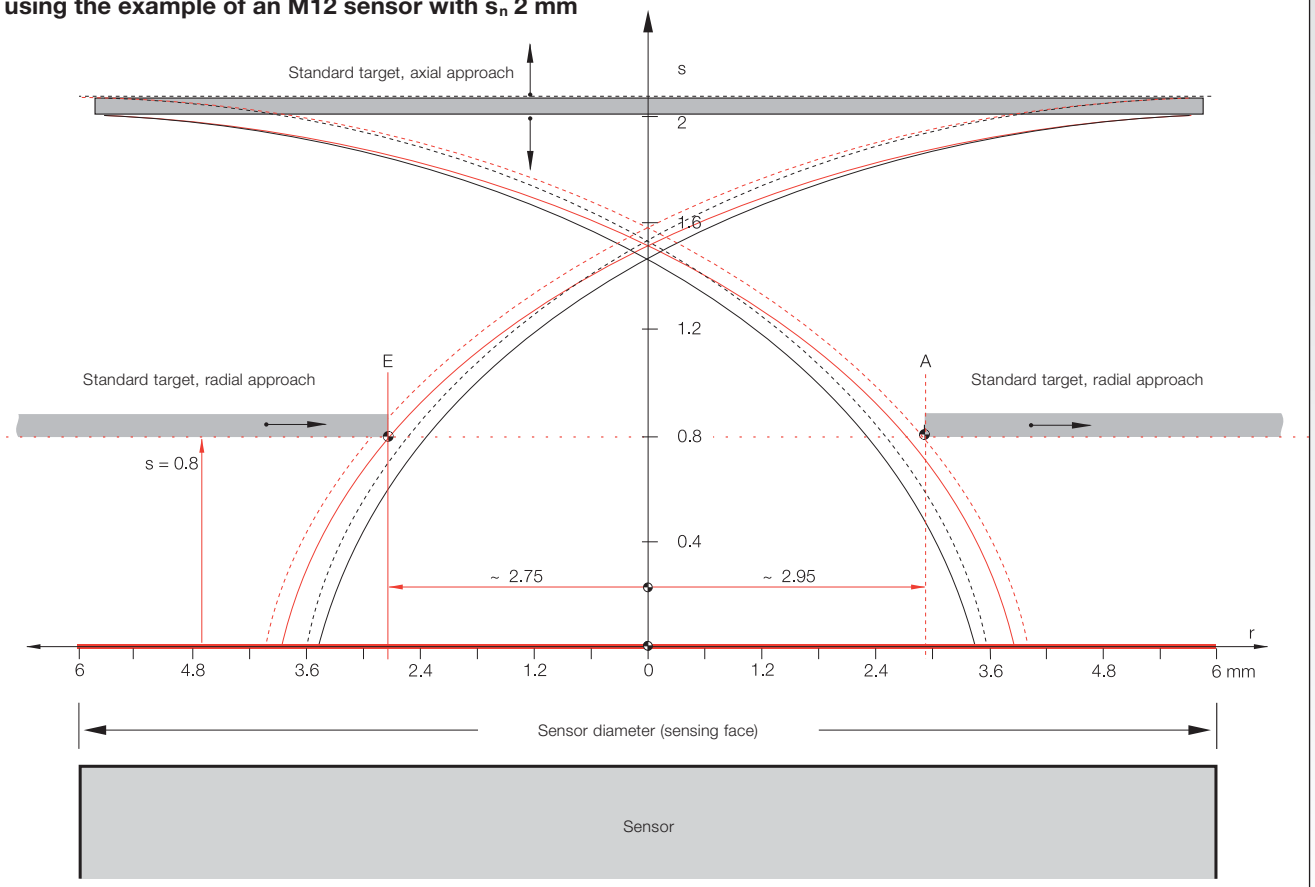
Due in part to manufacturing tolerances within a production run, the exact switchpoint must in any case be established on site. The solid lines represent the respective switchpoint (E), the dashed lines indicate the turn-off point (A). The red lines apply to switches with a clear zone, and the black lines for flush mount types. Since the switching operation can be induced from either direction, the curves are shown mirrored from the system axis.

Examples

Passing objects on conveyor lines generate a signal change when their front edge crosses the turn-on curve on the entry side. The signal reverses again when the back edge of the passing object crosses the (mirrored) turn-off curve on the opposite side.

With **reversing parts** (e. g. limit of travel), the signal reversal occurs at the turn-off curve on the same side.

Typical approach curves using the example of an M12 sensor with s_n 2 mm



The **vertical axis** in the diagram shows the distance of the switchpoint from the sensing face. It is referenced to the nominal sensing distance s_n (see page **1.0.**10).

At a distance of 0.8 mm, a laterally approaching target reaches the solid line turn-on curve at point “E” and leaves the turn-off curve at point “A”.

The **horizontal axis** in the diagram is referenced to the radius of the sensing face (see page **1.0.**2). The zero point of this axis lies in the center of the shell core cap. In our example for the M12 switch, the radius is r = 6 mm.

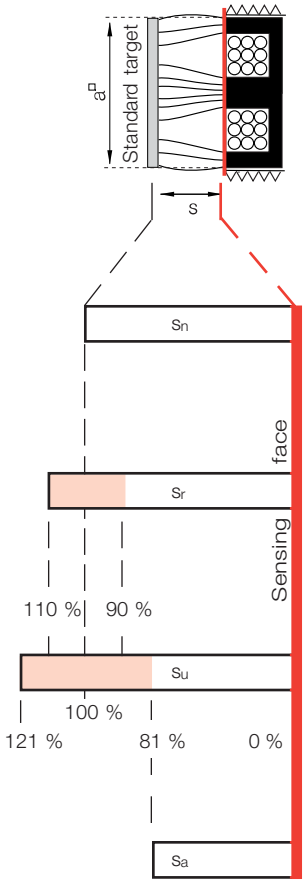
Example:
The distance of the turn-on and turn-off point (from the system axis) is typically
E ~ 2.75 mm
A ~ 2.95 mm.

Switching distances

Switching distance s

... is the distance between the standard target and the sensing face of the proximity switch at which a signal change is generated

per EN 60947-5-2. For “normally open” this means from OFF to ON and for normally closed from ON to OFF.



Rated operating distance s_n

... is a theoretical value, which does not take into account manufacturing

tolerances, operating temperatures, supply voltages, etc.

Effective operating distance s_r

... is the switching distance of a single proximity switch measured under specified conditions, e.g. flush mountable, rated operating

voltage U_e, temperature T_a = +23 °C ±5 °C ($0.9\ s_n \le s_r \le 1.1\ s_n$)

Useful operating distance s_u

... is the switching distance of a single proximity switch under specified temperature and voltage conditions

($0.81\ s_n \le s_u \le 1.21\ s_n$).

Assured operating distance s_a

... is any switching distance for which an operation of the proximity switch within the permissible operating

conditions (temperatures, voltages) is guaranteed ($0 \le s_a \le 0.81\ s_n$).

Switching distance identifier (in sections **1.1**, **1.2** and **1.5**)

		Housing	Switching distance
none	standard switching distance per IEC 60947-5-2		
Switching distance ■ ■	**"2×"** the switching distance vs. standard	Ø 3 mm*	1 mm flush
		Ø 4 mm/M5*	1.5 mm flush
		Ø 6.5 mm...M30	1.5...2x
Switching distance ■ ■ ■	**"3×"** the switching distance vs. standard	Ø 3 mm*	3 mm non-flush
		Ø 4 mm/M5*	5 mm non-flush
		Ø 6.5 mm...M12	2.2...3x
		M18...M30	depending on version
Switching distance ■ ■ ■ ■	**"4×"** the switching distance vs. standard		

*Switching distance in mm. The switching distances for these sensors are not standardized.

Repeat accuracy R

... of s_r is determined at rated operating voltage U_e under the following conditions:

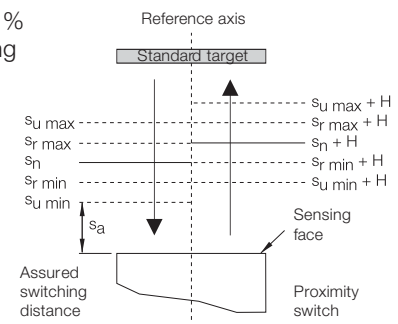
Temperature: T = +23 °C ±5 °C
Relative humidity: ≤ 90 %
Measuring duration: t = 8 h.

The permissible deviation per EN 60947-5-2 is $R \le 0.1\ s_r$.

Hysteresis H (switching hysteresis when target is backed off)

... is given as a percentage of the effective operating distance s_r. It is measured at an ambient temperature of +23 °C ±5 and at the rated operational voltage.

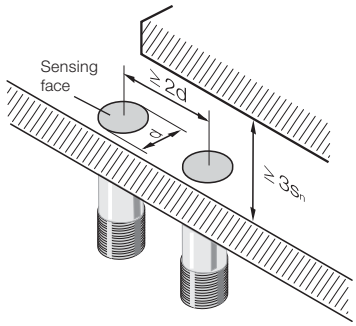
It must be less than 20 % of the effective operating distance (s_r).
$H \le 0.2\ s_r$



Installation in metal
Sensors with standard switching distance

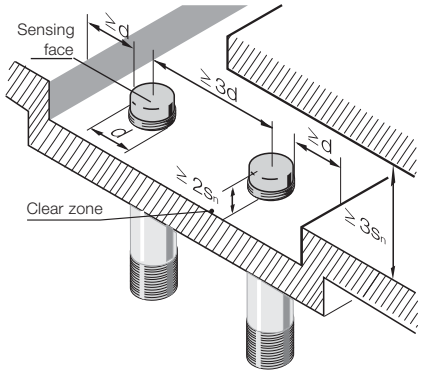
Flush mountable proximity switches

... can be installed with their sensing faces flush to the metal. The distance from opposing metal surfaces must be ≥ $3s_n$ and the distance between two proximity switches (side-by-side) ≥ 2d.



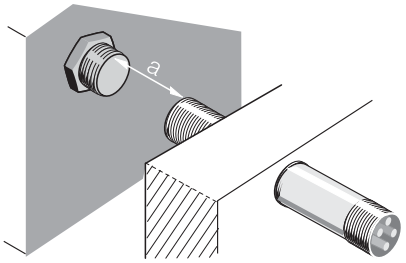
Non-flush mountable proximity switches

... can be identified by their "caps", since they have no metal housing surrounding the area of the sensing face. The sensing face must extend ≥ $2s_n$ from the metallic installation medium. The distance from opposing metal surfaces must be ≥ $3s_n$ and the distance between two adjacent proximity switches ≥ 3d.



Opposing installation of 2 sensors

... requires for all inductive proximity switches a minimum distance of ≥ 3d between the sensing face.



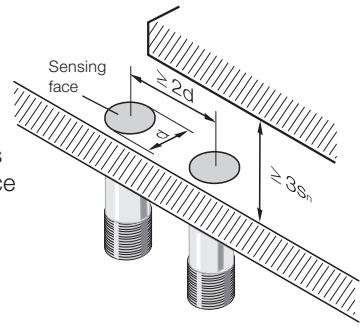
Installation medium

Ferromagnetic materials:	Iron, steel or other magnetizable materials.
Alloys:	Brass, aluminum or other non-magnetizable materials.
Other materials:	Plastics, electrically non-conducting materials.

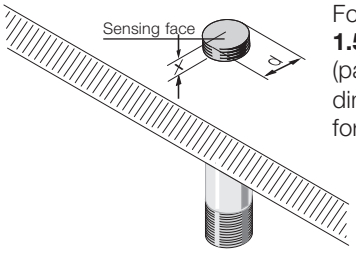
Installation in metal
Sensors with switching distance indicator ■■

Flush mountable proximity switches

... can be installed with their sensing faces flush to the metal. Installation in alloy may result in a reduction of the switching distance. The distance to opposing switches must be ≥ $3s_n$, and the distance between adjacent switches (side-by-side) must be ≥ 2d. In order to install the sensor in ferromagnetic materials, the following guidelines are used for dimension "×".



Housing size d	Dimension „×"
Ø 3 mm	1 mm
Ø 4 mm	1.5 mm
M5	1.5 mm
Ø 6.5 mm	0 mm
M8	0 mm
M12	1.5 mm
M18	2.5 mm
M30	3.5 mm



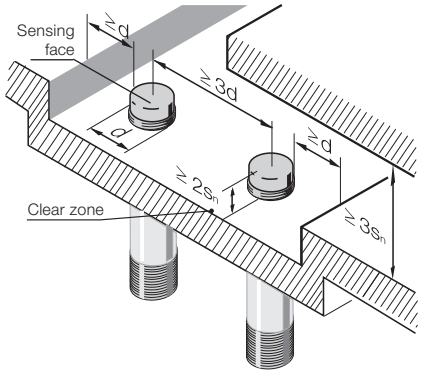
For Factor 1 sensors (page **1.5.**5 ...) and ATEX NAMUR (page **1.5.**40 ...) the dimension „×" is not needed for installation in metal.

For section **1.2**:

Housing size d	Dimension „×"
M8	0 mm
M12	0 mm
M18	0.7 mm
M30	3.5 mm

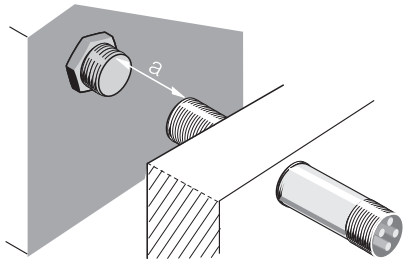
Non-flush mountable proximity switches

... can be identified by their „caps", since they have no metal housing surrounding the area of the sensing face. The sensing face must extend ≥ $2s_n$ from the metallic installation medium. The distance from opposing metal surfaces must be ≥ $3s_n$ and the distance between sensors ≥ 3d.



Opposing installation of 2 sensors

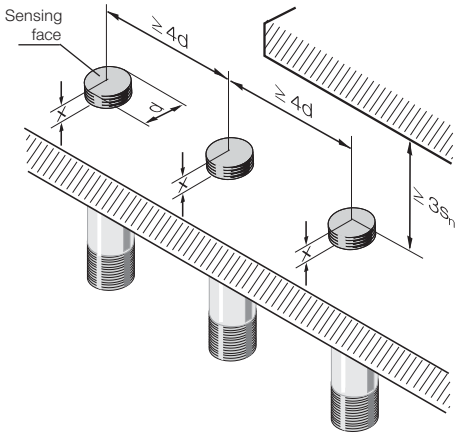
... requires for all inductive proximity switches a minimum distance of ≥ 4d between the sensing face.



Installation in metal
Sensors with switching distance indicator ■■■ and ■■■■

Quasi-flush mountable proximity switches

... require a space behind the sensing face which is free of conducting materials. Under this condition the specified switching distance is available without limitation. Dimension "x" (see fig.) indicates the shortest distance between the sensing face and the conductive material behind it.



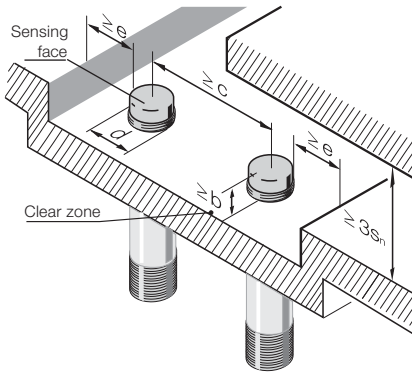
Housing size d	Switching distance ■■■ Dimension „x" for installation in ferromagnetic materials	other metals	Switching distance ■■■■ Dimension „x" for installation in ferromagnetic materials	other metals
Ø 6.5 mm, M8	2.0 mm	1.0 mm	3.0 mm	2.0 mm
M12	2.5 mm	2.0 mm	4.0 mm	3.0 mm
M18	4.0 mm	2.5 mm		
M30	8.0 mm	4.0 mm		
8×8 mm	≥ 1 mm			

Non-flush mountable proximity switches

... can be identified by their „caps", since they have no metal housing surrounding the area of the sensing face.

The distance from opposing metal surfaces must be ≥ $3s_n$.
Installation conditions:

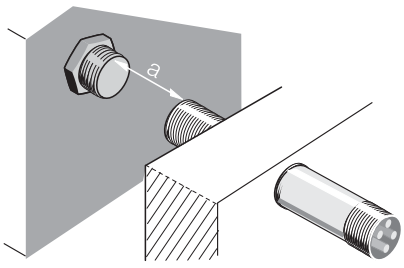
Housing size d	Dimension b	Dimension c	Dimension e
Ø 3 mm	≥ 10 mm	≥ 30 mm	≥ 10 mm
Ø 4 mm	≥ 15 mm	≥ 40 mm	≥ 20 mm
M5	≥ 15 mm	≥ 40 mm	≥ 20 mm
Ø 6.5 mm	≥ 8 mm	≥ 32 mm	≥ 8 mm
M8	≥ 8 mm	≥ 32 mm	≥ 8 mm
M12	≥ 10 mm	≥ 48 mm	≥ 12 mm
M18	≥ 20 mm	≥ 72 mm	≥ 18 mm
M30	≥ 35 mm in steel ≥ 25 mm in alloy ≥ 20 mm in stainless steel	≥ 120 mm	≥ 30 mm



Opposing installation of 2 sensors

... requires for all inductive proximity switches a minimum distance of ≥ 5d between the sensing faces. For exceptions see table:

Housing size	Dimension a
Ø 3 mm	20 mm
Ø 4 mm	45 mm
M5	45 mm



	Materials	Use and characteristics	
Metals	**Al** Aluminum wrought alloy	Standard aluminum for cut shaping. Can be anodized. Used for housings and fastening parts.	
	CuZn Brass	Standard housing material with surface protection.	
	Stainless steel	Excellent corrosion resistance and strength. Quality 1.4034, 1.4104: Standard material. Quality 1.4305, 1.4301: Standard material for food grade applications.	Quality 1.4401, 1.4404, 1.4571: For food grade applications with heightened requirements for chemical resistance at elevated temperatures.
	GD-Al Cast aluminum	Low specific gravity. Good strength and resistance.	Some types can be anodized.
	GD-Zn Cast zinc	Good resistance and strength. Usually with protective surface coating.	
Plastics	**ABS** Acrylonitrile Butadiene Styrene	Impact resistant, inflexible, limited chemical resistance. Some types flame-retardant.	Used for housings.
	AES/CP Acrylonitrile-Ethylene-propylene-Styrene	Impact resistant, inflexible, limited chemical resistance.	Used for housings.
	EP Epoxy resin	Duromer, molding resin, highest mechanical strength and temperature resistance.	Very good dimensional stability. Non-melting.
	LCP Liquid Crystalline Polymer	High mechanical strength and temperature resistance. Very good chemical	resistance. Inherently non-flammable.
	PA 6, PA 66, PA mod., PA 12 Polyamide	Good mechanical strength. Temperature resistance.	PA 12 approved for food industry applications.
	PA transp. Transparent polyamide	Transparent, hard, inflexible. Good chemical resistance.	
	PBT Polybuteneterephthalate	High mechanical strength and temperature resistance. Some types flame-retardant.	Good chemical resistance. Good oil resistance.
	PC Polycarbonate	Clear, hard, elastic and impact resistant. Good	temperature resistance. Limited chemical resistance.
	PEEK Polyetheretherketone	Thermoplastic. Very high strength and temperature resistance. Good chemical resistance. Can be sterilized,	good resistance to ionizing radiation.

	Materials	Use and characteristics	
Plastics	**PEI** Polyetherimide	High mechanical strength and good temperature resistance. Good chemical resistance even with many	solvents. Transparent with amber-yellow inherent color (not pigmented).
	PMMA Polymethylmethacrylate	Clear, transparent, hard, scratch-resistance, UV	resistant, mainly for optical applications.
	POM Polyoxymethylene	High impact resistance, good mechanical strength. Good chemical resistance.	
	PP Polypropylene	Very good electrical properties. Impact resistant, tough, mechanically resilient.	Very low water absorption. Good to very good chemical resistance.
	PPE Polyphenylenether	Tough, inflexible, high mechanical strength over a wide temperature range.	Good chemical resistance. Good hot water resistance.
	PTFE Polytetraflourethylene	Best temperature and chemical resistance.	
	PUR Polyurethane	Elastic, abrasion-resistant, impact-resistant. Good resistance to oils, greases,	solvents (used for gaskets and cable jackets).
	PVC Polyvinylchloride	Good mechanical strength and chemical resistance (cable).	
	PVDF Polyvinylidenfluoride	Thermoplastic. High temperature resistance and mechanical strength. Good	chemical resistance (similar to PTFE).
Other	**Glass**	Good chemical resistance and strength. Used primarily in optical	applications (lenses, covering panes).
	Ceramic	Very good strength and chemical resistance. Electrically insulating.	Excellent temperature resistance.

Cable types

PUR cable, PUR jacketed		PVC cable, PVC jacketed	
No. of wires × cross-section [mm²]	Outside diameter typical [mm]	No. of wires × cross-section [mm²]	Outside diameter typical [mm]
2×0.08	3...4	2×0.14	2.5...3.5
2×0.14	3...4.1	2×0.34	4.5...5.5
2×0.34	4...5.5		
		3×0.14	2.7....4.5
3×0.06	2...2.5	3×0.25	4...5
3×0.09	2.5....3	3×0.34	4.5...5.5
3×0.14	2.5...3.5		
3×0.25	3.5...4.5	4×0.25	4.5...5.5
3×0.34	4...5.5		
3×0.75	6.5...7		
4×0.14	3...4		
4×0.25	4...5.5		
8×0.25	6...8		

Least bending radius

tensioned	untensioned	Cable trailing and roller deflection
4×D	3×D	4×D...7.5×D "SP" only

Special cable

SP cable is a cross irradiated PUR cable that has good resistance to weld splatter.

A special connection cable is used for sensors that need to be used at higher ambient temperatures.

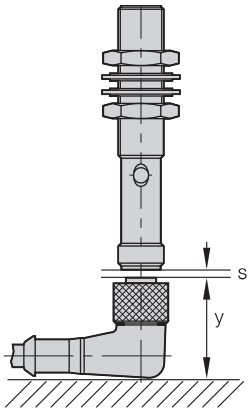
Tightening torques

For permissible tightening torque, see data sheets or sensor packaging.

Removal clearance

The removal clearance refers to the necessary clearance which must be allowed for when removing the connector without difficulty.

It results from the connector height "y" plus a space "s", which is determined mainly by the spatial conditions.



Housing tolerances for unthreaded tubular sensors

Diameter	tolerance
Ø 3 mm	–0.1
Ø 4 mm	–0.1
Ø 6.5 mm	–0.15
Ø 8 mm	–0.15

Quality Management System
per DIN EN ISO 9001:2000

Balluff company	
Balluff GmbH	Germany
Balluff Elektronika KFT	Hungary
Nihon Balluff Com. Ltd.	Japan
Balluff U.K. Ltd.	Great Britain
Balluff Automation s.r.l.	Italy
Balluff Inc.	USA
Gebhard Balluff Vetriebsgmbh	Austria
Balluff CZ	Czech Republic
Hy-Tech AG	Switzerland
Balluff Sensortechnik AG	Switzerland
Balluff Controles Elétricos Ltda.	Brazil

Environmental Management System
per DIN EN ISO 14001:2005

Balluff company	
Balluff GmbH	Germany
Balluff Elektronika KFT	Hungary

Balluff products meet the EU Directives

Products requiring marking are subjected to a conformity evaluation process according to the EU Directive and the product is marked with the CE Marking. Balluff products fall under the following EU Directives:

2004/108/EG	EMC Directive
2006/95/EG	Low-Voltage Directive applies to AC and AC/DC sensors
94/9/EG	ATEX Directive applies to products having the Ex marking

Approvals

... are granted by national and international institutions. Their symbols affirm that our products meet the specifications of these institutions.

„US Safety System“ and „Canadian Standards Association“ under the auspices of Underwriters Laboratories Inc. (cUL).

CCC Marking by the Chinese CQC.

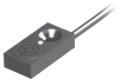
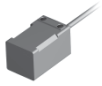
Balluff is a member of ALPHA

ALPHA, an association for testing and certification of low-voltage devices, promotes the individual responsibility of the manufacturer of such devices by means of uniform test procedures according to current standards and thereby supports the attainment of high product quality. ALPHA also grants nationally recognized product certificates when certain prerequisites are met. Through ALPHA's membership in LOVAG (Low Voltage Agreement Group), its certificates are also recognized in other European countries.

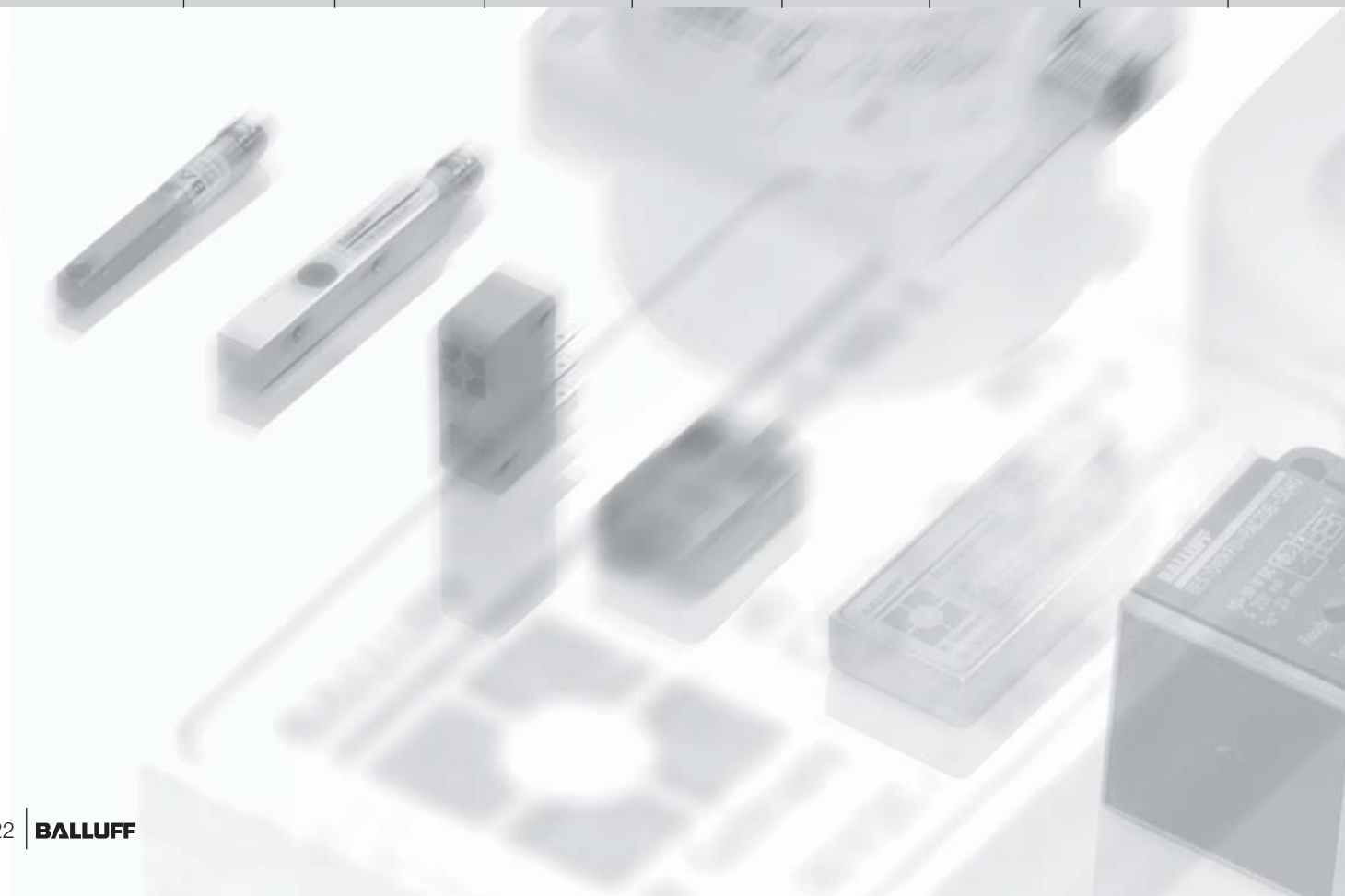
Sensors	Low-voltage equipment	EN 60947-5-2/IEC 60947-5-2	
	NAMUR sensors	EN 60947-5-6/IEC 60947-5-6	
Insulation class	II ⧈	EN 60947-5-2/IEC 60947-5-2	
Degree of protection (enclosure rating)	IP 60...67	EN 60529/IEC 60529	
	IP 68 per BWN Pr. 20	Balluff Factory Standard (BWN): Temperature storage 48 h at 60 °C, 8 temperature cycles per EN 60068-2-14/ IEC 60068-2-14 between the reference temperatures as per data sheet, 1 h under water, insulation test,	24 h under water, insulation test, 8 temperature cycles per EN 60068-2-14/ IEC 60068-2-14 between the reference temperatures as per data sheet, 7 days under water, insulation test.
	IP 68 per BWN Pr. 27	Balluff Factory Standard (BWN):	Testing of products for use in the food industry.
	IP 69K	DIN 40050 Part 9	Protection against infiltration of water under high pressure and steam cleaning.

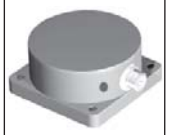
EMC (Electromagnetic Compatibility)	Emissions, RF noise voltage and RF noise radiation from electrical equipment	EN 55011
	Static discharge immunity (ESD)	EN 61000-4-2/IEC 61000-4-2
	Radio frequency immunity (RFI)	EN 61000-4-3/IEC 61000-4-3
	Immunity to fast transients (burst)	EN 61000-4-4/IEC 61000-4-4
	Immunity to line-carried noise induced by high-frequency fields	EN 61000-4-6/IEC 61000-4-6
	Immunityto voltage dips and voltage interruptions	EN 61000-4-11/IEC 61000-4-11
	Surge-voltage stability	EN 60947-5-2/IEC 60947-5-2
Environmental simulation	Vibration, sinusoidal	EN 60068-2-6/IEC 60068-2-6
	Shock	EN 60068-2-27/IEC 60068-2-27
	Continuous shock	EN 60068-2-29/IEC 60068-2-29
Ex-zone	Electrical equipment for explosive atmospheres, general requirements. Succeeded by: Electrical equipment for gas explosive atmospheres, general requirements.	EN 50014 EN 60079-0
	Electrical equipment for explosive atmospheres, intrinsically-safe “i”.	EN 50020
	For conformity, see product marking.	

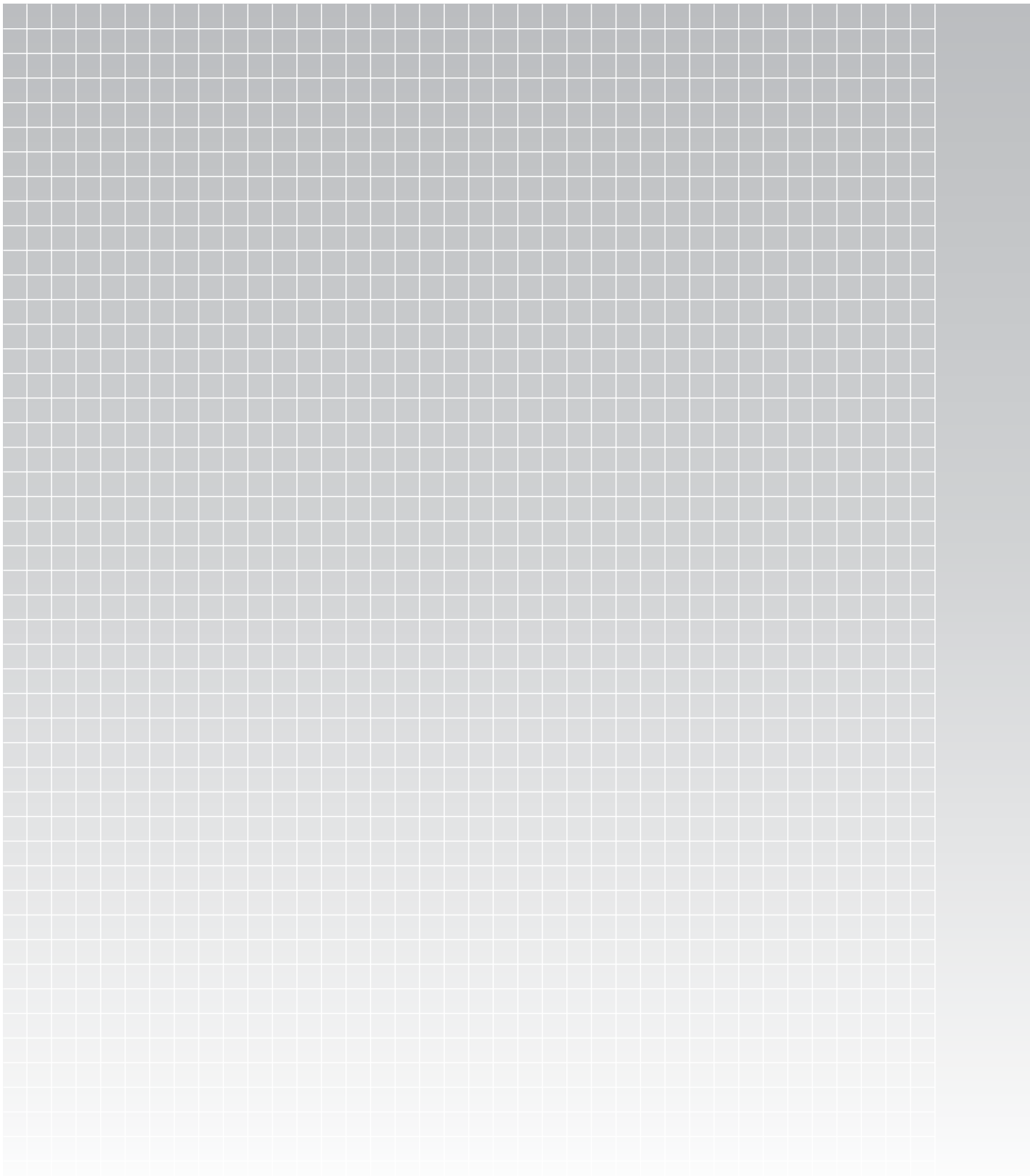
								
Housing	**Ø 3 mm, Ø 4 mm**	**M5**	**Ø 6.5 mm, M8, Ø 8 mm**	**M12**	**M16**	**M18**	**M30**	
	starting **Section.**Page							
DC 3-/4-wire	**1.1.**2 ...	**1.1.**6 ...	**1.1.**9 ...	**1.1.**24 ...		**1.1.**33 ...	**1.1.**40 ...	
DC 2-wire			**1.2.**2 ...	**1.2.**4 ...		**1.2.**6 ...	**1.2.**8 ...	
AC/DC 2-wire				**1.3.**2 ...		**1.3.**3	**1.3.**3	
AC 2-wire				**1.4.**2 ...		**1.4.**3	**1.4.**3	
Weld and magnetic field immune			**1.5.**4 ...	**1.5.**5 ...		**1.5.**6 ...	**1.5.**7 ...	
Magnetic field immune								
Diagnostics				**1.5.**15 ...		**1.5.**15		
Steelface				**1.5.**20 ...		**1.5.**21	**1.5.**21	
Pressure/high pressure rated			**1.5.**22 ...	**1.5.**23 ...	**1.5.**26 ...	**1.5.**23 ...		
Pressure rated Ex				**1.5.**37		**1.5.**37		
Namur Ex			**1.5.**40	**1.5.**41		**1.5.**41		
Temperature rated		**1.5.**42	**1.5.**42	**1.5.**42		**1.5.**43	**1.5.**43	
PROXINOX®				**1.5.**44 ...		**1.5.**46 ...	**1.5.**47 ...	

								
	5×5 mm	**8×8 mm**	**8×16 mm**	**10×30 mm**	**16.5×30 mm**	**17.5×17.3 mm**	**20×32 mm**	**25×50 mm**
	1.1.47	**1.1.**50 ...	**1.1.**48 ...	**1.1.**49	**1.1.**53	**1.1.**58	**1.1.**55	**1.1.**58 ...
							1.5.11	
							1.5.12 ...	
								1.5.43

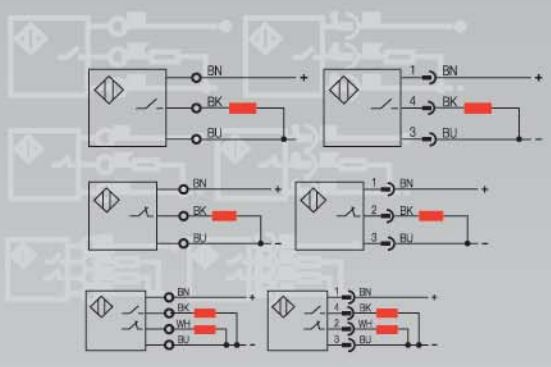
								
Housing	**26×26 mm**	**26×40 mm**	**42×48 mm**	**74×60.5 mm**	**40×40 mm Unicompact**	**40×40 mm Unisensor**	**80×80, 84, 92 mm Maxisensor**	
	starting **Section.**Page							
DC 3-/4-wire		**1.1.**56 ...	**1.1.**60	**1.1.**61	**1.1.**62 ...	**1.1.**65 ...	**1.1.**68	
DC 2-wire	**1.2.**12				**1.2.**10 ...		**1.2.**11	
AC/DC 2-wire		**1.3.**4			**1.3.**5	**1.3.**6	**1.3.**7	
Factor 1					**1.5.**2 ...			
Diagnostics					**1.5.**15			
Weld and magnetic field immune					**1.5.**9			
Magnetic field immune						**1.5.**13		
Namur Ex					**1.5.**41			
Extended switching distance								
Ring Sensors								

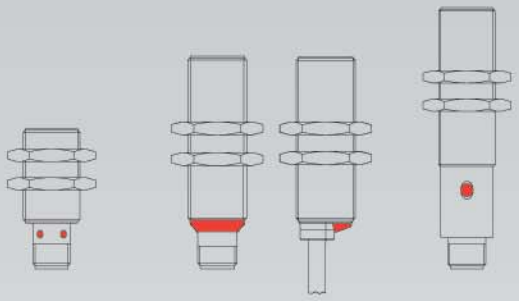


								
	35×35 mm	**∅ 80×67 mm**	**∅ 110×110 mm**	**Ring sensor**				
	1.5.53	**1.5.**52	**1.5.**54					
				1.5.51				



Inductive – DC 3-/4-wire





Short housing

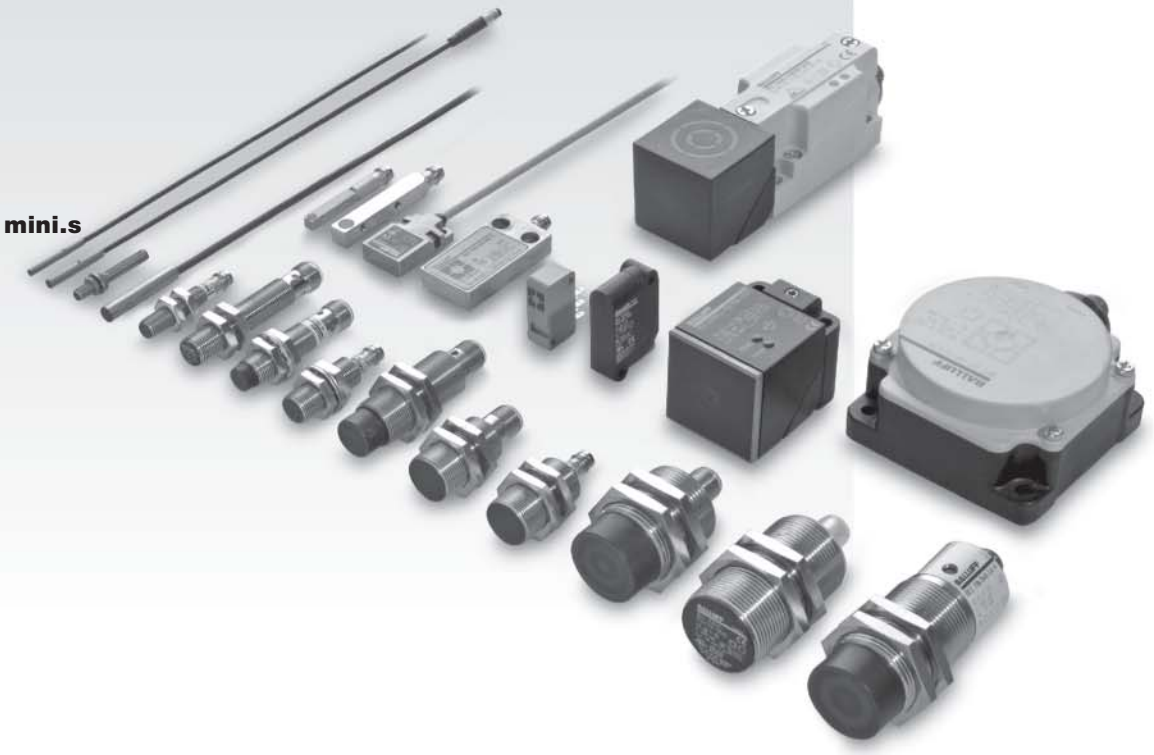
Mid-length with maximum thread length

Long housing

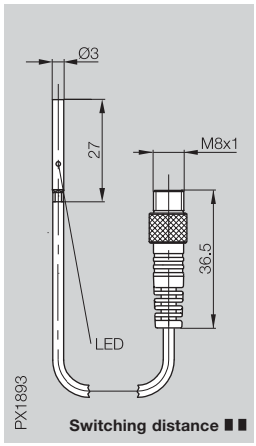
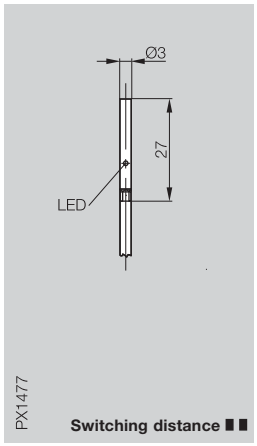
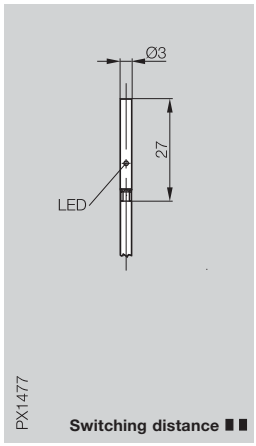
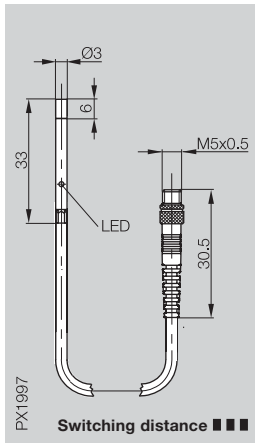
Our standard line in 3- and 4-wire DC versions

In this comprehensive line Balluff offers proximity switches from Ø 3 mm to 80×80 mm for virtually any application in the field of automation.

These highest quality sensors are designed and manufactured according to worldwide standards and the latest technology. Our 100 % final inspection of all products is your assurance that only carefully tested sensors leave our plants.



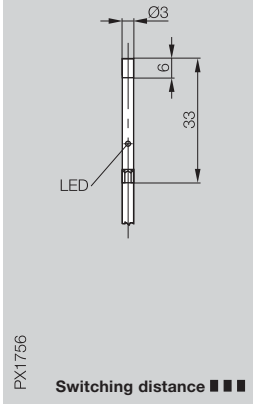
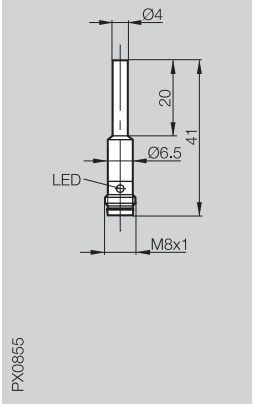
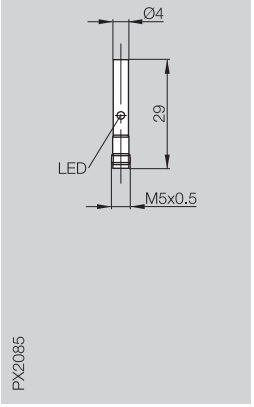
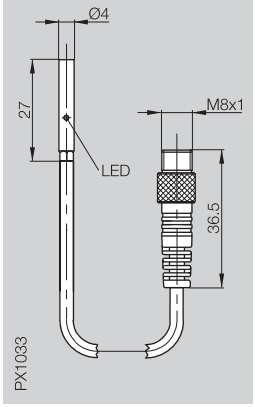
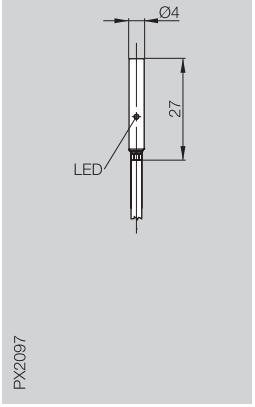
mini.s

Housing size			Ø **3 mm**	Ø **3 mm**	Ø **3 mm**	Ø **3 mm**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush	non-flush
Rated operating distance s_n			**1 mm**	**1 mm**	**1 mm**	**3 mm**
Assured operating distance s_a			0...0.8 mm	0...0.8 mm	0...0.8 mm	0...2.3 mm
						
PNP	NO	①	BES 516-3044-G-E4-C-S49-00,3	BES 516-3044-G-E4-C-PU-02		BES 516-3048-G-E4-C-S26-00,3
	NC	②		BES 516-3045-G-E4-C-PU-02		
NPN	NO	④			BES 516-3046-G-E4-L-PU-02	
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	21.6...26.4 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V	≤ 1.5 V	≤ 2.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e			100 mA	100 mA	100 mA	50 mA
No-load supply current I_0 max.			≤ 12 mA	≤ 12 mA	≤ 12 mA	≤ 10 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	no	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 15 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	0...+70 °C	0...+70 °C
Switching frequency f			2000 Hz	2000 Hz	5000 Hz	3000 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67	IP 67
Housing material			Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material of sensing face			POM	POM	POM	POM
Connection			0.3 m PUR cable with connector	2 m cable PUR	2 m cable PUR	0.3 m PUR cable with connector
No. of wires × cross-section				3×0.09 mm²	3×0.09 mm²	
Approval			cULus	cULus		
Recommended connector			BKS-_ 48			BKS-B 25

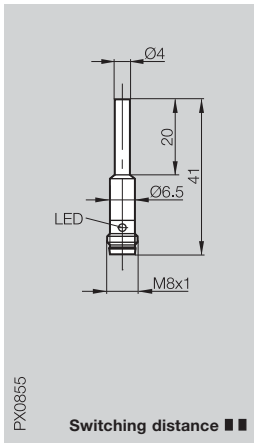
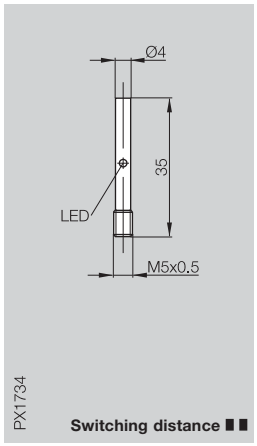
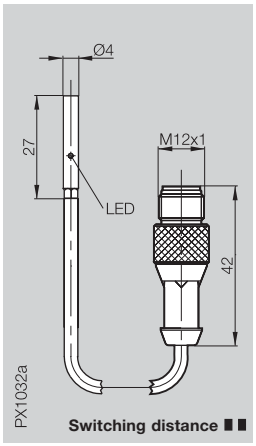
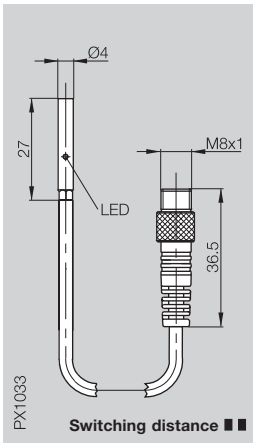
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

mini.s
The new sensor dimension

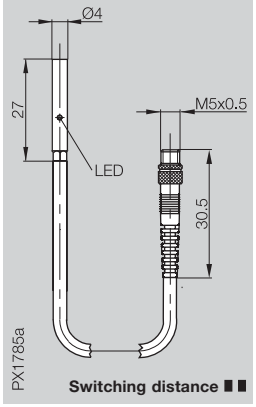
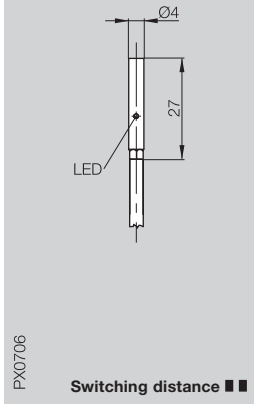
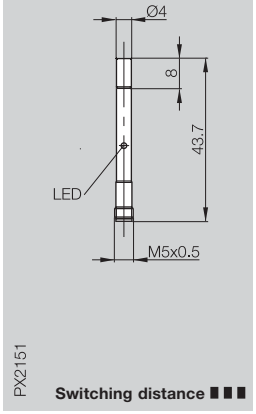
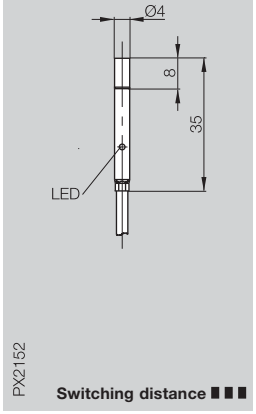
	Ø **3 mm**	Ø **4 mm**	Ø **4 mm**	Ø **4 mm**	Ø **4 mm**
	non-flush	flush	flush	flush	flush
	3 mm	**0.8 mm**	**0.8 mm**	**0.8 mm**	**0.8 mm**
	0...2.3 mm	0...0.6 mm	0...0.6 mm	0...0.6 mm	0...0.6 mm
					
	BES 516-3048-G-E4-C-PU-02	BES 516-3007-E5-C-S49 BES 516-3017-E5-C-S49	BES G04EC-PSC08B-S26G BES G04EC-POC08B-S26G	BES 516-3007-E4-C-S49-00,3 BES 516-3017-E4-C-S49-00,3	BES 516-3007-E4-C-PU-02
		BES 516-3008-E5-C-S49	BES G04EC-NSC08B-S26G	BES 516-3008-E4-C-S49-00,2	
	21.6...26.4 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	50 mA	100 mA	100 mA	100 mA	100 mA
	≤ 10 mA	≤ 12 mA	≤ 12 mA	≤ 12 mA	≤ 12 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 15 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	0...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	3000 Hz	3000 Hz	3000 Hz	3000 Hz	3000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	POM	POM	POM	POM	POM
	2 m cable PUR	Connector	Connector	0.2 m/0.3 m PUR cable with connector	2 m cable PUR
	3×0.09 mm²				3×0.14 mm²
		cULus	cULus	cULus	cULus
		BKS-_ 48/BKS-_ 49	BKS-B 25/BKS-B 26	BKS-_ 48	

1.1
5
Connectors, Holders ... Page 5.2 ...

Housing size			**Ø 4 mm**	**Ø 4 mm**	**Ø 4 mm**	**Ø 4 mm**
Mounting (see notes starting p. **1.0.**11)			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	NO	①	BES 516-3007-G-E5-C-S49	BES G04ED-PSC15B-S26G	BES 516-3007-G-E4-C-S4-00,2	BES 516-3007-G-E4-C-S49-00,3
	NC	②	BES 516-3017-G-E5-C-S49		BES 516-3017-G-E4-C-S4-00,2	BES 516-3017-G-E4-C-S49-00,3
NPN	NO	④	BES 516-3008-G-E5-C-S49			BES 516-3008-G-E4-C-S49-00,2
	NC	⑤	BES 516-3018-G-E5-C-S49			
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e			100 mA	100 mA	100 mA	100 mA
No-load supply current I_0 max.			≤ 12 mA	≤ 10 mA	≤ 12 mA	≤ 12 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			3000 Hz	3000 Hz	3000 Hz	3000 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67	IP 67
Housing material			Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material of sensing face			POM	POM	POM	POM
Connection			Connector	Connector	0.2 m PUR cable with connector	0.2 m/0.3 m PUR cable with connector
No. of wires × cross-section						
Approval			cULus	cULus	cULus	cULus
Recommended connector			BKS-_ 48/BKS-_ 49	BKS-B 25/BKS-B 26	BKS-_ 19	BKS-_ 48

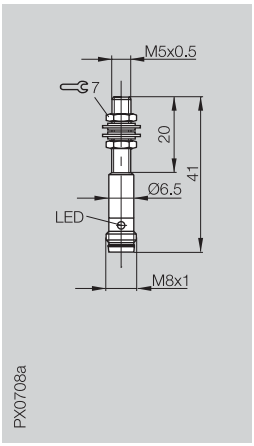
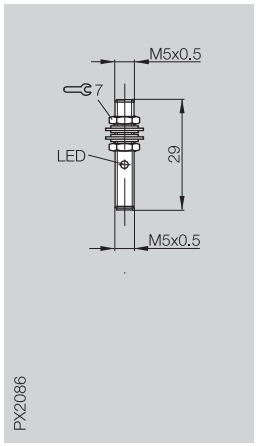
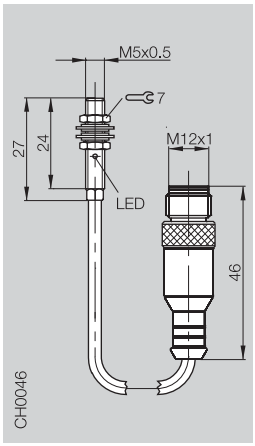
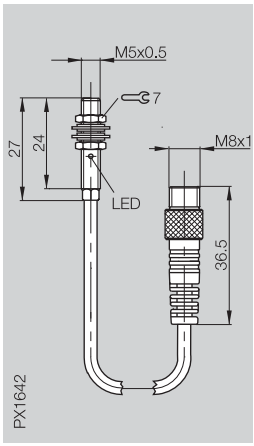
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

	∅ 4 mm flush **1.5 mm** 0...1.2 mm	**∅ 4 mm** flush **1.5 mm** 0...1.2 mm	**∅ 4 mm** non-flush **5 mm** 0...4.1 mm	**∅ 4 mm** non-flush **5 mm** 0...4.1 mm	
					
	BES 516-3007-G-E4-C-S26-00,2	BES 516-3007-G-E4-C-PU-02 BES 516-3017-G-E4-C-PU-02	BES G04ED-PSC50F-S26G	BES G04ED-PSC50F-EP02	
		BES 516-3008-G-E4-C-PU-02 BES 516-3018-G-E4-C-PU-02			
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
	≤ 3 V	≤ 3 V	≤ 2.5 V	≤ 2.5 V	
	75 V DC	75 V DC	75 V DC	75 V DC	
	100 mA	100 mA	100 mA	100 mA	
	≤ 12 mA	≤ 12 mA	≤ 10 mA	≤ 10 mA	
	yes	yes	yes	yes	
	yes	yes	yes	yes	
	≤ 5 %	≤ 5 %	≤ 10 %	≤ 10 %	
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
	3000 Hz	3000 Hz	3000 Hz	3000 Hz	
	DC 13	DC 13	DC 13	DC 13	
	yes	yes	yes	yes	
	IP 67	IP 67	IP 67	IP 67	
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	
	POM	POM	POM	POM	
	0.2 m PUR cable with connector	2 m cable PUR	Connector	2 m cable PUR	
		3×0.14 mm²		3×0.14 mm²	
	cULus	cULus	cULus	cULus	
	BKS-B 25		BKS-B 25/BKS-B 26		

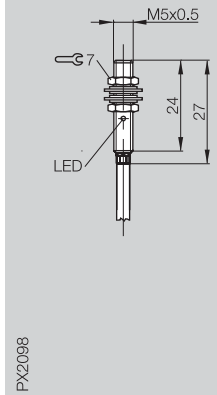
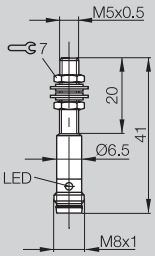
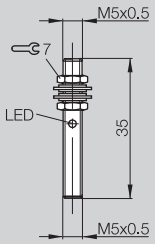
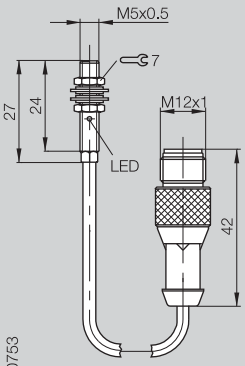
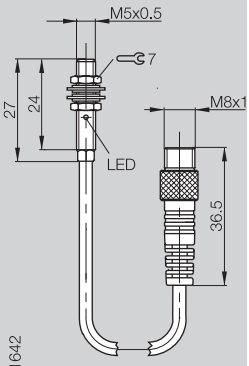
1.1

5
Connectors, Holders ...
Page 5.2 ...

Housing size			**M5×0.5**	**M5×0.5**	**M5×0.5**	**M5×0.5**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush	flush
Rated operating distance s_n			**0.8 mm**	**0.8 mm**	**0.8 mm**	**0.8 mm**
Assured operating distance s_a			0...0.6 mm	0...0.6 mm	0...0.6 mm	0...0.6 mm
						
PNP	NO	①	BES 516-3005-E5-C-S49	BES M05EC-PSC08B-S26G	BES 516-3005-E4-C-S4-00,3	BES 516-3005-E4-C-S49-00,3
	NC	②	BES 516-3022-E5-C-S49	BES M05EC-POC08B-S26G		
NPN	NO	④	BES 516-3006-E5-C-S49	BES M05EC-NSC08B-S26G		
	NC	⑤				
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e			100 mA	100 mA	100 mA	100 mA
No-load supply current I_0 max.			≤ 12 mA	≤ 12 mA	≤ 10 mA	≤ 12 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			3000 Hz	3000 Hz	3000 Hz	3000 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67	IP 67
Housing material			Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material of sensing face			POM	POM	POM	POM
Connection			Connector	Connector	0.3 m PUR cable with connector	0.3 m PUR cable with connector
No. of wires × cross-section						
Approval			cULus	cULus	cULus	cULus
Recommended connector			BKS-_ 48/BKS-_ 49	BKS-B 25/BKS-B 26	BKS-_ 19	BKS-_ 48

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

	M5×0.5	**M5×0.5**	**M5×0.5**	**M5×0.5**	**M5×0.5**
	flush	flush	flush	flush	flush
	0.8 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
	0...0.6 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
	 PX2098	 PX0708a Switching distance ■■	 PX1735 Switching distance ■■	 PX0753 Switching distance ■■	 PX1642 Switching distance ■■
	BES 516-3005-E4-C-PU-02	BES 516-3005-G-E5-C-S49 BES 516-3022-G-E5-C-S49	BES M05ED-PSC15B-S26G	BES 516-3005-G-E4-C-S4-00,2	BES 516-3005-G-E4-C-S49-00,3 BES 516-3022-G-E4-C-S49-00,3
		BES 516-3006-G-E5-C-S49 BES 516-3023-G-E5-C-S49			
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	100 mA	100 mA	100 mA	100 mA	100 mA
	≤ 12 mA	≤ 12 mA	≤ 10 mA	≤ 12 mA	≤ 12 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	3000 Hz	3000 Hz	3000 Hz	3000 Hz	3000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	POM	POM	POM	POM	POM
	2 m cable PUR	Connector	Connector	0.2 m PUR cable with connector	0.3 m PUR cable with connector
	3×0.14 mm²				
	cULus	cULus	cULus	cULus	cULus
		BKS-_ 48/BKS-_ 49	BKS-B 25/BKS-B 26	BKS-_ 19	BKS-_ 48

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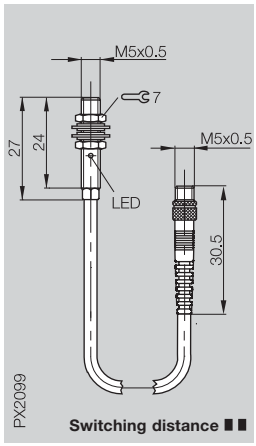
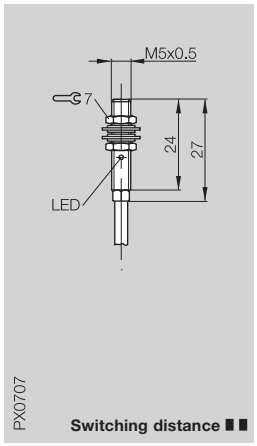
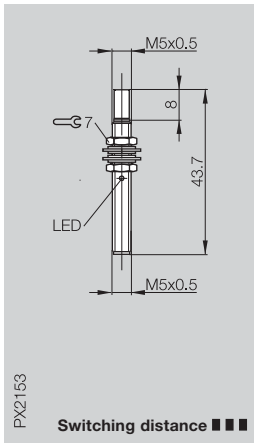
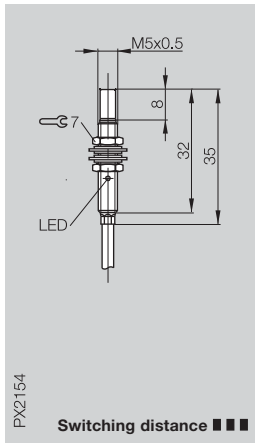
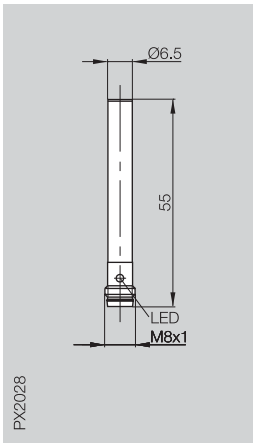
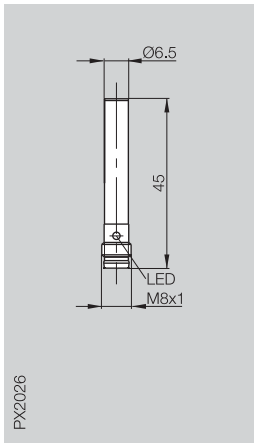
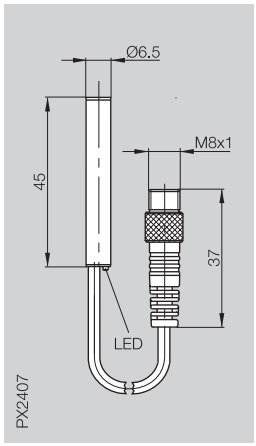
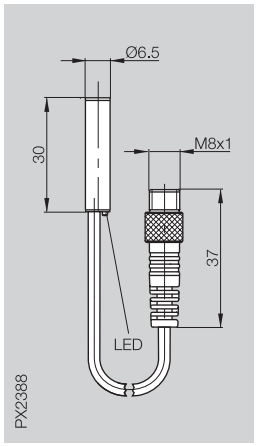
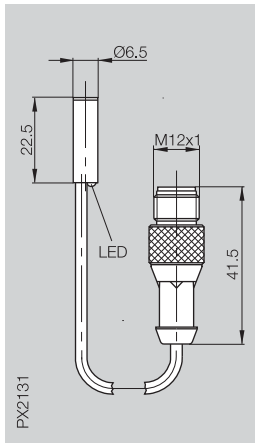
Connectors, Holders ...
Page 5.2 ...

Housing size		**M5×0.5**	**M5×0.5**	**M5×0.5**	**M5×0.5**
Mounting (see notes starting p. **1.0.**11)		flush	flush	non-flush	non-flush
Rated operating distance s_n		**1.5 mm**	**1.5 mm**	**5 mm**	**5 mm**
Assured operating distance s_a		0...1.2 mm	0...1.2 mm	0...4.1 mm	0...4.1 mm
					
PNP	NO ①	BES 516-3005-G-E4-C-S26-00,3	BES 516-3005-G-E4-C-PU-02	BES M05ED-PSC50F-S26G	BES M05ED-PSC50F-EP02
	NC ②		BES 516-3022-G-E4-C-PU-02		
NPN	NO ④		BES 516-3006-G-E4-C-PU-02		
	NC ⑤		BES 516-3023-G-E4-C-PU-02		
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e		≤ 3 V	≤ 3 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i		75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e		100 mA	100 mA	100 mA	100 mA
No-load supply current I_0 max.		≤ 12 mA	≤ 12 mA	≤ 10 mA	≤ 10 mA
Polarity reversal protected		yes	yes	yes	yes
Short circuit protected		yes	yes	yes	yes
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 10 %	≤ 10 %
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f		3000 Hz	3000 Hz	3000 Hz	3000 Hz
Utilization category		DC 13	DC 13	DC 13	DC 13
Function indicator		yes	yes	yes	yes
Degree of protection per IEC 60529		IP 67	IP 67	IP 67	IP 67
Insulation class					
Housing material		Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material of sensing face		POM	POM	POM	POM
Connection		0.3 m PUR cable with connector	2 m cable PUR	Connector	2 m cable PUR
No. of wires × cross-section			3×0.14 mm²		3×0.14 mm²
Approval		cULus	cULus	cULus	cULus
Recommended connector		BKS-B 25		BKS-B 25/BKS-B 26	

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

	∅ 6.5 mm	**∅ 6.5 mm**	**∅ 6.5 mm**	**∅ 6.5 mm**	**∅ 6.5 mm**
	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 516-371-S49-C	BES 516-371-E5-C-S49	BES 516-371-E0-C-S49-00,5	BES 516-371-E4-C-S49-00,3	BES 516-371-SA10-S4-00,3
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	250 V AC	250 V AC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 9 mA	≤ 9 mA	≤ 9 mA	≤ 9 mA	≤ 10 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	3000 Hz	3000 Hz	3000 Hz	3000 Hz	4000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
			⧈	⧈	
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	PA 12	PA 12	PA 12	PA 12	PBT
	Connector	Connector	0.5 m PUR cable with connector	0.3 m PUR cable with connector	0.3 m PUR cable with connector
	cULus	cULus	cULus	cULus	
	BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49	BKS-_ 48	BKS-_ 48	BKS-_ 19

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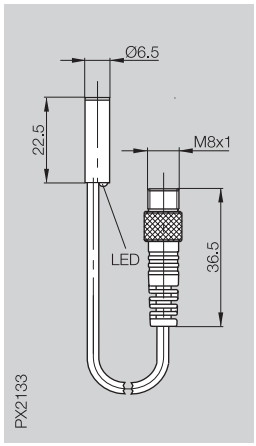
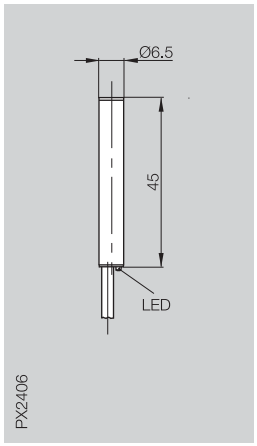
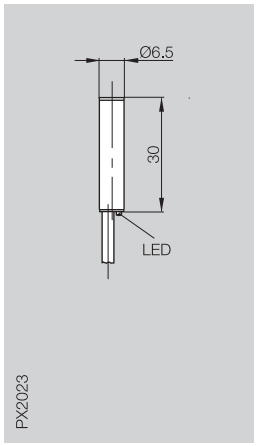
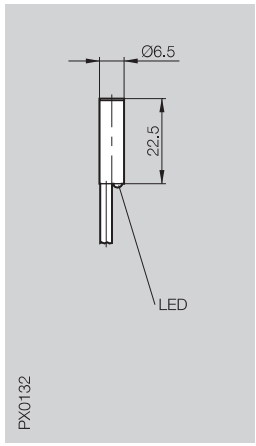
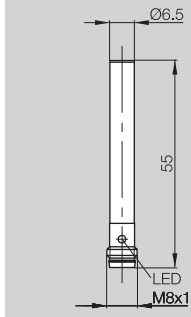
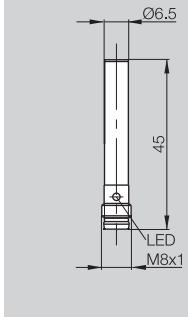
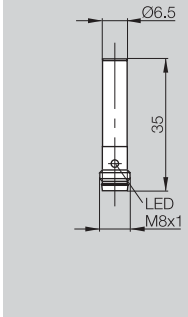
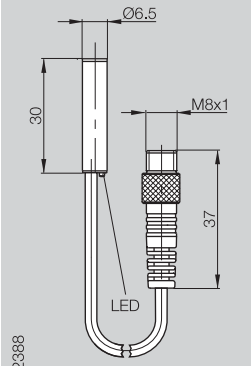
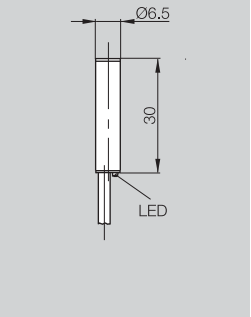
Connectors, Holders ... Page 5.2 ...

Housing size			Ø **6.5 mm**	Ø **6.5 mm**	Ø **6.5 mm**	Ø **6.5 mm**
Mounting (see notes starting p. **1.0.**11)			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	NO	①	BES 516-371-SA10-S49-00,3	BES 516-371-E0-C-02	BES 516-371-E4-C-02	BES 516-371-SA10-02
	NC	②				
NPN	NO	④			BES 516-372-E4-C-02	BES 516-372-SA1-02
	NC	⑤				
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i			75 V DC	250 V AC	250 V AC	75 V DC
Rated operational current I_e			200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 10 mA	≤ 9 mA	≤ 9 mA	≤ 25 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			4000 Hz	3000 Hz	3000 Hz	1500 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
Insulation class				⧈	⧈	
Housing material			CuZn coated	Stainless steel	Stainless steel	CuZn coated
Material of sensing face			PBT	PA 12	PA 12	PBT
Connection			0.3 m PUR cable with connector	2 m PVC cable	2 m PVC cable	2 m PVC cable
No. of wires × cross-section				3×0.14 mm²	3×0.14 mm²	3×0.14 mm²
Approval				cULus	cULus	
Recommended connector			BKS-_ 48			

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

	∅ 6.5 mm flush **2 mm** 0...1.6 mm	∅ 6.5 mm flush **2 mm** 0...1.6 mm	∅ 6.5 mm flush **2 mm** 0...1.6 mm	∅ 6.5 mm flush **2 mm** 0...1.6 mm	∅ 6.5 mm flush **2 mm** 0...1.6 mm
					
	BES 516-371-G-S49-C	BES 516-371-G-E5-C-S49 BES 516-3021-G-E5-C-S49	BES 516-371-SA15-C-S49	BES 516-371-G-E4-C-S49-00,3	BES 516-371-G-E4-C-02 BES 516-3021-G-E4-C-02
		BES 516-372-G-E5-C-S49 BES 516-3025-G-E5-C-S49			BES 516-372-G-E4-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 9 mA	≤ 18 mA	≤ 9 mA	≤ 9 mA	≤ 18 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	1500 Hz	1500 Hz	1500 Hz	1500 Hz	1500 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 68 per BWN Pr. 20 ⧈	IP 68 per BWN Pr. 20 ⧈
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	PA 12	PA 12	PA 12	PA 12	PA 12
	Connector	Connector	Connector	0.3 m PUR cable with connector	2 m PVC cable 3×0.14 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49	BKS-_ 48	

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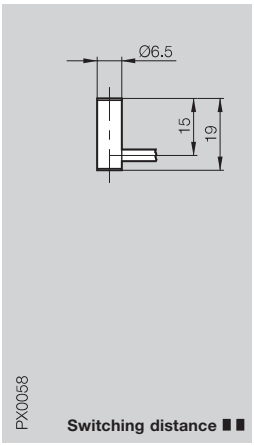
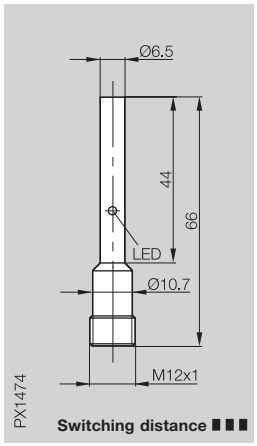
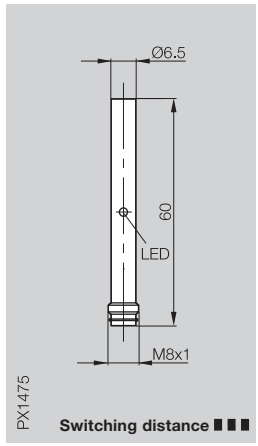
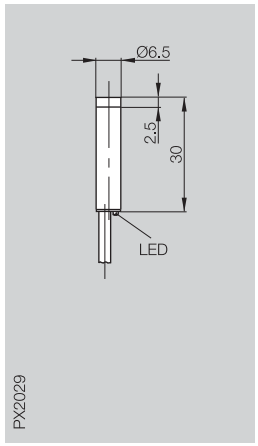
Connectors, Holders ...
Page 5.2 ...

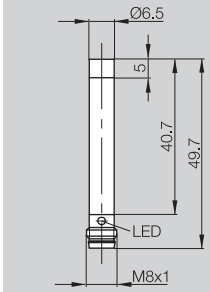
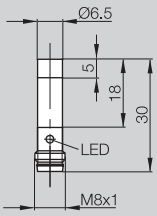
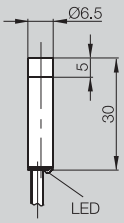
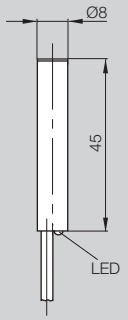
DC 3-wire
Ø 6.5 mm
s_n 2 mm, 2.5 mm, 3 mm

Ø6.5 mm

Housing size			**Ø 6.5 mm**	**Ø 6.5 mm**	**Ø 6.5 mm**	**Ø 6.5 mm**
Mounting (see notes starting p. **1.0.**11)			flush	quasi flush	quasi flush	non-flush
Rated operating distance s_n			**2 mm**	**3 mm**	**3 mm**	**2.5 mm**
Assured operating distance s_a			0...1.6 mm	0...2.4 mm	0...2.4 mm	0...2 mm
						
PNP	NO	①	BES 516-371-SA13-PU-02	BES G06MH1-PSC30B-S04G	BES G06MI-PSC30B-S49G	BES 516-349-E4-C-02
	NC	②			BES G06MI-POC30B-S49G	
NPN	NO	④		BES G06MH1-NSC30B-S04G	BES G06MI-NSC30B-S49G	BES 516-350-E4-C-02
	NC	⑤			BES G06MI-NOC30B-S49G	
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	250 V AC
Rated operational current I_e			200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 10 mA	≤ 12 mA	≤ 12 mA	≤ 18 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			2000 Hz	1000 Hz	1000 Hz	2000 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			no	yes	yes	yes
Degree of protection per IEC 60529			IP 65	IP 67	IP 67	IP 68 per BWN Pr. 20
Insulation class						⧈
Housing material			Stainless steel	CuZn coated	CuZn coated	Stainless steel
Material of sensing face			PBT	PBT	PBT	PA 12
Connection			2 m cable PUR	Connector	Connector	2 m PVC cable
No. of wires × cross-section			3×0.14 mm²			3×0.14 mm²
Approval						cULus
Recommended connector				BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

	Ø 6.5 mm	**Ø 6.5 mm**	**Ø 6.5 mm**		**Ø 8 mm**
	non-flush	non-flush	non-flush		flush
	4 mm	**4 mm**	**4 mm**		**1.5 mm**
	0...3.2 mm	0...3.2 mm	0...3.2 mm		0...1.2 mm
	 PX1613 **Switching distance ■■**	 PX2416 **Switching distance ■■**	 PX2415 **Switching distance ■■**		 PX2162
	BES G06EF-PSC40F-S49G	BES G06EB-PSC40F-S49G BES G06EB-POC40F-S49G	BES G06ED-PSC40F-BV02 BES G06ED-POC40F-BV02		BES G08EG-PSC15B-BV02
		BES G06EB-NSC40F-S49G BES G06EB-NOC40F-S49G	BES G06ED-NSC40F-BV02 BES G06ED-NOC40F-BV02		
	10...30 V DC	10...30 V DC	10...30 V DC		10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V		≤ 2.5 V
	75 V DC	75 V DC	250 V AC		250 V AC
	200 mA	200 mA	200 mA		200 mA
	≤ 12 mA	≤ 18 mA	≤ 18 mA		≤ 9 mA
	yes	yes	yes		yes
	yes	yes	yes		yes
	≤ 5 %	≤ 5 %	≤ 5 %		≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C		–25...+70 °C
	5000 Hz	1500 Hz	1500 Hz		3000 Hz
	DC 13	DC 13	DC 13		DC 13
	yes	yes	yes		yes
	IP 67	IP 67	IP 68 per BWN Pr. 20		IP 68 per BWN Pr. 20
			⧈		⧈
	Stainless steel	Stainless steel	Stainless steel		Stainless steel
	PBT	PA 12	PA 12		PBT
	Connector	Connector	2 m PVC cable		2 m PVC cable
			3×0.14 mm²		3×0.14 mm²
	cULus	cULus	cULus		cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49			

1.1

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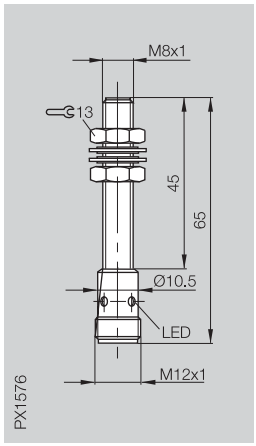
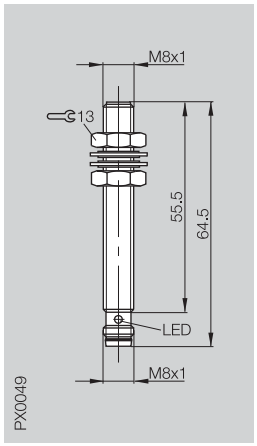
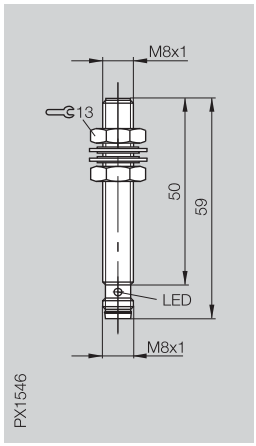
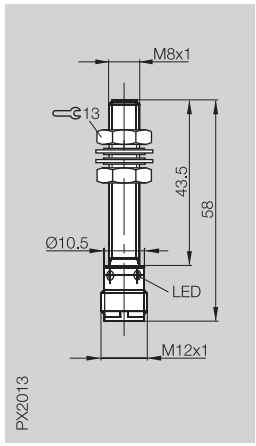
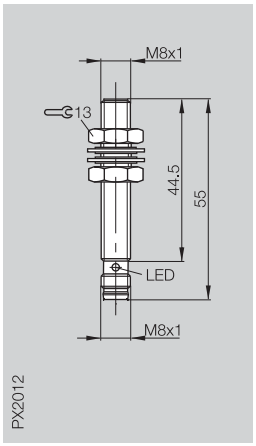
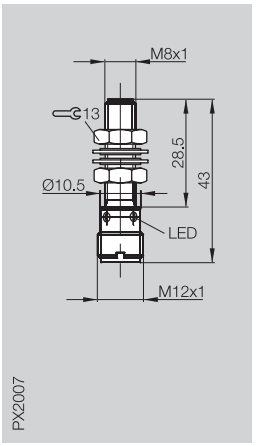
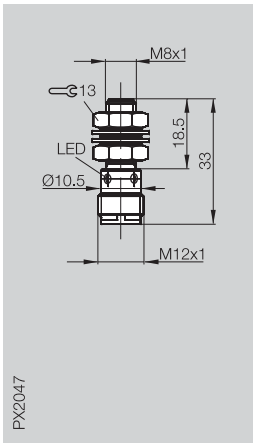
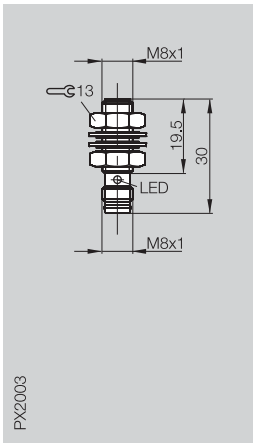
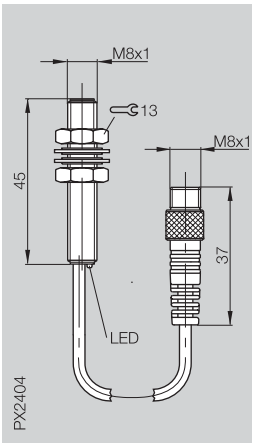
Connectors, Holders ...
Page 5.2 ...

Housing size			**M8×1**	**M8×1**	**M8×1**	**M8×1**
Mounting (see notes starting p. **1.0.**11)			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	NO	①	BES M08MH1-PSC15B-S04G	BES 516-324-SA33	BES M08MI-PSC15B-S49G	BES M08EH-PSC15B-S04G
	NC	②	BES M08MH1-POC15B-S04G			BES M08EH-POC15B-S04G
NPN	NO	④	BES M08MH1-NSC15B-S04G		BES M08MI-NSC15B-S49G	BES M08EH-NSC15B-S04G
	NC	⑤	BES M08MH1-NOC15B-S04G			BES M08EH-NOC15B-S04G
Supply voltage U_B			12...30 V DC	10...30 V DC	12...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 3 V	≤ 2.5 V	≤ 3 V	≤ 2.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	250 V AC
Rated operational current I_e			100 mA	200 mA	100 mA	200 mA
No-load supply current I_0 max.			PNP ≤ 12 mA, NPN ≤ 18 mA	≤ 25 mA	PNP ≤ 12 mA, NPN ≤ 18 mA	PNP ≤ 9 mA, NPN ≤ 18 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			1000 Hz	1000 Hz	1000 Hz	3000 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67	IP 68 per BWN Pr. 20
Insulation class						⧈
Housing material			CuZn coated	Stainless steel	CuZn coated	Stainless steel
Material of sensing face			PA 12	PBT	PA 12	PBT
Connection			Connector	Connector	Connector	Connector
Approval			cULus		cULus	cULus
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6

Other cable lengths on request.

	M8×1	**M8×1**	**M8×1**	**M8×1**	**M8×1**
	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 516-324-S49-C BES 516-377-S49-C	BES M08EE-PSC15B-S04G BES M08EE-POC15B-S04G	BES M08EC-PSC15B-S04G	BES M08EC-PSC15B-S49G BES M08EC-POC15B-S49G	BES 516-324-E0-C-S49-00,2 BES 516-377-E0-C-S49-00,2
	BES 516-343-S49-C BES 516-378-S49-C	BES M08EE-NSC15B-S04G		BES M08EC-NSC15B-S49G	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	PNP ≤ 9 mA, NPN ≤ 18 mA	PNP ≤ 9 mA, NPN ≤ 18 mA	≤ 9 mA	PNP ≤ 9 mA, NPN ≤ 18 mA	≤ 9 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70°C	–25...+70 °C
	3000 Hz	3000 Hz	3000 Hz	3000 Hz	3000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	⧈	⧈	⧈	⧈	⧈
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	PA 12	PBT	PBT	PBT	PA 12
	Connector	Connector	Connector	Connector	0.2 m PUR cable with connector
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	BKS-_ 48

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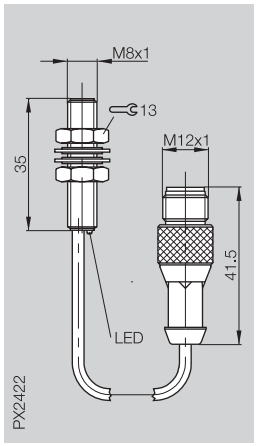
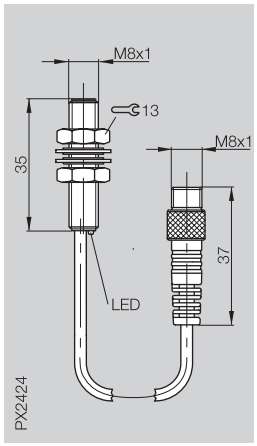
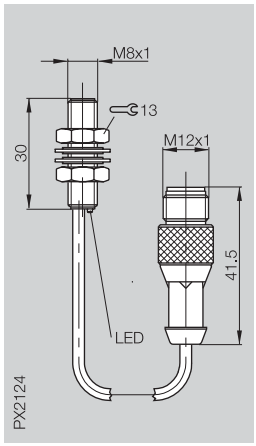
Connectors, Holders ...
Page 5.2 ...

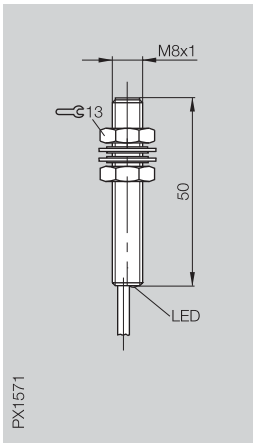
Housing size	**M8×1**	**M8×1**	**M8×1**	**M8×1**	
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush	
Rated operating distance s_n	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**	
Assured operating distance s_a	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	

CE







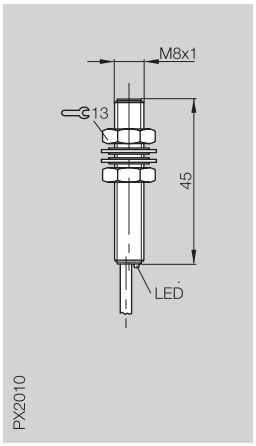
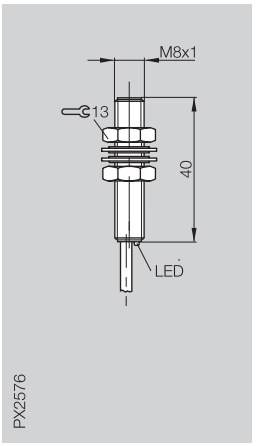
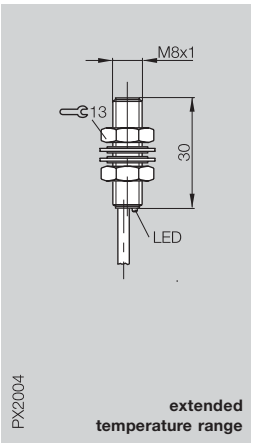
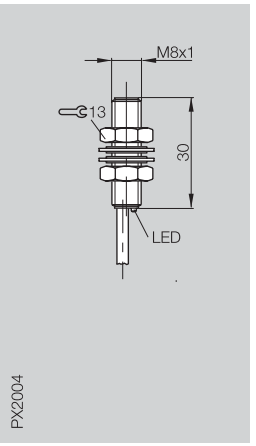
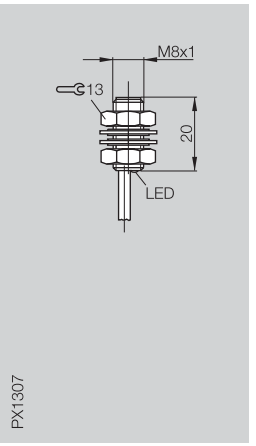


PNP	NO	①	BES 516-324-E3-C-S4-00,3	BES 516-324-E3-C-S49-00,3	BES 516-324-E4-C-S4-00,3	BES M08MI-PSC15B-BV02
	NC	②	BES 516-377-E3-C-S4-PU-00,3			BES M08MI-POC15B-BV02
NPN	NO	④				BES M08MI-NSC15B-BV02
	NC	⑤				

Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	12...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i	250 V AC	250 V AC	250 V AC	75 V DC
Rated operational current I_e	200 mA	200 mA	200 mA	100 mA
No-load supply current I_0 max.	≤ 9 mA	≤ 9 mA	≤ 9 mA	PNP ≤ 10 mA, NPN ≤ 18 mA
Polarity reversal protected	yes	yes	yes	yes
Short circuit protected	yes	yes	yes	yes
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	3000 Hz	3000 Hz	3000 Hz	1000 Hz
Utilization category	DC 13	DC 13	DC 13	DC 13
Function indicator	yes	yes	yes	yes
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
Insulation class	⧈	⧈	⧈	
Housing material	Stainless steel	Stainless steel	Stainless steel	CuZn coated
Material of sensing face	PA 12	PA 12	PA 12	PA 12
Connection	0.3 m PUR cable with connector	0.3 m PUR cable with connector	0.3 m PUR cable with connector	2 m PVC cable
No. of wires × cross-section				3×0.14 mm²
Approval	cULus	cULus	cULus	cULus
Recommended connector	BKS-_ 19	BKS-_ 48	BKS-_ 19	

① Wiring diagrams see page **1.0.**6

Other cable lengths on request.

	M8×1	**M8×1**	**M8×1**	**M8×1**	**M8×1**
	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 516-324-E0-C-02 BES 516-377-E0-C-02	BES M08EF-PSC15B-BP02 BES M08EF-POC15B-BP02	BES 516-324-SA45-E4-C-PU-03	BES 516-324-E4-C-02 BES 516-377-E4-C-02	BES 516-324-SA44-C-02
	BES 516-343-E0-C-02 BES 516-378-E0-C-02			BES 516-343-E4-C-02 BES 516-378-E4-C-02	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	PNP ≤ 9 mA, NPN ≤ 11 mA	≤ 9 mA	≤ 9 mA	PNP ≤ 9 mA, NPN ≤ 11 mA	≤ 25 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–40...+85 °C	–25...+70 °C	–25...+70 °C
	3000 Hz	3000 Hz	3000 Hz	3000 Hz	1500 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
	⧈	⧈	⧈	⧈	
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	PA 12	PBT	PA 12	PA 12	PBT
	2 m PVC cable	2 m cable PUR	3 m cable PUR	2 m PVC cable	3 m PVC cable
	3×0.14 mm²	3×0.14 mm²	3×0.14 mm²	3×0.14 mm²	3×0.14 mm²
	cULus	cULus	cULus	cULus	cULus

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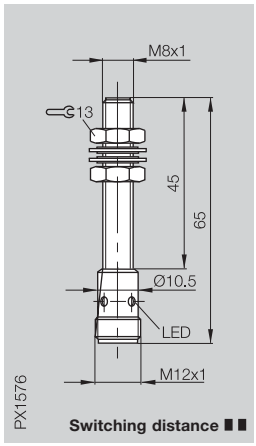
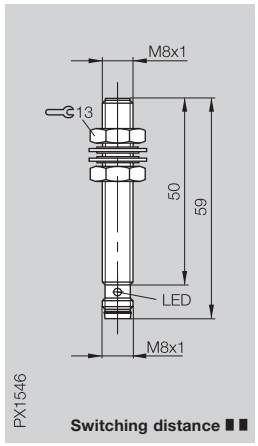
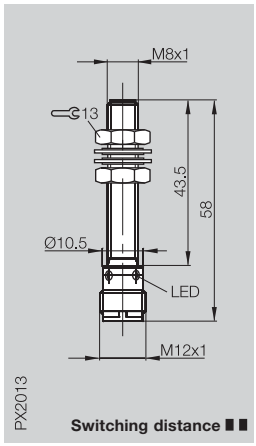
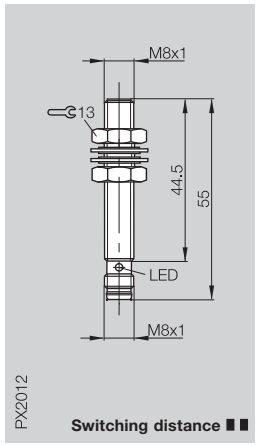
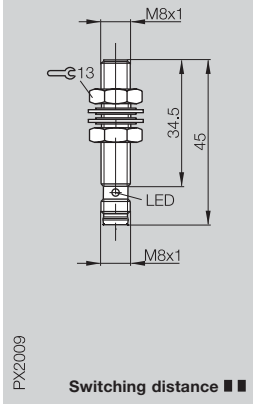
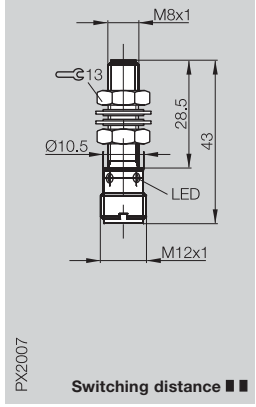
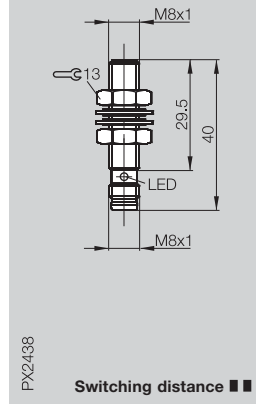
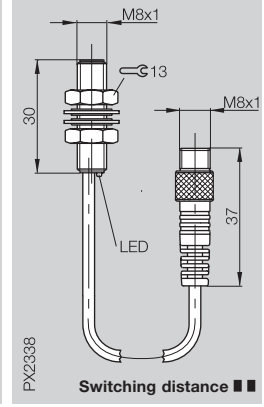
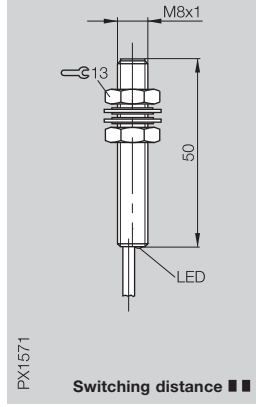
Connectors, Holders ...
Page 5.2 ...

Housing size		**M8×1**	**M8×1**	**M8×1**	**M8×1**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**2 mm**	**2 mm**	**2 mm**	**2 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	
						
PNP	NO ①	BES M08MH1-PSC20B-S04G	BES M08MI-PSC20B-S49G	BES M08EH-PSC20B-S04G	BES 516-324-G-S49-C	
	NC ②		BES M08MI-POC20B-S49G		BES 516-377-G-S49-C	
NPN	NO ④	BES M08MH1-NSC20B-S04G	BES M08MI-NSC20B-S49G			
	NC ⑤					
Supply voltage U_B		12...30 V DC	12...30 V DC	10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e		≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	
Rated insulation voltage U_i		75 V DC	75 V DC	250 V AC	250 V AC	
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA	
No-load supply current I_0 max.		PNP ≤ 10 mA, NPN ≤ 18 mA	PNP ≤ 10 mA, NPN ≤ 18 mA	≤ 9 mA	≤ 9 mA	
Polarity reversal protected		yes	yes	yes	yes	
Short circuit protected		yes	yes	yes	yes	
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f		700 Hz	700 Hz	1500 Hz	1500 Hz	
Utilization category		DC 13	DC 13	DC 13	DC 13	
Function indicator		yes	yes	yes	yes	
Degree of protection per IEC 60529		IP 67	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	
Insulation class				⧈	⧈	
Housing material		CuZn coated	CuZn coated	Stainless steel	Stainless steel	
Material of sensing face		PA 12	PA 12	PBT	PBT	
Connection		Connector	Connector	Connector	Connector	
No. of wires × cross-section						
Approval		cULus	cULus	cULus	cULus	
Recommended connector		BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

	M8×1	**M8×1**	**M8×1**	**M8×1**	**M8×1**
	flush	flush	flush	flush	flush
	2 mm	**2 mm**	**2 mm**	**2 mm**	**2 mm**
	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm
					
	BES 516-324-G-E5-C-S49 BES 516-377-G-E5-C-S49	BES M08EE-PSC20B-S04G	BES M08EE-PSC20B-S49G BES M08EE-POC20B-S49G	BES 516-324-G-E4-C-S49-00,2 BES 516-377-G-E4-C-S49-00,3	BES M08MI-PSC20B-BV02
	BES 516-343-G-E5-C-S49 BES 516-378-G-E5-C-S49		BES M08EE-NSC20B-S49G BES M08EE-NOC20B-S49G		BES M08MI-NSC20B-BV02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	12...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	PNP ≤ 9 mA, NPN ≤ 11 mA	≤ 9 mA	PNP ≤ 9 mA, NPN ≤ 11 mA	≤ 9 mA	PNP ≤ 10 mA, NPN ≤ 18 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	1500 Hz	1500 Hz	1500 Hz	1500 Hz	700 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	CuZn coated
	PA 12	PBT	PBT	PA 12	PBT
	Connector	Connector	Connector	0.2 m/0.3 m PUR cable with connector	2 m PVC cable
					3×0.14 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	BKS-_ 48	

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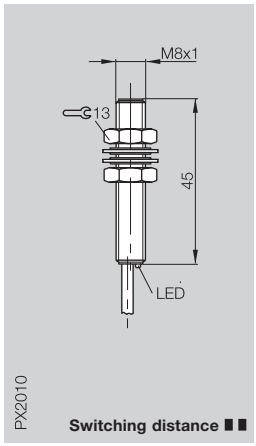
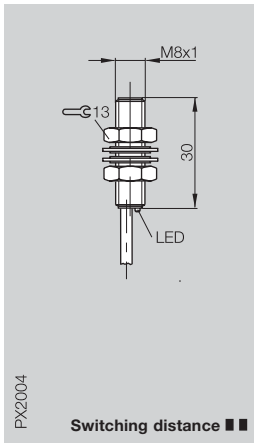
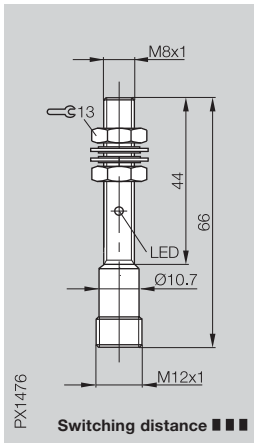
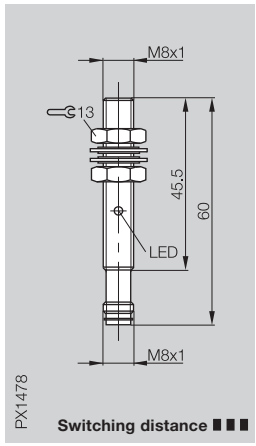
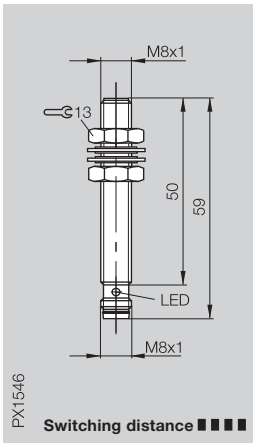
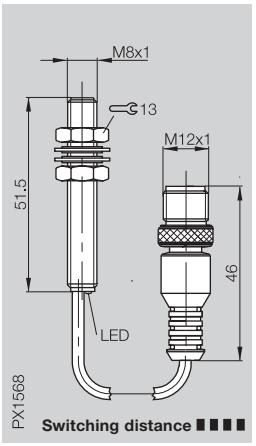
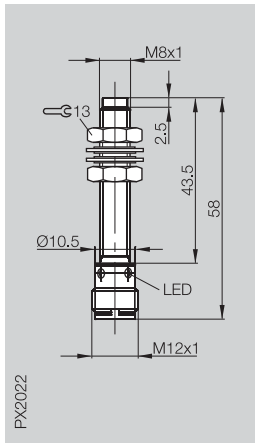
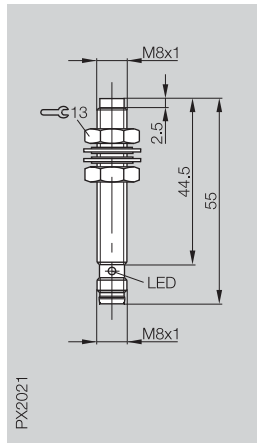
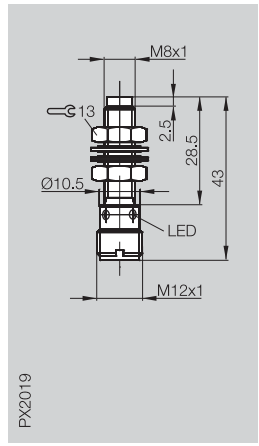
Connectors, Holders ... Page 5.2 ...

Housing size		**M8×1**	**M8×1**	**M8×1**	**M8×1**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	quasi flush	quasi flush	
Rated operating distance s_n		**2 mm**	**2 mm**	**3 mm**	**3 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...2.4 mm	0...2.4 mm	
						
PNP	NO ①	BES 516-324-G-E0-C-02	BES 516-324-G-E4-C-02	BES M08MH1-PSC30B-S04G	BES M08MH1-PSC30B-S49G	
	NC ②		BES 516-377-G-E4-C-02			
NPN	NO ④		BES 516-343-G-E4-C-02	BES M08MH1-NSC30B-S04G	BES M08MH1-NSC30B-S49G	
	NC ⑤		BES 516-378-G-E4-C-02			
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e		≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	
Rated insulation voltage U_i		250 V AC	250 V AC	75 V DC	75 V DC	
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA	
No-load supply current I_0 max.		≤ 9 mA	PNP ≤ 9 mA, NPN ≤ 11 mA	≤ 12 mA	≤ 12 mA	
Polarity reversal protected		yes	yes	yes	yes	
Short circuit protected		yes	yes	yes	yes	
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f		1500 Hz	1500 Hz	1000 Hz	1000 Hz	
Utilization category		DC 13	DC 13	DC 13	DC 13	
Function indicator		yes	yes	yes	yes	
Degree of protection per IEC 60529		IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	IP 67	
Insulation class		⧈	⧈			
Housing material		Stainless steel	Stainless steel	CuZn coated	CuZn coated	
Material of sensing face		PA 12	PA 12	PBT	PBT	
Connection		2 m PVC cable	2 m PVC cable	Connector	Connector	
No. of wires × cross-section		3×0.14 mm²	3×0.14 mm²			
Approval		cULus	cULus			
Recommended connector				BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

	M8×1	**M8×1**	**M8×1**	**M8×1**	**M8×1**
	quasi flush	quasi flush	non-flush	non-flush	non-flush
	4 mm	**4 mm**	**2.5 mm**	**2.5 mm**	**2.5 mm**
	0...2.9 mm	0...2.9 mm	0...2 mm	0...2 mm	0...2 mm
					
	BES M08MI-PSC40B-S49G	BES M08MI-PSC40B-BP00,2-GS04	BES M08EG-PSC25F-S04G BES M08EG-POC25F-S04G	BES 516-383-S49-C	BES M08ED-PSC25F-S04G
	BES M08MI-NSC40B-S49G	BES M08MI-NSC40B-BP00,2-GS04	BES M08EG-NSC25F-S04G		BES M08ED-NSC25F-S04G
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.8 V	≤ 2.8 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 10 mA	≤ 10 mA	PNP ≤ 9 mA, NPN ≤ 18 mA	≤ 9 mA	≤ 11 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	0...+60 °C	0...+60 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	800 Hz	800 Hz	2000 Hz	2000 Hz	2000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
			⧈	⧈	⧈
	CuZn coated	CuZn coated	Stainless steel	Stainless steel	Stainless steel
	PBT	PBT	PBT	PA 12	PBT
	Connector	0.2 m PUR cable with connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 19	BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20

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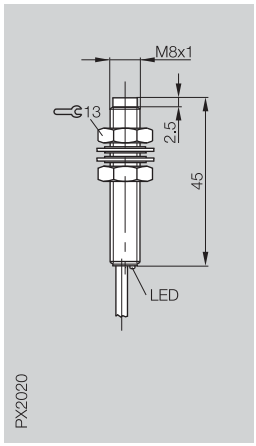
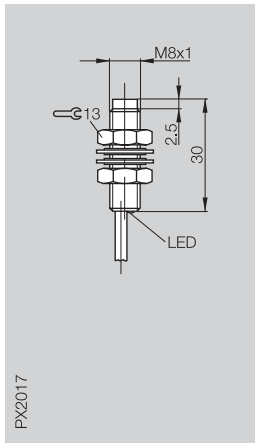
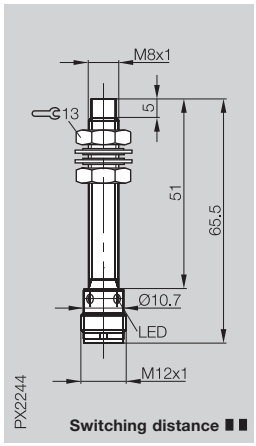
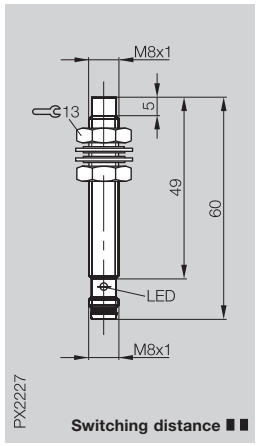
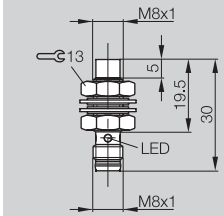
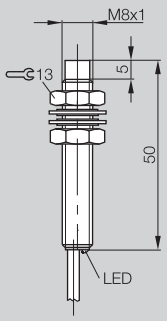
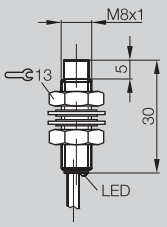
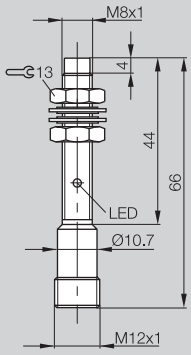
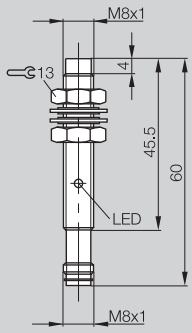
Connectors, Holders ...
Page 5.2 ...

Housing size		**M8×1**	**M8×1**	**M8×1**	**M8×1**	
Mounting (see notes starting p. **1.0.**11)		non-flush	non-flush	non-flush	non-flush	
Rated operating distance s_n		**2.5 mm**	**2.5 mm**	**4 mm**	**4 mm**	
Assured operating distance s_a		0...2 mm	0...2 mm	0...3.2 mm	0...3.2 mm	
						
PNP	NO ①	BES 516-383-E0-C-02	BES 516-383-E4-C-02	BES M08EH-PSC40F-S04G	BES M08EH-PSC40F-S49G	
	NC ②			BES M08EH-POC40F-S04G	BES M08EH-POC40F-S49G	
NPN	NO ④	BES 516-384-E0-C-02	BES 516-384-E4-C-02	BES M08EH-NSC40F-S04G	BES M08EH-NSC40F-S49G	
	NC ⑤			BES M08EH-NOC40F-S04G	BES M08EH-NOC40F-S49G	
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e		≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	
Rated insulation voltage U_i		250 V AC	250 V AC	250 V AC	250 V AC	
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA	
No-load supply current I_0 max.		PNP ≤ 9 mA, NPN ≤ 18 mA	PNP ≤ 9 mA, NPN ≤ 18 mA	≤ 14 mA	≤ 14 mA	
Polarity reversal protected		yes	yes	yes	yes	
Short circuit protected		yes	yes	yes	yes	
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f		2000 Hz	2000 Hz	1500 Hz	1500 Hz	
Utilization category		DC 13	DC 13	DC 13	DC 13	
Function indicator		yes	yes	yes	yes	
Degree of protection per IEC 60529		IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	IP 68 per BWN Pr. 20	
Insulation class		⧈	⧈	⧈	⧈	
Housing material		Stainless steel	Stainless steel	Stainless steel	Stainless steel	
Material of sensing face		PA 12	PA 12	PBT	PBT	
Connection		2 m PVC cable	2 m PVC cable	Connector	Connector	
No. of wires × cross-section		3×0.14 mm²	3×0.14 mm²			
Approval		cULus	cULus	cULus	cULus	
Recommended connector				BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

	M8×1	**M8x1**	**M8x1**	**M8×1**	**M8×1**
	non-flush	non-flush	non-flush	non-flush	non-flush
	4 mm	**4 mm**	**4 mm**	**6 mm**	**6 mm**
	0...3.2 mm	0...3.2 mm	0...3.2 mm	0...4.9 mm	0...4.9 mm
	 PX2403 **Switching distance ■■**	 PX2228 **Switching distance ■■**	 PX2402 **Switching distance ■■**	 PX1479 **Switching distance ■■■**	 PX1481 **Switching distance ■■■**
	BES M08EB-PSC40F-S49G BES M08EB-POC40F-S49G	BES M08EG-PSC40F-BV02 BES M08EG-POC40F-BV02	BES M08ED-PSC40F-BV02 BES M08ED-POC40F-BV02	BES M08MG1-PSC60F-S04G	BES M08MG1-PSC60F-S49G BES M08MG1-POC60F-S49G
	BES M08EB-NSC40F-S49G BES M08EB-NOC40F-S49G	BES M08EG-NSC40F-BV02 BES M08EG-NOC40F-BV02	BES M08ED-NSC40F-BV02 BES M08ED-NOC40F-BV02	BES M08MG1-NSC60F-S04G	BES M08MG1-NSC60F-S49G BES M08MG1-NOC60F-S49G
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 18 mA	≤ 14 mA	≤ 18 mA	≤ 12 mA	≤ 12 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	1500 Hz	1500 Hz	1500 Hz	500 Hz	500 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	IP 67
	⧈	⧈	⧈		
	Stainless steel	Stainless steel	Stainless steel	CuZn coated	CuZn coated
	PBT	PBT	PA 12	PBT	PBT
	Connector	2 m PVC cable	2 m PVC cable	Connector	Connector
		3x0.14 mm²	3x0.14 mm²		
	cULus	cULus	cULus		
	BKS-_ 48/BKS-_ 49			BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49

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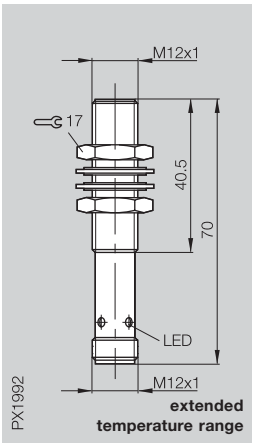
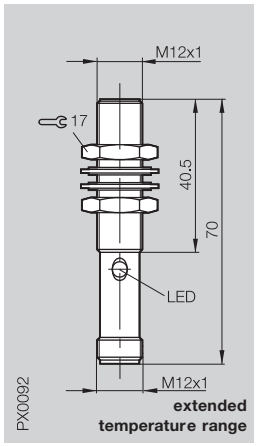
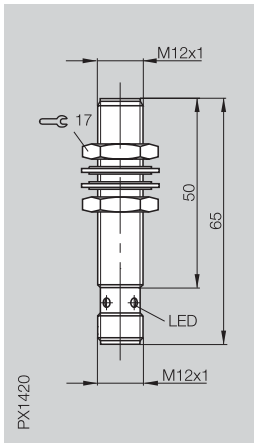
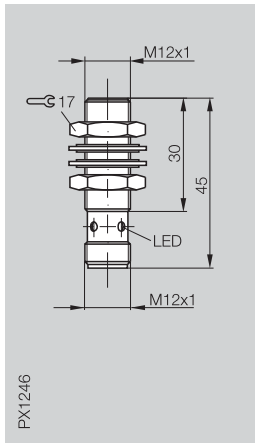
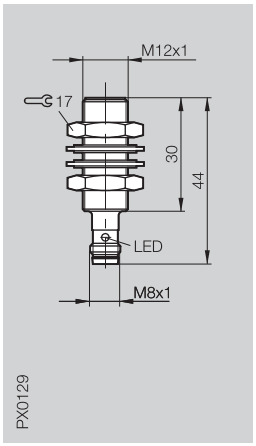
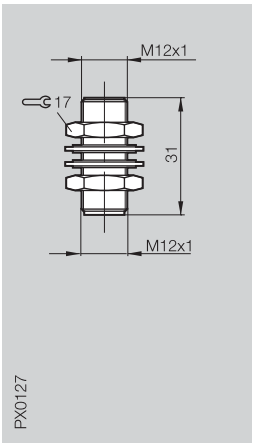
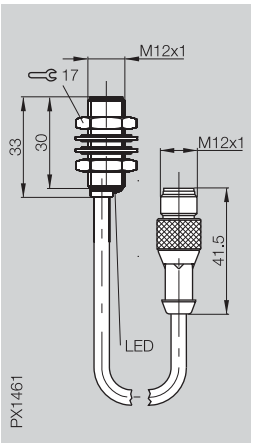
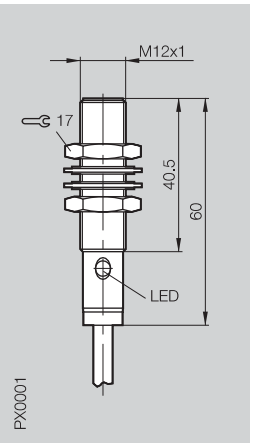
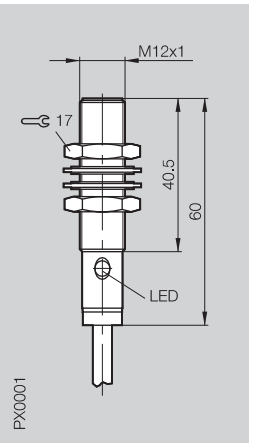
Connectors, Holders ...
Page 5.2 ...

Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**2 mm**	**2 mm**	**2 mm**	**2 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	
						
PNP	NO ①	BES 516-325-S4-C		BES M12MI-PSC20B-S04G	BES 516-325-E5-C-S4	
	NC ②		BES 516-370-S4-C	BES M12MI-POC20B-S04G	BES 516-370-E5-C-S4	
	complementary ③	BES 516-113-S4-C				
NPN	NO ④		BES 516-329-S4-C	BES M12MI-NSC20B-S04G	BES 516-329-E5-C-S4	
	NC ⑤		BES 516-375-S4-C	BES M12MI-NOC20B-S04G	BES 516-375-E5-C-S4	
	complementary ⑥	BES 516-118-S4-C				
Supply voltage U_B		10...30 V DC	10...30 V DC	12...30 V DC	10...30 V DC	
Voltage drop U_d at I_e		≤ 1.5 V	≤ 1.5 V	≤ 2.5 V	≤ 2 V	
Rated insulation voltage U_i		250 V AC	250 V AC	250 V AC	250 V AC	
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA	
No-load supply current I_0 max.		≤ 8 mA	≤ 8 mA	≤ 15 mA	≤ 10 mA	
Polarity reversal protected		yes	yes	yes	yes	
Short circuit protected		yes	yes	yes	yes	
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a		–40...+85 °C	–40...+85 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f		3000 Hz	3000 Hz	1200 Hz	5000 Hz	
Utilization category		DC 13	DC 13	DC 13	DC 13	
Function indicator		yes	yes	yes	yes	
Degree of protection per IEC 60529		IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	
Insulation class		⧈	⧈	⧈	⧈	
Housing material		Stainless steel	Stainless steel	CuZn coated	CuZn coated	
Material of sensing face		PA 12	PA 12	PA 12	PBT	
Connection		Connector	Connector	Connector	Connector	
No. of wires × cross-section						
Approval		cULus	cULus	cULus	cULus	
Recommended connector		BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	

① Wiring diagrams see page **1.0.**6

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

	M12×1	**M12×1**	**M12×1**	**M12×1**	**M12×1**
	flush	flush	flush	flush	flush
	2 mm	**2 mm**	**2 mm**	**2 mm**	**2 mm**
	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm
					
	BES 516-325-E5-Y-S49	BES 516-325-SA45	BES 516-325-E4-C-S4-00,5	BES 516-325-B0-C-02 BES 516-370-B0-C-02	BES 516-113-B0-C-03
				BES 516-329-B0-C-02 BES 516-375-B0-C-02	BES 516-118-B0-C-03
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 3.5 V	≤ 2.5 V	≤ 2 V	≤ 1.5 V	≤ 2.5 V
	75 V DC	75 V DC	250 V AC	250 V AC	250 V AC
	130 mA	200 mA	200 mA	200 mA	200 mA
	≤ 25 mA	≤ 20 mA	≤ 10 mA	≤ 8 mA	≤ 32 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	1000 Hz	1000 Hz	5000 Hz	3000 Hz	800 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	no	yes	yes	yes
	IP 67	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
			⧈	⧈	⧈
	CuZn coated	CuZn coated	CuZn coated	Stainless steel	Stainless steel
	PA 12	PA 12	PBT	PA 12	PA 12
	Connector	Connector	0.5 m PUR cable with connector	2 m PVC cable	3 m PVC cable
				3×0.34 mm²	4×0.25 mm²
	cULus		cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20	BKS-_ 19		

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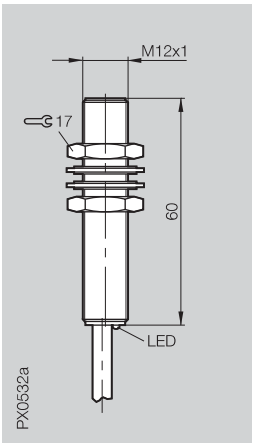
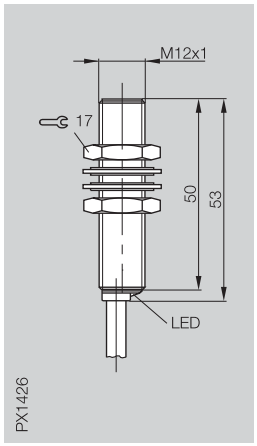
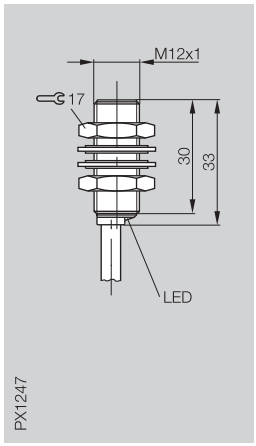
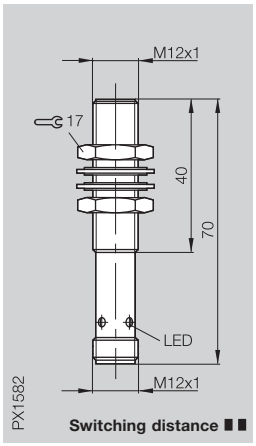
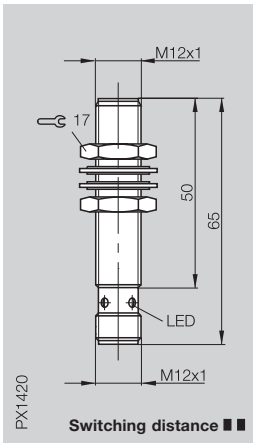
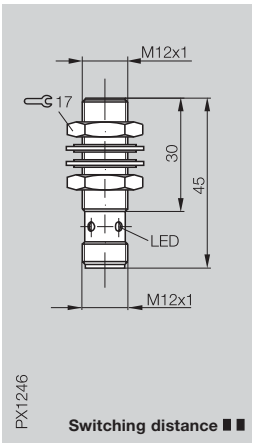
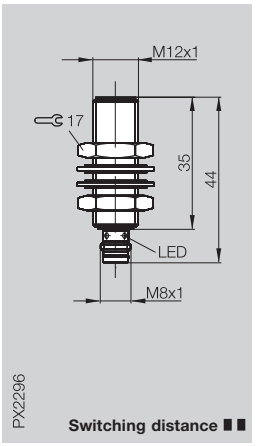
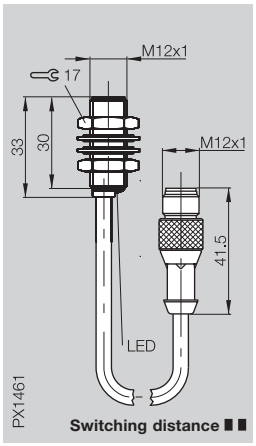
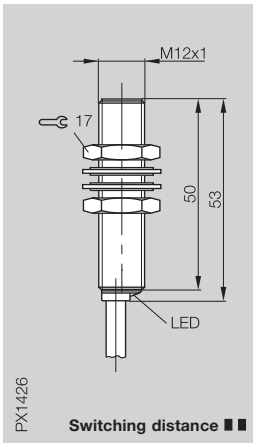
Connectors, Holders ...
Page 5.2 ...

Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**2 mm**	**2 mm**	**2 mm**	**4 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...1.6 mm	0...3.2 mm	
						
PNP	NO ①	BES 516-325-SA56-03	BES M12MI-PSC20B-BV02	BES 516-325-E4-C-02	BES 516-325-G-S4-C	
	NC ②		BES M12MI-POC20B-BV02	BES 516-370-E4-C-02		
NPN	NO ④		BES M12MI-NSC20B-BV02	BES 516-329-E4-C-02		
	NC ⑤			BES 516-375-E4-C-02		
Supply voltage U_B		10...30 V DC	12...30 V DC	10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e		≤ 1.7 V	≤ 2.5 V	≤ 2 V	≤ 2.5 V	
Rated insulation voltage U_i		75 V DC	250 V AC	250 V AC	75 V DC	
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA	
No-load supply current I_0 max.		≤ 25 mA	≤ 15 mA	≤ 12 mA	≤ 25 mA	
Polarity reversal protected		yes	yes	yes	yes	
Short circuit protected		yes	yes	yes	yes	
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f		800 Hz	1200 Hz	5000 Hz	1000 Hz	
Utilization category		DC 13	DC 13	DC 13	DC 13	
Function indicator		yes	yes	yes	yes	
Degree of protection per IEC 60529		IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	
Insulation class			⧈	⧈		
Housing material		Stainless steel	CuZn coated	CuZn coated	CuZn coated	
Material of sensing face		PA 12	PA 12	PBT	LCP	
Connection		3 m PVC cable	2 m PVC cable	2 m PVC cable	Connector	
No. of wires × cross-section		3×0.34 mm²	3×0.34 mm²	3×0.34 mm²		
Approval			cULus	cULus	cULus	
Recommended connector					BKS-_ 19/BKS-_ 20	

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

	M12×1	**M12×1**	**M12×1**	**M12×1**	**M12×1**
	flush	flush	flush	flush	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
					
	BES M12MI-PSC40B-S04G BES M12MI-POC40B-S04G	BES 516-325-G-E5-C-S4 BES 516-370-G-E5-C-S4	BES 516-325-G-E5-C-S49 BES 516-370-G-E5-C-S49	BES 516-325-G-E4-C-S4-00,5	BES M12MI-PSC40B-BV02 BES M12MI-POC40B-BV02
	BES M12MI-NSC40B-S04G BES M12MI-NOC40B-S04G	BES 516-329-G-E5-C-S4 BES 516-375-G-E5-C-S4	BES 516-329-G-E5-C-S49 BES 516-375-G-E5-C-S49		BES M12MI-NSC40B-BV02
	12...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	12...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	75 V DC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 14 mA	≤ 14 mA	≤ 10 mA	≤ 15 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	300 Hz	1000 Hz	1000 Hz	2500 Hz	300 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	⧈	⧈		⧈	⧈
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	LCP	LCP	LCP	LCP	LCP
	Connector	Connector	Connector	0.5 m PUR cable with connector	2 m PVC cable
					3×0.34 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	BKS-_ 19	

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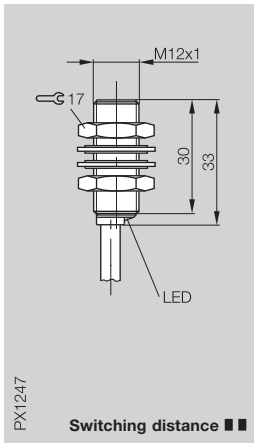
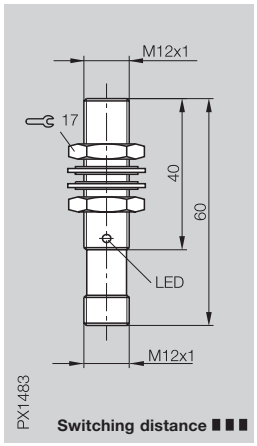
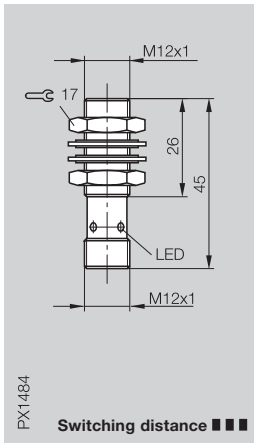
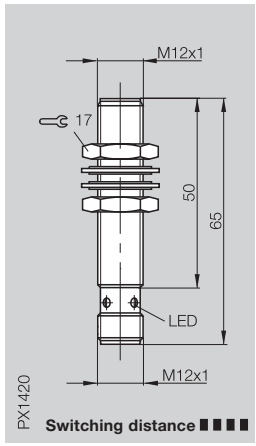
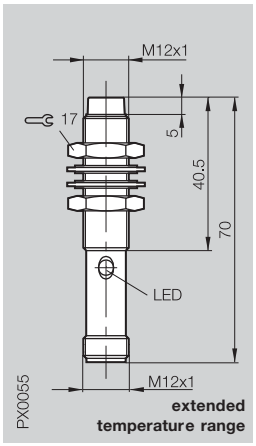
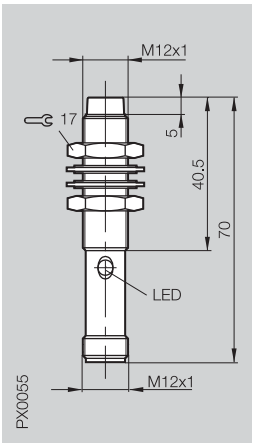
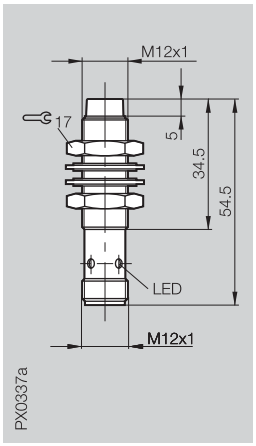
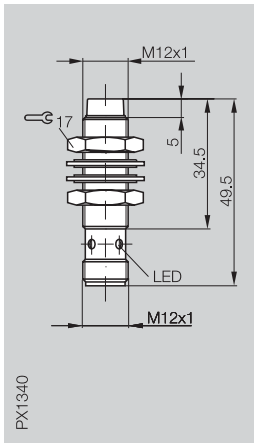
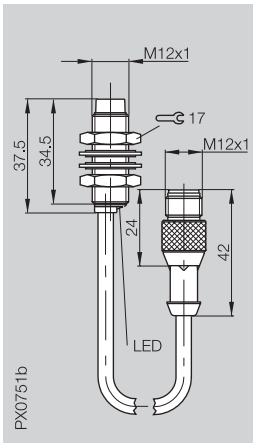
Connectors, Holders ...
Page 5.2 ...

Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		flush	quasi flush	quasi flush	quasi flush
Rated operating distance s_n		**4 mm**	**6 mm**	**6 mm**	**8 mm**
Assured operating distance s_a		0...3.2 mm	0...4.9 mm	0...4.9 mm	0...5.8 mm
					
PNP	NO ①		BES 516-325-G-E4-C-02	BES M12MG1-PSC60B-S04G	BES M12MD1-PSC60B-S04G	BES M12MI-PSH80B-S04G
	NC ②		BES 516-370-G-E4-C-02	BES M12MG1-POC60B-S04G		
	complementary ③					
NPN	NO ④		BES 516-329-G-E4-C-02	BES M12MG1-NSC60B-S04G	BES M12MD1-NSC60B-S04G	BES M12MI-NSH80B-S04G
	NC ⑤		BES 516-375-G-E4-C-02	BES M12MG1-NOC60B-S04G		
	complementary ⑥					
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...55 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2 V	≤ 2 V	≤ 2.5 V
Rated insulation voltage U_i			250 V AC	75 V DC	75 V DC	250 V AC
Rated operational current I_e			200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 14 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 10 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	0...+60 °C
Switching frequency f			1000 Hz	800 Hz	800 Hz	300 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 68 per BWN Pr. 20	IP 67	IP 67	IP 67
Insulation class			⧈			⧈
Housing material			CuZn coated	CuZn coated	CuZn coated	CuZn coated
Material of sensing face			LCP	PBT	PBT	LCP
Connection			2 m PVC cable	Connector	Connector	Connector
No. of wires × cross-section			3×0.34 mm²			
Approval			cULus			
Recommended connector				BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

	M12×1 non-flush **4 mm** 0...3.2 mm	M12×1 non-flush **4 mm** 0...3.2 mm	M12×1 non-flush **4 mm** 0...3.2 mm	M12×1 non-flush **4 mm** 0...3.2 mm	M12×1 non-flush **4 mm** 0...3.2 mm
					
	BES 516-356-S4-C BES 516-3019-S4-C	BES 516-131-S4-C		BES 516-356-E5-C-S4 BES 516-3019-E5-C-S4	BES 516-356-E4-C-S4-00,3
	BES 516-357-S4-C BES 516-3030-S4-C	BES 516-122-S4-C	BES 516-357-E5-Y-S4		
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 1.5 V	≤ 2.5 V	≤ 3.5 V	≤ 2 V	≤ 2 V
	250 V AC	250 V AC	75 V DC	250 V AC	250 V AC
	200 mA	200 mA	130 mA	200 mA	200 mA
	≤ 8 mA	≤ 32 mA	≤ 25 mA	≤ 10 mA	≤ 10 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–40...+85 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	1500 Hz	400 Hz	400 Hz	2000 Hz	2000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	⧈	⧈		⧈	⧈
	Stainless steel	Stainless steel	CuZn coated	CuZn coated	CuZn coated
	PA 12	PA 12	PA 12	PBT	PBT
	Connector	Connector	Connector	Connector	0.3 m PUR cable with connector
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19

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Connectors, Holders ...
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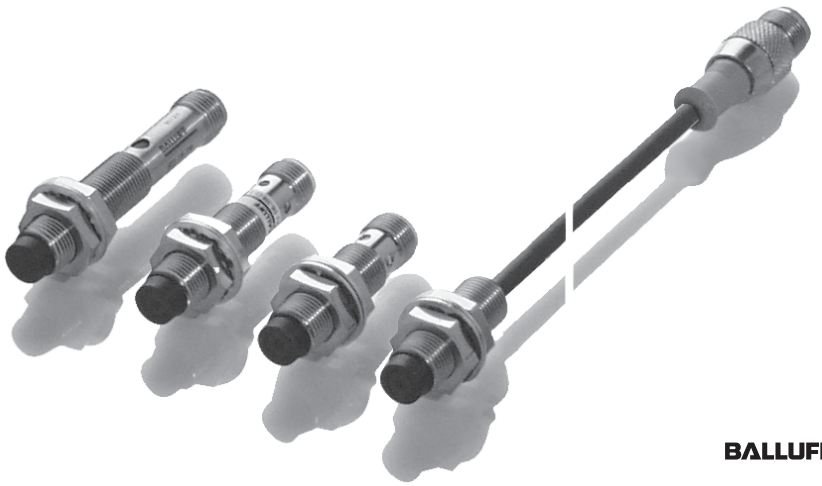
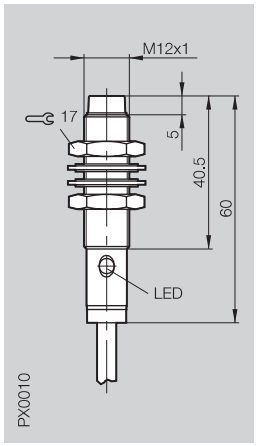
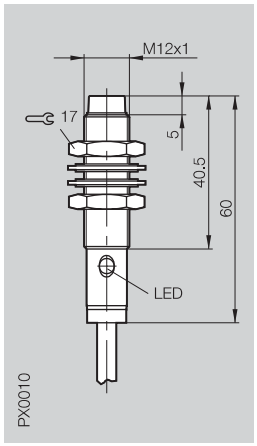
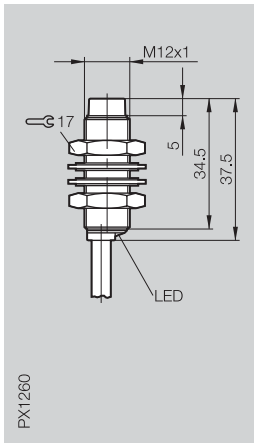
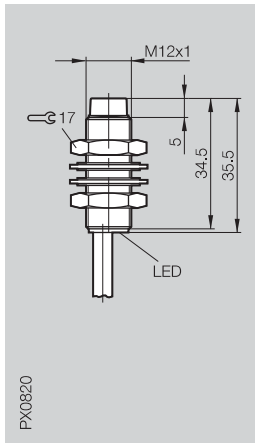
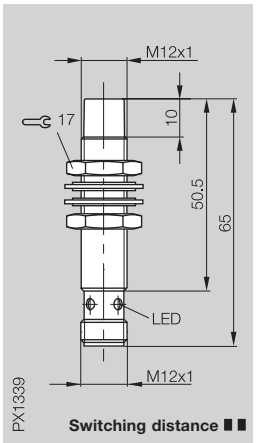
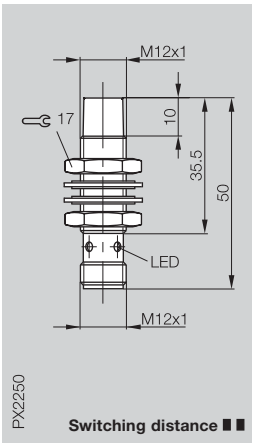
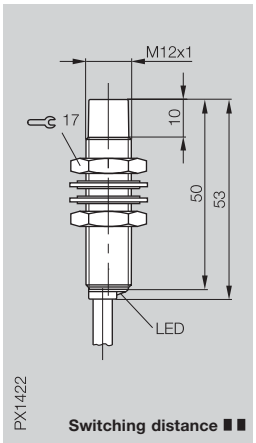


Housing size			**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush	non-flush	non-flush
Rated operating distance s_n			**4 mm**	**4 mm**	**4 mm**	**4 mm**
Assured operating distance s_a			0...3.2 mm	0...3.2 mm	0...3.2 mm	0...3.2 mm
						
PNP	NO	①	BES 516-356-B0-C-02		BES 516-356-E4-C-02	
	NC	②	BES 516-3019-B0-C-02		BES 516-3019-E4-C-02	
	complementary	③		BES 516-131-B0-C-03		
NPN	NO	④	BES 516-357-B0-C-02			BES 516-357-E4-Y-02
	NC	⑤	BES 516-3030-B0-C-02		BES 516-3030-E4-C-02	
	complementary	⑥		BES 516-122-B0-C-03		
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 1.5 V	≤ 2.5 V	≤ 2 V	≤ 3.5 V
Rated insulation voltage U_i			250 V AC	250 V AC	250 V AC	75 V DC
Rated operational current I_e			200 mA	200 mA	200 mA	130 mA
No-load supply current I_0 max.			≤ 8 mA	≤ 32 mA	≤ 10 mA	≤ 25 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			1500 Hz	400 Hz	2000 Hz	400 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Insulation class			⧈	⧈	⧈	
Housing material			Stainless steel	Stainless steel	CuZn coated	CuZn coated
Material of sensing face			PA 12	PA 12	PBT	PA 12
Connection			2 m PVC cable	3 m PVC cable	2 m PVC cable	2 m PVC cable
No. of wires × cross-section			3×0.34 mm²	4×0.25 mm²	3×0.34 mm²	3×0.34 mm²
Approval			cULus	cULus	cULus	cULus
Recommended connector						

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths
quality are available on request.

	M12×1	**M12×1**	**M12×1**		
	non-flush	non-flush	non-flush		
	8 mm	**8 mm**	**8 mm**		
	0...6.5 mm	0...6.5 mm	0...6.5 mm		
					
	BES M12MG-PSC80F-S04G BES M12MG-POC80F-S04G	BES M12MD-PSC80F-S04G BES M12MD-POC80F-S04G	BES M12MG-PSC80F-BV02 BES M12MG-POC80F-BV02		
	BES M12MG-NSC80F-S04G BES M12MG-NOC80F-S04G	BES M12MD-NSC80F-S04G BES M12MD-NOC80F-S04G	BES M12MG-NSC80F-BV02 BES M12MG-NOC80F-BV02		
	10...30 V DC	10...30 V DC	10...30 V DC		
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V		
	250 V AC	250 V AC	250 V AC		
	200 mA	200 mA	200 mA		
	≤ 14 mA	≤ 14 mA	≤ 14 mA		
	yes	yes	yes		
	yes	yes	yes		
	≤ 5 %	≤ 5 %	≤ 5 %		
	–25...+70 °C	–25...+70 °C	–25...+70 °C		
	800 Hz	800 Hz	800 Hz		
	DC 13	DC 13	DC 13		
	yes	yes	yes		
	IP 67	IP 67	IP 67		
	⧈	⧈	⧈		
	CuZn coated	CuZn coated	CuZn coated		
	PBT	PBT	PBT		
	Connector	Connector	2 m PVC cable		
			3×0.34 mm²		
	cULus	cULus	cULus		
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20			

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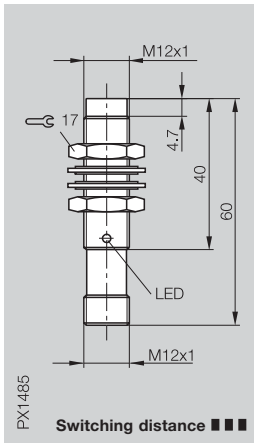
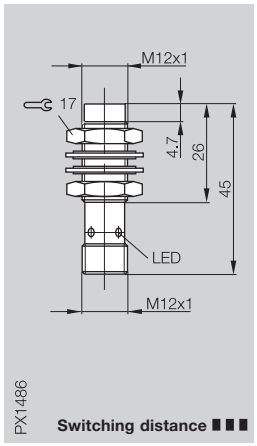
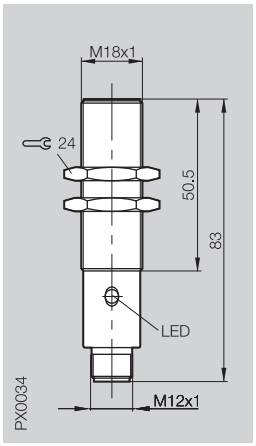
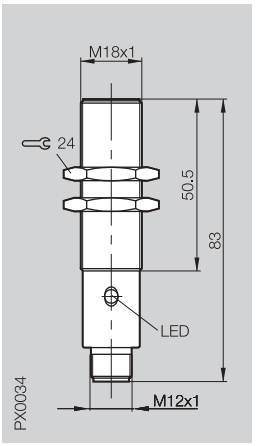
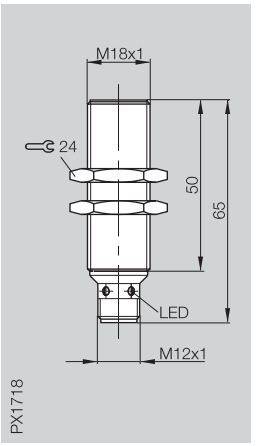
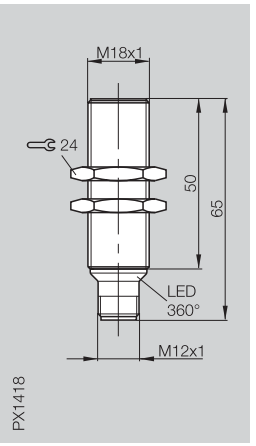
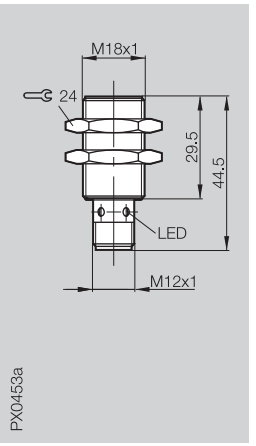
Connectors, Holders ... Page 5.2 ...

Housing size			**M12×1**	**M12×1**		
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush		
Rated operating distance s_n			**10 mm**	**10 mm**		
Assured operating distance s_a			0...8.1 mm	0...8.1 mm		
						
PNP	NO	①	BES M12MF1-PSC10F-S04G	BES M12MC1-PSC10F-S04G		
	NC	②	BES M12MF1-POC10F-S04G			
	complementary	③				
NPN	NO	④	BES M12MF1-NSC10F-S04G	BES M12MC1-NSC10F-S04G		
	NC	⑤				
	complementary	⑥				
Supply voltage U_B			10...30 V DC	10...30 V DC		
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V		
Rated insulation voltage U_i			75 V DC	75 V DC		
Rated operational current I_e			200 mA	200 mA		
No-load supply current I_0 max.			≤ 10 mA	≤ 10 mA		
Polarity reversal protected			yes	yes		
Short circuit protected			yes	yes		
Repeat accuracy R			≤ 5 %	≤ 5 %		
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C		
Switching frequency f			400 Hz	400 Hz		
Utilization category			DC 13	DC 13		
Function indicator			yes	yes		
Degree of protection per IEC 60529			IP 67	IP 67		
Insulation class						
Housing material			CuZn coated	CuZn coated		
Material of sensing face			PBT	PBT		
Connection			Connector	Connector		
Approval						
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20		

① Wiring diagrams see page **1.0.**6
Switching distance ■■■ see page **1.0.**10

	M18×1	**M18×1**	**M18×1**	**M18×1**	**M18×1**
	flush	flush	flush	flush	flush
	5 mm	**5 mm**	**5 mm**	**5 mm**	**5 mm**
	0...4.1 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm
					
	BES 516-326-S4-C BES 516-367-S4-C	BES 516-105-S4-C	BES M18MI-PSC50B-S04G	BES M18MI-PSC50B-S04K BES M18MI-POC50B-S04K	BES 516-367-E5-Y-S4
	BES 516-355-S4-C BES 516-366-S4-C	BES 516-111-S4-C		BES M18MI-NSC50B-S04K BES M18MI-NOC50B-S04K	BES 516-355-E5-Y-S4
	10...30 V DC	10...30 V DC	12...30 V DC	12...30 V DC	10...30 V DC
	≤ 1.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 3.5 V
	250 V AC	250 V AC	250 V AC	250 V AC	75 V DC
	200 mA	200 mA	200 mA	200 mA	130 mA
	≤ 8 mA	≤ 30 mA	≤ 15 mA	≤ 15 mA	≤ 25 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	900 Hz	500 Hz	700 Hz	700 Hz	500 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
	⧈	⧈	⧈	⧈	
	CuZn coated	CuZn coated	CuZn coated	CuZn coated/ PA 6 transparent	CuZn coated
	PA 12	PA 12	PA 12	PA 12	PA 12
	Connector	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

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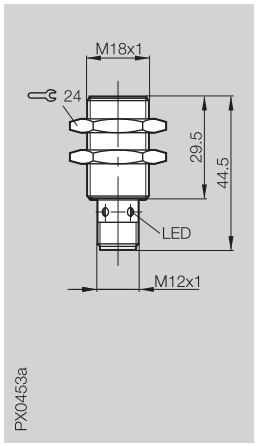
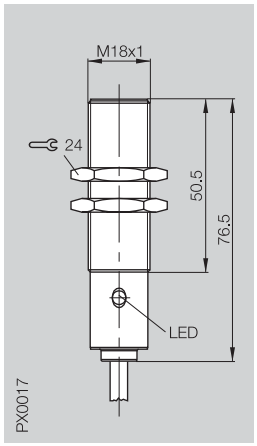
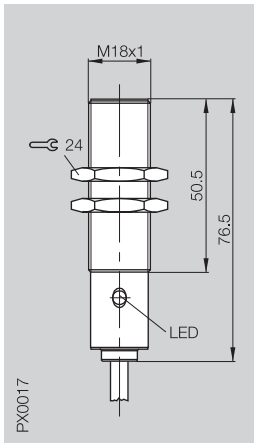
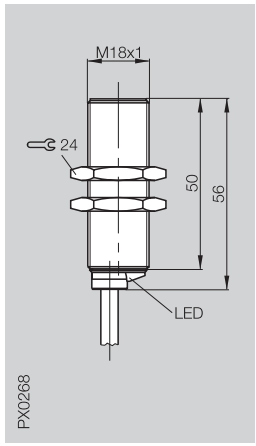
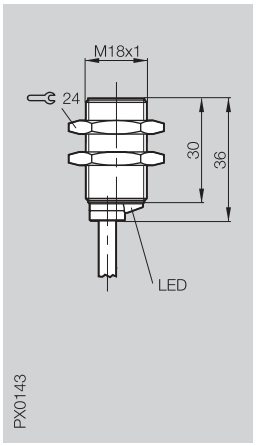
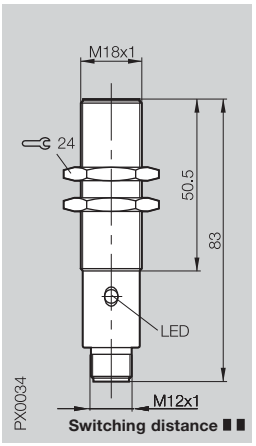
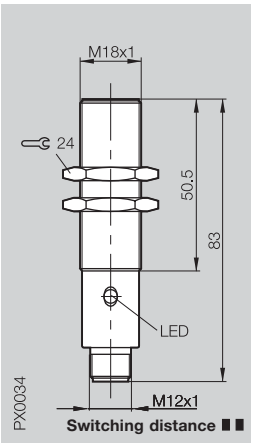
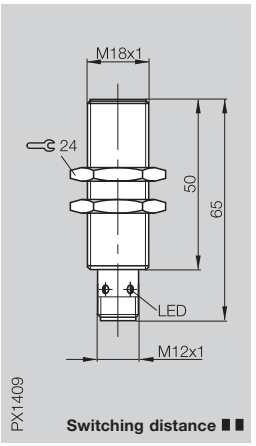
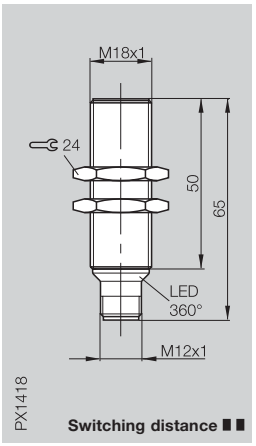
Connectors, Holders ...
Page 5.2 ...

Housing size	**M18×1**	**M18×1**	**M18×1**	**M18×1**	
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush	
Rated operating distance s_n	**5 mm**	**5 mm**	**5 mm**	**5 mm**	
Assured operating distance s_a	0...4.1 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm	
					
PNP NO ①	BES 516-326-E5-C-S4	BES 516-326-B0-C-02		BES M18MI-PSC50B-BV02	
PNP NC ②				BES M18MI-POC50B-BV02	
PNP complementary ③			BES 516-105-B0-C-03		
NPN NO ④		BES 516-355-B0-C-02		BES M18MI-NSC50B-BV02	
NPN complementary ⑥			BES 516-111-B0-C-03		
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	12...30 V DC	
Voltage drop U_d at I_e	≤ 2 V	≤ 1.5 V (PNP)/≤ 2.5 V (NPN)	≤ 2.5 V	≤ 2.5 V	
Rated insulation voltage U_i	75 V DC	250 V AC	250 V AC	250 V AC	
Rated operational current I_e	200 mA	200 mA	200 mA	200 mA	
No-load supply current I_0 max.	≤ 10 mA	≤ 25 mA	≤ 30 mA	≤ 15 mA	
Polarity reversal protected	yes	yes	yes	yes	
Short circuit protected	yes	yes	yes	yes	
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f	1000 Hz	900 Hz (PNP)/500 Hz (NPN)	500 Hz	700 Hz	
Utilization category	DC 13	DC 13	DC 13	DC 13	
Function indicator	yes	yes	yes	yes	
Degree of protection per IEC 60529	IP 67	IP 68 per BWN Pr. 20	IP 67	IP 68 per BWN Pr. 20	
Insulation class		⧈	⧈	⧈	
Housing material	CuZn coated	CuZn coated	CuZn coated	CuZn coated	
Material of sensing face	PBT	PA 12	PA 12	PA 12	
Connection	Connector	2 m PVC cable	3 m PVC cable	2 m PVC cable	
No. of wires × cross-section		3×0.34 mm²	4×0.25 mm²	3×0.34 mm²	
Approval	cULus	cULus	cULus	cULus	
Recommended connector	BKS-_ 19/BKS-_ 20				

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

	M18×1	**M18×1**	**M18×1**	**M18×1**	**M18×1**
	flush	flush	flush	flush	flush
	5 mm	**8 mm**	**8 mm**	**8 mm**	**8 mm**
	0...4.1 mm	0...6.5 mm	0...6.5 mm	0...6.5 mm	0...6.5 mm
					
	BES 516-326-E4-C-02	BES 516-326-G-S4-C	BES 516-326-G-S4-H BES 516-105-G-S4-H	BES M18MI-PSC80B-S04G	BES M18MI-PSC80B-S04K BES M18MI-POC80B-S04K BES M18MI-NSC80B-S04K
	10...30 V DC	10...30 V DC	10...55 V DC	10...30 V DC	12...30 V DC
	≤ 2 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 10 mA	≤ 12 mA	≤ 15 mA	≤ 18 mA	≤ 15 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	0...+70 °C	0...+70 °C	–25...+70 °C	–25...+70 °C
	1000 Hz	80 Hz	80 Hz	1000 Hz	150 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 68 per BWN Pr. 20
				⧈	⧈
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	CuZn coated/ PA 6 transparent
	PBT	PBT	PBT	PBT	PA 12
	2 m PVC cable	Connector	Connector	Connector	Connector
	3×0.34 mm²				
	cULus	cULus		cULus	cULus
		BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

All-round LED

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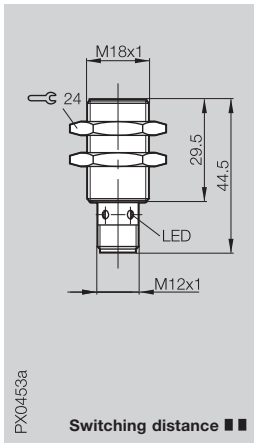
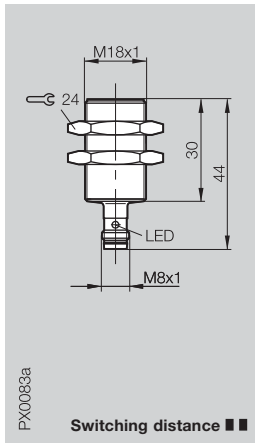
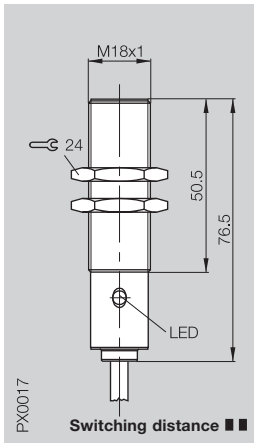
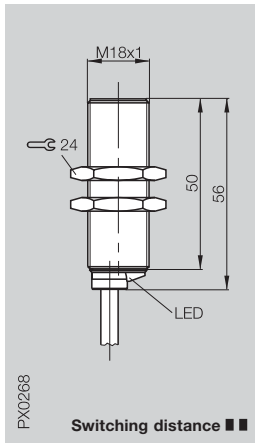
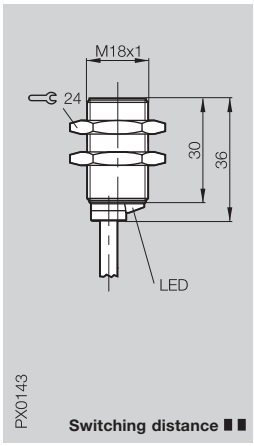
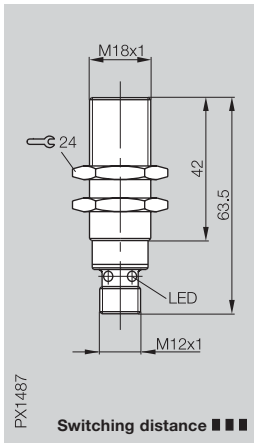
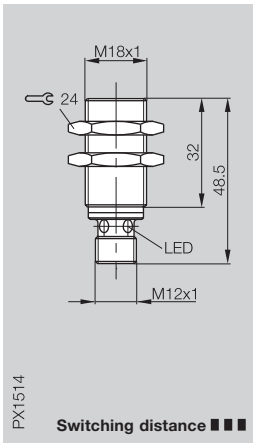
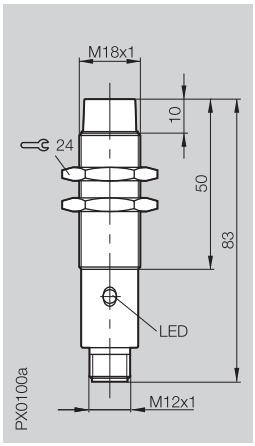
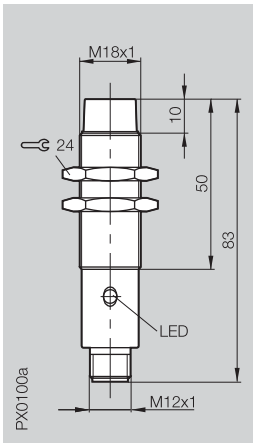
Connectors, Holders ...
Page 5.2 ...

Housing size			**M18×1**	**M18×1**	**M18×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush	flush
Rated operating distance s_n			**8 mm**	**8 mm**	**8 mm**	**8 mm**
Assured operating distance s_a			0...6.5 mm	0...6.5 mm	0...6.5 mm	0...6.5 mm
						
PNP	NO	①	BES 516-326-G-E5-Y-S4	BES 516-326-G-E5-Y-S49	BES 516-326-G-B0-C-PU-02	BES M18MI-PSC80B-BV02
	NC	②	BES 516-367-G-E5-Y-S4	BES 516-367-G-E5-Y-S49		
	complementary	③				
NPN	NO	④	BES 516-355-G-E5-Y-S4	BES 516-355-G-E5-Y-S49		BES M18MI-NSC80B-BV02
	NC	⑤		BES 516-366-G-E5-Y-S49		
	complementary	⑥				
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	12...30 V DC
Voltage drop U_d at I_e			≤ 3.5 V	≤ 3.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	250 V AC	250 V AC
Rated operational current I_e			130 mA	130 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 25 mA	≤ 25 mA	≤ 12 mA	≤ 15 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	0...+70 °C	–25...+70 °C
Switching frequency f			200 Hz	200 Hz	80 Hz	150 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67	IP 68 per BWN Pr. 20
Insulation class					⧈	⧈
Housing material			CuZn coated	CuZn coated	CuZn coated	CuZn coated
Material of sensing face			PBT	PBT	PBT	PA 12
Connection			Connector	Connector	2 m cable PUR	2 m PVC cable
No. of wires × cross-section					3×0.34 mm²	3×0.34 mm²
Approval			cULus	cULus	cULus	cULus
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49		

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

	M18×1	**M18×1**	**M18×1**	**M18×1**	**M18×1**
	flush	quasi flush	quasi flush	non-flush	non-flush
	8 mm	**12 mm**	**12 mm**	**8 mm**	**8 mm**
	0...6.5 mm	0...9.7 mm	0...9.7 mm	0...6.5 mm	0...6.5 mm
					
	BES 516-326-G-E4-Y-02 BES 516-367-G-E4-Y-02	BES M18MG1-PSC12B-S04G	BES M18MD1-PSC12B-S04G	BES 516-360-S4-C BES 516-3026-S4-C	BES 516-123-S4-C
	BES 516-355-G-E4-Y-02 BES 516-366-G-E4-Y-02	BES M18MG1-NSC12B-S04G	BES M18MD1-NSC12B-S04G	BES 516-361-S4-C	BES 516-124-S4-C
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 3.5 V	≤ 2 V	≤ 2 V	≤ 1.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC	250 V AC	250 V AC
	130 mA	200 mA	200 mA	200 mA	200 mA
	≤ 25 mA	≤ 10 mA	≤ 10 mA	≤ 8 mA	≤ 30 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	200 Hz	500 Hz	500 Hz	600 Hz	200 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 67	IP 67	IP 68 per BWN Pr. 20 ⧈	IP 67 ⧈
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	PBT	PBT	PBT	PA 12	PA 12
	2 m PVC cable	Connector	Connector	Connector	Connector
	3×0.34 mm²				
	cULus			cULus	cULus
		BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

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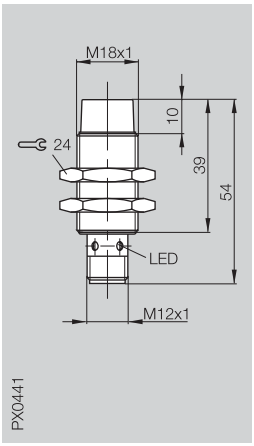
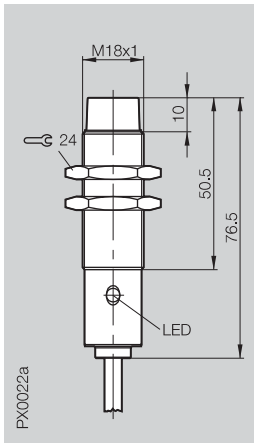
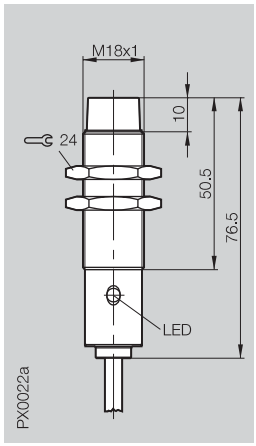
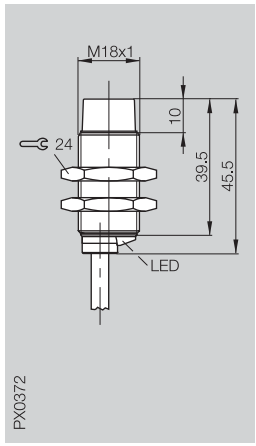
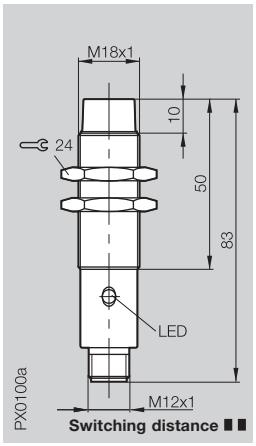
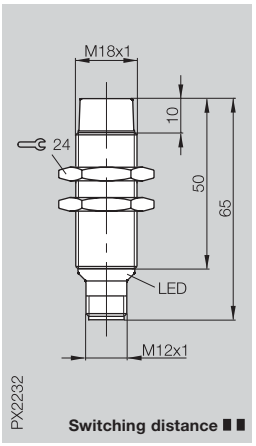
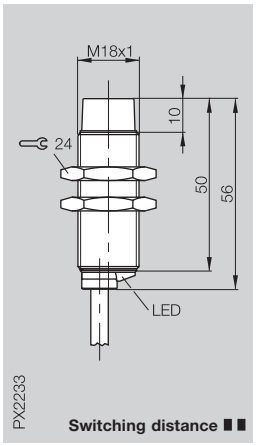
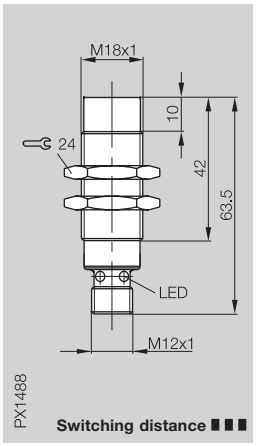
Connectors, Holders ...
Page 5.2 ...

Housing size			**M18×1**	**M18×1**	**M18×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush	non-flush	non-flush
Rated operating distance s_n			**8 mm**	**8 mm**	**8 mm**	**8 mm**
Assured operating distance s_a			0...6.5 mm	0...6.5 mm	0...6.5 mm	0...6.5 mm
						
PNP	NO	①	BES 516-360-E5-Y-S4	BES 516-360-B0-C-02		BES 516-360-E4-Y-02
	NC	②	BES 516-3026-E5-Y-S4	BES 516-3026-B0-C-02		BES 516-3026-E4-Y-02
	complementary	③			BES 516-123-B0-C-03	
NPN	NO	④	BES 516-361-E5-Y-S4	BES 516-361-B0-C-02		BES 516-361-E4-Y-02
	NC	⑤		BES 516-3031-B0-C-02		
	complementary	⑥			BES 516-124-B0-C-03	
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 3.5 V	≤ 1.5 V	≤ 2.5 V	≤ 3.5 V
Rated insulation voltage U_i			75 V DC	250 V AC	250 V AC	75 V DC
Rated operational current I_e			130 mA	200 mA	200 mA	130 mA
No-load supply current I_0 max.			≤ 25 mA	≤ 25 mA	≤ 30 mA	≤ 25 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			200 Hz	600 Hz (PNP)/200 Hz (NPN)	200 Hz	200 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 68 per BWN Pr. 20 (PNP)/ IP 67 (NPN)	IP 67	IP 68 per BWN Pr. 20
Insulation class				⧈	⧈	
Housing material			CuZn coated	CuZn coated	CuZn coated	CuZn coated
Material of sensing face			PA 12	PA 12	PA 12	PA 12
Connection			Connector	2 m PVC cable	3 m PVC cable	2 m PVC cable
No. of wires × cross-section				3×0.34 mm²	4×0.25 mm²	3×0.34 mm²
Approval			cULus	cULus	cULus	cULus
Recommended connector			BKS-_ 19/BKS-_ 20			

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

	M18×1	**M18×1**	**M18×1**	**M18×1**	
	non-flush	non-flush	non-flush	non-flush	
	16 mm	**16 mm**	**16 mm**	**20 mm**	
	0...13 mm	0...12.8 mm	0...12.8 mm	0...16.2 mm	
					
	BES 516-360-G-S4-H BES 516-123-G-S4-H	BES M18MG-PSC16F-S04K BES M18MG-POC16F-S04K	BES M18MG-PSC16F-BV02 BES M18MG-POC16F-BV02	BES M18ME1-PSC20F-S04G	
		BES M18MG-NSC16F-S04K BES M18MG-NOC16F-S04K	BES M18MG-NSC16F-BV02 BES M18MG-NOC16F-BV02	BES M18ME1-NSC20F-S04G	
	10...55 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2 V	
	250 V AC	250 V AC	250 V AC	75 V DC	
	200 mA	200 mA	200 mA	200 mA	
	≤ 15 mA	≤ 14 mA	≤ 14 mA	≤ 10 mA	
	yes	yes	yes	yes	
	yes	yes	yes	yes	
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
	80 Hz	800 Hz	800 Hz	200 Hz	
	DC 13	DC 13	DC 13	DC 13	
	yes	yes	yes	yes	
	IP 68 per BWN Pr. 20	IP 67	IP 67	IP 54	
	⧈	⧈	⧈		
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	
	PA 12	PBT	PBT	PBT	
	Connector	Connector	2 m PVC cable 3×0.34 mm²	Connector	
		cULus	cULus		
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20		BKS-_ 19/BKS-_ 20	

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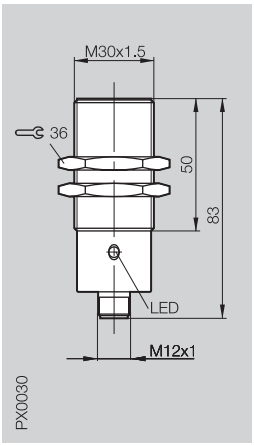
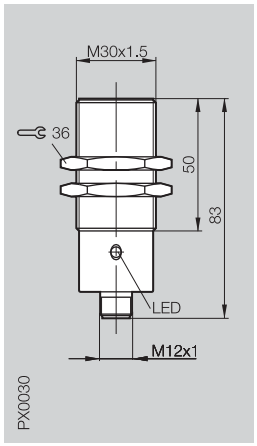
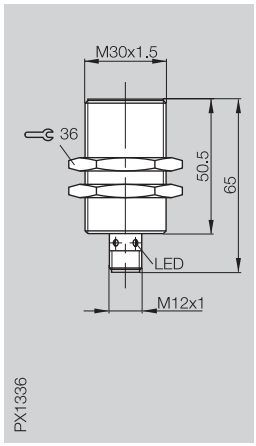
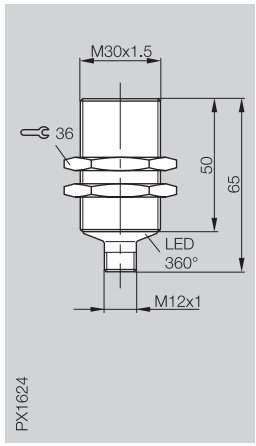
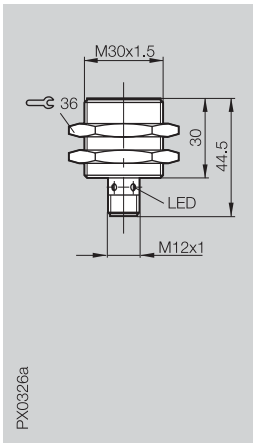
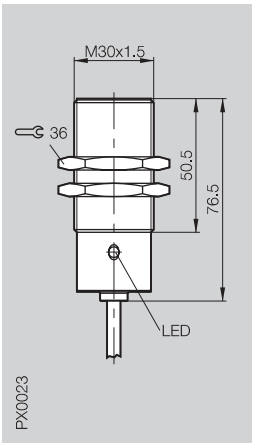
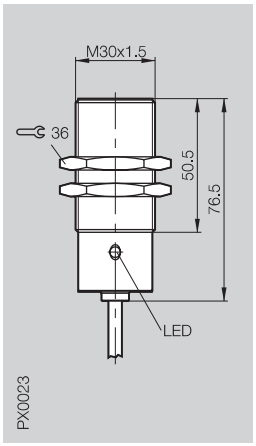
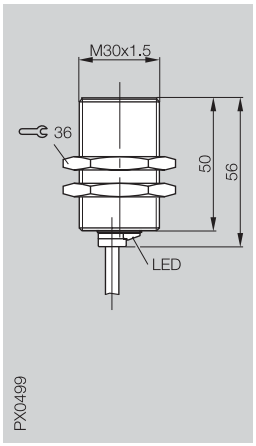
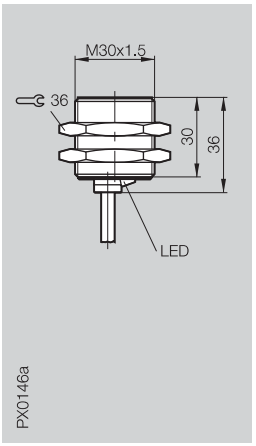
Connectors, Holders ...
Page 5.2 ...

Housing size			**M30×1.5**	**M30×1.5**	**M30×1.5**	**M30×1.5**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush	flush
Rated operating distance s_n			**10 mm**	**10 mm**	**10 mm**	**10 mm**
Assured operating distance s_a			0...8.1 mm	0...8.1 mm	0...8.1 mm	0...8.1 mm
						
PNP	NO	①	BES 516-327-S4-C		BES M30MI-PSC10B-S04G	BES M30MI-PSC10B-S04K
	NC	②	BES 516-3028-S4-C			BES M30MI-POC10B-S04K
	complementary	③		BES 516-114-S4-C		
NPN	NO	④	BES 516-359-S4-C			BES M30MI-NSC10B-S04K
	NC	⑤				BES M30MI-NOC10B-S04K
	complementary	⑥		BES 516-120-S4-C		
Supply voltage U_B			10...30 V DC	10...30 V DC	12...30 V DC	12...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i			250 V AC	250 V AC	75 V DC	250 V AC
Rated operational current I_e			200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 25 mA	≤ 30 mA	≤ 10 mA	≤ 10 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			300 Hz	300 Hz	400 Hz	400 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 68 per BWN Pr. 20	IP 67	IP 67	IP 68 per BWN Pr. 20
Insulation class			⧈	⧈		⧈
Housing material			CuZn coated	CuZn coated	CuZn coated	CuZn coated/ PA 6 transparent
Material of sensing face			PA 12	PA 12	PA 12	PA 12
Connection			Connector	Connector	Connector	Connector
No. of wires × cross-section						
Approval			cULus	cULus	cULus	cULus
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6

For sensors with cable, other lengths and PUR quality are available on request.

All-round LED

	M30×1.5	**M30×1.5**	**M30×1.5**	**M30×1.5**	**M30×1.5**
	flush	flush	flush	flush	flush
	10 mm	**10 mm**	**10 mm**	**10 mm**	**10 mm**
	0...8.1 mm	0...8.1 mm	0...8.1 mm	0...8.1 mm	0...8.1 mm
					
	BES 516-327-E5-Y-S4 BES 516-3028-E5-Y-S4	BES 516-327-B0-C-02	BES 516-114-B0-C-03	BES M30MI-PSC10B-BV02 BES M30MI-POC10B-BV02	BES 516-327-E4-Y-02
	BES 516-359-E5-Y-S4	BES 516-359-B0-C-02	BES 516-120-B0-C-03	BES M30MI-NSC10B-BV02 BES M30MI-NOC10B-BV02	BES 516-359-E4-Y-02
	10...30 V DC	10...30 V DC	10...30 V DC	12...30 V DC	10...30 V DC
	≤ 3.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 3.5 V
	75 V DC	250 V AC	250 V AC	250 V AC	75 V DC
	130 mA	200 mA	200 mA	200 mA	130 mA
	≤ 25 mA	≤ 25 mA	≤ 30 mA	≤ 10 mA	≤ 25 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	500 Hz	300 Hz	300 Hz	400 Hz	200 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 68 per BWN Pr. 20	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
		⧈	⧈	⧈	
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	PA 12	PA 12	PA 12	PA 12	PA 12
	Connector	2 m PVC cable	3 m PVC cable	2 m PVC cable	2 m PVC cable
		3×0.34 mm²	4×0.25 mm²	3×0.34 mm²	3×0.34 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20				

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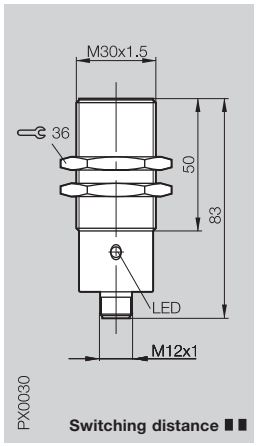
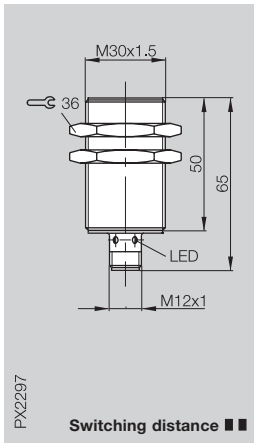
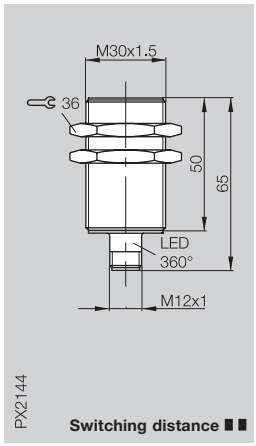
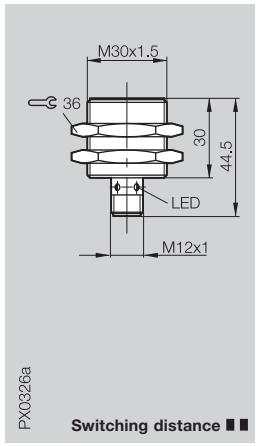
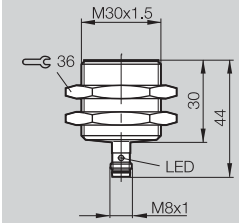
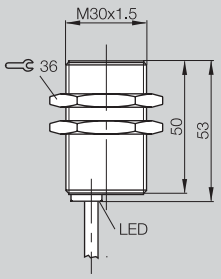
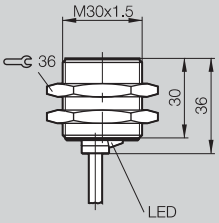
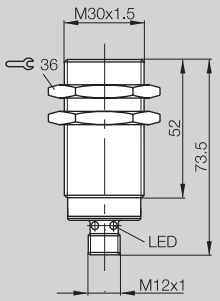
Connectors, Holders ...
Page 5.2 ...

Housing size	**M30×1.5**	**M30x1.5**	**M30×1.5**	**M30×1.5**	
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush	
Rated operating distance s_n	**15 mm**	**15 mm**	**15 mm**	**15 mm**	
Assured operating distance s_a	0...12.2 mm	0...12.2 mm	0...12.2 mm	0...12.2 mm	
					
PNP NO ①		BES M30MI-PSC15B-S04G	BES M30MI-PSC15B-S04K	BES 516-327-G-E5-Y-S4	
PNP NC ②			BES M30MI-POC15B-S04K	BES 516-3028-G-E5-Y-S4	
PNP complementary ③	BES 516-114-G-S4-H				
NPN NO ④			BES M30MI-NSC15B-S04K		
NPN NC ⑤			BES M30MI-NOC15B-S04K		
Supply voltage U_B	10...55 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 3.5 V	
Rated insulation voltage U_i	250 V AC	250 V AC	250 V AC	75 V DC	
Rated operational current I_e	200 mA	200 mA	200 mA	130 mA	
No-load supply current I_0 max.	≤ 15 mA	≤ 10 mA	≤ 10 mA	≤ 25 mA	
Polarity reversal protected	yes	yes	yes	yes	
Short circuit protected	yes	yes	yes	yes	
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f	150 Hz	100 Hz	100 Hz	100 Hz	
Utilization category	DC 13	DC 13	DC 13	DC 13	
Function indicator	yes	yes	yes	yes	
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 67	IP 67	IP 67	
Insulation class	⧈	⧈	⧈		
Housing material	CuZn coated	CuZn coated	CuZn coated	CuZn coated	
Material of sensing face	PA 12	PA 12	PA 12	PA 12	
Connection	Connector	Connector	Connector	Connector	
No. of wires × cross-section					
Approval		cULus	cULus	cULus	
Recommended connector	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

All-round LED

	M30×1.5	M30x1.5	M30×1.5	M30×1.5	
	flush	flush	flush	quasi flush	
	15 mm	**15 mm**	**15 mm**	**22 mm**	
	0...12.2 mm	0...12.2 mm	0...12.2 mm	0...17.8 mm	
	 PX0054a **Switching distance ■■**	 PX2160 **Switching distance ■■**	 PX0146a **Switching distance ■■**	 PX1489 **Switching distance ■■■**	
	BES 516-327-G-E5-Y-S49	BES M30MI-PSC15B-BV02 BES M30MI-POC15B-BV02	BES 516-327-G-E4-Y-02 BES 516-3028-G-E4-Y-02	BES M30MI1-PSC22B-S04G BES M30MI1-POC22B-S04G	
	BES 516-359-G-E5-Y-S49		BES 516-359-G-E4-Y-02	BES M30MI1-NSC22B-S04G	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
	≤ 3.5 V	≤ 2.5 V	≤ 3.5 V	≤ 2 V	
	75 V DC	250 V AC	75 V DC	75 V DC	
	130 mA	200 mA	130 mA	200 mA	
	≤ 25 mA	≤ 10 mA	≤ 25 mA	≤ 10 mA	
	yes	yes	yes	yes	
	yes	yes	yes	yes	
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
	100 Hz	100 Hz	100 Hz	200 Hz	
	DC 13	DC 13	DC 13	DC 13	
	yes	yes	yes	yes	
	IP 67	IP 67	IP 68 per BWN Pr. 20	IP 67	
		⧈			
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	
	PA 12	PA 12	PA 12	PBT	
	Connector	2 m PVC cable	2 m PVC cable	Connector	
		3×0.34 mm²	3×0.34 mm²		
	cULus	cULus	cULus		
	BKS-_ 48/BKS-_ 49			BKS-_ 19/BKS-_ 20	

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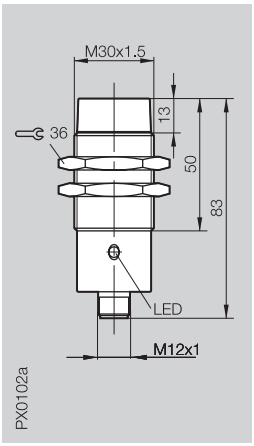
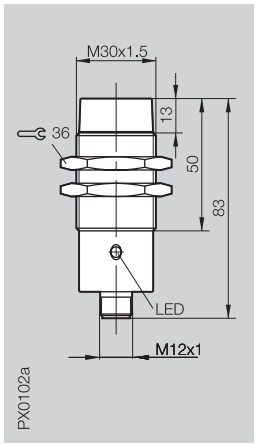
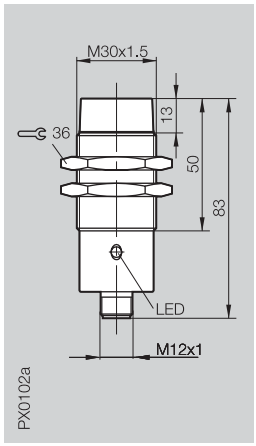
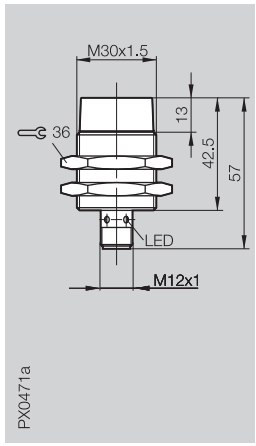
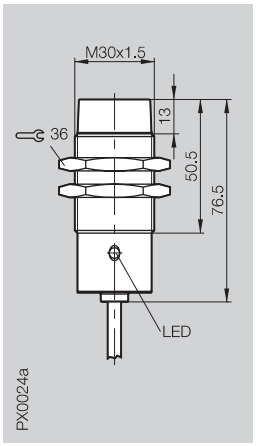
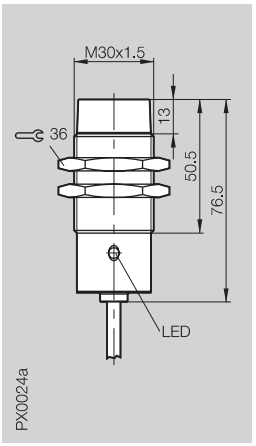
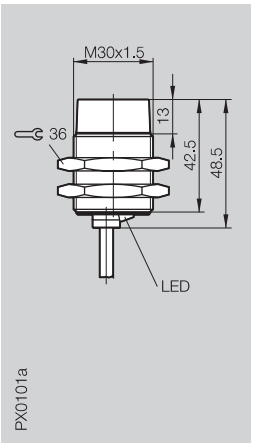
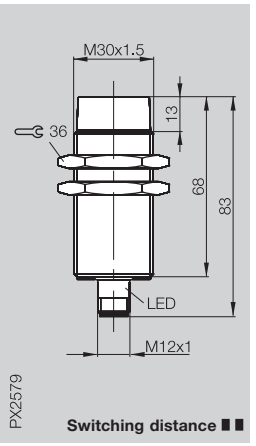
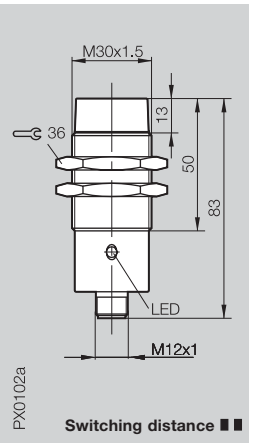
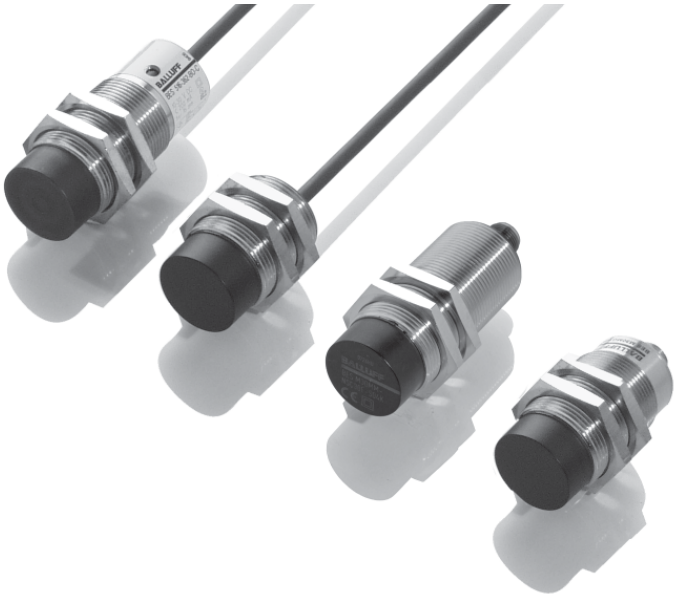
Connectors, Holders ...
Page 5.2 ...

Housing size			**M30×1.5**	**M30×1.5**	**M30×1.5**	**M30×1.5**
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush	non-flush	non-flush
Rated operating distance s_n			**15 mm**	**15 mm**	**15 mm**	**15 mm**
Assured operating distance s_a			0...12.2 mm	0...12.2 mm	0...12.2 mm	0...12.2 mm
						
PNP	NO	①	BES 516-362-S4-C		BES 516-362-S4-H	BES 516-362-E5-Y-S4
	NC	②	BES 516-3029-S4-C			BES 516-3029-E5-Y-S4
	complementary	③		BES 516-125-S4-C		
NPN	NO	④	BES 516-363-S4-C			BES 516-363-E5-Y-S4
	NC	⑤	BES 516-3033-S4-C			
	complementary	⑥				
Supply voltage U_B			10...30 V DC	10...30 V DC	10...55 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V	≤ 1.5 V	≤ 3.5 V
Rated insulation voltage U_i			250 V AC	250 V AC	250 V AC	75 V DC
Rated operational current I_e			200 mA	200 mA	200 mA	130 mA
No-load supply current I_0 max.			≤ 25 mA	≤ 30 mA	≤ 12 mA	≤ 25 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			100 Hz	100 Hz	400 Hz	100 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
Insulation class			⧈	⧈	⧈	
Housing material			CuZn coated	CuZn coated	CuZn coated	CuZn coated
Material of sensing face			PA 12	PA 12	PA 12	PA 12
Connection			Connector	Connector	Connector	Connector
No. of wires × cross-section						
Approval			cULus	cULus		cULus
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

	M30×1.5	**M30×1.5**	**M30×1.5**	**M30×1.5**	**M30×1.5**
	non-flush	non-flush	non-flush	non-flush	non-flush
	15 mm	**15 mm**	**15 mm**	**30 mm**	**30 mm**
	0...12.2 mm	0...12.2 mm	0...12.2 mm	0...24.3 mm	0...24.3 mm
					
	BES 516-362-B0-C-02 BES 516-3029-B0-C-02	BES 516-125-B0-C-03	BES 516-362-E4-Y-02 BES 516-3029-E4-Y-02	BES M30MM-PSC30F-S04K BES M30MM-POC30F-S04K	BES 516-362-G-S4-H
	BES 516-363-B0-C-02 BES 516-3033-B0-C-02	BES 516-126-B0-C-03	BES 516-363-E4-Y-02	BES M30MM-NSC30F-S04K BES M30MM-NOC30F-S04K	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...55 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 3.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	75 V DC	250 V AC	250 V AC
	200 mA	200 mA	130 mA	200 mA	200 mA
	≤ 25 mA	≤ 30 mA	≤ 25 mA	≤ 10 mA	≤ 15 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	100 Hz	100 Hz	100 Hz	300 Hz	70 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 67	IP 68 per BWN Pr. 20	IP 67	IP 68 per BWN Pr. 20
	⧈	⧈			⧈
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	PA 12	PA 12	PA 12	PBT	PA 12
	2 m PVC cable	3 m PVC cable	2 m PVC cable	Connector	Connector
	3×0.34 mm²	4×0.25 mm²	3×0.34 mm²		
	cULus	cULus	cULus	cULus	
				BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20



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Connectors, Holders ...
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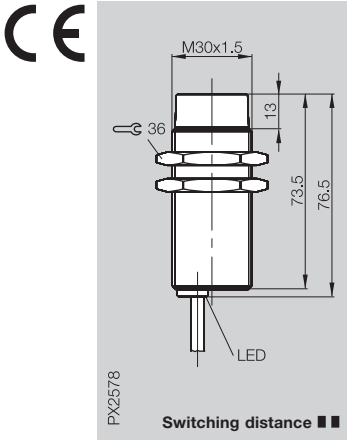
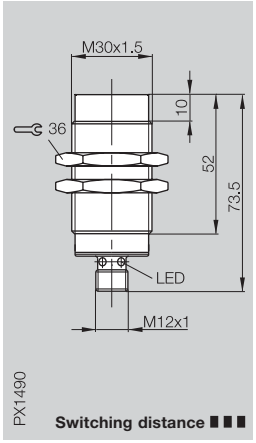
Housing size			**M30×1.5**	**M30×1.5**		
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush		
Rated operating distance s_n			**30 mm**	**40 mm**		
Assured operating distance s_a			0...24.3 mm	0...32.4 mm		



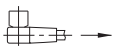


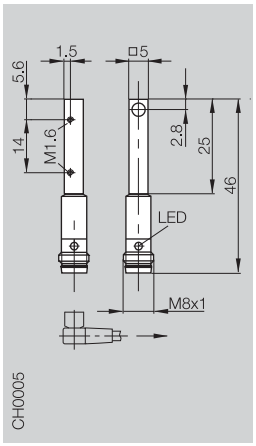
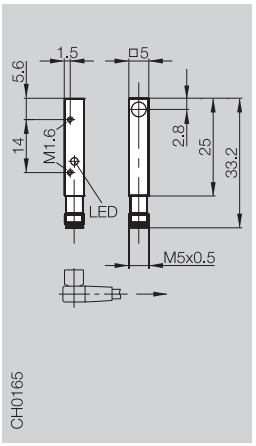
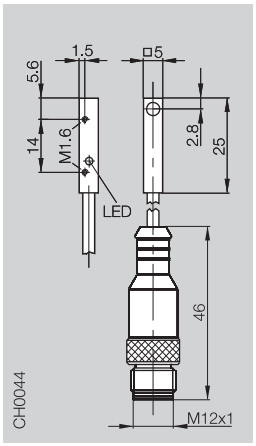
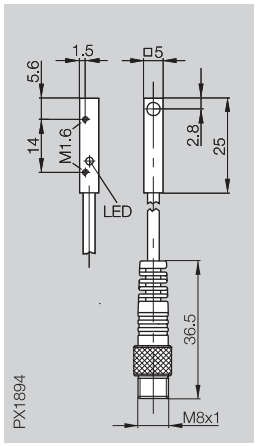
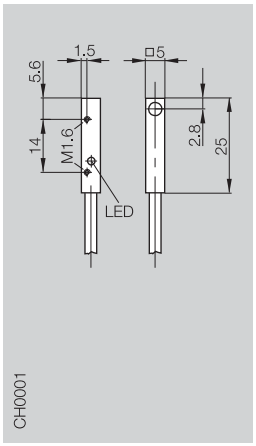
PNP	NO	①	BES M30MM-PSC30F-BV02	BES M30MG1-PSC40F-S04G		
	NC	②	BES M30MM-POC30F-BV02			
NPN	NO	④	BES M30MM-NSC30F-BV02			
	NC	⑤	BES M30MM-NOC30F-BV02			

Supply voltage U_B	10...30 V DC	10...30 V DC			
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2 V			
Rated insulation voltage U_i	250 V AC	75 V DC			
Rated operational current I_e	200 mA	200 mA			
No-load supply current I_0 max.	≤ 10 mA	≤ 10 mA			
Polarity reversal protected	yes	yes			
Short circuit protected	yes	yes			
Repeat accuracy R	≤ 5 %	≤ 5 %			
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C			
Switching frequency f	300 Hz	100 Hz			
Utilization category	DC 13	DC 13			
Function indicator	yes	yes			
Degree of protection per IEC 60529	IP 67	IP 54			
Housing material	CuZn coated	CuZn coated			
Material of sensing face	PBT	PBT			
Connection	2 m PVC cable	Connector			
No. of wires × cross-section	3×0.34 mm²				
Approval	cULus				
Recommended connector		BKS-_ 19/BKS-_ 20			

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

 Connector orientation

	5×5×46 mm	5×5×33 mm	5×5×25 mm	5×5×25 mm	5×5×25 mm
	flush	flush	flush	flush	flush
	0.8 mm	**0.8 mm**	**0.8 mm**	**0.8 mm**	**0.8 mm**
	0...0.6 mm	0...0.6 mm	0...0.6 mm	0...0.6 mm	0...0.6 mm
					
	BES 516-3040-I02-C-S49 BES 516-3042-I02-C-S49	BES Q05AC-PSC08B-S26G BES Q05AC-POC08B-S26G	BES 516-3040-I02-C-S4-00,3	BES 516-3040-I02-C-S49-00,3	BES 516-3040-I02-C-PU-02 BES 516-3042-I02-C-PU-02
	BES 516-3041-I02-C-S49 BES 516-3043-I02-C-S49	BES Q05AC-NSC08B-S26G BES Q05AC-NOC08B-S26G			BES 516-3041-I02-C-PU-02 BES 516-3043-I02-C-PU-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	100 mA	100 mA	100 mA	100 mA	100 mA
	≤ 12 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 12 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	3000 Hz	3000 Hz	1000 Hz	3000 Hz	3000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 65	IP 67	IP 67
	anodized Al	anodized Al	anodized Al	anodized Al	anodized Al
	POM	POM	POM	POM	POM
	Connector	Connector	0.3 m PUR cable with connector	0.3 m PUR cable with connector	2 m cable PUR
					3×0.14 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 25/BKS-_ 26	BKS-_ 19	BKS-_ 48	

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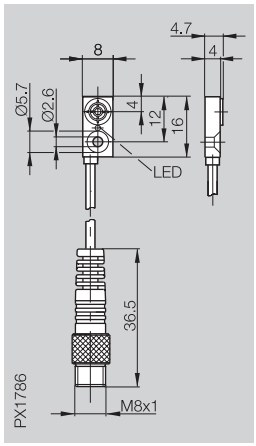
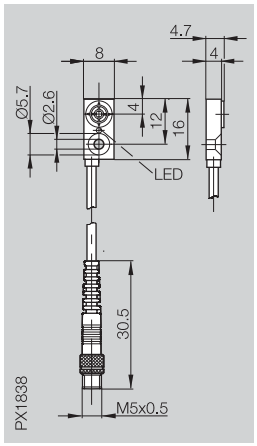
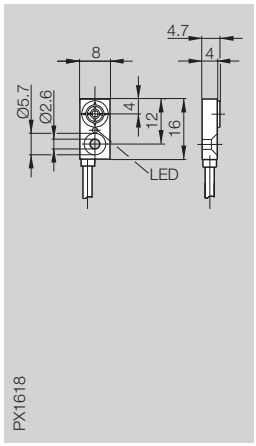
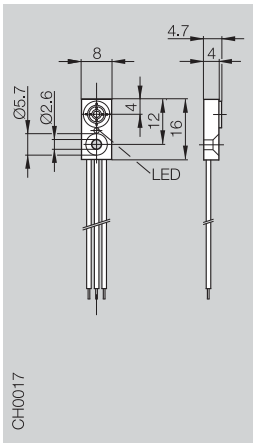
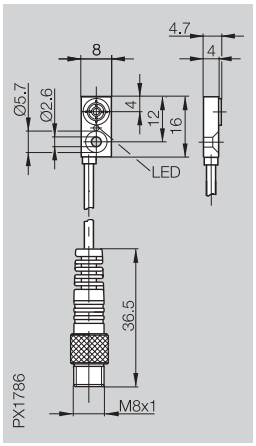
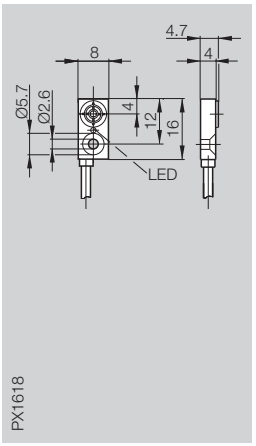
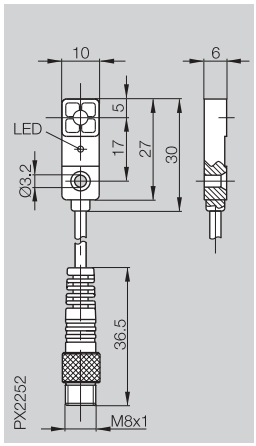
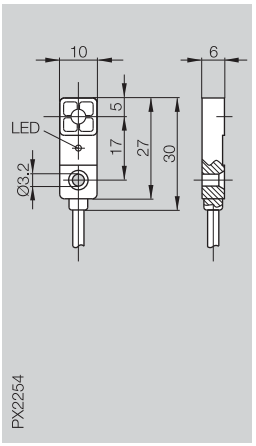
Connectors, Holders ... Page 5.2 ...

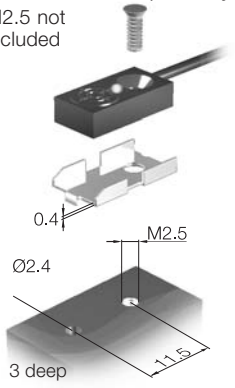
Housing size		**8×16×4 mm** R04	**8×16×4 mm** R04	**8×16×4 mm** R04	**8×16×4 mm** R04	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**	
Assured operating distance s_a		0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	
						
PNP	NO ①	BES R04KC-PSC15B-EP00,13-GS49	BES R04KC-PSC15B-EP00,2-GS26	BES R04KC-PSC15B-EV02	BES R04KC-PSC15B-LV00,3	
	NC ②	BES R04KC-POC15B-EP00,13-GS49	BES R04KC-POC15B-EP00,2-GS26	BES R04KC-POC15B-EV02		
NPN	NO ④	BES R04KC-NSC15B-EP00,13-GS49	BES R04KC-NSC15B-EP00,2-GS26	BES R04KC-NSC15B-EV02		
	NC ⑤	BES R04KC-NOC15B-EP00,13-GS49	BES R04KC-NOC15B-EP00,2-GS26	BES R04KC-NOC15B-EV02		
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e		≤ 3 V	≤ 3 V	≤ 3 V	≤ 3 V	
Rated insulation voltage U_i		75 V DC	75 V DC	75 V DC	75 V DC	
Rated operational current I_e		100 mA	100 mA	100 mA	100 mA	
No-load supply current I_0 max.		≤ 12 mA	≤ 12 mA	≤ 12 mA	≤ 10 mA	
Polarity reversal protected		no	no	no	no	
Short circuit protected		yes	yes	yes	yes	
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f		600 Hz	600 Hz	600 Hz	600 Hz	
Utilization category		DC 12	DC 12	DC 12	DC 12	
Function indicator		yes	yes	yes	yes	
Degree of protection per IEC 60529		IP 67	IP 67	IP 67	IP 67	
Housing material		PA 6	PA 6	PA 6	PA 6	
Material of sensing face		PA 6	PA 6	PA 6	PA 6	
Connection		0.13 m PUR cable with connector	0.2 m PUR cable with connector	2 m PVC cable	3×0.3 m single leads PVC	
No. of wires × cross-section				3×0.09 mm²	3×0.09 mm²	
Approval		cULus	cULus	cULus	cULus	
Recommended connector		BKS-_ 48	BKS-B 25			

① Wiring diagrams see page **1.0.**6

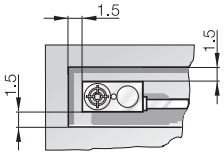
Other cable lengths on request.

	8×16×4 mm R04	**8×16×4 mm** R04		**10×30×6 mm** R03	**10×30×6 mm** R03
	non-flush	non-flush		flush	flush
	2.5 mm	**2.5 mm**		**3 mm**	**3 mm**
	0...2 mm	0...2 mm		0...2.4 mm	0...2.4 mm
					
	BES R04KC-PSC25F-EP00,3-GS49	BES R04KC-PSC25F-EV02		BES R03KC-PSC30B-BP00,3-GS49	BES R03KC-PSC30B-EP02 BES R03KC-POC30B-EP05
					BES R03KC-NSC30B-EP05 BES R03KC-NOC30B-EP05
	10...30 V DC	10...30 V DC		5...30 V DC	5...30 V DC
	≤ 2.5 V	≤ 2.5 V		≤ 1.5 V	≤ 1.5 V
	75 V DC	75 V DC		75 V DC	75 V DC
	100 mA	100 mA		100 mA	100 mA
	≤ 10 mA	≤ 10 mA		≤ 6 mA	≤ 6 mA
	no	no		no	no
	yes	yes		yes	yes
	≤ 5 %	≤ 5 %		≤ 1 %	≤ 1 %
	–25...+70 °C	–25...+70 °C		–25...+70 °C	–25...+70 °C
	150 Hz	150 Hz		1000 Hz	1000 Hz
	DC 12	DC 12		DC 12	DC 12
	yes	yes		yes	yes
	IP 67	IP 67		IP 67	IP 67
	PA 6	PA 6		PA 6	PA 6
	PA 6	PA 6		PA 6	PA 6
	0.3 m PUR cable with connector	2 m PVC cable		0.3 m PUR cable with connector	2 m/5 m PUR cable
		3×0.09 mm²			3×0.14 mm²
	cULus	cULus		cULus	cULus
	BKS-_ 48			BKS-_ 48	

Mounting bracket BES R04-MF-01 for BES R04... with s_n 1.5 mm
please order separately
M2.5 not included



Installation note for BES R04... with s_n 2.5 mm
Aluminum: full flush mountable
Steel: surrounding 1.5 mm clear zone



1.1
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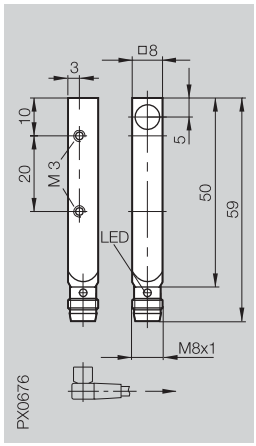
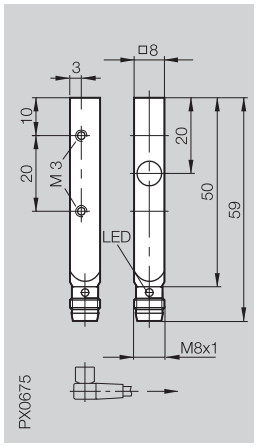
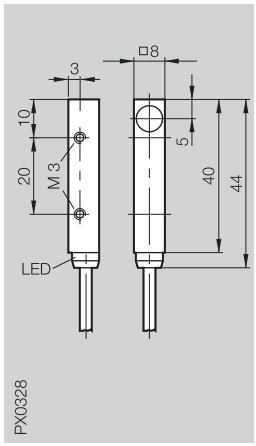
Connectors ... page 5.2 ...

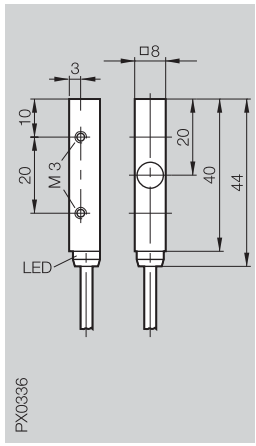
8×8×59 mm, 8×8×44 mm

Housing size	**8×8×59 mm**	**8×8×59 mm**	**8×8×44 mm**	**8×8×44 mm**
Mounting (see notes starting p. **1.0.**11)	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







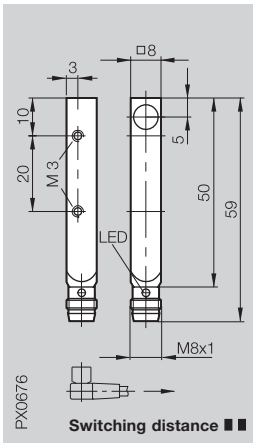
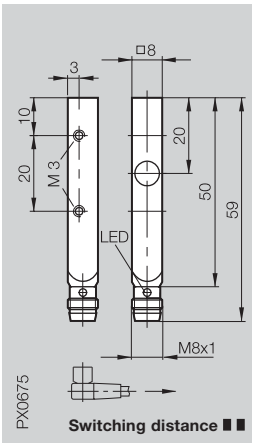
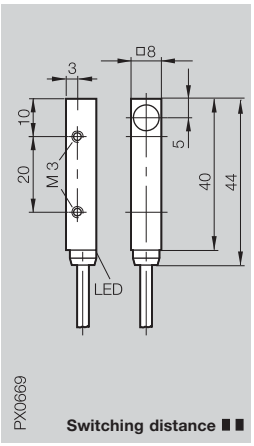
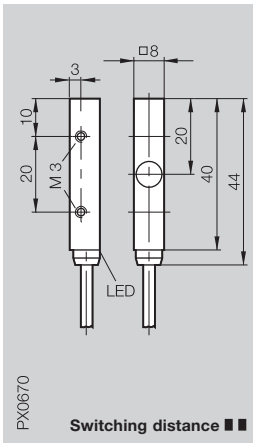
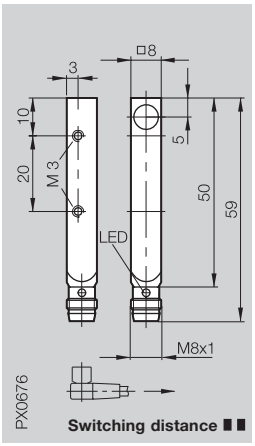


PNP	NO	①	BES 516-300-S166-S49	BES 516-300-S202-S49	BES 516-300-S166-02	BES 516-300-S202-02
	NC	②	BES 516-300-S180-S49		BES 516-300-S180-02	
NPN	NO	④	BES 516-300-S170-S49	BES 516-300-S254-S49	BES 516-300-S170-02	
	NC	⑤				
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e			200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 12 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			5000 Hz	5000 Hz	5000 Hz	5000 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			yes	yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67	IP 67
Housing material			GD-Zn coated	GD-Zn coated	GD-Zn coated	GD-Zn coated
Material of sensing face			POM	POM	POM	POM
Connection			Connector	Connector	2 m PVC cable	2 m PVC cable
No. of wires × cross-section					3×0.14 mm²	3×0.14 mm²
Approval			cULus	cULus	cULus	cULus
Recommended connector			BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49		

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

Connector orientation

	8×8×59 mm	8×8×59 mm	8×8×44 mm	8×8×44 mm	8×8×59 mm
	flush	flush	flush	flush	flush
	2 mm	**2 mm**	**2 mm**	**2 mm**	**2.5 mm**
	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...2 mm
					
	BES Q08ZC-PSC20B-S49G BES Q08ZC-POC20B-S49G	BES Q08ZE-PSC20B-S49G BES Q08ZE-POC20B-S49G	BES Q08ZC-PSC20B-BV02 BES Q08ZC-POC20B-BV02	BES Q08ZE-PSC20B-BV02 BES Q08ZE-POC20B-BV02	BES Q08ZC-PSC25B-S49G
	BES Q08ZC-NSC20B-S49G BES Q08ZC-NOC20B-S49G	BES Q08ZE-NSC20B-S49G BES Q08ZE-NOC20B-S49G	BES Q08ZC-NSC20B-BV02 BES Q08ZC-NOC20B-BV02	BES Q08ZE-NSC20B-BV02	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 12 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	3000 Hz	3000 Hz	3000 Hz	3000 Hz	2000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	GD-Zn coated	GD-Zn coated	GD-Zn coated	GD-Zn coated	GD-Zn coated
	POM	POM	POM	POM	POM
	Connector	Connector	2 m PVC cable	2 m PVC cable	Connector
			3×0.14 mm²	3×0.14 mm²	
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49			BKS-_ 48/BKS-_ 49

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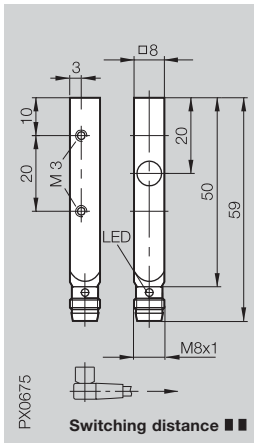
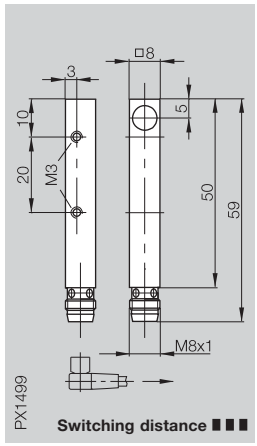
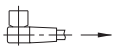
Connectors ...
page 5.2 ...

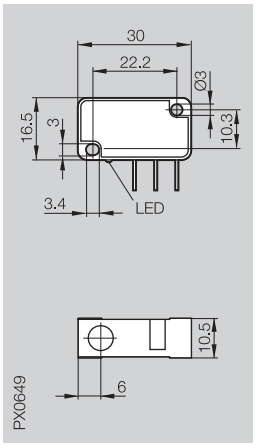
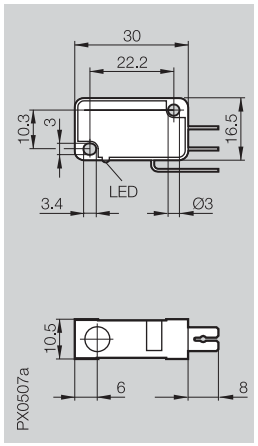
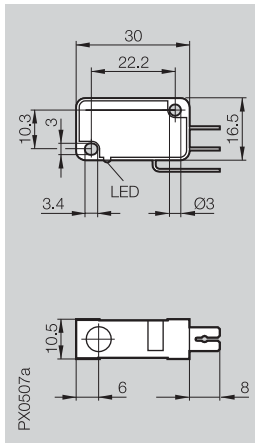
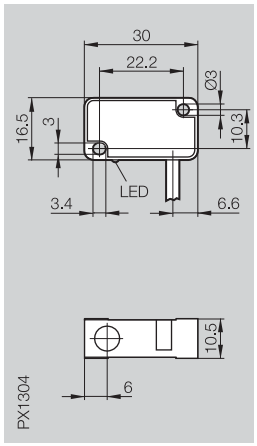
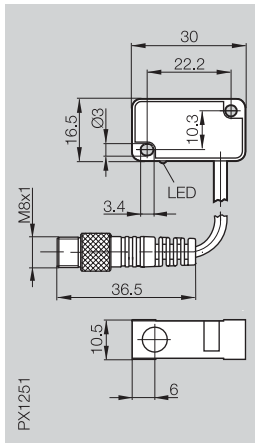
Housing size			**8×8×59 mm**	**8×8×59 mm**		
Mounting (see notes starting p. **1.0.**11)			flush	quasi flush		
Rated operating distance s_n			**2.5 mm**	**3 mm**		
Assured operating distance s_a			0...2 mm	0...2.4 mm		
						
PNP	NO	①	BES Q08ZE-PSC25B-S49G	BES Q08MG-PSC30B-S49G		
	NC	②				
NPN	NO	④		BES Q08MG-NSC30B-S49G		
	NC	⑤				
Supply voltage U_B			10...30 V DC	10...30 V DC		
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2 V		
Rated insulation voltage U_i			75 V DC	75 V DC		
Rated operational current I_e			200 mA	200 mA		
No-load supply current I_0 max.			≤ 12 mA	≤ 10 mA		
Polarity reversal protected			yes	yes		
Short circuit protected			yes	yes		
Repeat accuracy R			≤ 5 %	≤ 5 %		
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C		
Switching frequency f			2000 Hz	1000 Hz		
Utilization category			DC 13	DC 13		
Function indicator			yes	yes		
Degree of protection per IEC 60529			IP 67	IP 67		
Housing material			CuZn coated	CuZn coated		
Material of sensing face			POM	PBT		
Connection			Connector	Connector		
No. of wires × cross-section						
Approval			cULus			
Recommended connector			BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49		

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

 Connector orientation

	16.5×30×10.5 mm Minisensor	**16.5×30×10.5 mm** Minisensor	**16.5×30×10.5 mm** Minisensor	**16.5×30×10.5 mm** Minisensor	**16.5×30×10.5 mm** Minisensor
	flush	flush	flush	flush	flush
	2 mm	**2 mm**	**2 mm**	**2 mm**	**2 mm**
	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm
					
	BES 517-398-N1-C	BES 517-398-N2-C		BES 517-398-N0-C-03	BES 517-398-N0-C-S49-00,2
	BES 517-351-N1-C	BES 517-351-N2-C	BES 517-351-SA2-C	BES 517-351-N0-C-03	BES 517-351-N0-C-S49-00,32
	BES 517-399-N1-C	BES 517-399-N2-C		BES 517-399-N0-C-03	BES 517-399-N0-C-S49-00,2
	BES 517-352-N1-C	BES 517-352-N2-C		BES 517-352-N0-C-03	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	2500 Hz	2500 Hz	2500 Hz	2500 Hz	2500 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	Housing IP 65/Connector IP 00	Housing IP 65/Connector IP 00	Housing IP 65/Connector IP 00	IP 65	IP 65
	PBT	PBT	PBT	PBT	PBT
	PBT	PBT	PBT	PBT	PBT
	Flat connector DIN 46244	Flat connector DIN 46244	Flat connector DIN 46244	3 m PVC cable	0.2 m/0.32 m PUR cable with connector
				3×0.14 mm²	
			Special pin configuration		BKS-_ 48

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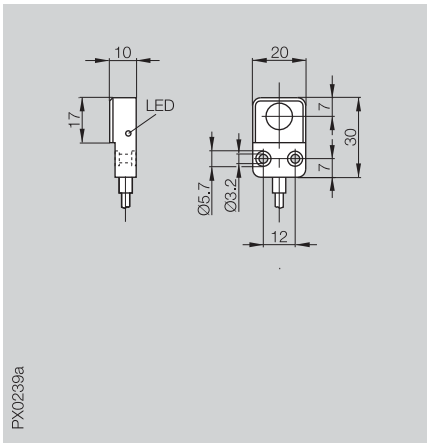
Connectors ...
page 5.2 ...

Housing size		**30×20×10 mm**		
Mounting (see notes starting p. **1.0.**11)		flush		
Rated operating distance s_n		**2 mm**		
Assured operating distance s_a		0...1.6 mm		



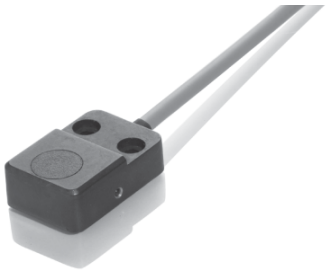
PNP	NO	①	BES 516-300-S279	
	complementary	③		
NPN	NO	④	BES 516-300-S255	
	complementary	⑥		

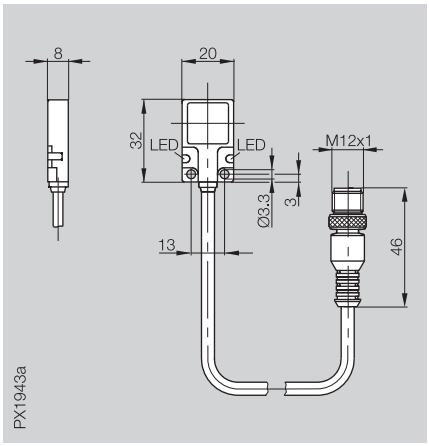
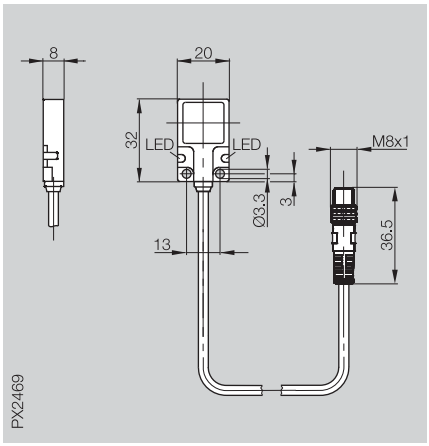
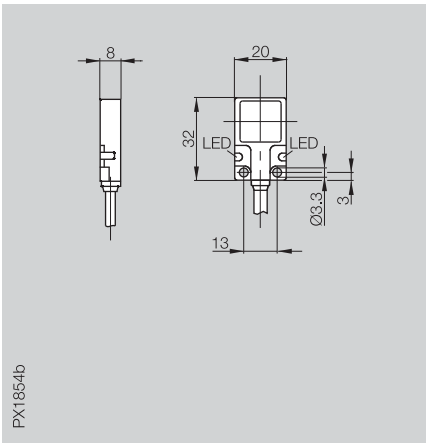
Supply voltage U_B	10...30 V DC		
Voltage drop U_d at I_e	≤ 0.5 V		
Rated insulation voltage U_i	75 V DC		
Rated operational current I_e	50 mA		
No-load supply current I_0 max.	≤ 25 mA		
Polarity reversal protected	yes		
Short circuit protected	no		
Repeat accuracy R	≤ 10 %		
Ambient temperature range T_a	–25...+70 °C		
Switching frequency f	1500 Hz		
Utilization category	DC 13		
Function/Supply voltage indicator	yes/no		
Degree of protection per IEC 60529	IP 65		
Housing material	Anodized GD-Al		
Material of sensing face	PBT		
Connection	5 m PVC cable		
No. of wires × cross-section	3×0.14 mm²		
Approval			
Recommended connector			

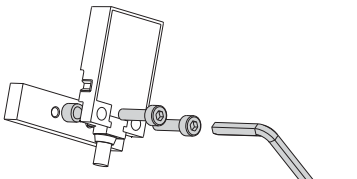
① Wiring diagrams see page **1.0.**6

For sensors with cable, other lengths are available on request.

For sensors with cable and connector, other lengths are available on request.



	20×32×8 mm R01	**20×32×8 mm** R01	**20×32×8 mm** R01
	flush	flush	flush
	7 mm	**7 mm**	**7 mm**
	0...5.7 mm	0...5.7 mm	0...5.7 mm
			
	BES R01ZC-PAC70B-BP00.2-GS04	BES R01ZC-PSC70B-BP00.3-GS49	BES R01ZC-PAC70B-BP03
			BES R01ZC-NAC70B-BP05
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 15 mA	≤ 15 mA
	yes	yes	yes
	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C
	150 Hz	150 Hz	150 Hz
	DC 13	DC 13	DC 13
	yes/yes	yes/yes	yes/yes
	IP 67	IP 67	IP 67
	GD-Zn	GD-Zn	GD-Zn
	PA 12	PA 12	PA 12
	0.2 m PUR cable with connector	0.3 m PUR cable with connector	3 m/5 m PUR cable
			4×0.14 mm²
	cULus	cULus	cULus
	BKS-_ 19	BKS-_ 48	



Mounting set BES R01-FK-1
consisting of:
2 cheese-head screws DIN 912 M3×12
2 spacers Ø5×Ø3.3×3.7
1 angled screwdriver DIN 911, 2.5 mm

Please order separately!

1.1

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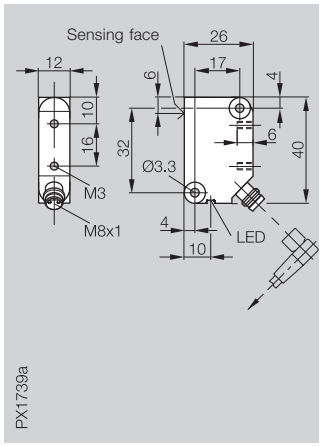
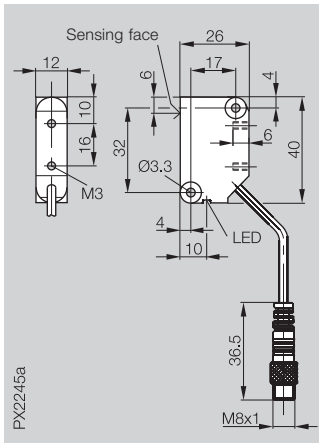
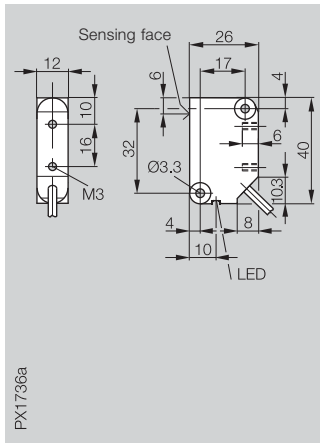
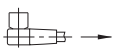
Connectors ...
page 5.2 ...

Housing size		**26×40×12 mm** R05	**26×40×12 mm** R05	**26×40×12 mm** R05
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush
Rated operating distance s_n		**2 mm**	**2 mm**	**2 mm**
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...1.6 mm
				
PNP	NO ①	BES R05KB-PSC20B-S49A	BES R05KB-PSC20B-BP00,3-GS49	BES R05KB-PSC20B-EP02
	NC ②			
NPN	NO ④			
	NC ⑤			
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e		≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i		75 V DC	75 V DC	250 V AC
Rated operational current I_e		200 mA	200 mA	200 mA
No-load supply current I_0 max.		≤ 9 mA	≤ 9 mA	≤ 9 mA
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f		400 Hz	400 Hz	400 Hz
Utilization category		DC 13	DC 13	DC 13
Function/Supply voltage indicator		yes/no	yes/no	yes/no
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Insulation class				⧈
Housing material		PA 12	PA 12	PA 12
Material of sensing face		PA 12	PA 12	PA 12
Connection		Connector	0.3 m PUR cable with connector	2 m cable PUR
No. of wires × cross-section				3×0.34 mm²
Approval		cULus	cULus	cULus
Recommended connector		BKS-_ 48/BKS-_ 49	BKS-_ 48	

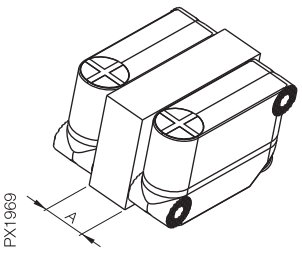
① Wiring diagrams see page **1.0.**6

For sensors with cable, other lengths are available on request.

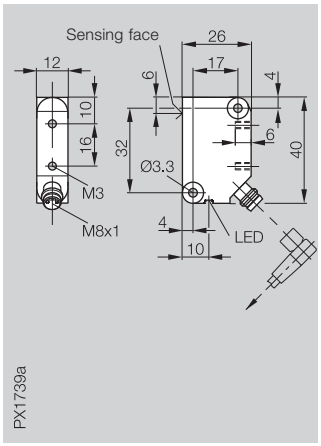
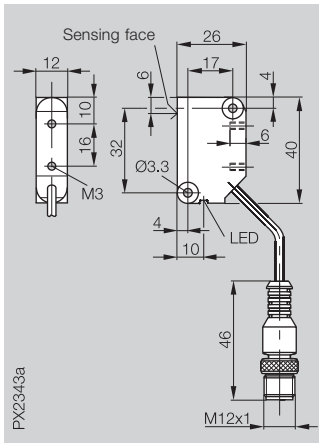
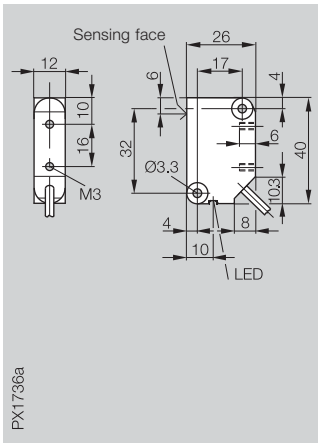
For sensors with cable and connector, other lengths are available on request.

 Connector orientation

Row mounting



for s_n 2 mm
– the sensors can be mounted without Distance A
for s_n 4 mm
– for plastics or without existing material in the space = Distance A at least 17 mm
– for metal in the space = Distance A at least 12 mm

	26×40×12 mm R05	**26×40×12 mm** R05	**26×40×12 mm** R05	
	flush	flush	flush	
	4 mm	**4 mm**	**4 mm**	
	0...3.2 mm	0...3.2 mm	0...3.2 mm	
				
	BES R05KB-PSC40B-S49A BES R05KB-POC40B-S49A	BES R05KB-PSC40B-EP00,3-GS04	BES R05KB-PSC40B-EV02	
	BES R05KB-NSC40B-S49A		BES R05KB-NOC40B-EV02	
	10...30 V DC	10...30 V DC	10...30 V DC	
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	
	75 V DC	250 V AC	250 V AC	
	200 mA	200 mA	200 mA	
	≤ 9 mA	≤ 9 mA	≤ 9 mA	
	yes	yes	yes	
	yes	yes	yes	
	≤ 5 %	≤ 5 %	≤ 5 %	
	–25...+70 °C	–25...+70 °C	–25...+70 °C	
	400 Hz	400 Hz	400 Hz	
	DC 13	DC 13	DC 13	
	yes/no	yes/no	yes/no	
	IP 67	IP 67	IP 67	
		⧈	⧈	
	PA 12	PA 12	PA 12	
	PA 12	PA 12	PA 12	
	Connector	0.3 m PUR cable with connector	2 m PVC cable	
			3×0.34 mm²	
	cULus	cULus	cULus	
	BKS-_ 48/BKS-_ 49	BKS-_ 19		

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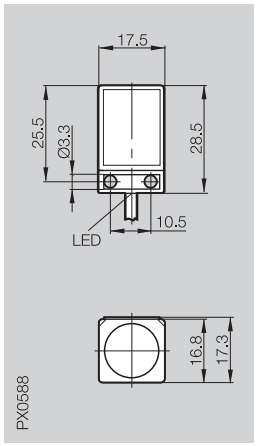
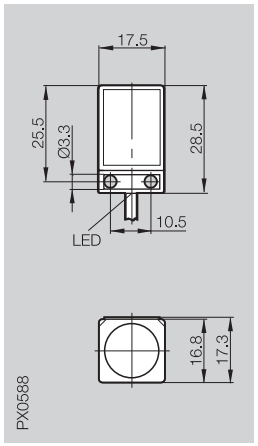
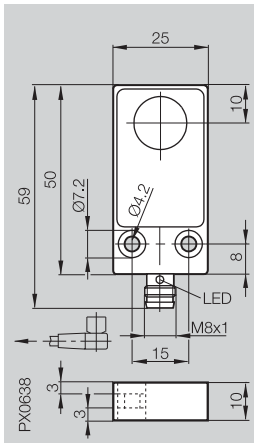
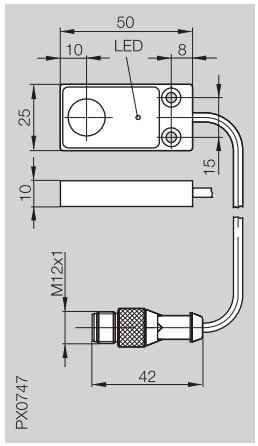
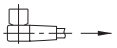
Connectors ...
page 5.2 ...

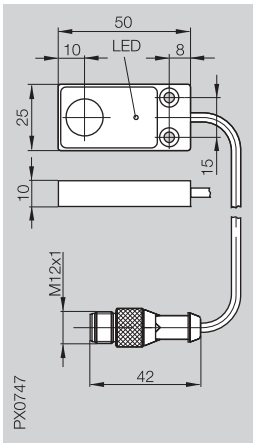
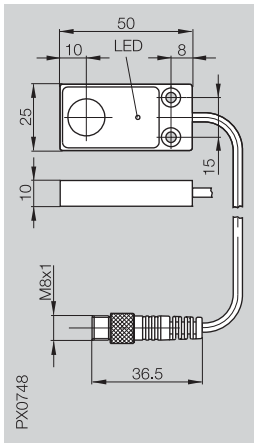
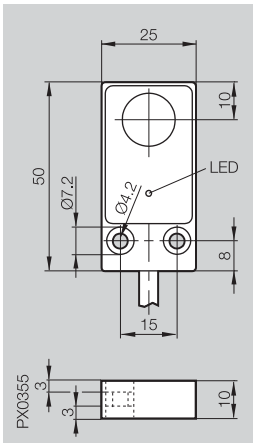
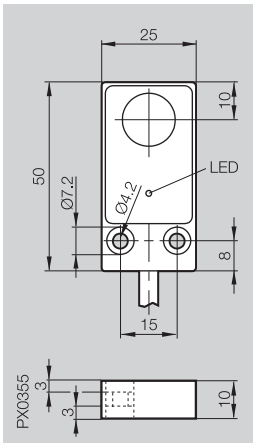
Housing size	**17.5×17.3×28.5 mm**	**17.5×17.3×28.5 mm**	**25×50×10 mm**	**25×50×10 mm**	
Mounting (see notes starting p. **1.0.**11)	flush	non-flush	flush	flush	
Rated operating distance s_n	**3 mm**	**5 mm**	**5 mm**	**5 mm**	
Assured operating distance s_a	0...2.4 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm	
					
PNP NO ①	BES 517-1603-QP-S-03	BES 517-1605-QP-S-03	BES 516-347-M0-C-S49	BES 516-347-M0-C-S4-00,2	
PNP complementary ③					
NPN NO ④	BES 517-1603-QN-S-03	BES 517-1605-QN-S-03			
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Voltage drop U_d at I_e	≤ 1.8 V	≤ 1.8 V	≤ 2.5 V	≤ 2.5 V	
Rated insulation voltage U_i	75 V DC	75 V DC	75 V DC	75 V DC	
Rated operational current I_e	50 mA	50 mA	200 mA	200 mA	
No-load supply current I_0 max.	≤ 20 mA	≤ 20 mA	≤ 25 mA	≤ 25 mA	
Polarity reversal protected	yes	yes	yes	yes	
Short circuit protected	yes	yes	yes	yes	
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
Switching frequency f	500 Hz	500 Hz	500 Hz	500 Hz	
Utilization category	DC 13	DC 13	DC 13	DC 13	
Function indicator	yes	yes	yes	yes	
Degree of protection per IEC 60529	IP 67	IP 67	IP 65	IP 67	
Housing material	AES/CP	AES/CP	GD-Al	GD-Al	
Material of sensing face	AES/CP	AES/CP	PBT	PBT	
Connection	3 m PVC cable	3 m PVC cable	Connector	0.2 m PUR cable with connector	
No. of wires × cross-section	3×0.14 mm²	3×0.14 mm²			
Recommended connector			BKS-_ 48/BKS-_ 49	BKS-_ 19	

① Wiring diagrams see page **1.0.**6

For sensors with cable, other lengths and PUR quality are available on request.

For sensors with cable and connector, other lengths are available on request.

 Connector orientation

	25×50×10 mm	**25×50×10 mm**	**25×50×10 mm**	**25×50×10 mm**	
	flush	flush	flush	flush	
	5 mm	**5 mm**	**5 mm**	**5 mm**	
	0...4.1 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm	
					
	BES 516-133-M0-C-S4-00,2	BES 516-347-M0-C-S49-00,2	BES 516-347-M0-C-02	BES 516-133-M0-C-02	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	
	75 V DC	75 V DC	75 V DC	75 V DC	
	200 mA	200 mA	200 mA	200 mA	
	≤ 32 mA	≤ 25 mA	≤ 25 mA	≤ 32 mA	
	yes	yes	yes	yes	
	yes	yes	yes	yes	
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	
	500 Hz	500 Hz	500 Hz	500 Hz	
	DC 13	DC 13	DC 13	DC 13	
	yes	yes	yes	yes	
	IP 67	IP 67	IP 67	IP 67	
	GD-Al	GD-Al	GD-Al	GD-Al	
	PBT	PBT	PBT	PBT	
	0.2 m PUR cable with connector	0.2 m PUR cable with connector	2 m PVC cable	2 m PVC cable	
			3×0.34 mm²	4×0.25 mm²	
	BKS-_ 19	BKS-_ 48			

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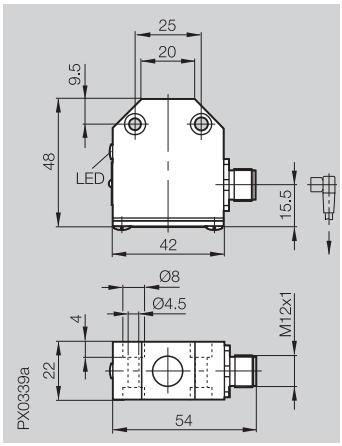
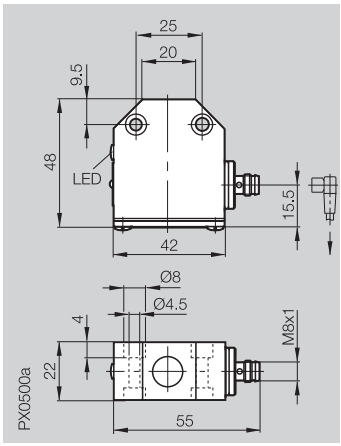
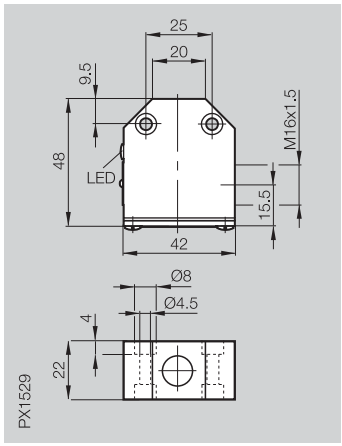
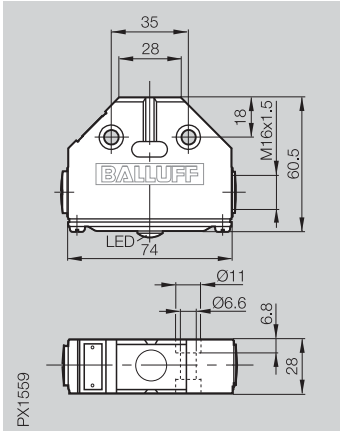
5
Connectors ...
page 5.2 ...

Housing size			**42×48×22 mm**	**42×48×22 mm**	**42×48×22 mm**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush
Rated operating distance s_n			**5 mm**	**5 mm**	**5 mm**
Assured operating distance s_a			0...4.1 mm	0...4.1 mm	0...4.1 mm
					
PNP	NO	①	BES 516-346-H2-Y-S4	BES 516-346-H2-Y-S49	BES 516-346-H2-Y
	NC	②	BES 516-341-H2-Y-S4		BES 516-341-H2-Y
	complementary	③			
NPN	NO	④			BES 516-344-H2-Y
	NC	⑤			BES 516-340-H2-Y
	complementary	⑥			
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 3.5 V	≤ 3.5 V	≤ 3.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC
Rated operational current I_e			130 mA	130 mA	130 mA
No-load supply current I_0 max.			≤ 25 mA	≤ 25 mA	≤ 25 mA
Polarity reversal protected			yes	yes	yes
Short circuit protected			yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f			500 Hz	500 Hz	500 Hz
Utilization category			DC 13	DC 13	DC 13
Function indicator			yes	yes	yes
Degree of protection per IEC 60529			IP 67	IP 67	IP 67
Housing material			Anodized GD-Al	Anodized GD-Al	Anodized GD-Al
Material of sensing face			PA 12	PA 12	PA 12
Connection			Connector	Connector	Screw terminals
max. conductor cross-section					up to 2.5 mm²
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	

① Wiring diagrams see page **1.0.**6

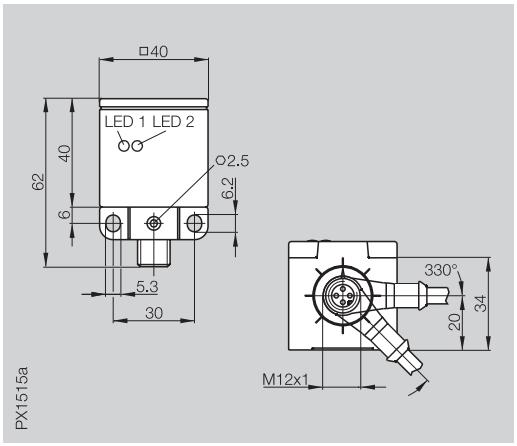
Connector orientation

	74×60.5×28 mm
	flush
	7 mm
	0...5.7 mm
	
	BES 516-161-H3-L
	BES 516-160-H3-L
	10...30 V DC
	≤ 1.5 V
	75 V DC
	400 mA
	≤ 30 mA
	yes
	no
	≤ 5 %
	–25...+70 °C
	300 Hz
	DC 13
	yes
	IP 67
	Anodized GD-Al
	PA 12
	Screw terminals
	up to 2.5 mm²

5
Connectors ...
page 5.2 ...

For additional multiple and single position limit switches in main catalog „The Mechanical Line“, on CD-ROM/DVD-ROM or online!

Housing size	**40×40×62 mm** Unicompact
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**20 mm**
Assured operating distance s_a	0...16.2 mm



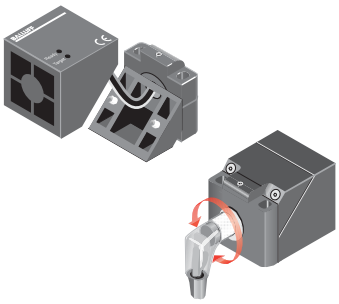
Unicompact
The flexible sensor for varied applications in machine and systems building, even when space is limited.

The connector can be rotated in any direction, so the cable always faces the desired direction.

PNP	NO ①	BES Q40KFU-PSC20B-S04G
	complementary ③	BES Q40KFU-PAC20B-S04G
NPN	complementary ⑥	

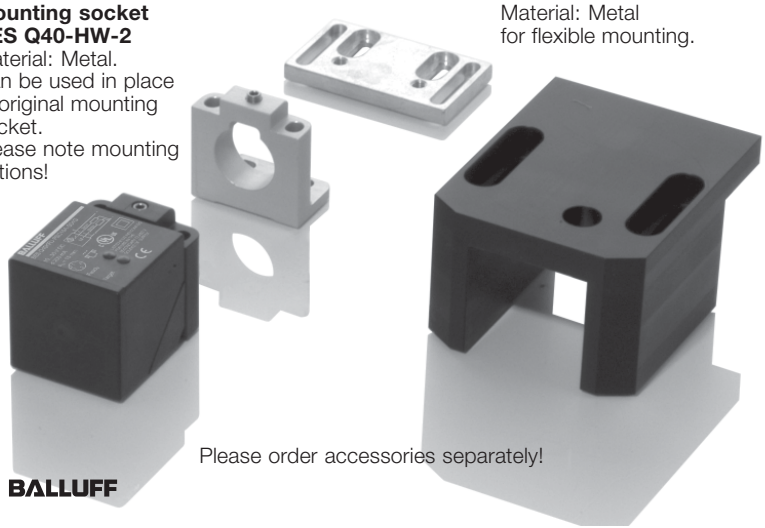
Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 20 mA
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	50 Hz
Utilization category	DC 13
Function/Supply voltage indicator	yes/yes
Degree of protection per IEC 60529	IP 67
Insulation class	⧈
Housing material	PBT
Material of sensing face	PBT
Connection	Connector
Approval	cULus
Recommended connector	BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6

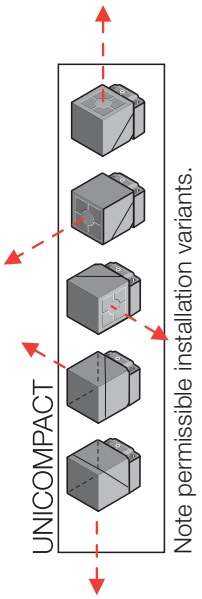


Mounting socket
BES Q40-HW-2
Material: Metal.
Can be used in place of original mounting socket.
Please note mounting options!

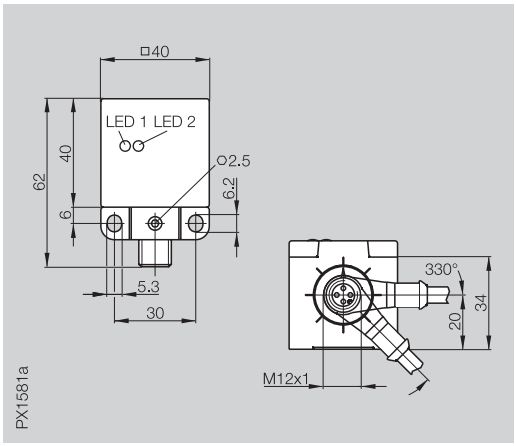
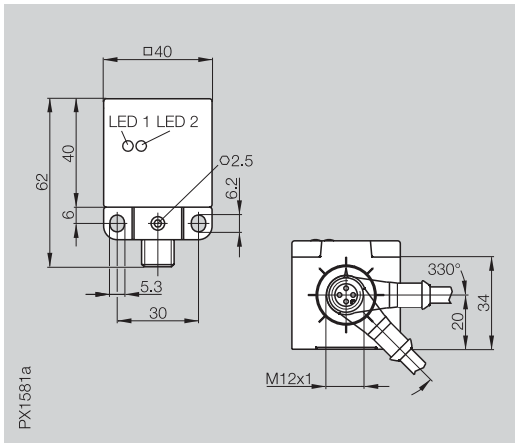
Mounting bracket
BES Q40-HW-1
Material: Metal
for flexible mounting.



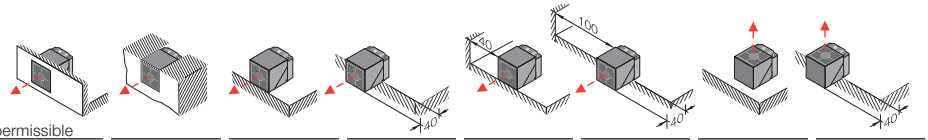
Protective cover
BES Q40-SH-2
Material: PA 6
Provides step protection.



Please order accessories separately!

	40×40×62 mm Unicompact non-flush **25 mm** 0...20.3 mm	**40×40×62 mm** Unicompact non-flush **30 mm** 0...24.3 mm
		
		BES Q40KFU-PSC30F-S04G BES Q40KFU-PAC30F-S04G
	BES Q40KFU-NAC25F-S04G	
	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC
	200 mA	200 mA
	≤ 20 mA	≤ 20 mA
	yes	yes
	yes	yes
	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C
	50 Hz	50 Hz
	DC 13	DC 13
	yes/yes	yes/yes
	IP 67	IP 67
	⧈	⧈
	PBT	PBT
	PBT	PBT
	Connector	Connector
	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

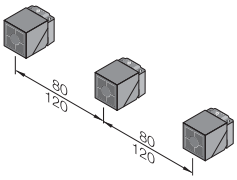
Permissible mounting options



Rated operating distance s_n	Attached using	permissible							
20 mm	original mounting socket (plastic)	yes	yes	yes	yes	yes	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	yes	yes	yes	yes	yes	yes	yes	yes
25 mm	Original mounting socket (plastic)	no	no	no	yes	no	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	no	no	no	yes	no	yes	yes	yes
30 mm	Original mounting socket (plastic)	no	no	no	yes	no	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	no	no	no	yes	no	yes	no	no

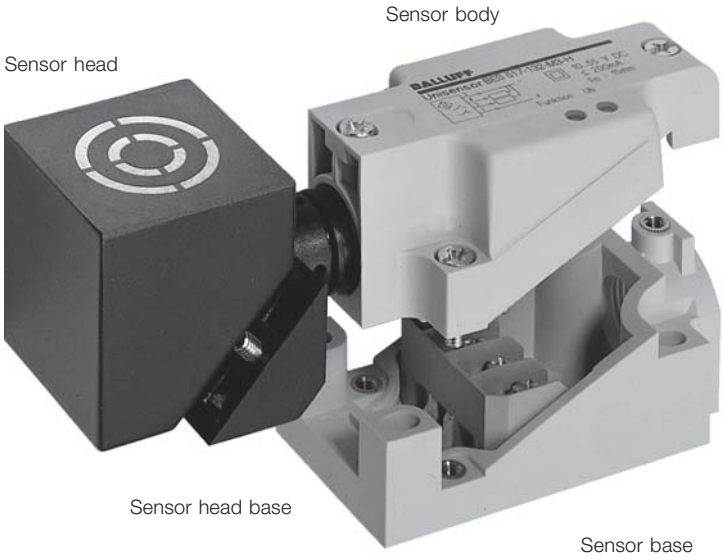
Row mounting

flush 80 mm
non-flush 120 mm



1.1

5
Connectors, Holders ...
Page 5.2 ...



The Unisensor – multiple uses

- The Unisensor is made up of three modular components: sensor head (including sensor head base), sensor body and sensor base.
- Easily removable pin contacts join sensor head and sensor body, e.g. easy interchange of the modules without wiring.
- Sensor base with wiring terminals, self-lifting pressure plates and ample wiring room.
- Sensor head rotatable in 5 different positions for easy adaptation to any application (see installation drawings).
- Plastic housing of PBT.
- DIN EN 60947-5-2 mounting dimensions.
- LED for supply voltage.
- LED for function indication
- Also available in special configuration for the automotive industry
- Cable fitting not included.
- In the complementary version, output terminals 2 or 4 can be wired to configure the switch as normally-closed (terminal 2) or normally-open (terminal 4). Connecting both terminals allows the switch to be used as both (see connection diagram ③ or ⑥).

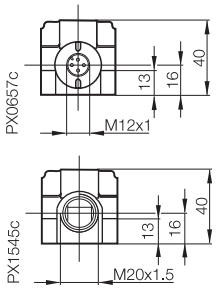
Positioning the sensor head

- Loosen the two holding screws on sensor head
- Rotate sensor head 180°
- Tighten holding screws

Rotating the sensor head

- Loosen holding screws
- Rotate the sensor head (complete with sensor head base) into the required position (range 270°)
- Tighten holding screws
- Sensor head is protected against over-rotation

Housing size		
Mounting (see notes starting p. **1.0.**11)		
Rated operating distance s_n		
Assured operating distance s_a		

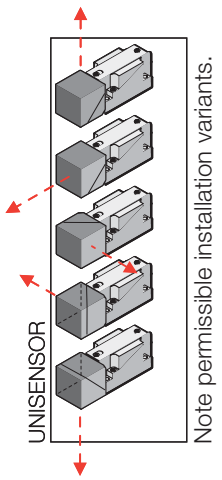


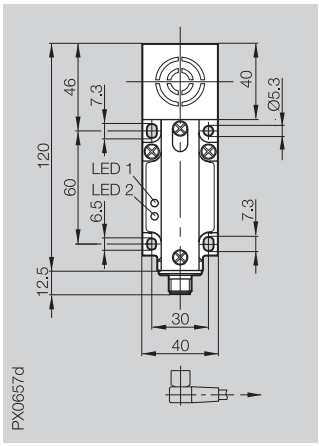
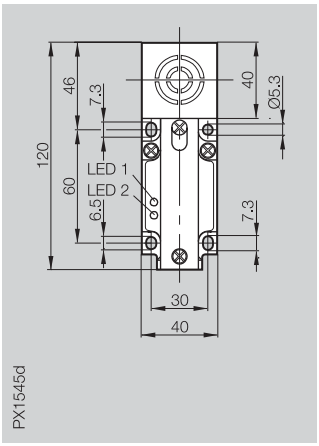
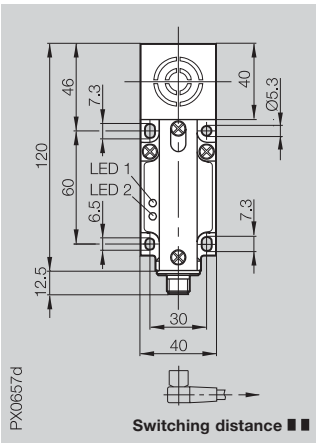
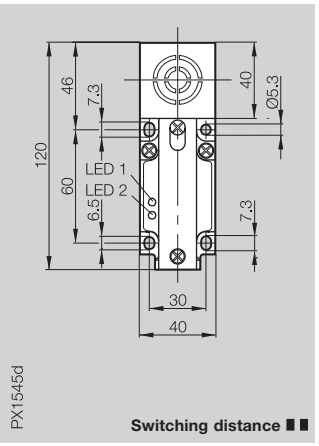
PNP	complementary	③
NPN	complementary	⑥

Supply voltage U_B		
Voltage drop U_d at I_e		
Rated insulation voltage U_i		
Rated operational current I_e		
No-load supply current I_0 max.		
Polarity reversal protected		
Short circuit protected		
Repeat accuracy R		
Ambient temperature range T_a		
Switching frequency f		
Utilization category		
Function/Supply voltage indicator		
Degree of protection per IEC 60529		
Insulation class		
Housing material		
Material of sensing face		
Connection		
max. conductor cross-section		
Recommended connector		
possible mounting options		

③ Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Connector orientation



	40×40×120 mm Unisensor	**40×40×120 mm** Unisensor	**40×40×120 mm** Unisensor	**40×40×120 mm** Unisensor
	flush	flush	flush	flush
	15 mm	**15 mm**	**20 mm**	**20 mm**
	0...12.2 mm	0...12.2 mm	0...16.2 mm	0...16.2 mm
				
	BES 517-132-M3-H-S4	BES 517-132-M3-H	BES 517-132-M6-H-S4	BES 517-132-M6-H
		BES 517-134-M3-H	BES 517-134-M6-H-S4	BES 517-134-M6-H
	10...55 V DC	10...55 V DC	10...55 V DC	10...55 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
	yes	yes	yes	yes
	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	100 Hz	100 Hz	50 Hz	50 Hz
	DC 13	DC 13	DC 13	DC 13
	yes/yes	yes/yes	yes/yes	yes/yes
	IP 67	IP 67	IP 67	IP 67
	⧈	⧈	⧈	⧈
	PBT	PBT	PBT	PBT
	PBT	PBT	PBT	PBT
	Connector	Screw terminals up to 2.5 mm²	Connector	Screw terminals up to 2.5 mm²
	BKS-_ 19/BKS-_ 20		BKS-_ 19/BKS-_ 20	
	Fig. 1 to 5	Fig. 1 to 5	Fig. 1 to 5	Fig. 1 to 5

Mounting options

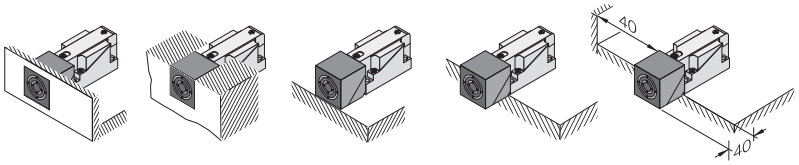
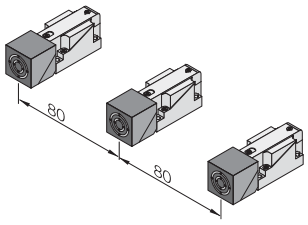


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

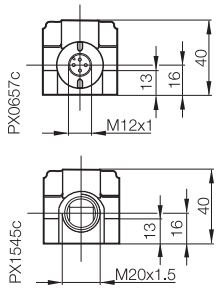
Row mounting

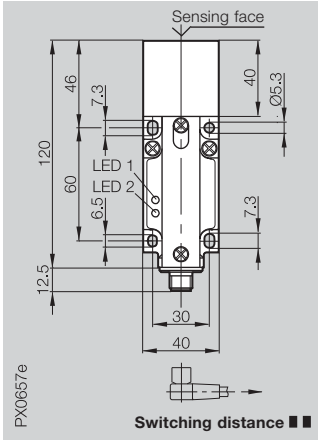


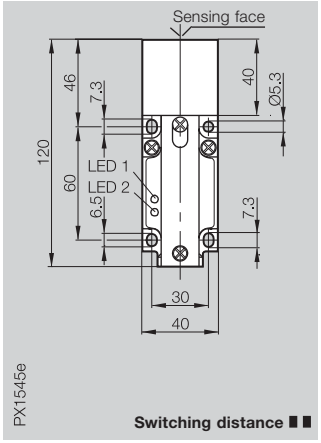
1.1

5
Connectors, mounting plate ... page 5.2 ...

Housing size			**40×40×120 mm** Unisensor	**40×40×120 mm** Unisensor
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush
Rated operating distance s_n			**programmable 25/40 mm**	**programmable 25/40 mm**
Assured operating distance s_a			0...20.3 mm/0...32.4 mm	0...20.3 mm/0...32.4 mm



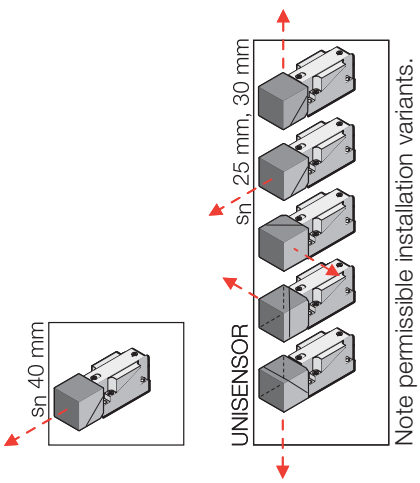


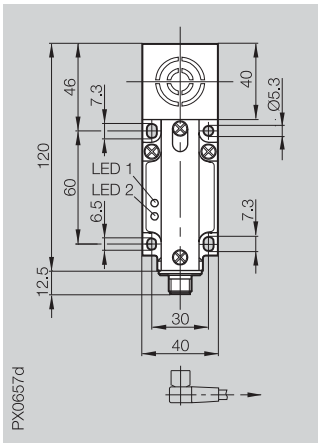
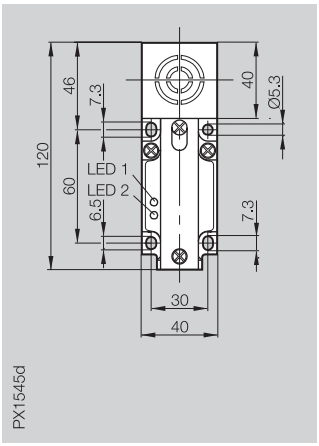
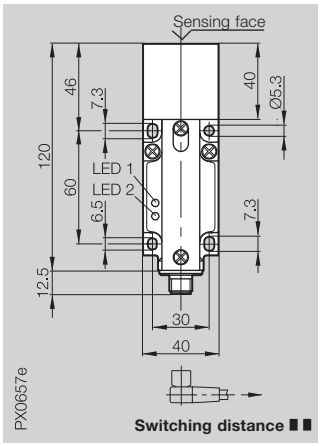
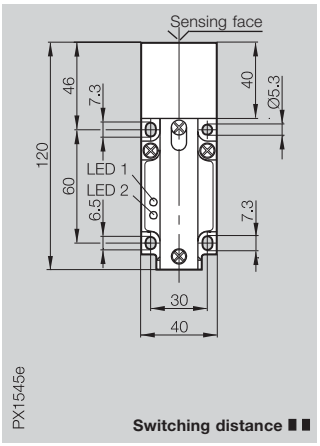


PNP	NO	①	BES 517-385-V-C-S4	BES 517-385-MV-C
	complementary	③		
NPN	complementary	⑥		
Supply voltage U_B			10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 3.5 V	≤ 3.5 V
Rated insulation voltage U_i			250 V AC	250 V AC
Rated operational current I_e			200 mA	200 mA
No-load supply current I_0 max.			≤ 15 mA	≤ 15 mA
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C
Switching frequency f			50 Hz	50 Hz
Utilization category			DC 13	DC 13
Function/Supply voltage indicator			yes/yes	yes/yes
Degree of protection per IEC 60529			IP 67	IP 67
Insulation class			⧈	⧈
Housing material			PBT	PBT
Material of sensing face			PBT	PBT
Connection			Connector	Screw terminals
max. conductor cross-section				up to 2.5 mm²
Recommended connector			BKS-_ 19/BKS-_ 20	
possible mounting options			s_n 40 mm Fig. 1 and 2 s_n 25 mm Fig. 1 to 3	s_n 40 mm Fig. 1 and 2 s_n 25 mm Fig. 1 to 3

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Connector orientation



	40×40×120 mm Unisensor non-flush **30 mm** 0...24.3 mm	**40×40×120 mm** Unisensor non-flush **30 mm** 0...24.3 mm	**40×40×120 mm** Unisensor non-flush **40 mm** 0...32.4 mm	**40×40×120 mm** Unisensor non-flush **40 mm** 0...32.4 mm
				
	BES 517-132-M5-H-S4	BES 517-132-M5-H	BES 517-132-M7-H-S4	BES 517-132-M7-H
	BES 517-134-M5-H-S4	BES 517-134-M5-H		
	10...55 V DC	10...55 V DC	10...55 V DC	10...55 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
	yes	yes	yes	yes
	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	60 Hz	60 Hz	50 Hz	50 Hz
	DC 13	DC 13	DC 13	DC 13
	yes/yes	yes/yes	yes/yes	yes/yes
	IP 67	IP 67	IP 67	IP 67
	⧈	⧈	⧈	⧈
	PBT	PBT	PBT	PBT
	PBT	PBT	PBT	PBT
	Connector	Screw terminals up to 2.5 mm²	Connector	Screw terminals up to 2.5 mm²
	BKS-_ 19/BKS-_ 20		BKS-_ 19/BKS-_ 20	
	Fig. 1 and 3	Fig. 1 and 3	Fig. 1 and 2	Fig. 1 and 2

Mounting options

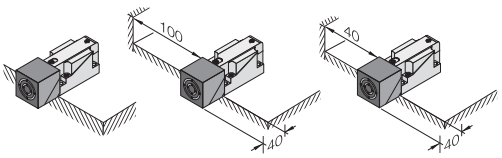
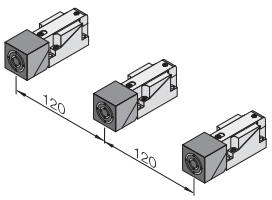


Fig. 1 Fig. 2 Fig. 3

Row mounting



1.1

5
Connectors, mounting plate ... page 5.2 ...

DC 3-/4-wire
Block style housings
s_n 40 mm, 50 mm

80×84×40 mm

Housing size	**80×84×40 mm** Maxisensor	**80×84×40 mm** Maxisensor
Mounting (see notes starting p. **1.0.**11)	flush	non-flush
Rated operating distance s_n	**40 mm**	**50 mm**
Assured operating distance s_a	0...32.4 mm	0...40.5 mm

Non-flush mount

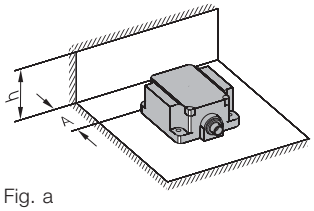


Fig. a

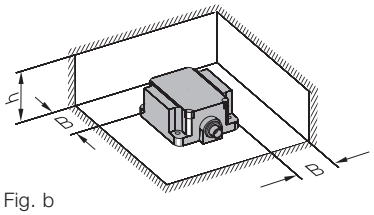


Fig. b

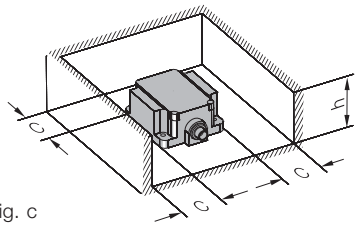
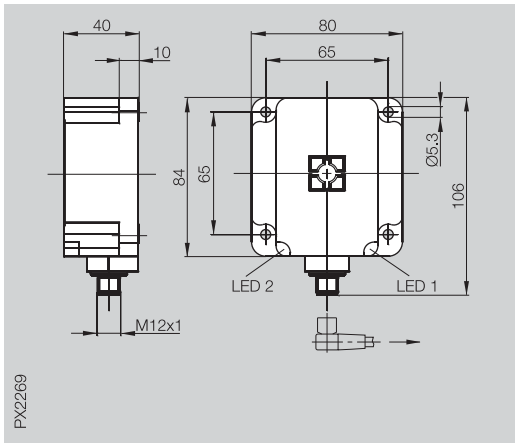


Fig. c



PNP	NO	①	BES Q80KA-PSH40B-S04Q	BES Q80KA-PSH50F-S04Q
	complementary	③	BES Q80KA-PAH40B-S04Q	BES Q80KA-PAH50F-S04Q
NPN	complementary	⑥		
Supply voltage U_B			10...55 V DC	10...55 V DC
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i			250 V AC	250 V AC
Rated operational current I_e			200 mA	200 mA
No-load supply current I_0 max.			≤ 15 mA	≤ 15 mA
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C
Switching frequency f			50 Hz	50 Hz
Utilization category			DC 13	DC 13
Function/Supply voltage indicator			yes/yes	yes/yes
Degree of protection per IEC 60529			IP 67	IP 67
Insulation class			⧈	⧈
Housing material			PBT	PBT
Material of sensing face			PBT	PBT
Connection			Connector	Connector
max. conductor cross-section				
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20
possible mounting options			Fig. d	Fig. a to c

Minimum distances with steel

h	A	B	C
40	70	80	90
70	80	90	100

Minimum distances with aluminum

h	A	B	C
40	0	10	10
70	10	20	20

Dimensions in mm

The change in effective operating distance s_r for these installation dimensions is ≤ 10 %.

Flush mount

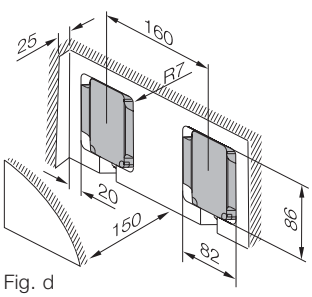
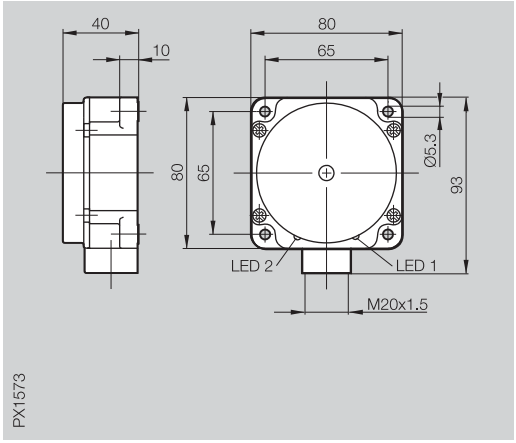
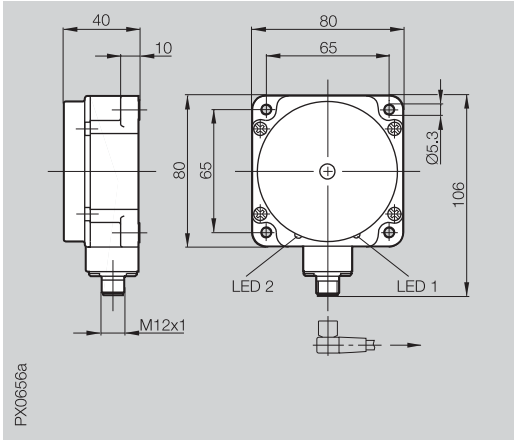


Fig. d

	80×80×40 mm Maxisensor flush	**80×80×40 mm** Maxisensor non-flush	**80×80×40 mm** Maxisensor non-flush
	40 mm	**50 mm**	**50 mm**
	0...32.4 mm	0...40.5 mm	0...40.5 mm
			
	BES 517-139-M4-H	BES 517-139-M5-H	
		BES 517-140-M5-H	BES 517-140-M5-H-S4
	10...55 V DC	10...55 V DC	10...55 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 15 mA	≤ 15 mA
	yes	yes	yes
	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C
	50 Hz	100 Hz	100 Hz
	DC 13	DC 13	DC 13
	yes/yes	yes/yes	yes/yes
	IP 67	IP 67	IP 67
	⧈	⧈	⧈
	PBT	PBT	PBT
	PBT	PBT	PBT
	Screw terminals	Screw terminals	Connector
	up to 2.5 mm²	to 2.5 mm²	
			BKS-_ 19/BKS-_ 20
	Fig. 1 to 4	Fig. 4	Fig. 4

Mounting in steel

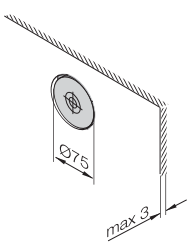


Fig. 1

Mounting in non-ferrous metals

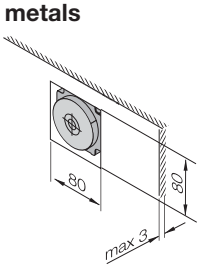


Fig. 2

Mounting in steel/ non-ferrous metals

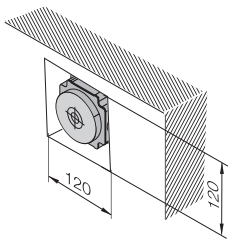


Fig. 3

Mounting on steel/ non-ferrous metals

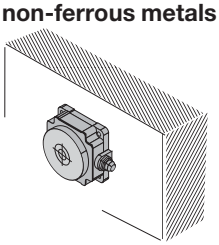
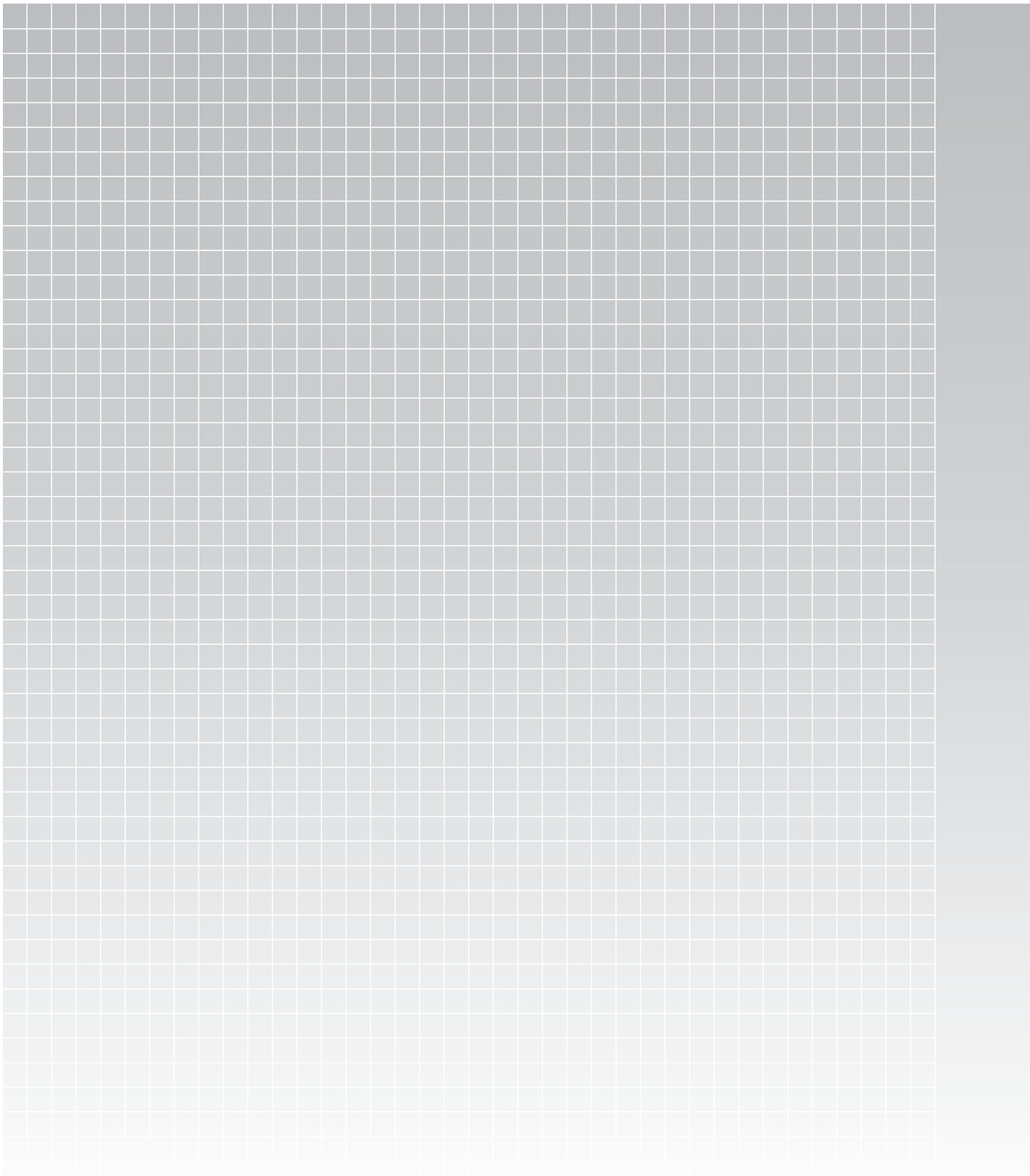


Fig. 4

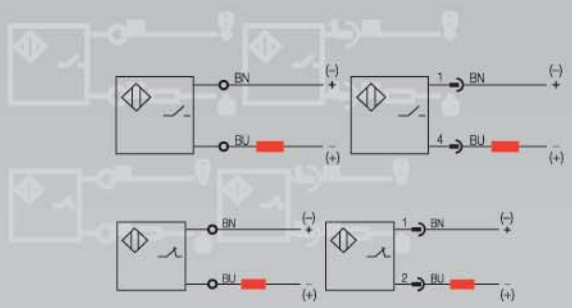
1.1

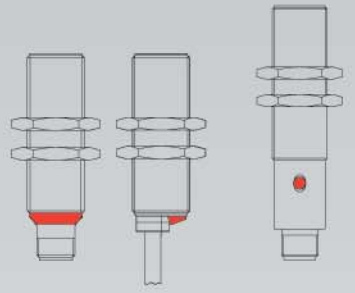
5
Connectors
page 5.2 ...



Inductive – DC 2-wire

1.2



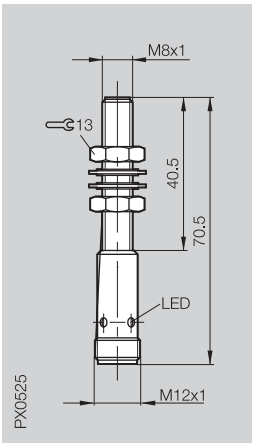
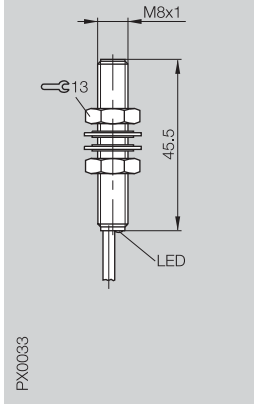
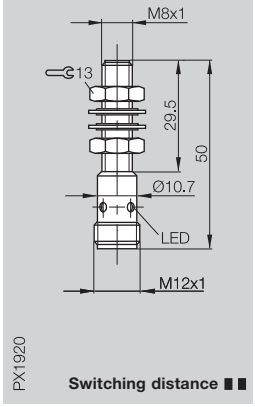
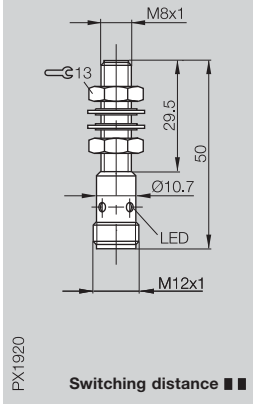


40 to 50 mm
housing length with
maximum thread
length and switching
distance ■■

Size
housing length

Our standard line in 2-wire DC

With this broad range of products, Balluff offers proximity switches in housings from M8 to M30 as well as block style housings for virtually any application in the field of automation.

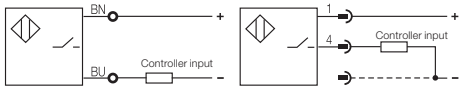
Housing size	**M8×1**	**M8×1**	**M8×1**	**M8×1**
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush
Rated operating distance s_n	**1.5 mm**	**1.5 mm**	**2 mm**	**2 mm**
Assured operating distance s_a	0...1.2 mm	0...1.2 mm	0...1.6 mm	0...1.6 mm
				
NO ⑨ non-polarized ⑦ polarized			BES M08ME1-USC20B-S04G	BES M08ME1-GSC20B-S04G
NC ⑩ non-polarized	BES 516-527-S4-H	BES 516-527-E0-H-03		
Supply voltage U_B	10...55 V DC non-polarized	10...55 V DC non-polarized	10...30 V DC non-polarized	10...30 V DC polarized
Voltage drop U_d at I_e	≤ 5 V	≤ 5 V	≤ 5 V	≤ 5 V
Rated insulation voltage U_i	75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e	130 mA	130 mA	100 mA	100 mA
Minimum operating current I_m	5 mA	5 mA	5 mA	5 mA
Off-state current I_r	≤ 500 µA	≤ 500 µA	≤ 600 µA	≤ 600 µA
Polarity reversal protected	yes	yes	yes	yes
Short circuit protected	yes	yes	yes	yes
Permissible load capacitance	≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	3000 Hz	3000 Hz	max. 1500 Hz	max. 1500 Hz
Utilization category	DC 13	DC 13	DC 13	DC 13
Function indicator	yes	yes	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67
Housing material	Stainless steel	Stainless steel	CuZn coated	CuZn coated
Material of sensing face	PBT	PBT	PBT	PBT
Connection	Connector	3 m PVC cable	Connector	Connector
No. of wires × cross-section		2×0.14 mm²		
Approval	cULus	cULus	cULus	cULus
Recommended connector	BKS-S 19-12/-S 20-12		BKS-S 19-11/-S 20-11	BKS-S 19-13/-S 20-13

⑨ For wiring diagrams for 2-wire controllers, see page **1.0.**6
Switching distance ■■ see page **1.0.**10

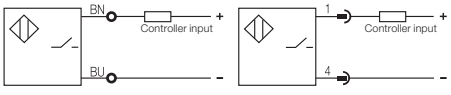
Other cable lengths and PUR cable jacket material on request.

Recommendation for wiring polarized sensors to 3-wire controllers

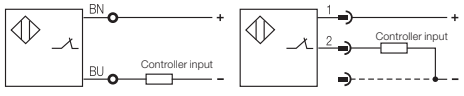
PNP/N.O.



NPN/N.O.



PNP/N.C.



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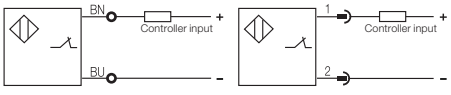
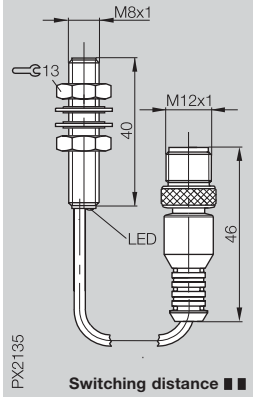
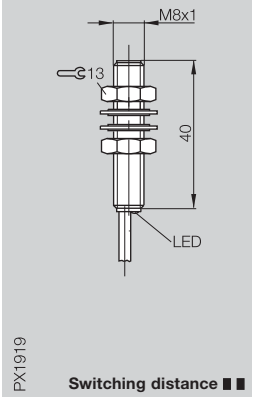
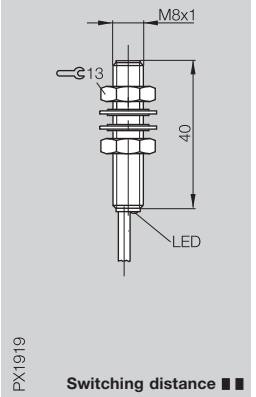


DC 2-wire sensors – for universal use

DC 2-wire sensors can also be used together with most PNP or NPN controllers.

Use of these sensors enables a reduction in the number of inventoried part numbers.

Suitability of the 2-wire sensors for the respective PNP or NPN controller should be tested in advance.

	M8×1	**M8×1**	**M8×1**		
	flush	flush	flush		
	2 mm	**2 mm**	**2 mm**		
	0...1.6 mm	0...1.6 mm	0...1.6 mm		
					
	BES M08MG-GSC20B-BP00,3-GS04	BES M08MG-USC20B-BV02	BES M08MG-GSC20B-BV02		
	10...30 V DC polarized	10...30 V DC non-polarized	10...30 V DC polarized		
	≤ 5 V	≤ 5 V	≤ 5 V		
	75 V DC	75 V DC	75 V DC		
	100 mA	100 mA	100 mA		
	5 mA	5 mA	5 mA		
	≤ 600 µA	≤ 600 µA	≤ 600 µA		
	yes	yes	yes		
	yes	yes	yes		
	≤ 1 µF	≤ 1 µF	≤ 1 µF		
	≤ 5 %	≤ 5 %	≤ 5 %		
	–25...+70 °C	–25...+70 °C	–25...+70 °C		
	max. 1500 Hz	max. 1500 Hz	max. 1500 Hz		
	DC 13	DC 13	DC 13		
	yes	yes	yes		
	IP 67	IP 67	IP 67		
	CuZn coated	CuZn coated	CuZn coated		
	PBT	PBT	PBT		
	0.3 m PUR cable with connector	2 m PVC cable	2 m PVC cable		
		2×0.14 mm²	2×0.14 mm²		
	cULus	cULus	cULus		
	BKS-S 19-13				

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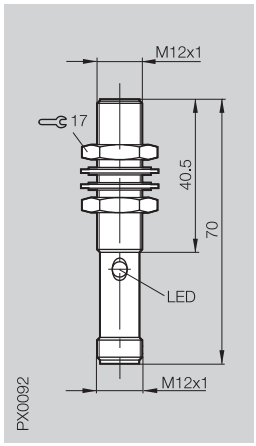
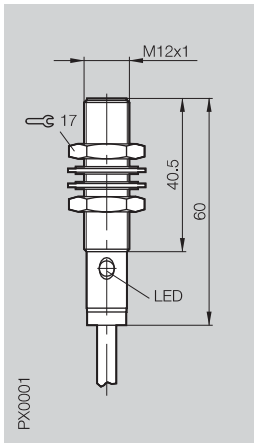
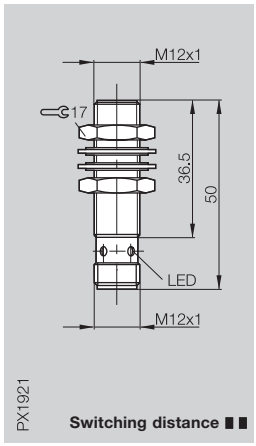
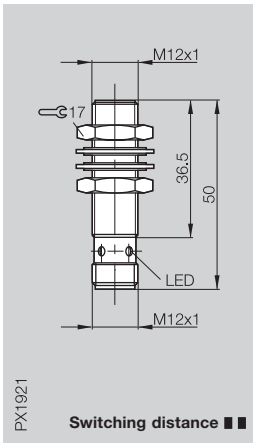
5
Connectors, Holders ...
Page 5.2 ...

Housing size	**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush
Rated operating distance s_n	**2 mm**	**2 mm**	**3 mm**	**3 mm**
Assured operating distance s_a	0...1.6 mm	0...1.6 mm	0...2.4 mm	0...2.4 mm





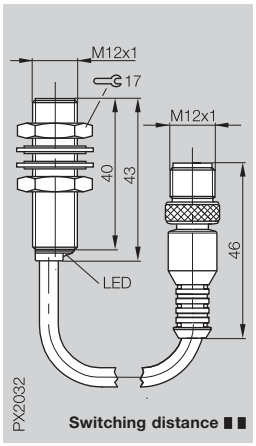
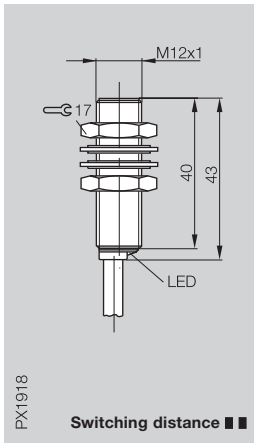
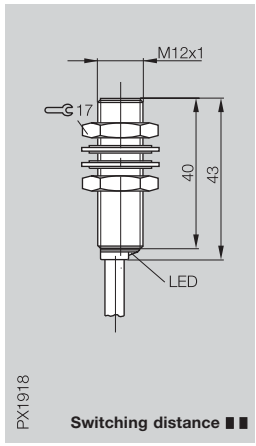
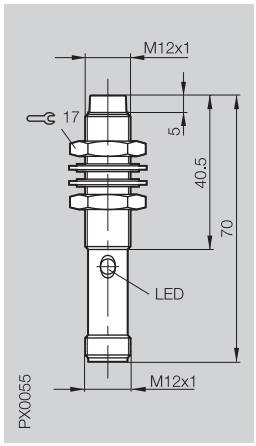
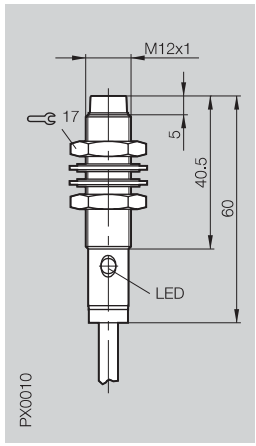




NO ⑨ non-polarized ⑦ polarized			BES M12MF-USC30B-S04G	BES M12MF-GSC30B-S04G
NC ⑩ non-polarized	BES 516-543-S4-H	BES 516-543-B0-H-03		
Supply voltage U_B	10...55 V DC non-polarized	10...55 V DC non-polarized	10...30 V DC non-polarized	10...30 V DC polarized
Voltage drop U_d at I_e	≤ 5 V	≤ 5 V	≤ 5 V	≤ 4 V
Rated insulation voltage U_i	250 V AC	250 V AC	75 V DC	75 V DC
Rated operational current I_e	200 mA	200 mA	100 mA	100 mA
Minimum operating current I_m	5 mA	5 mA	5 mA	5 mA
Off-state current I_r	≤ 500 µA	≤ 500 µA	≤ 600 µA	≤ 600 µA
Polarity reversal protected	yes	yes	yes	yes
Short circuit protected	yes	yes	yes	yes
Permissible load capacitance	≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	2500 Hz	2500 Hz	max. 1300 Hz	max. 1300 Hz
Utilization category	DC 13	DC 13	DC 13	DC 13
Function indicator	yes	yes	yes	yes
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	IP 67
Insulation class	⧈	⧈		
Housing material	Stainless steel	Stainless steel	CuZn coated	CuZn coated
Material of sensing face	PA 12	PA 12	PA 12	PA 12
Connection	Connector	3 m PVC cable	Connector	Connector
No. of wires × cross-section		2×0.34 mm²		
Approval	cULus	cULus	cULus	cULus
Recommended connector	BKS-S 19-12/-S 20-12		BKS-S 19-11/-S 20-11	BKS-S 19-13/-S 20-13

⑨ Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths and
PUR cable jacket material on request.

	M12×1	M12×1	M12×1	M12×1	M12×1
	flush	flush	flush	non-flush	non-flush
	3 mm	**3 mm**	**3 mm**	**4 mm**	**4 mm**
	0...2.4 mm	0...2.4 mm	0...2.4 mm	0...3.2 mm	0...3.2 mm
					
	BES M12MG-GSC30B-BP00,3-GS04	BES M12MG-USC30B-BV02	BES M12MG-GSC30B-BV02	BES 516-545-S4-H	BES 516-545-B0-H-03
	10...30 V DC polarized	10...30 V DC non-polarized	10...30 V DC polarized	10...55 V DC non-polarized	10...55 V DC non-polarized
	≤ 4 V	≤ 5 V	≤ 4 V	≤ 5 V	≤ 5 V
	75 V DC	75 V DC	75 V DC	250 V AC	250 V AC
	100 mA	100 mA	100 mA	200 mA	200 mA
	5 mA	5 mA	5 mA	5 mA	5 mA
	≤ 600 µA	≤ 600 µA	≤ 600 µA	≤ 500 µA	≤ 500 µA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	max. 1300 Hz	max. 1300 Hz	max. 1300 Hz	1000 Hz	1000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
				⧈	⧈
	CuZn coated	CuZn coated	CuZn coated	Stainless steel	Stainless steel
	PBT	PA 12	PA 12	PA 12	PA 12
	0.3 m PUR cable with connector	2 m PVC cable	2 m PVC cable	Connector	3 m PVC cable
		2×0.34 mm²	2×0.34 mm²		2×0.34 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-S 19-13			BKS-S 19-12/-S 20-12	

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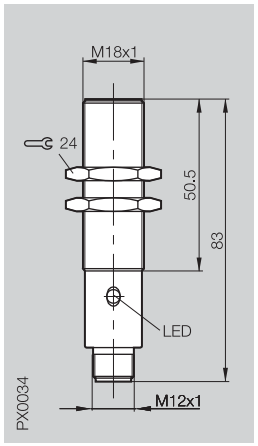
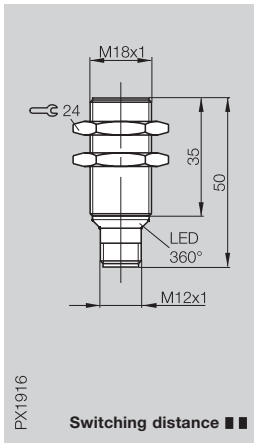
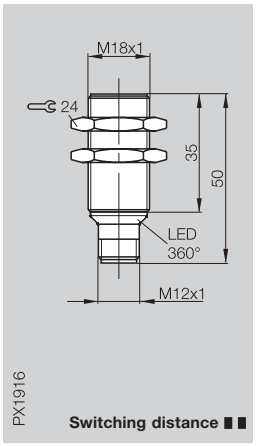
5
Connectors, Holders ...
Page 5.2 ...

Housing size	**M18×1**	**M18×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush
Rated operating distance s_n	**5 mm**	**7 mm**	**7 mm**
Assured operating distance s_a	0...4.1 mm	0...5.7 mm	0...5.7 mm





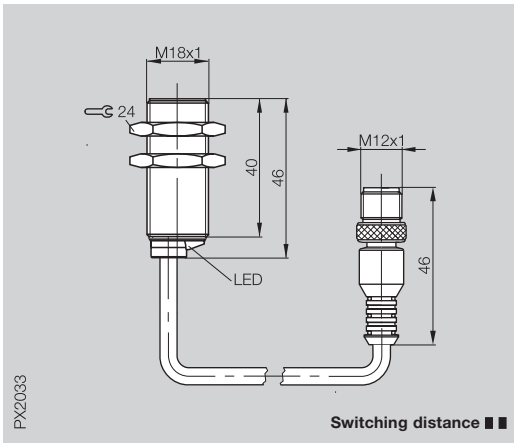
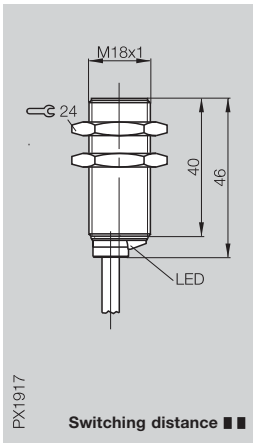
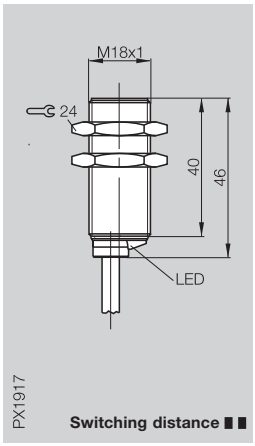
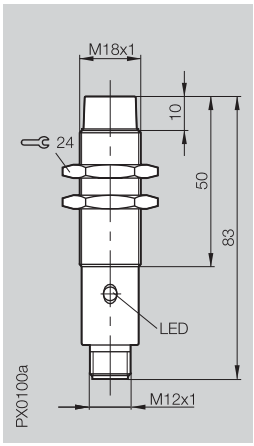


NO ⑨ non-polarized ⑦ polarized		BES M18MF-USC70B-S04K	BES M18MF-GSC70B-S04K
NC ⑩ non-polarized	BES 516-539-S4-H		
Supply voltage U_B	10...55 V DC non-polarized	10...30 V DC non-polarized	10...30 V DC polarized
Voltage drop U_d at I_e	≤ 5 V	≤ 5 V	≤ 4 V
Rated insulation voltage U_i	250 V AC	75 V DC	75 V DC
Rated operational current I_e	200 mA	100 mA	100 mA
Minimum operating current I_m	5 mA	5 mA	5 mA
Off-state current I_r	≤ 500 µA	≤ 600 µA	≤ 600 µA
Polarity reversal protected	yes	yes	yes
Short circuit protected	yes	yes	yes
Permissible load capacitance	≤ 1 µF	≤ 1 µF	≤ 1 µF
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	250 Hz	max. 600 Hz	max. 600 Hz
Utilization category	DC 13	DC 13	DC 13
Function indicator	yes	yes	yes
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 67	IP 67
Insulation class	⧈		
Housing material	CuZn coated	CuZn coated	CuZn coated
Material of sensing face	PA 12	PBT	PBT
Connection	Connector	Connector	Connector
No. of wires × cross-section			
Approval	cULus	cULus	cULus
Recommended connector	BKS-S 19-12/-S 20-12	BKS-S 19-11/-S 20-11	BKS-S 19-13/-S 20-13

⑨ Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths and
PUR cable jacket material on request.

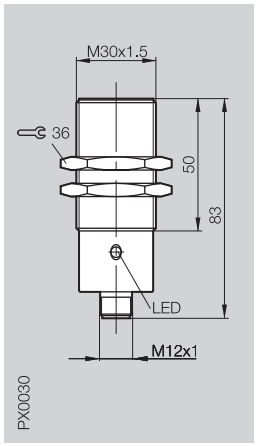
All-round LED

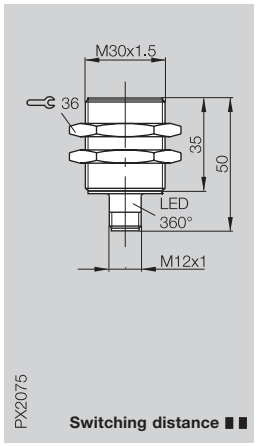
	M18×1	**M18×1**	**M18×1**	**M18×1**
	flush	flush	flush	non-flush
	7 mm	**7 mm**	**7 mm**	**8 mm**
	0...5.7 mm	0...5.7 mm	0...5.7 mm	0...6.5 mm
				
	BES M18MG-GSC70B-BP00,3-GS04	BES M18MG-USC70B-BV02	BES M18MG-GSC70B-BV02	BES 516-547-S4-H
	10...30 V DC polarized	10...30 V DC non-polarized	10...30 V DC polarized	10...55 V DC non-polarized
	≤ 4 V	≤ 5 V	≤ 4 V	≤ 5 V
	75 V DC	75 V DC	75 V DC	250 V AC
	100 mA	100 mA	100 mA	200 mA
	5 mA	5 mA	5 mA	5 mA
	≤ 600 µA	≤ 600 µA	≤ 600 µA	≤500 µA
	yes	yes	yes	yes
	yes	yes	yes	yes
	≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	max. 600 Hz	max. 600 Hz	max. 600 Hz	200 Hz
	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67
	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	PBT	PBT	PBT	PA 12
	0.3 m PUR cable with connector	2 m PVC cable	2 m PVC cable	Connector
		2×0.34 mm²	2×0.34 mm²	
	cULus	cULus	cULus	cULus
	BKS-S 19-13			BKS-S 19-12/-S 20-12

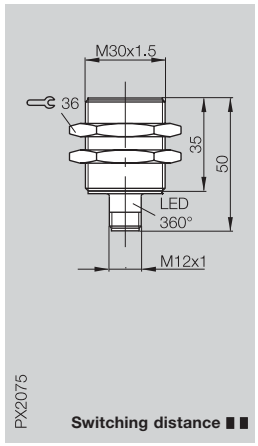
1.2

5
Connectors, Holders ...
Page 5.2 ...

Housing size	**M30×1.5**	**M30×1.5**	**M30×1.5**
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush
Rated operating distance s_n	**10 mm**	**15 mm**	**15 mm**
Assured operating distance s_a	0...8.1 mm	0...12.2 mm	0...12.2 mm





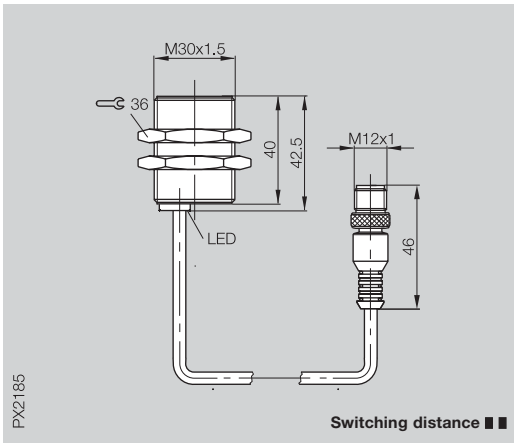
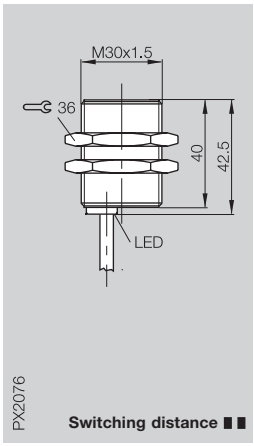
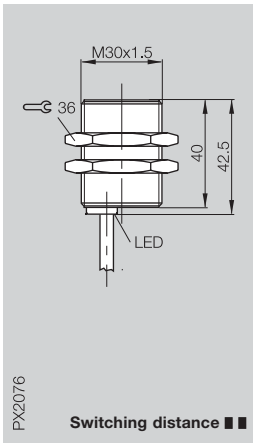
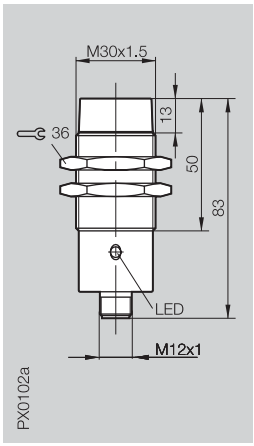


NO ⑨ non-polarized ⑦ polarized		BES M30MF-USC15B-S04K	BES M30MF-GSC15B-S04K
NC ⑩ non-polarized	BES 516-541-S4-H		
Supply voltage U_B	10...55 V DC non-polarized	10...30 V DC non-polarized	10...30 V DC polarized
Voltage drop U_d at I_e	≤ 5 V	≤ 5 V	≤ 4 V
Rated insulation voltage U_i	250 V AC	75 V DC	75 V DC
Rated operational current I_e	200 mA	100 mA	100 mA
Minimum operating current I_m	5 mA	5 mA	5 mA
Off-state current I_r	≤ 500 µA	≤ 600 µA	≤ 600 µA
Polarity reversal protected	yes	yes	yes
Short circuit protected	yes	yes	yes
Permissible load capacitance	≤ 1 µF	≤ 1 µF	≤ 1 µF
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	150 Hz	max. 400 Hz	max. 400 Hz
Utilization category	DC 13	DC 13	DC 13
Function indicator	yes	yes	yes
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 67	IP 67
Insulation class	⧈		
Housing material	CuZn coated	CuZn coated	CuZn coated
Material of sensing face	PA 12	PA 12	PA 12
Connection	Connector	Connector	Connector
No. of wires × cross-section			
Approval	cULus	cULus	cULus
Recommended connector	BKS-S 19-12/-S 20-12	BKS-S 19-11/-S 20-11	BKS-S 19-13/-S 20-13

⑨ Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths and
PUR cable jacket material on request.

All-round LED

	M30×1.5	**M30×1.5**	**M30×1.5**	**M30×1.5**
	flush	flush	flush	non-flush
	15 mm	**15 mm**	**15 mm**	**15 mm**
	0...12.2 mm	0...12.2 mm	0...12.2 mm	0...12.2 mm
				
	BES M30MF-GSC15B-BP00,3-GS04	BES M30MF-USC15B-BV02	BES M30MF-GSC15B-BV02	BES 516-549-S4-H
	10...30 V DC polarized	10...30 V DC non-polarized	10...30 V DC polarized	10...55 V DC non-polarized
	≤ 4 V	≤ 5 V	≤ 4 V	≤ 5 V
	75 V DC	75 V DC	75 V DC	250 V AC
	100 mA	100 mA	100 mA	200 mA
	5 mA	5 mA	5 mA	5 mA
	≤ 600 µA	≤ 600 µA	≤ 600 µA	≤ 500 µA
	yes	yes	yes	yes
	yes	yes	yes	yes
	≤ 1 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	max. 400 Hz	max. 400 Hz	max. 400 Hz	100 Hz
	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 68 per BWN Pr. 20
				⧈
	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	PA 12	PA 12	PA 12	PA 12
	0.3 m PUR cable with connector	2 m PVC cable	2 m PVC cable	Connector
		2×0.34 mm²	2×0.34 mm²	
	cULus	cULus	cULus	cULus
	BKS-S 19-13			BKS-S 19-12/-S 20-12

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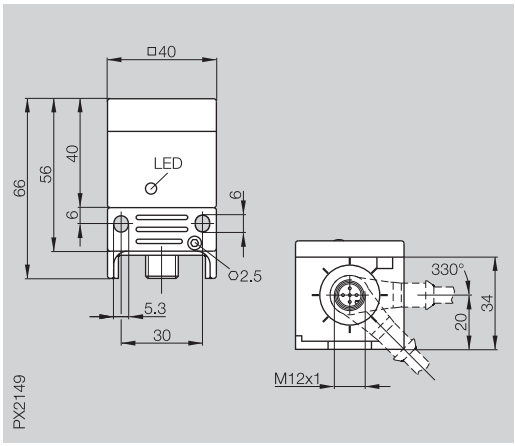
Connectors, Holders ...
Page 5.2 ...

Housing size	**40×40×66 mm** Unicompact
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**15 mm**
Assured operating distance s_a	0...12.2 mm



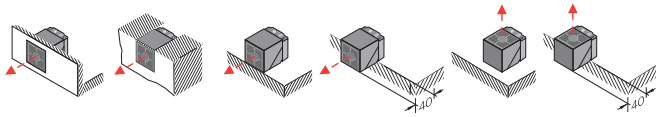
Unicompact
The flexible sensor for machine and systems building. The detection axis can be set in 5 directions. Long switching distance in compact package.

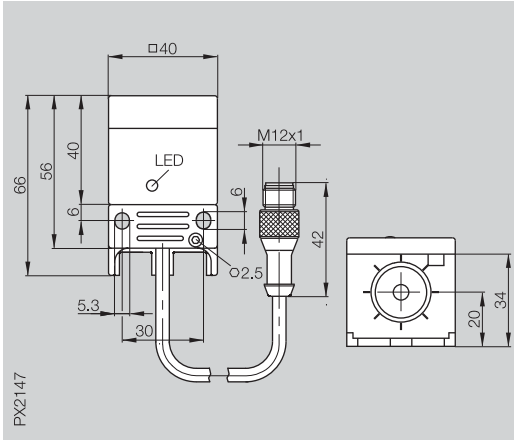
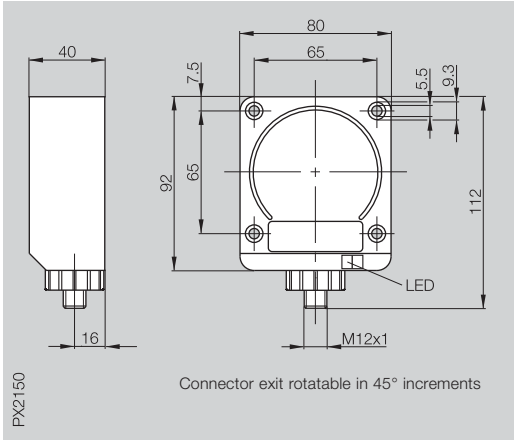
Maxisensor
Long switching distance with low installation height in the detection direction. Ideal for systems building and conveying equipment.

NO ⑦ polarized	BES Q40KFU-GSH15B-S04G
NC ⑧ polarized	
Supply voltage U_B	10...55 V DC polarized
Voltage drop U_d at I_e	≤ 4.6 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	100 mA
Minimum operating current I_m	2 mA
Off-state current I_r	≤ 800 µA
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 10 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	150 Hz
Utilization category	DC 13
Function indicator	yes
Degree of protection per IEC 60529	IP 67
Insulation class	⧈
Housing material	PBT
Material of sensing face	PEI
Connection	Connector
Recommended connector	BKS-S 19-13/-S 20-13

⑦ Wiring diagrams see page **1.0.**6

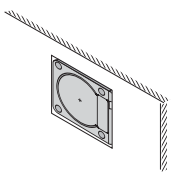
Permissible installation variations for Unicompact



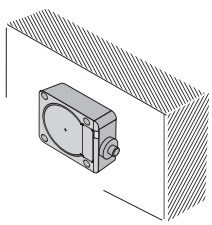
	40×40×66 mm Unicompact	**80×92×40 mm** Maxisensor
	flush	flush
	15 mm	**50 mm**
	0...12.2 mm	0...40.5 mm
		
	BES Q40KFU-GSH15B-EP00,8-GS04 BES Q40KFU-GOH15B-EP00,8-GS04	BES Q80KA-GSH50B-S04Q
	10...55 V DC polarized	10...55 V DC polarized
	≤ 4.6 V	≤ 4.6 V
	250 V AC	250 V AC
	100 mA	400 mA
	2 mA	4 mA
	≤ 800 µA	≤ 600 µA
	yes	yes
	yes	yes
	≤ 10 %	≤ 10 %
	–25...+70 °C	–25...+50 °C
	150 Hz	90 Hz
	DC 13	DC 13
	yes	yes
	IP 67	IP 67
	⧈	⧈
	PBT	PPE
	PEI	PPE
	0.8 m PUR cable with connector	Connector
	BKS-S 19-13/S 19-12	BKS-S 19-13/-S 20-13

Permissible mounting variations for Maxisensor

Mounting in steel/ non-ferrous metals



Mounting on steel/ non-ferrous metals



For non-flush mounting the switching distance is reduced by max. 5.5 mm.

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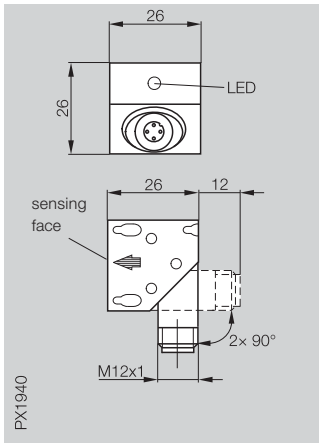
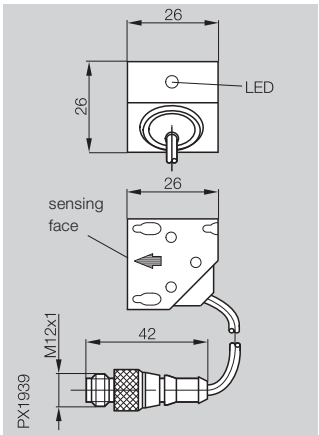
Connectors, Holders ... Page 5.2 ...

Housing size	**26×26×26 mm**	**26×26×26 mm**
Mounting (see notes starting p. **1.0.**11)	flush	flush
Rated operating distance s_n	**10 mm**	**10 mm**
Assured operating distance s_a	0...8.1 mm	0...8.1 mm





Small, compact block sensor with extended switching distance for fast installation

The connector mount is rotatable and the sensing face can be oriented in 3 directions.

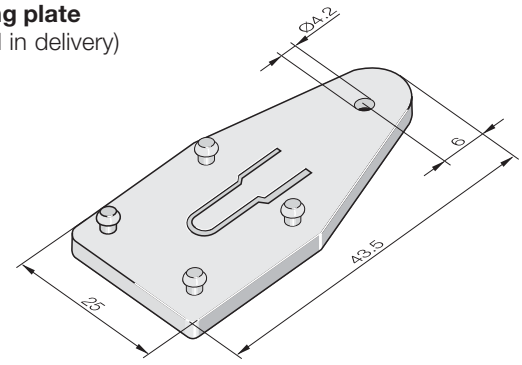
Simple replacement with no loss of position thanks to the fixed mounting plate:

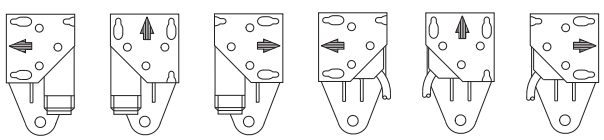
- Cost savings
- No special tools necessary
- Simple to install

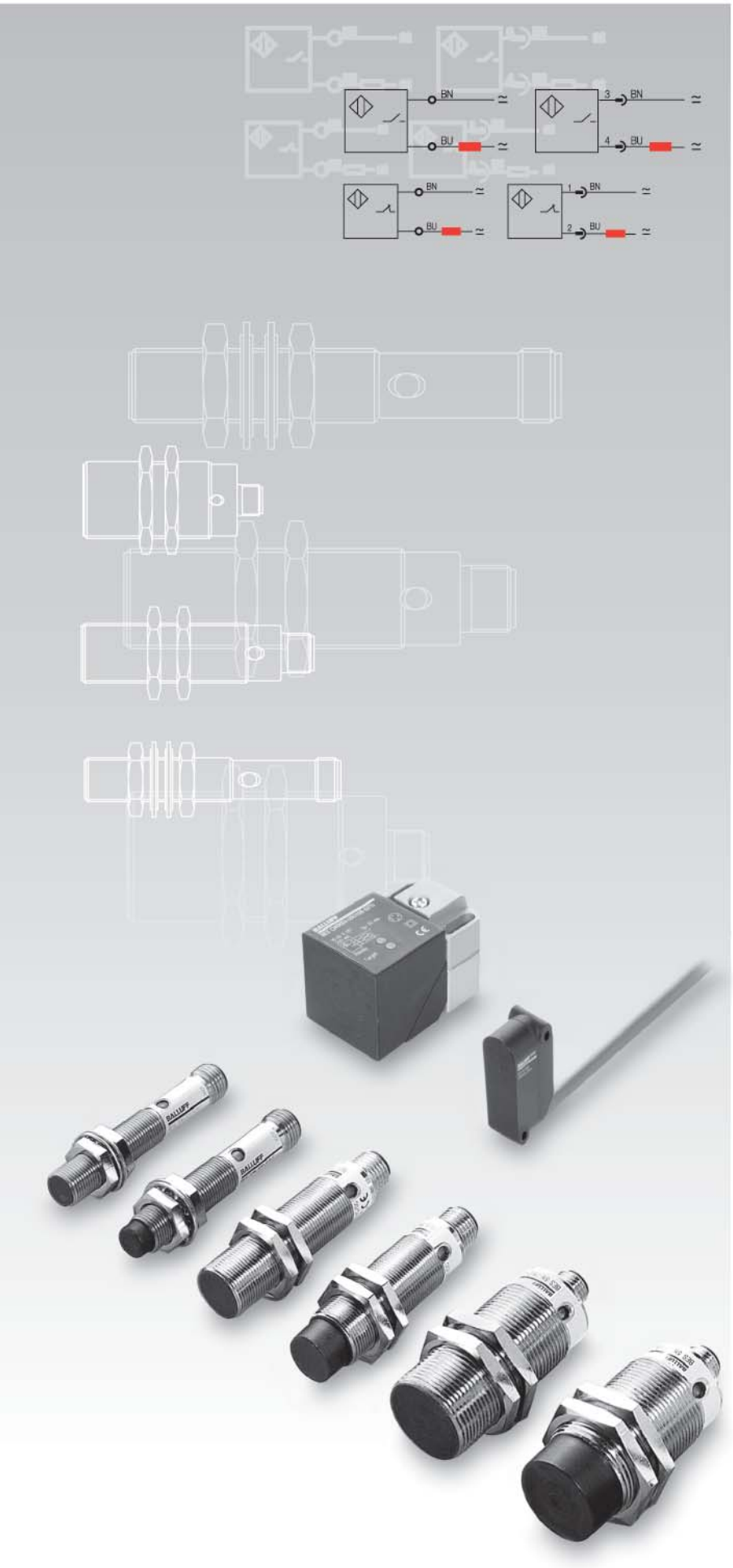
NO ⑦ polarized	BES Z03K-GSS10B-S04U-006	BES Z03K-GSS10B-EP00,15-GS04-006
Supply voltage U_B	10...36 V DC polarized	10...36 V DC polarized
Voltage drop U_d at I_e	≤ 4.5 V	≤ 4.5 V
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	100 mA	100 mA
Minimum operating current I_m	2 mA	2 mA
Off-state current I_r	≤ 600 µA	≤ 600 µA
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Permissible load capacitance	0.1 µF	0.1 µF
Repeat accuracy R	≤ 10	≤ 10
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C
Switching frequency f	250 Hz	250 Hz
Utilization category	DC 13	DC 13
Function indicator	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67
Insulation class	⧈	⧈
Housing material	PA mod.	PA mod.
Material of sensing face	PA mod.	PA mod.
Connection	Connector	0.15 m PUR cable with connector
Recommended connector	BKS-S 19-13/-S 20-13	BKS-S 19-13

⑦ Wiring diagrams see page **1.0.**6

Mounting plate
(included in delivery)







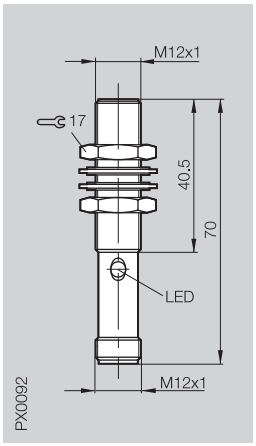
Inductive – AC/DC 2-wire

Our standard line in 2-wire AC/DC versions

With this broad range of product, Balluff offers proximity switches in housings from M12 to 80×80 mm for virtually any application in the field of automation.

These highest quality sensors are designed and manufactured according to worldwide standards and the latest technology. 100 % testing of all products is your assurance that only carefully checked sensors are shipped.

Housing size	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**2 mm**
Assured operating distance s_a	0...1.6 mm



NO	⑯	BES 516-207-S27-E
NC	⑰	BES 516-208-S27-E

Rated operational voltage U_e	110 V AC
Supply voltage U_B	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 11 V; ≤ 7.5 V dyn.
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	130 mA
Minimum operating current I_m	5 mA
Off-state current I_r	≤ 1.7 mA at 110 V AC
Inrush current I_k t ≤ 20 ms	≤ 0.7 A/≤ 0.5 Hz
Polarity reversal protected	yes
Short circuit/overload protected	yes/yes

Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	≤ 1000 Hz
Utilization category	AC 140/DC 13
Function indicator	yes

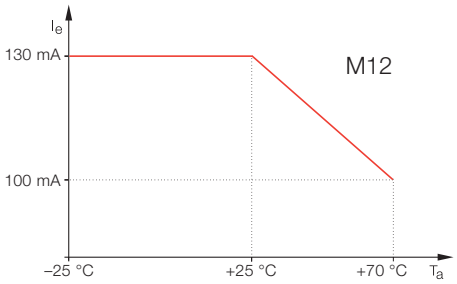
Degree of protection per IEC 60529	IP 67
Insulation class	with protection ground
Housing material	Stainless steel
Material of sensing face	PA 12
Connection	Connector

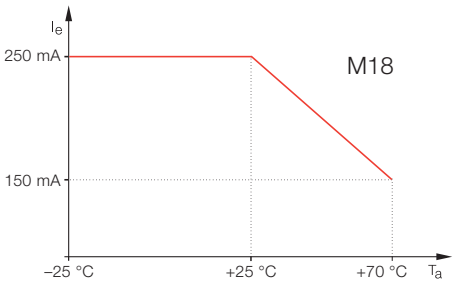
Approval	cULus
Recommended connector	BKS-S 27/BKS-S 28

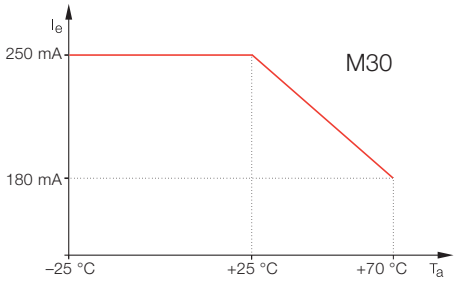
⑯ Wiring diagrams see page **1.0.**6

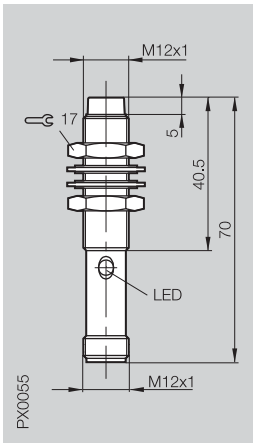
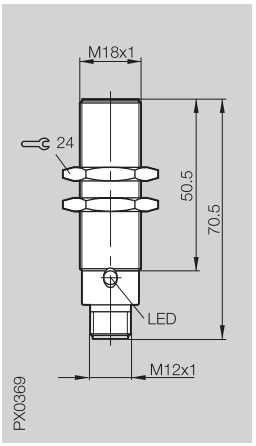
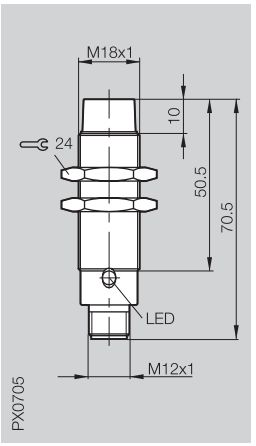
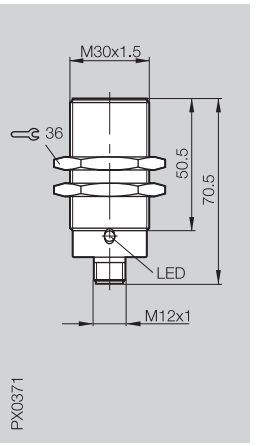
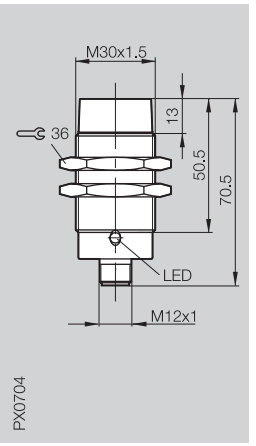
Cable versions (Insulation class 2) on request.

Current reduction as a function of ambient temperature range



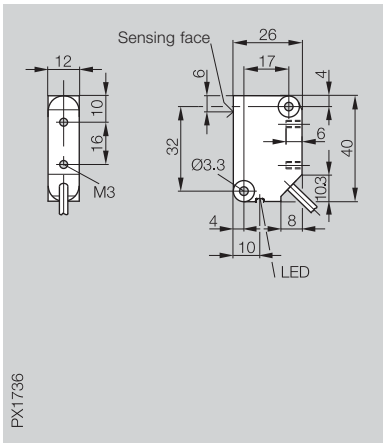


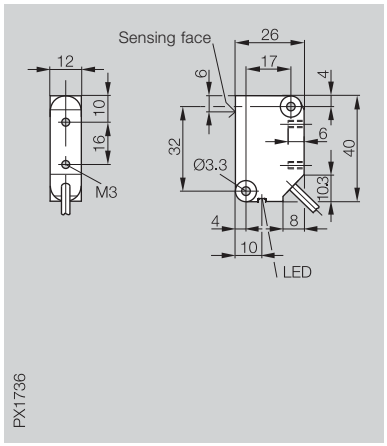


	M12×1	M18×1	M18×1	M30×1.5	M30×1.5
	non-flush	flush	non-flush	flush	non-flush
	4 mm	**5 mm**	**8 mm**	**10 mm**	**15 mm**
	0...3.2 mm	0...4.1 mm	0...6.5 mm	0...8.1 mm	0...12.2 mm
					
	BES 516-209-S27-E BES 516-210-S27-E	BES 516-211-E5-E-S27 BES 516-212-E5-E-S27	BES 516-213-E5-E-S27 BES 516-214-E5-E-S27	BES 516-215-E5-E-S27 BES 516-216-E5-E-S27	BES 516-217-E5-E-S27 BES 516-218-E5-E-S27
	110 V AC	110 V AC	110 V AC	110 V AC	110 V AC
	20...250 V AC/DC	20...250 V AC/DC	20...250 V AC/DC	20...250 V AC/DC	20...250 V AC/DC
	≤ 11 V; ≤ 7.5 V dyn.	≤ 11 V; ≤ 7.5 V dyn.	≤ 11 V; ≤ 7.5 V dyn.	≤ 11 V; ≤ 7.5 V dyn.	≤ 11 V; ≤ 7.5 V dyn.
	250 V AC	250 V AC	250 V AC	250 V AC	250 V AC
	130 mA	250 mA	250 mA	250 mA	250 mA
	5 mA	5 mA	5 mA	5 mA	5 mA
	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC
	≤ 0.7 A/≤ 0.5 Hz	≤ 1.5 A/≤ 1 Hz	≤ 1.5 A/≤ 1 Hz	≤ 3 A/≤ 1 Hz	≤ 3 A/≤ 1 Hz
	yes	yes	yes	yes	yes
	yes/yes	yes/yes	yes/yes	yes/yes	yes/yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 10 %	≤ 10 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	≤ 600 Hz	≤ 400 Hz	≤ 250 Hz	≤ 150 Hz	≤ 100 Hz
	AC 140/DC 13	AC 140/DC 13	AC 140/DC 13	AC 140/DC 13	AC 140/DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	with protection ground	with protection ground	with protection ground	with protection ground	with protection ground
	Stainless steel	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	PA 12	PA 12	PA 12	PA 12	PA 12
	Connector	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus	cULus
	BKS-S 27/BKS-S 28	BKS-S 27/BKS-S 28	BKS-S 27/BKS-S 28	BKS-S 27/BKS-S 28	BKS-S 27/BKS-S 28

5
Connectors, Holders ...
Page 5.2 ...

Housing size	**26×40×12 mm** R05	**26×40×12 mm** R05
Mounting (see notes starting p. **1.0.**11)	flush	flush
Rated operating distance s_n	**2 mm**	**4 mm**
Assured operating distance s_a	0...1.6 mm	0...3.2 mm



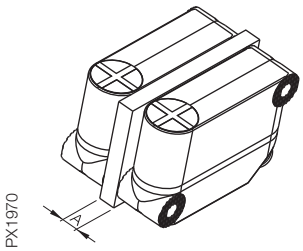


NO ⑬	BES R05KB-USU20B-EV02	BES R05KB-USU40B-EV02
Rated operational voltage U_e	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 12 V; ≤ 8.5 V dyn.	≤ 12 V; ≤ 8.5 V dyn.
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	130 mA	130 mA
Minimum operating current I_m	5 mA	5 mA
Off-state current I_r	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC
Inrush current I_k t ≤ 20 ms	≤ 0.7 A/≤ 0.5 Hz	≤ 0.7 A/≤ 0.5 Hz
Polarity reversal protected	yes	yes
Short circuit/overload protected	yes/yes	yes/yes
Repeat accuracy R	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C
Switching frequency f	400 Hz	400 Hz
Utilization category	AC 140/DC 13	AC 140/DC 13
Function indicator	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67
Insulation class	⧈	⧈
Housing material	PA 12	PA 12
Material of sensing face	PA 12	PA 12
Connection	2 m PVC cable	2 m PVC cable
No. of wires × cross-section	2×0.34 mm²	2×0.34 mm²

⑬ Wiring diagrams see page **1.0.**6

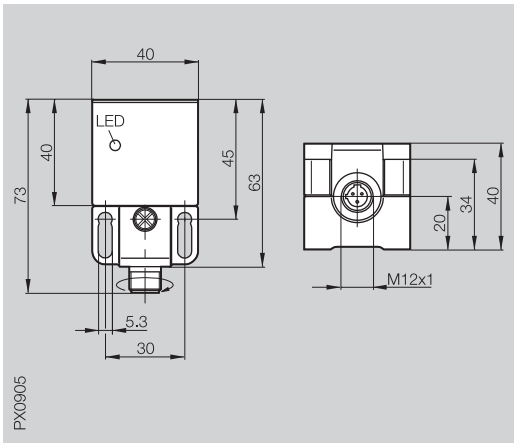
Other cable lengths and PUR cable jacket material on request.

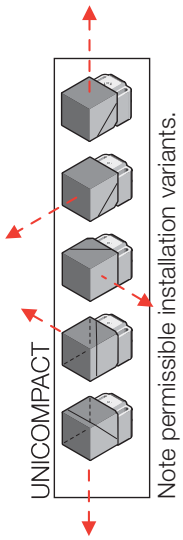
Row mounting



– for plastics or without existing material in the space
= Distance A at least 5 mm
– for metal in the space
= Distance A at least 4 mm

Housing size	**40×40×73 mm** Unicompact	**40×40×73 mm** Unicompact
Mounting (see notes starting p. **1.0.**11)	flush	non-flush
Rated operating distance s_n	**15 mm**	**mount. dependent 20/25 mm**
Assured operating distance s_a	0...12.2 mm	0...16.2/0...20.3 mm

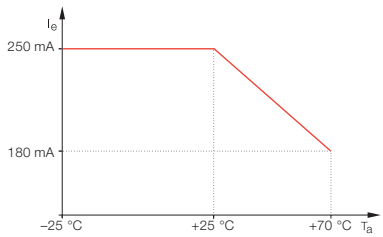




NO ⑯	BES Q40KEU-USU15B-S27G	BES Q40KEU-USU25F-S27G
Rated operational voltage U_e	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 11 V; ≤ 7.5 V dyn.	≤ 11 V; ≤ 7.5 V dyn.
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	250 mA	250 mA
Minimum operating current I_m	5 mA	5 mA
Off-state current I_r	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC
Inrush current I_k t ≤ 20 ms	≤ 2 A/≤ 1 Hz	≤ 2 A/≤ 1 Hz
Polarity reversal protected	yes	yes
Short circuit/overload protected	yes/yes	yes/yes
Repeat accuracy R	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C
Switching frequency f	100 Hz	100 Hz
Utilization category	AC 140/DC 13	AC 140/DC 13
Function indicator	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67
Insulation class	with protection ground	with protection ground
Housing material	PBT/GD-ZnAl	PBT/GD-ZnAl
Material of sensing face	PBT	PBT
Connection	Connector	Connector
Recommended connector	BKS-S 27/BKS-S 28	BKS-S 27/BKS-S 28
possible mounting options	Fig. 1 to 6	s_n 20 mm Fig. 4 and 6 s_n 25 mm Fig. 3 and 5

⑯ Wiring diagrams see page **1.0.**6

Current reduction as a function of ambient temperature range



Mounting options

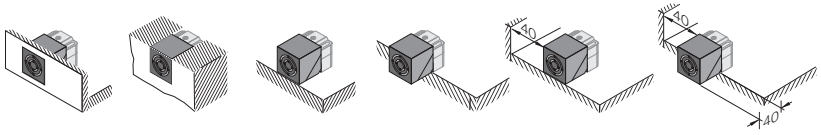
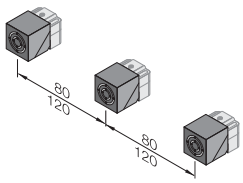
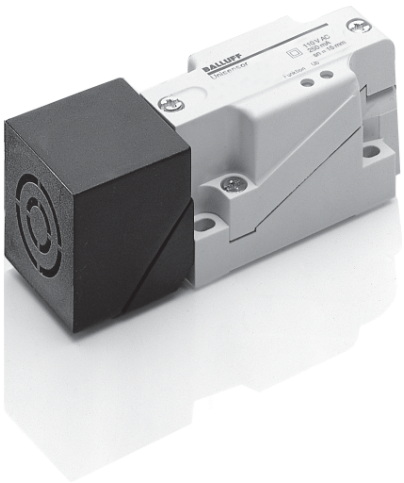


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

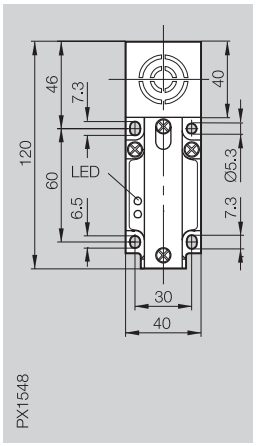
Row mounting
flush 80 mm
non-flush 120 mm



1.3
5
Connectors ...
page 5.2 ...

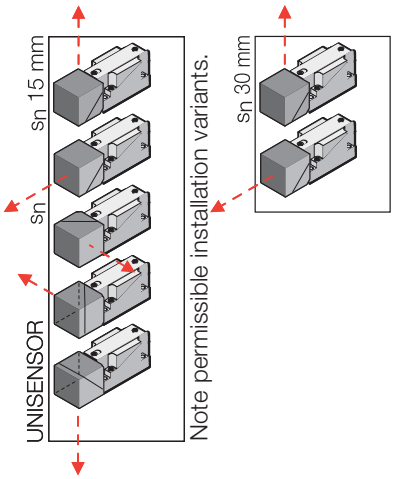


Housing size	**40×40×120 mm** Unisensor	**40×40×120 mm** Unisensor
Mounting (see notes starting p. **1.0.**11)	flush	non-flush
Rated operating distance s_n	**15 mm**	**30 mm**
Assured operating distance s_a	0...12.2 mm	0...24.3 mm



Programmable Unisensor

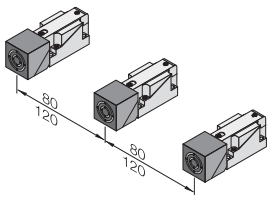
Unisensors can be set for normally open and normally closed function. A wire jumper is used to change the setting.



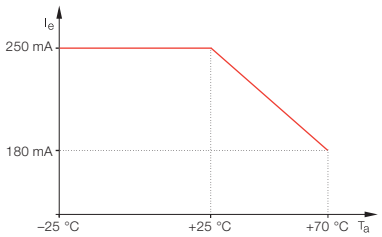
NO/NC programmable ⑮	BES 517-223-M3-E	BES 517-223-M5-E
Rated operational voltage U_e	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 11.5 V; ≤ 7.5 V dyn.	≤ 12.5 V; ≤ 9 V dyn.
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	250 mA	250 mA
Minimum operating current I_m	5 mA	5 mA
Off-state current I_r	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC
Inrush current I_k t ≤ 20 ms	≤ 1 A/≤ 1 Hz	≤ 1 A/≤ 1 Hz
Polarity reversal protected	yes	yes
Short circuit/overload protected	yes/yes	yes/yes
Repeat accuracy R	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C
Switching frequency f	≤ 100 Hz	≤ 100 Hz
Utilization category	AC 140/DC 13	AC 140/DC 13
Function/Supply voltage indicator	yes/no	yes/no
Degree of protection per IEC 60529	IP 67	IP 67
Insulation class	⧈	⧈
Housing material	PBT	PBT
Material of sensing face	PBT	PBT
Connection	Screw terminals	Screw terminals
max. wire cross-section	≤ 2.5 mm²	≤ 2.5 mm²
Approval	cULus	cULus
possible mounting options	Fig. 1 to 6	Fig. 4 and 5

⑮ Wiring diagrams see page **1.0.**6

Row mounting
flush 80 mm
non-flush 120 mm



Current reduction as a function of ambient temperature range



Mounting options

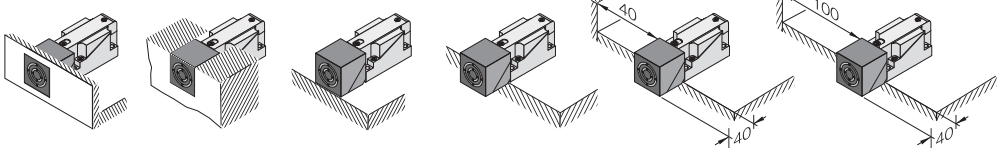
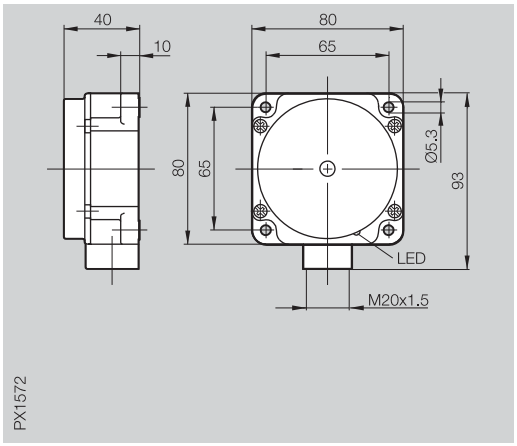


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

Housing size	**80×80×40 mm** Maxisensor	**80×80×40 mm** Maxisensor
Mounting (see notes starting p. **1.0.**11)	non-flush	non-flush
Rated operating distance s_n	**40 mm**	**50 mm**
Assured operating distance s_a	0...32.4 mm	0...40.5 mm



NO/NC programmable ⑮	BES 517-224-M4-E	BES 517-224-M5-E
Rated operational voltage U_e	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 11 V; ≤ 7.5 V dyn.	≤ 11 V; ≤ 7.5 V dyn.
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	250 mA	250 mA
Minimum operating current I_m	5 mA	5 mA
Off-state current I_r	≤ 1.7 mA at 110 V AC	≤ 1.7 mA at 110 V AC
Inrush current I_k t ≤ 20 ms	≤ 1 A/≤ 1 Hz	≤ 1 A/≤ 1 Hz
Polarity reversal protected	yes	yes
Short circuit/overload protected	yes/yes	yes/yes
Repeat accuracy R	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C
Switching frequency f	≤ 10 Hz	≤ 10 Hz
Utilization category	AC 140/DC 13	AC 140/DC 13
Function indicator	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67
Insulation class	⧈	⧈
Housing material	PBT	PBT
Material of sensing face	PBT	PBT
Connection	Screw terminals	Screw terminals
max. wire cross-section	≤ 2.5 mm²	≤ 2.5 mm²
Approval	cULus	cULus
possible mounting options	Fig. 1 and 2	Fig. 2

⑮ Wiring diagrams see page **1.0.**6

Maxisensor programmable

Maxisensors can be set for normally open and normally closed function. A wire contact is used to change the setting.

Mounting in non-ferrous metals

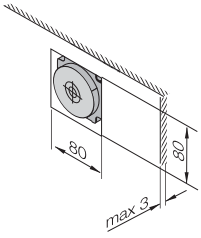


Fig. 1

Mounting in steel/ non-ferrous metals

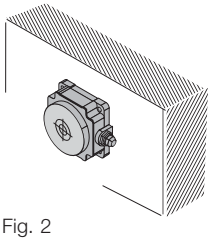
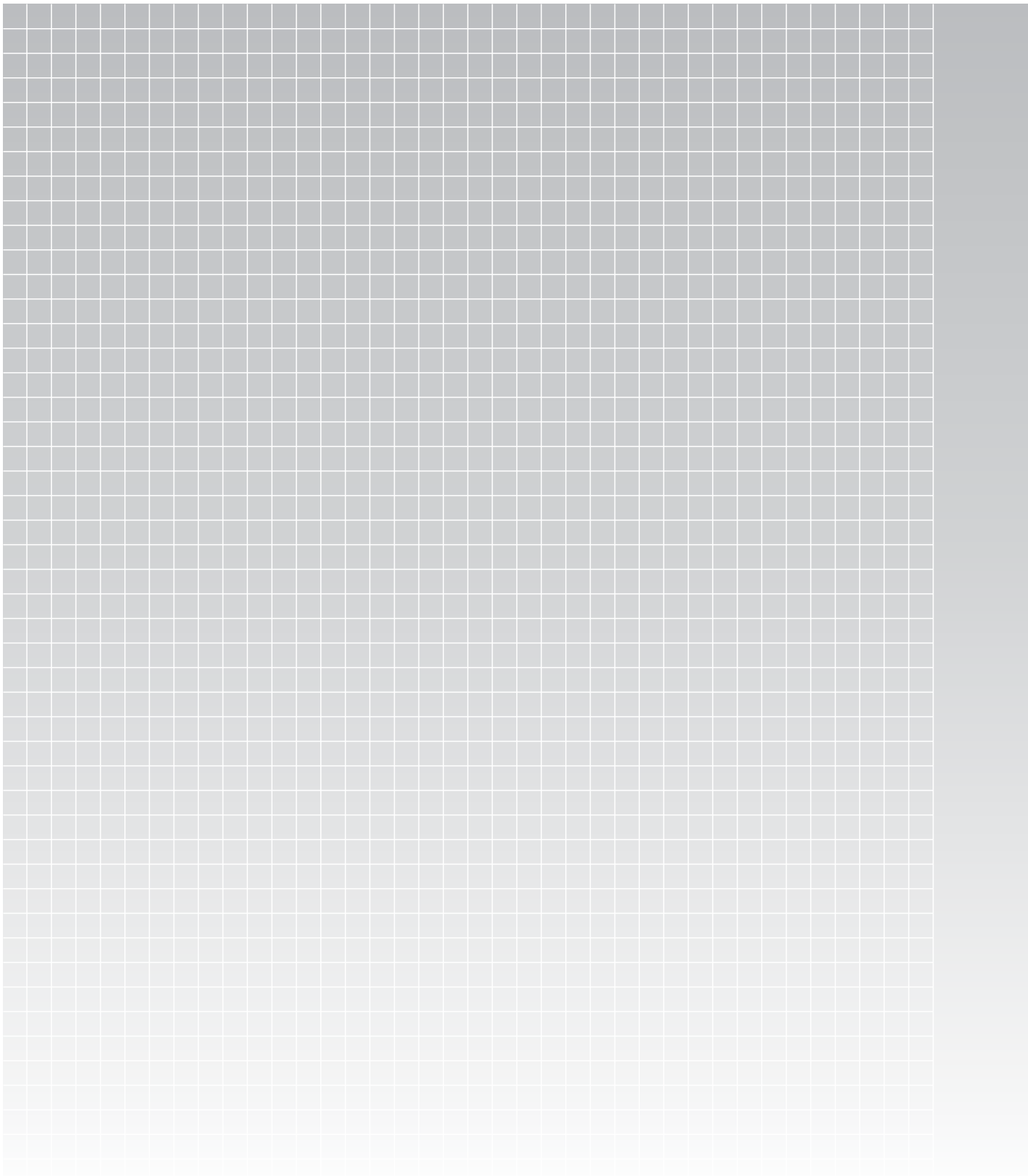
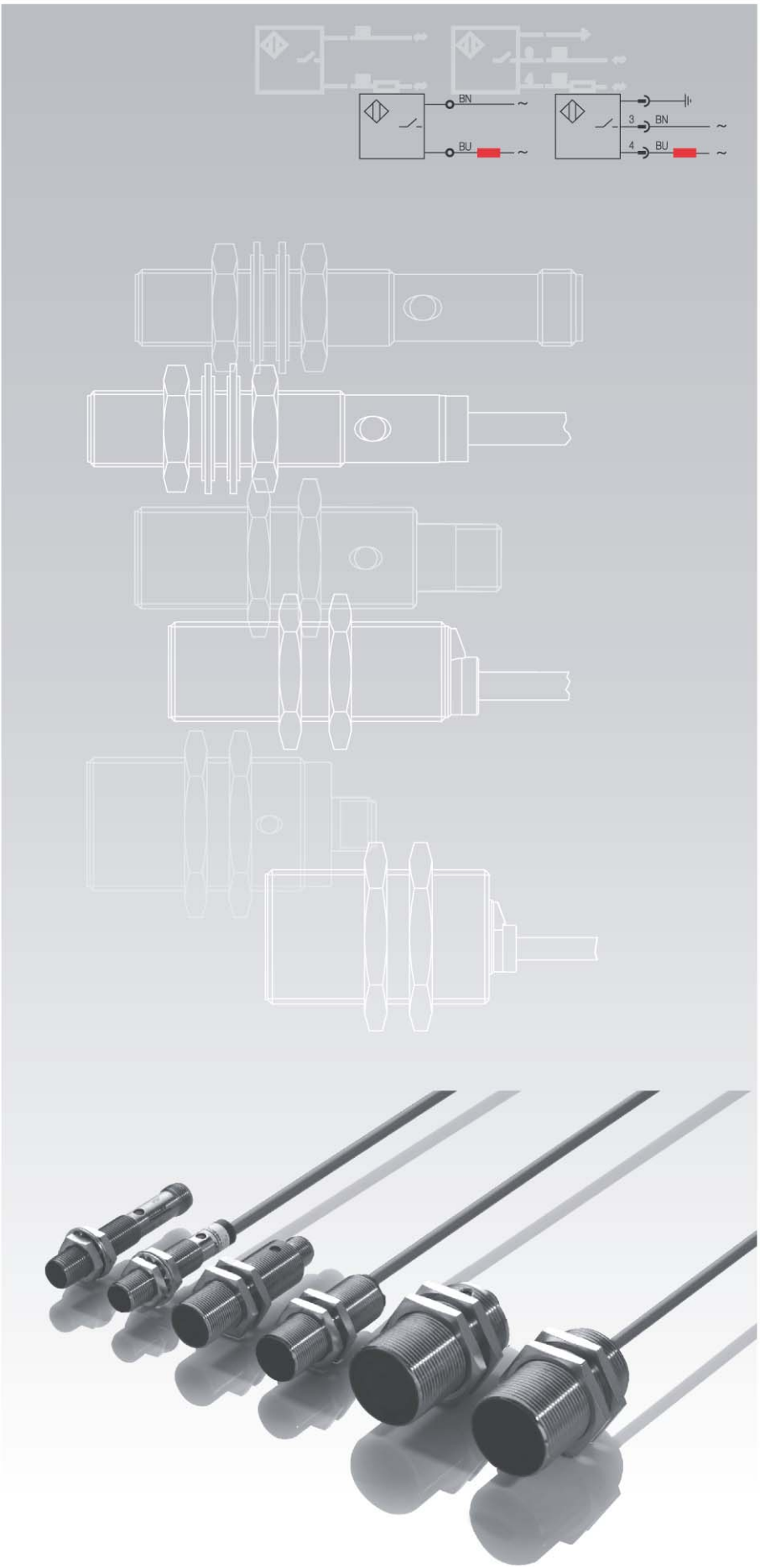


Fig. 2

1.3
5
Connectors, mounting plate ... page 5.2 ...





Inductive – AC 2-wire

Our standard line in 2-wire AC

Balluff offers AC sensors in M12, M18 and M30 size.

AC sensors are optimized for processors and controllers having an AC voltage input.

These sensors are used mainly in Asia and America.

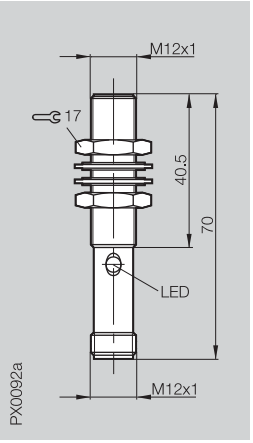
As long as the rated operating current is maintained, these sensors can be used for directly driving contactors and relays.

Recommendation

Short circuit protection: Miniature fuse per IEC 60127-2 Sheet 1, ≤ 2 A (fast acting). See wiring diagrams.

After a short circuit check the unit for reliable function.

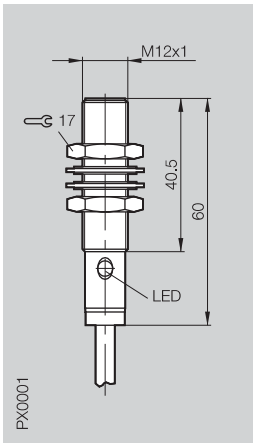
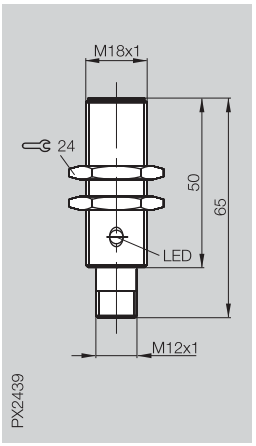
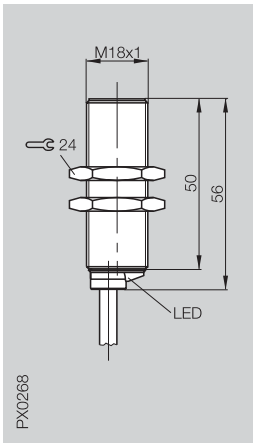
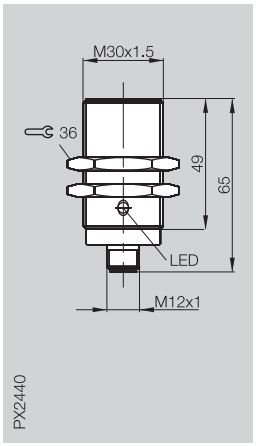
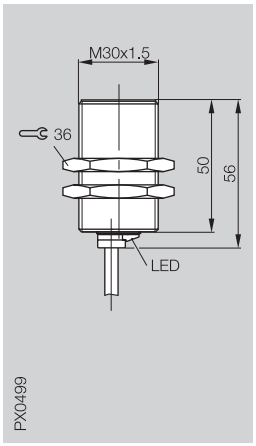
Housing size	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**2 mm**
Assured operating distance s_a	0...1.6 mm



NO ⑪	BES 516-449-S27-L
Supply voltage U_B	20...250 V AC
Voltage drop U_d at I_e	≤ 4 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	500 mA
Polarity reversal protected	yes
Short circuit protected	no
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	25 Hz
Utilization category	AC 140
Function indicator	yes
Degree of protection per IEC 60529	IP 67
Insulation class	with protection ground
Housing material	CuZn coated
Material of sensing face	PA 12
Connection	Connector
No. of wires × cross-section	
Approval	cULus
Recommended connector	BKS-S 27/BKS-S 28

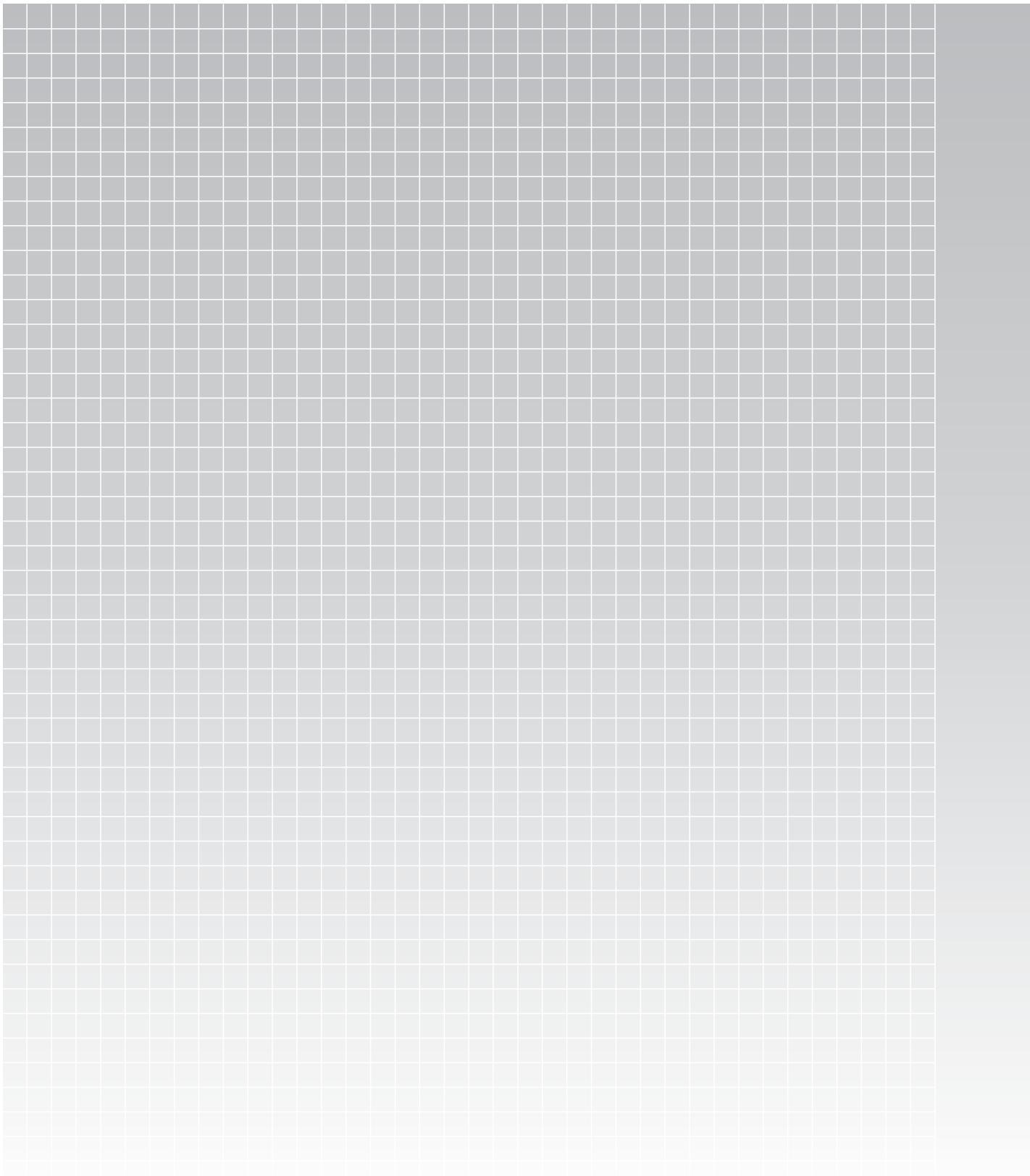
⑪ Wiring diagrams see page **1.0.**6

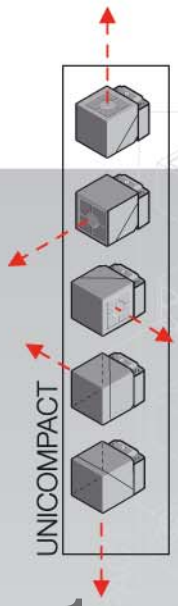
Other cable lengths on request.

	M12×1	**M18×1**	**M18×1**	**M30×1.5**	**M30×1.5**
	flush	flush	flush	flush	flush
	2 mm	**5 mm**	**5 mm**	**10 mm**	**10 mm**
	0...1.6 mm	0...4.1 mm	0...4.1 mm	0...8.1 mm	0...8.1 mm
					
	BES 516-449-BO-L-02	BES 516-420-E5-L-S27	BES 516-420-E4-L-02	BES 516-418-E5-L-S27	BES 516-418-E4-L-02
	20...250 V AC	20...250 V AC	20...250 V AC	20...250 V AC	20...250 V AC
	≤ 4 V	≤ 4 V	≤ 4 V	≤ 4 V	≤ 4 V
	250 V AC	250 V AC	250 V AC	250 V AC	250 V AC
	500 mA	500 mA	500 mA	500 mA	500 mA
	yes	yes	yes	yes	yes
	no	no	no	no	no
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	25 Hz	25 Hz	25 Hz	25 Hz	10 Hz
	AC 140	AC 140	AC 140	AC 140	AC 140
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	⧈	with protection ground	⧈	with protection ground	⧈
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	PA 12	PA 12	PA 12	PA 12	PA 12
	2 m PVC cable	Connector	2 m PVC cable	Connector	2 m PVC cable
	2×0.34 mm²		2×0.34 mm²		2×0.34 mm²
	cULus	cULus	cULus	cULus	cULus
		BKS-S 27/BKS-S 28		BKS-S 27/BKS-S 28	

1.4

5
Connectors, Holders ...
Page 5.2 ...





Inductive – Special Properties

Factor 1

DESINA

Diagnostic

pressue rated

high pressure rated

STEELFACE

NAMUR

magnetic field *immune*

weld *immune*

temperature rated

extended switching distance

PROXINOX®

Ring Sensors

Inductive sensors with special mechanical and/or electrical properties.

- Use under extremely harsh conditions
- Resistant to coolants and lubricants
- Use in welding systems, magnetic field immune
- Use in hydraulic systems, high pressure rated to 500 bar
- For use in the food and chemicals industries, stainless steel housing
- Use in error monitoring, self-diagnostic
- Use at high ambient temperatures up to +120 °C

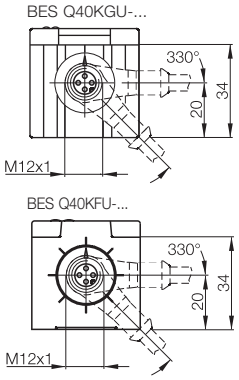
Factor 1 Sensors
detect objects such as steel, aluminum or brass at the same switching distance (no reduction factor).

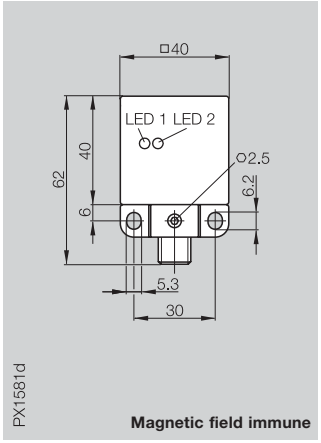
This property offers advantages in applications where the material of the target object can vary.

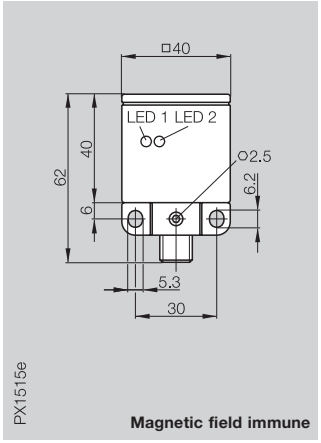
In addition, all Factor 1 sensors are **magnetic field immune.**

Their function is not impaired by strong electromagnetic fields (such as from induction hardening or welding equipment).
The switching response of Factor 1 sensors is unaffected by weld currents of up to 25 kA (at a distance from energetic conductors of approx. 5 cm).

Housing size	**40×40×62 mm** Unicompact	**40×40×62 mm** Unicompact
Mounting (see notes starting p. **1.0.**11)	flush	flush
Rated operating distance s_n	**15 mm**	**20 mm**
Assured operating distance s_a	0...12.2 mm	0...16.2 mm







PNP	NO ①	BES Q40KFU-PSC15A-S04G	BES Q40KFU-PSC20A-S04G
	complementary ③	BES Q40KFU-PAC15A-S04G	BES Q40KFU-PAC20A-S04G
Supply voltage U_B		10...30 V DC	10...30 V DC
Voltage drop U_d at I_e		≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i		250 V AC	250 V AC
Rated operational current I_e		200 mA	200 mA
No-load supply current I_0 max.		≤ 20 mA	≤ 20 mA
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Repeat accuracy R		≤ 5 %	≤ 5 %
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C
Switching frequency f		400 Hz	400 Hz
Utilization category		DC 13	DC 13
Function/Supply voltage indicator		yes/yes	yes/yes
Degree of protection per IEC 60529		IP 67	IP 67
Insulation class		⧈	⧈
Housing material		PBT	PBT
Material of sensing face		PBT	PBT
Connection		Connector	Connector
Approval		cULus	cULus
Recommended connector		BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

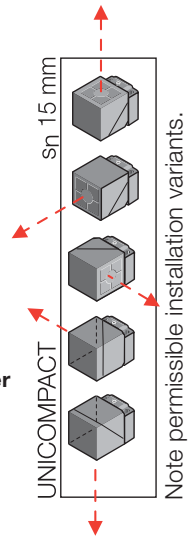
① Wiring diagrams see page **1.0.**6

Mounting socket
BES Q40-HW-2
Material: Metal.
Can be used in place of original mounting socket.
Please note mounting options!

Mounting bracket
BES Q40-HW-1
Material:
Metal for flexible installation.

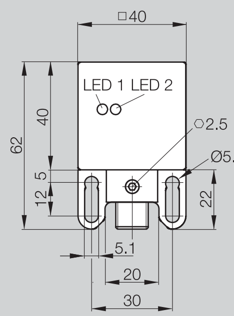
Protective cover
BES Q40-SH-2
Material:
PA 6 as step protection.

Weld protection
BES Q40-SH-1
Material: Metal.
For applications directly in the weld area.
Only for BES Q40KFU-...**A**-..!

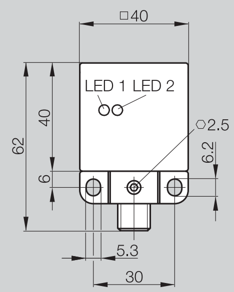


Please order accessories separately!

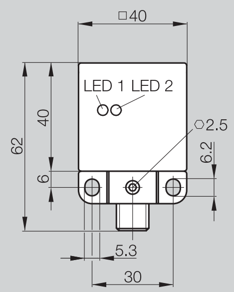
40×40×62 mm Unicompact	**40×40×62** Unicompact	**40×40×62 mm** Unicompact	**40×40×62 mm** Unicompact
Single-sided flush/non-flush	Single-sided flush/non-flush	non-flush	non-flush
25 mm	**35 mm**	**35 mm**	**40 mm**
0...20.3 mm	0...28.4 mm	0...28.4 mm	0...32.4 mm



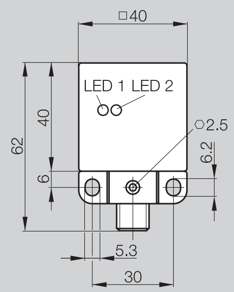
PX2378
Magnetic field immune



PX1581d
Magnetic field immune



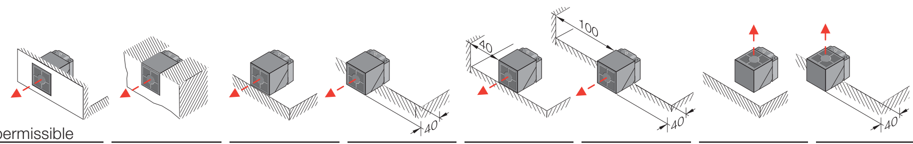
PX1581d
Magnetic field immune



PX1581d
Magnetic field immune

	BES Q40KFU-PSC35Z-S04G-011	BES Q40KFU-PSC35E-S04G	
BES Q40KGU-PAC25Z-S04G-011		BES Q40KFU-PAC35E-S04G	BES Q40KFU-PAC40E-S04G
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
250 V AC	250 V AC	250 V AC	250 V AC
200 mA	200 mA	200 mA	200 mA
≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
yes	yes	yes	yes
yes	yes	yes	yes
≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
–25...+70 °C	–10...+60 °C	–10...+70 °C	–10...+70 °C
250 Hz	250 Hz	250 Hz	100 Hz
DC 13	DC 13	DC 13	DC 13
yes/yes	yes/yes	yes/yes	yes/yes
IP 67	IP 67	IP 67	IP 67
⧈	⧈	⧈	⧈
PBT	PBT	PBT	PBT
PBT	PBT	PBT	PBT
Connector	Connector	Connector	Connector
cULus	cULus	cULus	cULus
BKS-S 19/BKS-S 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

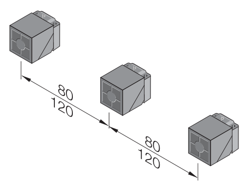
Permissible mounting options



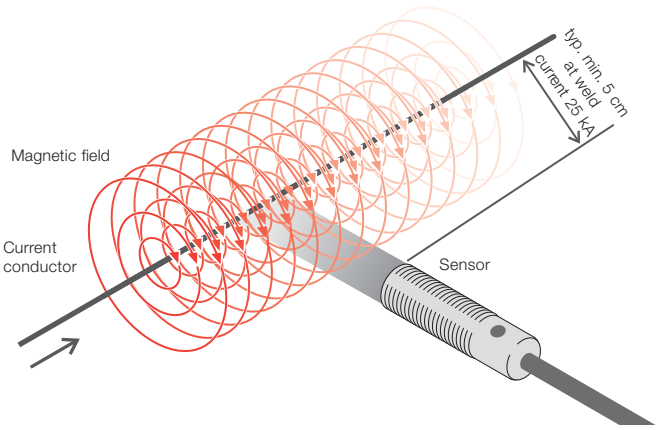
Rated operating distance s_n	Attached using	permissible							
15 mm	original mounting socket (plastic)	yes	yes	yes	yes	yes	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	yes	yes	yes	yes	yes	yes	yes	yes
20 mm	Original mounting socket (plastic)	yes	yes	yes	yes	yes	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	yes	yes	yes	yes	yes	yes	yes	yes
25 mm	Original mounting socket (plastic)	no	no	yes	yes	yes	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	no	no	yes	yes	no	yes	yes	yes*
35 mm at	Original mounting socket (plastic)	no	no	no	yes	no	yes	yes	yes
BES...35E...	Mounting socket BES Q40-HW-2 (metal)	no	no	no	yes	yes	yes	no	no
35 mm at	Original mounting socket (plastic)	no	no	yes	yes	no	yes	yes	yes
BES...35Z...011	Mounting socket BES Q40-HW-2 (metal)	no	no	no	yes	no	yes	no	yes*
40 mm	Original mounting socket (plastic)	no	no	no	yes	no	yes	no	yes
	Mounting socket BES Q40-HW-2 (metal)	no	no	no	yes		yes	no	no

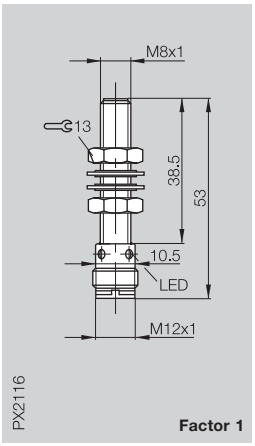
*s_r may be reduced by up to 15 %.
For BES...25Z/35Z...011 see additional mounting options at www.balluff.com

Row mounting
flush 80 mm
non-flush 120 mm



Housing size	**M8×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**1.5 mm**
Assured operating distance s_a	0...1.2 mm





Weld immune Factor 1 Sensors

... the all-rounder for harsh industrial applications.

Magnetic field immune

Insensitive to magnetic fields which can be created with electrical currents of up to 25 kA (at a distance from energetic conductors of approx. 5 cm).

Weld splatter resistant

Resistant to metal splatter and combustion remains caused by welding.

Factor 1

Identical switching distance for steel, stainless, aluminum or brass.

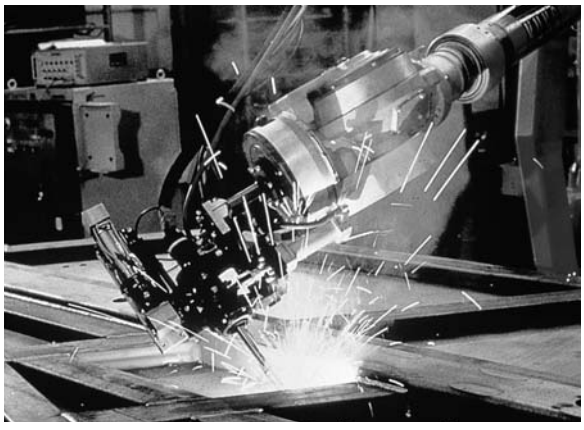
Note about part number

BES ...**-W** Teflon-coated active surface and housing to protect against weld splatter.

PNP NO ①	BES M08EG1-PSC15A-S04G-W
Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	150 mA
No-load supply current I_0 max.	≤ 15 mA
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	2000 Hz
Utilization category	DC 13
Function indicator	yes
Degree of protection per IEC 60529	IP 67
Insulation class	⧈
Housing material	Stainless steel, PTFE coated
Material of sensing face	PBT and PTFE
Connection	Connector
Approval	
Recommended connector	BKS-_ 19/BKS-_ 20

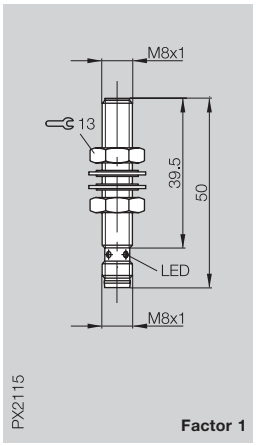
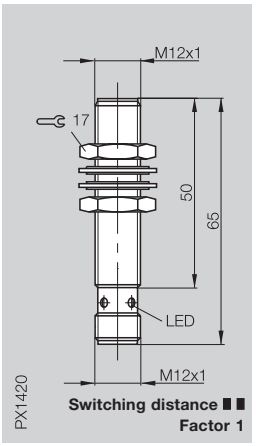
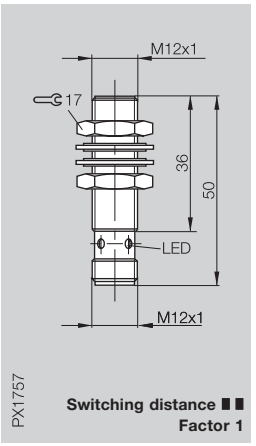
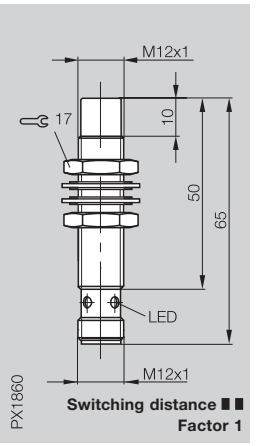
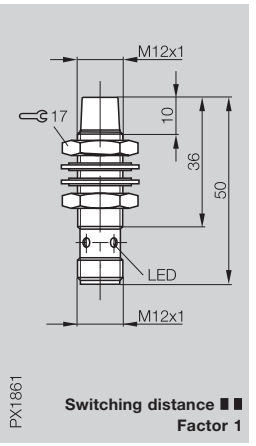
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

On request:
For applications in direct weld area we recommend the connectors with irradiated cable as an accessory.

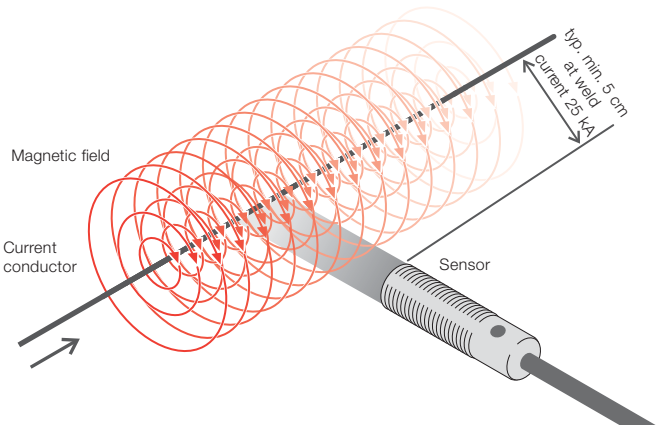


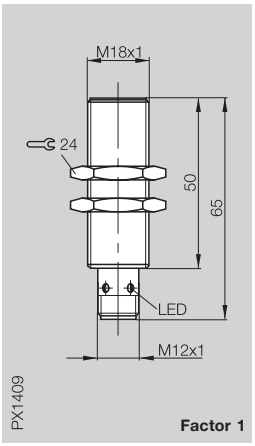
magnetic field ***immune***
+ weld splatter ***resistant***
= weld ***immune***

+ **Factor 1**

	M8×1	**M12×1**	**M12×1**	**M12×1**	**M12×1**
	flush	flush	flush	non-flush	non-flush
	1.5 mm	**3 mm**	**3 mm**	**8 mm**	**8 mm**
	0...1.2 mm	0...2.4 mm	0...2.4 mm	0...6.5 mm	0...6.5 mm
					
	BES M08EG-PSC15A-S49G-W	BES M12ML-PSC30A-S04G-W	BES M12MF1-PSC30A-S04G-W	BES M12ML-PSC80E-S04G-W	BES M12MD1-PSC80E-S04G-W
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC	250 V AC
	150 mA	200 mA	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	2000 Hz	2000 Hz	2000 Hz	2000 Hz	2000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	⧈	⧈	⧈	⧈	⧈
	Stainless steel, PTFE coated	Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated
	LCP and PTFE	LCP and PTFE	LCP and PTFE	LCP and PTFE	LCP and PTFE
	Connector	Connector	Connector	Connector	Connector
		cULus	cULus	cULus	cULus
	BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

Housing size	**M18×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**5 mm**
Assured operating distance s_a	0...4.1 mm





Weld immune Factor 1 Sensors

... the all-rounder for harsh industrial applications.

Magnetic field immune

Insensitive to magnetic fields which can be created with electrical currents of up to 25 kA (at a distance from energetic conductors of approx. 5 cm).

Weld splatter resistant

Resistant to metal splatter and combustion remains caused by welding.

Factor 1

Identical switching distance for steel, stainless, aluminum or brass.

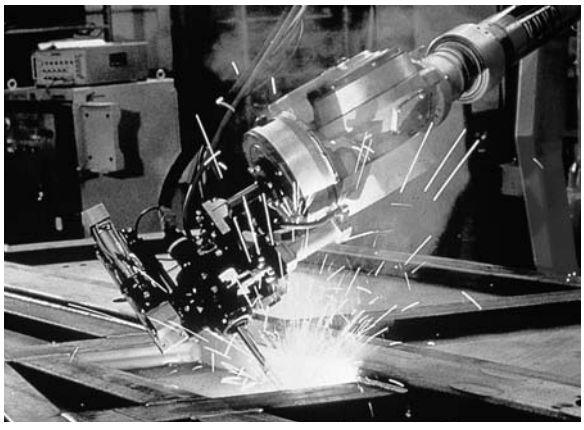
Note about part number

BES ...**-W** Teflon coated active surface and housing to protect against weld splatter.

PNP NO ①	BES M18ML-PSC50A-S04G-W
Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 15 mA
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	2500 Hz
Utilization category	DC 13
Function indicator	yes
Degree of protection per IEC 60529	IP 67
Insulation class	⧈
Housing material	Brass, PTFE coated
Material of sensing face	LCP and PTFE
Connection	Connector
Approval	
Recommended connector	BKS-_ 19/BKS-_ 20

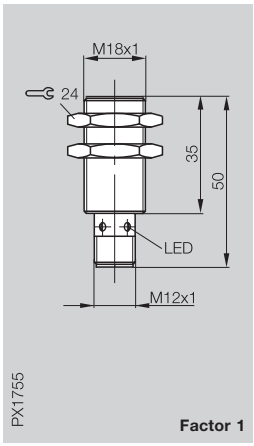
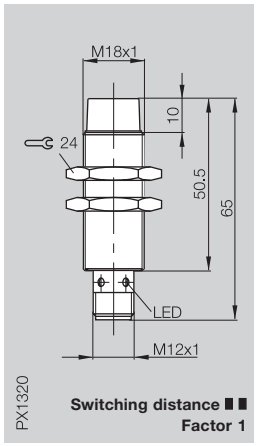
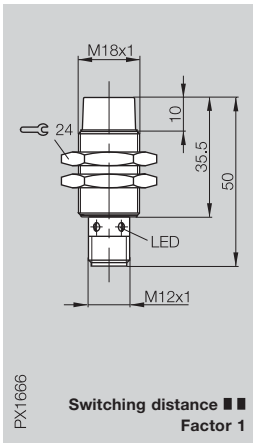
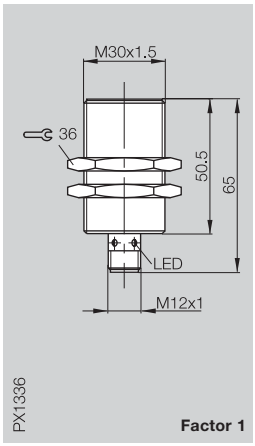
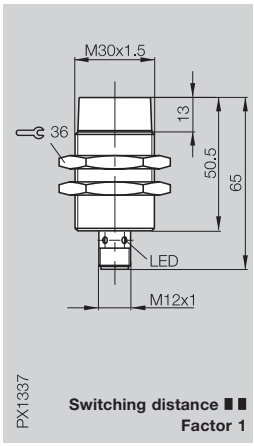
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

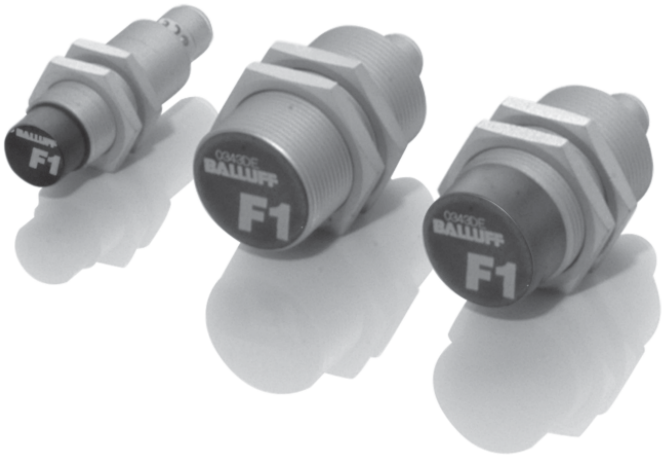
On request:
For applications in direct weld area we recommend the connectors with irradiated cable as an accessory.



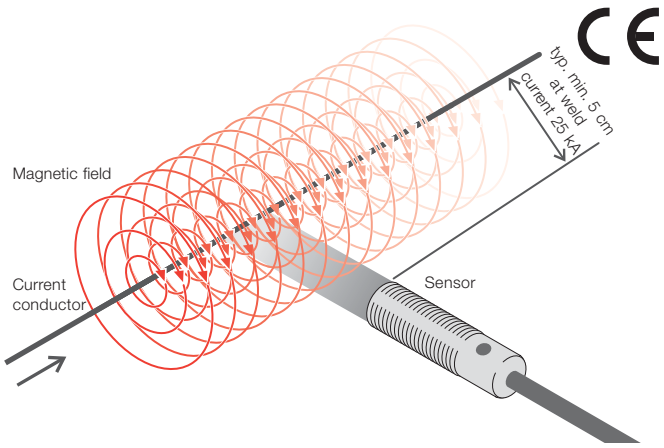
magnetic field ***immune***
+ weld splatter ***resistant***
= weld ***immune***

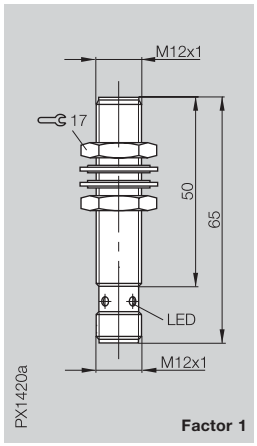
+ **Factor 1**

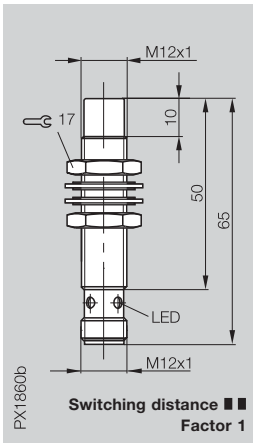
	M18×1	M18×1	M18×1	M30×1.5	M30×1.5
	flush	non-flush	non-flush	flush	non-flush
	5 mm	**12 mm**	**12 mm**	**10 mm**	**20 mm**
	0...4.1 mm	0...9.7 mm	0...9.7 mm	0...8.1 mm	0...16.2 mm
					
	BES M18MF1-PSC50A-S04G-W	BES M18ML-PSC12E-S04G-W	BES M18MD-PSC12E-S04G-W	BES M30ML-PSC10A-S04G-W	BES M30ML-PSC20E-S04G-W
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 17 mA	≤ 17 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	2500 Hz	2500 Hz	2500 Hz	600 Hz	1000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	⧈	⧈	⧈	⧈	⧈
	Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated
	LCP and PTFE	LCP and PTFE	LCP and PTFE	LCP and PTFE	LCP and PTFE
	Connector	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

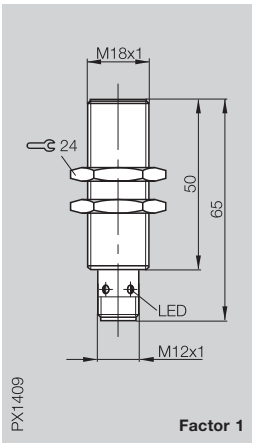


Housing size	**M12×1**	**M12×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)	flush	non-flush	flush
Rated operating distance s_n	**3 mm**	**8 mm**	**5 mm**
Assured operating distance s_a	0...2.2 mm	0...6.3 mm	0...3.9 mm









Weld immune Factor 1 Sensors

... the all-rounder for harsh industrial applications.

Magnetic field immune

Insensitive to magnetic fields which can be created with electrical currents of up to 25 kA (at a distance from energetic conductors of approx. 5 cm).

Weld splatter resistant

Resistant to metal splatter and combustion remains caused by welding.

Factor 1

Identical switching distance for steel, stainless, aluminum or brass.

Note about part number

BES ...**-W01**
Ceramic coating.
Rugged ceramic coating, thick for the most extreme welding environments.

PNP	NO ①	BES M12ML-PSC30A-S04G-W01	BES M12ML-PSC80E-S04G-W01	BES M18ML-PSC50A-S04G-W01
	complementary ③			
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e		≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i		250 V AC	250 V AC	250 V AC
Rated operational current I_e		200 mA	200 mA	200 mA
No-load supply current I_0 max.		≤ 15 mA	≤ 15 mA	≤ 15 mA
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f		2000 Hz	2000 Hz	2500 Hz
Utilization category		DC 13	DC 13	DC 13
Function/Supply voltage indicator		yes/no	yes/no	yes/no
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Insulation class		⧈	⧈	⧈
Housing material		Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated
Material of sensing face		Ceramic coating	Ceramic coating	Ceramic coating
Connection		Connector	Connector	Connector
Approval		cULus	cULus	cULus
Recommended connector		BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

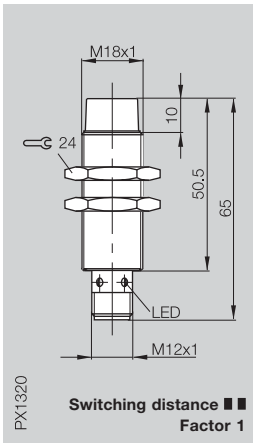
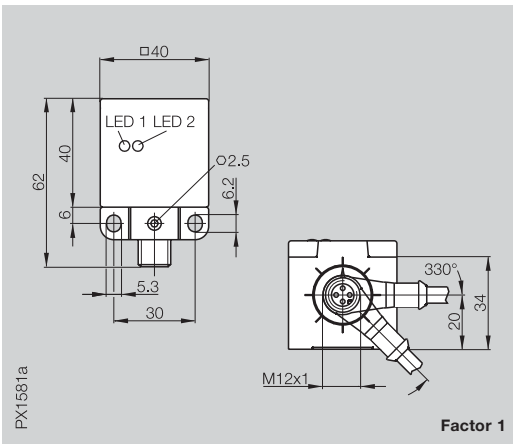
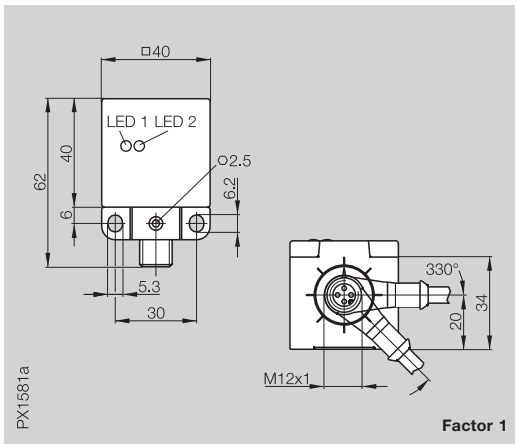
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

On request:
For applications in direct weld area we recommend the connectors with irradiated cable as an accessory.

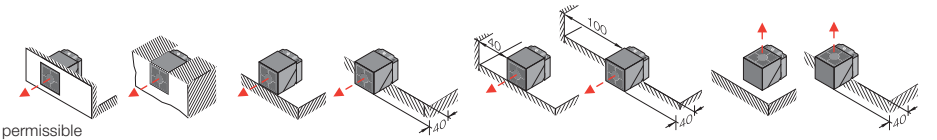
magnetic field ***immune***
+ weld splatter ***resistant***
= weld ***immune***

+ **Factor 1**

+ ceramic ***coated***

	M18×1	**40×40×62 mm** Unicompact	**40×40×62 mm** Unicompact
	non-flush	flush	non-flush
	12 mm	**15 mm**	**35 mm**
	0...9.5 mm	0...11.9 mm	0...28.1 mm
			
	BES M18ML-PSC12E-S04G-W01	BES Q40KFU-PSC15A-S04G-W01 BES Q40KFU-PAC15A-S04G-W01	BES Q40KFU-PSC35E-S04G-W01 BES Q40KFU-PAC35E-S04G-W01
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 20 mA	≤ 20 mA
	yes	yes	yes
	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–10...+70 °C
	2500 Hz	400 Hz	250 Hz
	DC 13	DC 13	DC 13
	yes/no	yes/yes	yes/yes
	IP 67	IP 67	IP 67
	⧈	⧈	⧈
	Brass, PTFE coated	PBT (part coated)	PBT (part coated)
	Ceramic coating	Ceramic coating	Ceramic coating
	Connector	Connector	Connector
	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

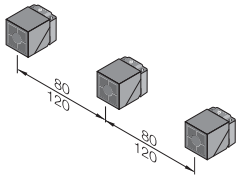
Permissible mounting options Unicompact



Rated operating distance s_n	Attached using	permissible							
15 mm	Original mounting socket (plastic)	yes	yes	yes	yes	yes	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	yes	yes	yes	yes	yes	yes	yes	yes
35 mm	Original mounting socket (plastic)	no	no	no	yes	no	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	no	no	no	yes	no	yes	no	no

Row mounting

flush 80 mm
non-flush 120 mm



Mounting bracket BES Q40-HW-1
Material: Metal

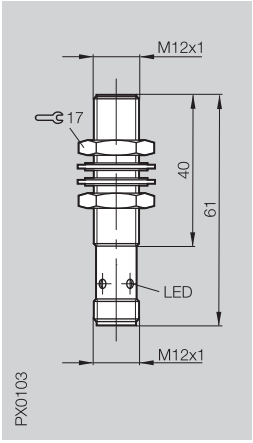
Mounting socket BES Q40-HW-2
Material: Metal.
Can be used in place of original mounting socket.
Please note mounting options!

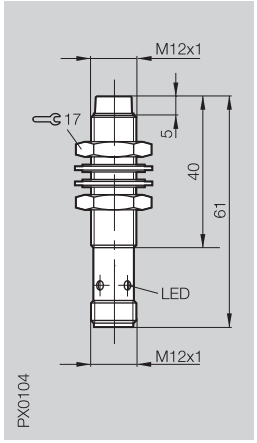
Please order accessories separately!

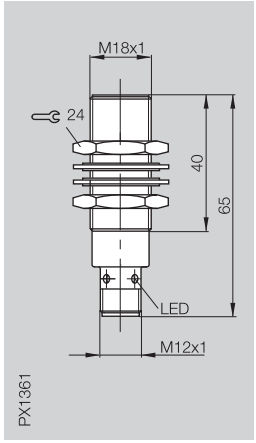
1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

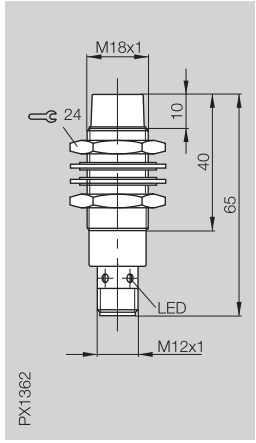
5
Connectors, Holders ... Page 5.2 ...

Housing size	**M12×1**	**M12×1**	**M18×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)	flush	non-flush	flush	non-flush
Rated operating distance s_n	**2 mm**	**4 mm**	**5 mm**	**8 mm**
Assured operating distance s_a	0...1.6 mm	0...3.2 mm	0...4.1 mm	0...6.5 mm









PNP NO ①	BES 516-325-S4-W	BES 516-356-S4-W	BES 516-326-S4-W	BES 516-360-S4-W
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2.5 V	≤ 1.5 V	≤ 2.5 V
Rated insulation voltage U_i	250 V AC	250 V AC	250 V AC	75 V DC
Rated operational current I_e	200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.	≤ 20 mA	≤ 20 mA	≤ 10 mA	≤ 20 mA
Polarity reversal protected	yes	yes	yes	yes
Short circuit protected	yes	yes	yes	yes
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	1000 Hz	1000 Hz	500 Hz	200 Hz
Utilization category	DC 13	DC 13	DC 13	DC 13
Function/Supply voltage indicator	yes/no	yes/no	yes/no	yes/no
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67
Insulation class	⧈	⧈	⧈	
Housing material	Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated	Brass, PTFE coated
Material of sensing face	LCP	PTFE	PTFE	PTFE
Connection	Connector	Connector	Connector	Connector
No. of wires × cross-section				
Approval	cULus	cULus	cULus	cULus
Recommended connector	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6

On request:
For applications directly in the welding area we recommend the connectors with irradiated cable as an accessory.

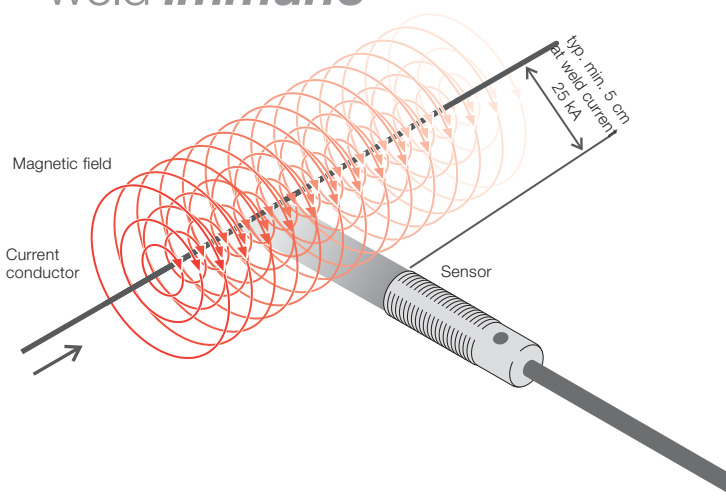
Magnetic field immune

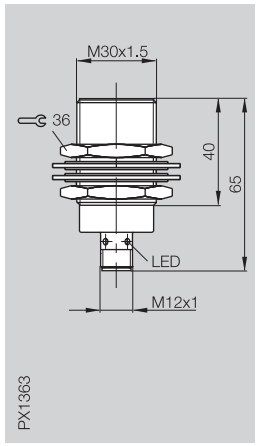
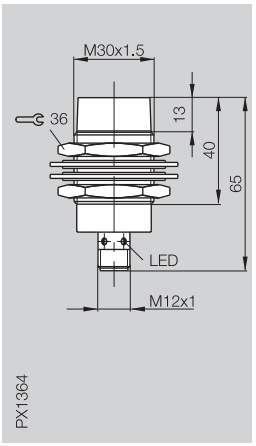
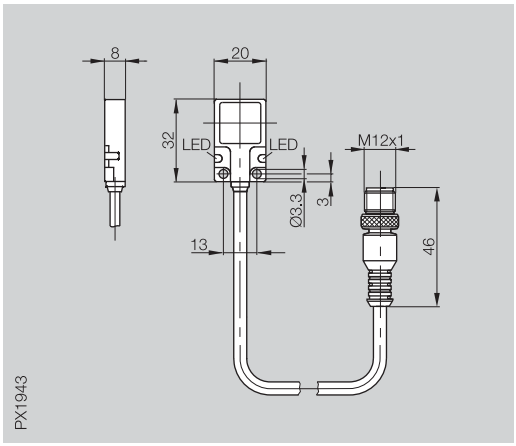
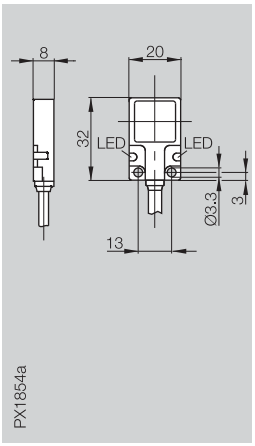
Insensitive to magnetic fields which can be created with electrical currents of up to 25 kA (at a distance from energetic conductors of approx. 5 cm).

Weld splatter resistant

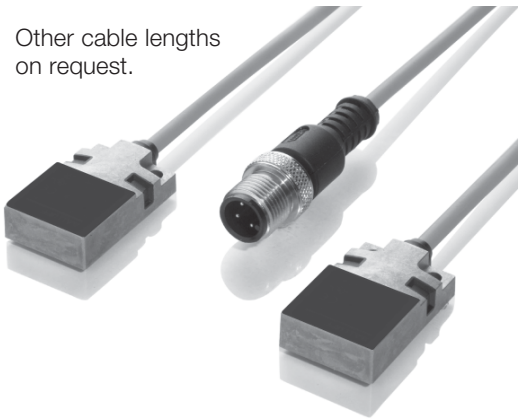
Resistant to metal splatter and combustion remains caused by welding.

magnetic field ***immune***
+ weld splatter ***resistant***
= weld ***immune***



	M30×1.5	**M30×1.5**	**20×32×8 mm** R01	**20×32×8 mm** R01
	flush	non-flush	flush	flush
	10 mm	**15 mm**	**5 mm**	**5 mm**
	0...8.1 mm	0...12.2 mm	0...4.1 mm	0...4.1 mm
				
	BES 516-327-S4-W	BES 516-362-S4-W	BES R01ZC-PSC50B-BX00.2-GS04-W01	BES R01ZC-PSC50B-BX05-W01
	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	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA
	≤ 8 mA	≤ 8 mA	≤ 15 mA	≤ 15 mA
	yes	yes	yes	yes
	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	100 Hz	100 Hz	100 Hz	100 Hz
	DC 13	DC 13	DC 13	DC 13
	yes/no	yes/no	yes/yes	yes/yes
	IP 67	IP 67	IP 67	IP 67
	⧈			
	Brass, PTFE coated	Brass, PTFE coated	GD-Zn	GD-Zn
	PTFE	PTFE	Ceramic coating	Ceramic coating
	Connector	Connector	0.2 m weld splatter resistant cable with connector, PUR irradiated	5 m weld splatter resistant cable, PUR irradiated
				3×0.25 mm²
	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19	

Other cable lengths on request.



Part numbering

BES ...**-W** Teflon-coated active surface and housing to protect against weld splatter.

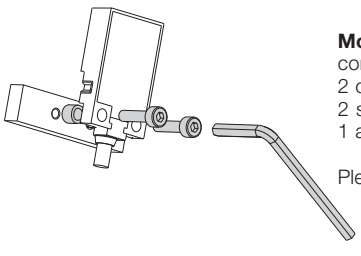
BES ...**-W01**
Ceramic coating.
Rugged ceramic coating, thick for the most extreme welding environments.

Main applications

Position monitoring on welding equipment and robots.

Special features of BES-R01ZC...W01

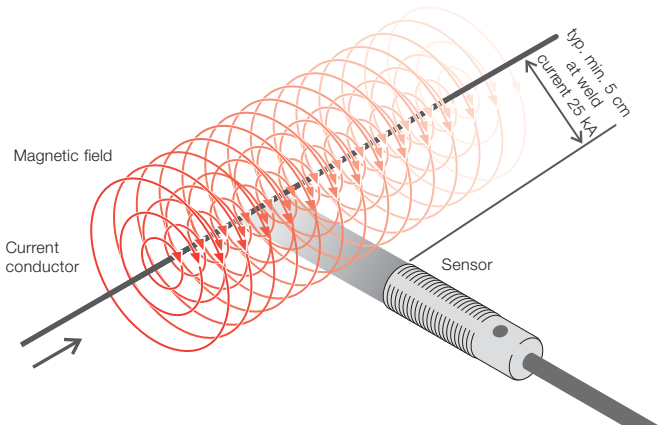
- Low profile in detection direction
- LED for function and power indication
- Cable weld splatter resistant and irradiated
- Sensing face with ceramic coating

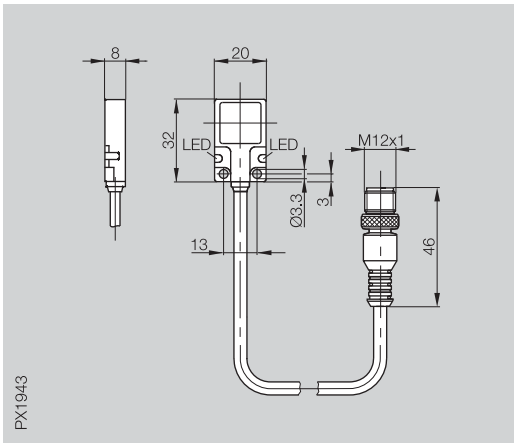


Mounting set BES R01-FK-1
consisting of:
2 cheese-head screws DIN 912 M3×12
2 spacers Ø5×Ø3.3×3.7
1 angled screwdriver DIN 911, 2.5 mm

Please order separately!

5
Connectors, Holders ...
Page 5.2 ...





Magnetic field immune

Insensitive to magnetic fields which can be created with electrical currents of up to 25 kA (at a distance from energetic conductors of approx. 5 cm).

Special features of BES-R01ZC...

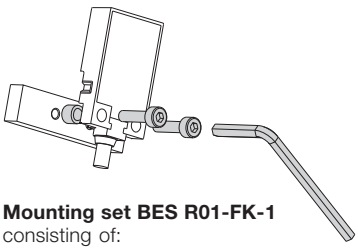
- Low profile in detection direction
- LED for function and power indication
- Cable weld splatter resistant and irradiated

Housing size			**20×32×8 mm** R01
Mounting (see notes starting p. **1.0.**11)			flush
Rated operating distance s_n			**5 mm**
Assured operating distance s_a			0...4.1 mm
PNP	NO	①	BES R01ZC-PSC50B-BX00.2-GS04-V
Supply voltage U_B			10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V
Rated insulation voltage U_i			75 V DC
Rated operational current I_e			200 mA
No-load supply current I_0 max.			≤ 15 mA
Polarity reversal protected			yes
Short circuit protected			yes
Repeat accuracy R			≤ 5 %
Ambient temperature range T_a			–25...+70 °C
Switching frequency f			100 Hz
Utilization category			DC 13
Function/Supply voltage indicator			yes/yes
Degree of protection per IEC 60529			IP 67
Housing material			GD-Zn
Material of sensing face			PA 12
Connection			0.2 m weld splatter resistant cable with connector, PUR irradiated
max. conductor cross-section			
Approval			cULus
Recommended connector			BKS-_ 19
possible mounting options			

① Wiring diagrams see page **1.0.**6

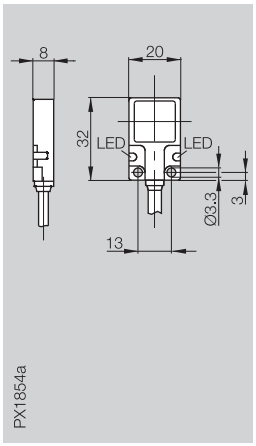
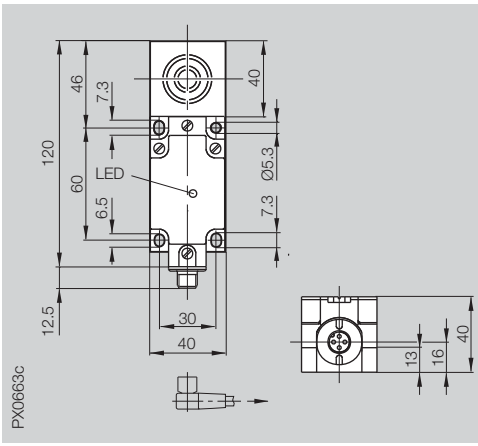
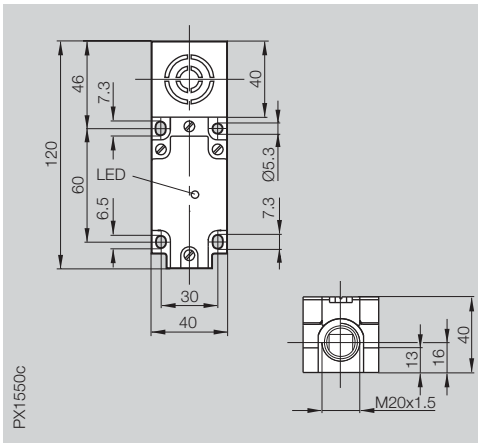
Other cable lengths on request.

→ Connector orientation



Mounting set BES R01-FK-1
consisting of:
2 cheese-head screws DIN 912 M3×12
2 spacers Ø5×Ø3.3×3.7
1 angled screwdriver DIN 911, 2.5 mm

Please order separately!

	20×32×8 mm R01	**40×40×120 mm** Unisensor	**40×40×120 mm** Unisensor
	flush	flush	flush
	5 mm	**15 mm**	**15 mm**
	0...4.1 mm	0...12.2 mm	0...12.2 mm
			
	BES R01ZC-PSC50B-BX03-V	BES 517-385-M3-CW-S-S4	BES 517-385-M3-CW-S
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 12 mA	≤ 12 mA
	yes	yes	yes
	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C
	100 Hz	15 Hz	15 Hz
	DC 13	DC 13	DC 13
	yes/yes	yes/no	yes/no
	IP 67	IP 67	IP 67
	GD-Zn	PBT	PBT
	PA 12	PBT	PBT
	3 m weld splatter resistant cable, PUR irradiated	Connector	Screw terminals up to 2.5 mm²
	3×0.25 mm²		
	cULus	cULus	cULus
		BKS-_ 19/BKS-_ 20	
		Fig. 1 to 5	Fig. 1 to 5

Mounting options

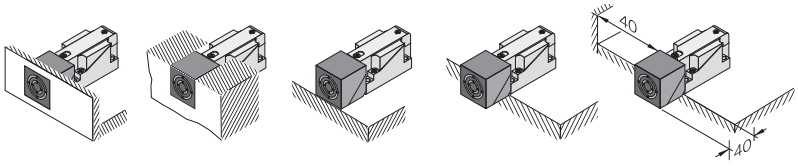
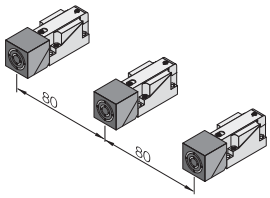
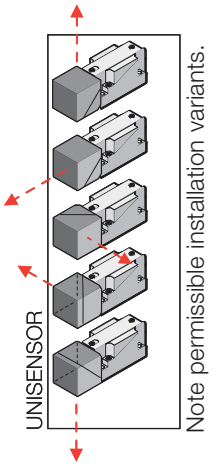


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

Row mounting





Desina sensors with diagnostic output

These inductive sensors have been specially designed to the Desina specification for demanding use on machine tools.

The additional diagnostic output monitors the switch and cable function. As long as the sensor is functional, a "High" signal is emitted.

Balluff sensors with Desina specification meet the requirements of ISO 23570-Part 1:
"Industrial automation systems and integration – Distributed installation in industrial applications – Part 1:
Sensors and actuators".

Note!

To ensure reliable function monitoring, connectors without LED must be used (see recommended connectors).

Additional features:

Factor 1 Sensors
detect objects such as steel, aluminum or brass at the same switching distance (no reduction factor).

This property offers advantages in applications where the material of the target object can vary.

In addition, all Factor 1 sensors are **magnetic field immune.**
Their function is not impaired by strong electromagnetic fields (such as from induction hardening or welding equipment).
Factor 1 sensors remain unaffected in their switching behavior by weld currents up to 25 kA.

Part numbering

BES ...**-M01**
Diagnostic function monitors sensor and cable function. Emits a high signal on the monitor output as long as the sensor is functional.

BES ...**-WM01**
Diagnostic function and Teflon-coating
(weld splatter resistant)

DESINA

www.desina.de

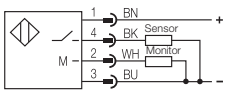
Housing size	
Mounting (see notes starting p. **1.0.**11)	
Rated operating distance s_n	
Assured operating distance s_a	

CE

PNP	NO
Supply voltage U_B	
Voltage drop U_d at I_e	
Rated insulation voltage U_i	
Rated operational current I_e	
Monitor output load capacity	
No-load supply current I_0 max.	
Polarity reversal protected	
Short circuit protected	
Repeat accuracy R	
Ambient temperature range T_a	
Switching frequency f	
Utilization category	
Function/Supply voltage indicator	
Degree of protection per IEC 60529	
Insulation class	
Housing material	
Material of sensing face	
Connection	
Approval	
Recommended connector	
possible mounting options	

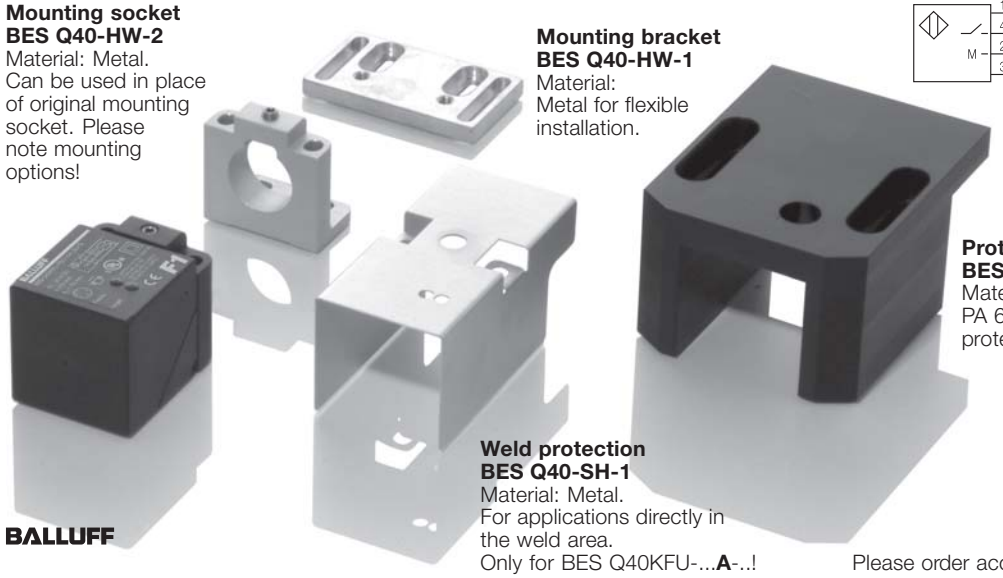
Switching distance ■■ see page **1.0.**10

Wiring diagram



Mounting socket
BES Q40-HW-2
Material: Metal.
Can be used in place of original mounting socket. Please note mounting options!

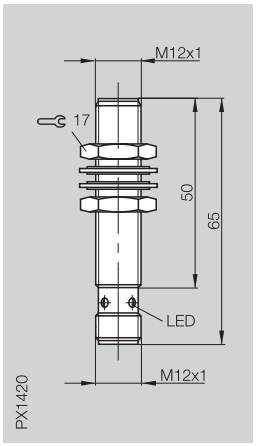
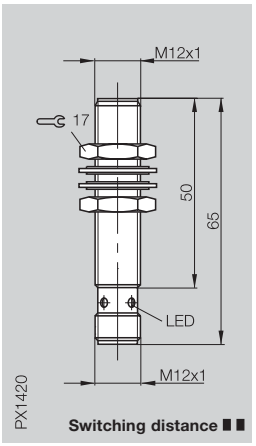
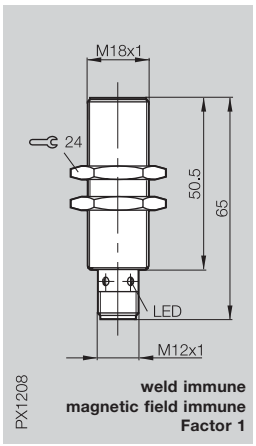
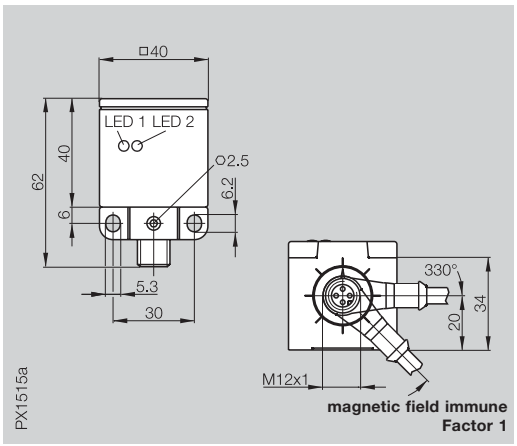
Mounting bracket
BES Q40-HW-1
Material:
Metal for flexible installation.



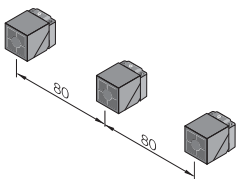
Protective cover
BES Q40-SH-2
Material:
PA 6 as step protection.

Weld protection
BES Q40-SH-1
Material: Metal.
For applications directly in the weld area.
Only for BES Q40KFU-...**A**-..!

Please order accessories separately!

	M12×1	M12×1	M18×1	40×40×62 mm Unicompact
	flush	flush	flush	flush
	2 mm	**4 mm**	**5 mm**	**15 mm**
	0...1.6 mm	0...3.2 mm	0...4.1 mm	0...12.2 mm
				
	BES M12MI-PSC20B-S04G-M01	BES M12MI-PSC40B-S04G-M01	BES M18MI-PSC50A-S04G-WM01	BES Q40KFU-PSC15A-S04G-M01
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 3.5 V	≤ 3.5 V
	250 V AC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA
	max. 50 mA	max. 50 mA	max. 50 mA	max. 50 mA
	≤ 12 mA	≤ 12 mA	≤ 25 mA	≤ 28 mA
	yes	yes	yes	yes
	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	2000 Hz	1000 Hz	15 Hz	13 Hz
	DC 13	DC 13	DC 13	DC 13
	yes/no	yes/no	yes/no	yes/yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	IP 67
	⧈	⧈	⧈	⧈
	CuZn coated	CuZn coated	Brass, PTFE coated	PBT
	LCP	LCP	LCP and PTFE	PBT
	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus
	BKS-S 19-3-PY/BKS-S 20-3-PY	BKS-S 19-3-PY/BKS-S 20-3-PY	BKS-S 19-3-PY/S 20-3-PY	BKS-S 19-3-PY/S 20-3-PY
				Fig. 1 to 4

Row mounting
flush 80 mm



Mounting options

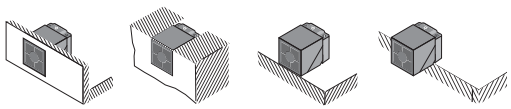
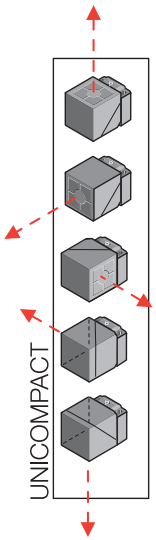


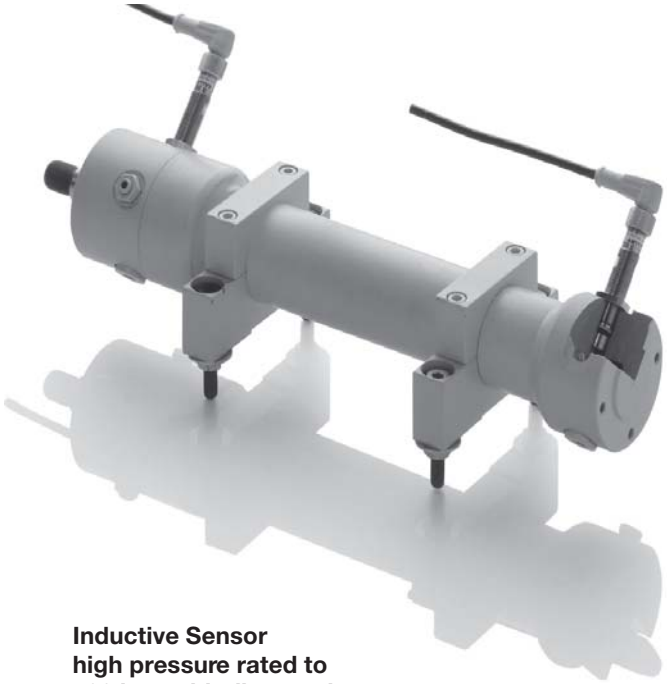
Fig. 1 Fig. 2 Fig. 3 Fig. 4



1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5
Connectors, Holders ... Page 5.2 ...

+ high pressure rated



Inductive Sensor high pressure rated to 500 bar, with diagnostics and setup aid.

This high pressure rated inductive sensor is used for position sensing of the piston position in hydraulic cylinders.

Here the active surface is subjected to high pressure inside the cylinder.

Balluff has developed a special manufacturing technique for making the active surface extremely resistant. The coils are encased in a Duromer. The additional diagnostic output monitors the sensor and cable function. As long as the sensor is functional a “High” signal is emitted.

The optical setup aid indicates when the optimum distance of the sensing face from the piston has been reached. This simplifies installation and helps to prevent damage to the sensor.

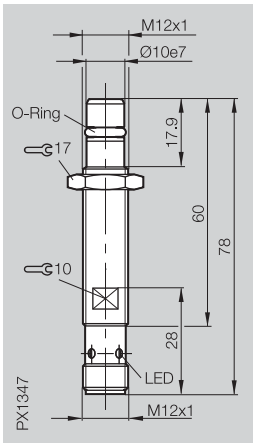
Note!

For reliable function monitoring, connectors without LED must be used (see recommended connectors).

Part numbering

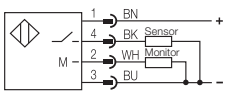
BES ...**-HM01**
Diagnostic function and high pressure rated active surface.

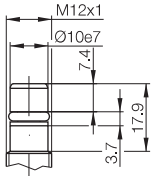
Housing size	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**1.5 mm**
Assured operating distance s_a	0...1.2 mm



PNP NO	BES M12EL-PSC15B-S04G-HM01
Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 3.7 V
Rated insulation voltage U_i	75 V DC
Rated operational current I_e	200 mA
Monitor output load capacity	max. 50 mA
No-load supply current I_0 max.	≤ 9 mA
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	300 Hz
Utilization category	DC 13
Function indicator	yes
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20
Housing material	Stainless steel
Material of sensing face	EP
Connection	Connector
Approval	cULus
Recommended connector	BKS-S 19-3-PY/BKS-S 20-3-PY
O-Ring/spare part number	5.3×2.4/631753
Support ring/spare part number	10×5.9×1/705918
High pressure rated to	**500 bar**

Wiring diagram





Function principle

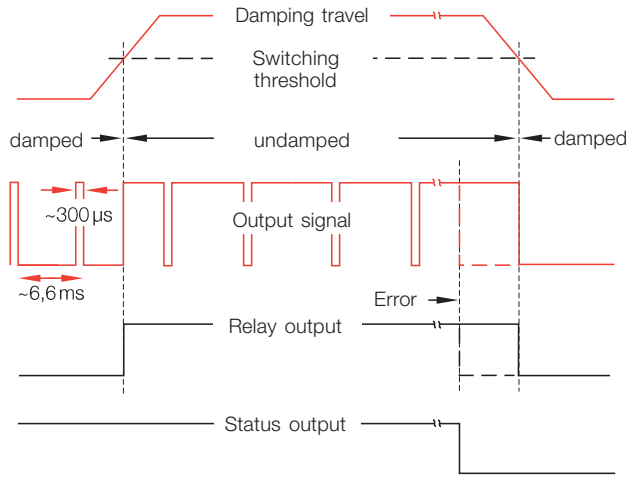
Proximity switches with dynamic diagnostics allow monitoring of the sensor functions including the cable.

To accomplish this, the oscillator state is changed using a pulse generator while the sensor is operating. As soon as the sensor head is damaged or the oscillator becomes electrically defective, the pulse generator is no longer able to change the oscillator state and the test pulses will be missing from the output.

The pulse frequency is f ~ 160 Hz and the pulse duration t ~ 300 µs. The pulse-pause ratio of t ~ 5 % selected is small enough that the test pulses can be filtered out by the input filter of a controller, or for example a relay can be directly driven.
The information “proximity switch damped or undamped” can therefore be processed in the usual fashion.

Function monitoring

The test pulses and thereby the function of the proximity switch are monitored by additional electronics which signal error-free function by means of a High level on the “Status/Output” message output.



Pulse diagram of a proximity switch with function diagnostics (NC).

For this Balluff offers a function diagnostics unit which can be easily installed in a controller:

Function diagnostics unit
see page **1.5.**19
– BES 113-FD-1
(for 1 Sensor)

The unit is compatible with:

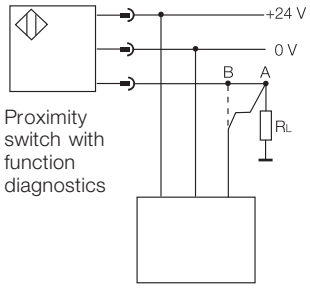
Inductive Sensors
see page **1.5.**18
– BES 113-356-SA6-S4
Normally open
– BES 113-356-SA31-S4
Normally open
– BES 113-3019-SA1-S4
Normally closed

Capacitive sensor
see page **4.**15
– BCS 20MG10-XPA1Y-8B-03
complementary.

Single faults are detected when monitoring for the entire system.

Installation notes

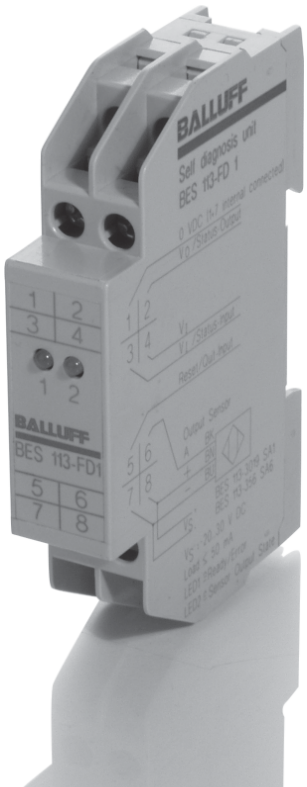
The signal line for the function diagnostics unit should be connected as closely as possible to the load R_L (Point A). When Point B is connected the cable segment between B and load R_L is not monitored.



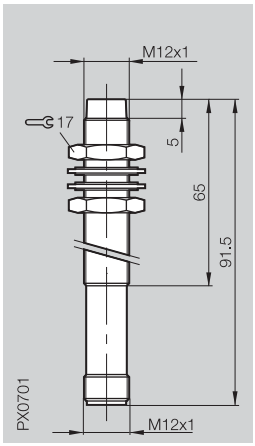
Note!

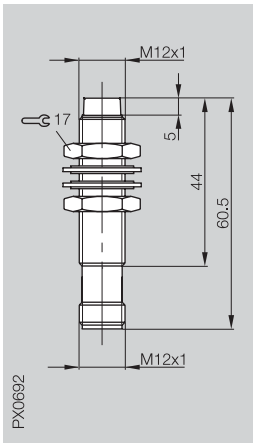
The system described here is not suitable for systems with personal protection.

For additional information please request a device description.



Housing size	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)	non-flush	non-flush
Rated operating distance s_n	**3.7 mm**	**4 mm**
Assured operating distance s_a	0...3 mm	0...3 mm





Note!

For function diagnostic switches with connector option, do not use connectors with integrated LED function indicator, since the LED is parallel to the load R_L and cable break monitoring is then no longer assured.

The switch function can however be monitored on the LEDs in the processor.

PNP				
	NO	①	BES 113-356-SA6-S4	BES 113-356-SA31-S4
	NC	②	BES 113-3019-SA1-S4	
Supply voltage U_B			20...30 V DC	20...30 V DC
Voltage drop U_d at I_e			typ. 2.5 V	typ. 3.5 V
Rated insulation voltage U_i			75 V DC	75 V DC
Rated operational current I_e			130 mA	130 mA
Minimum operating current I_m			1 mA	5 mA
No-load supply current I_0 max.			≤ 25 mA	≤ 10 mA
Output resistance R_a			Open collector	Open collector
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %
Effective operating distance s_r			3.7 mm +20 %/–10 %	4 mm +20 %/–10 %
Ambient temperature range T_a			–25...+70 °C	0...+70 °C
Switching frequency f			300 Hz	300 Hz
Utilization category			DC 12	DC 13
Function indicator			no	no
Degree of protection per IEC 60529			IP 67	IP 67
Housing material			CuZn coated	CuZn coated
Material of sensing face			PA 12	LCP
Connection			Connector (cable length ≤ 50 m to controller)	Connector (cable length ≤ 50 m to controller)
Recommended connector			BKS-_ 19/20-1 NO BKS-_ 19/20-2 NC	BKS-_ 19/20-1 NO

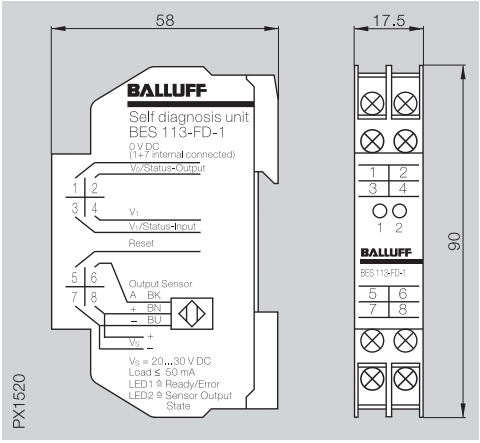
① Wiring diagrams see page **1.0.**6

Description	**Function diagnostics unit** with electronic output
Use	For function diagnostic sensors BES 113-... (see page **1.5.**18) or BCS 20... page **4.**15

The function diagnostics unit BES 113-FD-1 monitors a proximity switch and its cable using dynamic function diagnostics. A logic circuit polls the sensor signals for the presence of test pulses and also monitors for proper function of the processor. For the machine controller it emits a High level signal on the “Status/Output” line when there is no fault and a Low signal when a fault is present. LED’s indicate the switching state of the sensor.

Recurring faults are stored by the device. They must be reset using a reset function (Low signal on 5).

If the BES 113-FD-1 is used as a single unit, terminals V_I (3 and 4) must be jumpered together.



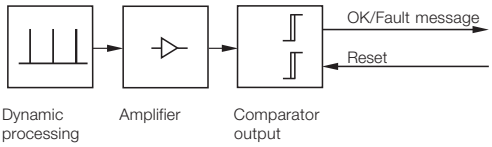
Ordering code		BES 113-FD-1
Supply voltage U_B		20...30 V DC
Ripple		≤ 15 %
No-load current		approx. 20 mA
Output voltage U_0 (referenced to 0 V)	low	0...(0.1×U_B) for defects in sensor or processor (fault)
	high	(0.5×U_B)...U_B for error-free function
Output current max.		50 mA
Ambient temperature range		0...+60 °C
LED 1 green		“Ready/Error” – in error-free state the LED is bright on. For defects (fault) the LED is very dim.
LED 2 yellow		“Sensor Output State” indicates the switching state of the sensor.
Housing attachment		Rail mount per DIN EN 50022-35
max. conductor cross-section		2×2.5 mm²
Degree of protection per IEC 60529		Housing IP 40, terminals IP 20

Cascading

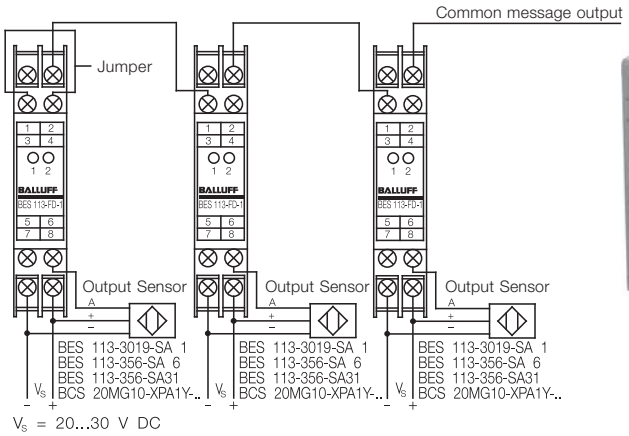
When cascading several BES 113-FD-1 the output (2) must be connected to the input (3) of the following device. The jumper between V_I is not needed except for the first device.

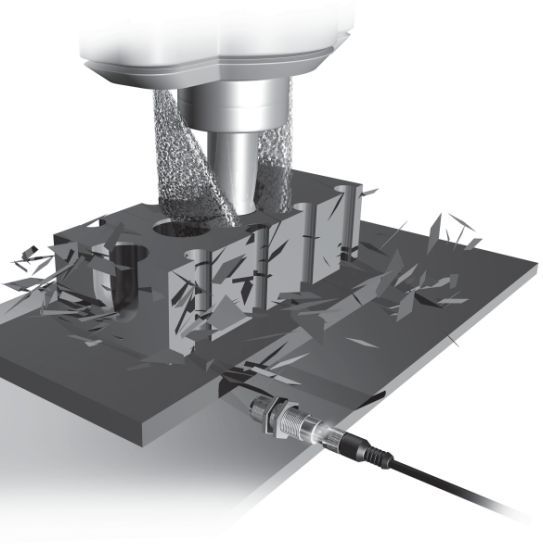
When there is a malfunction, the message appears on the last device. The defective sensor is indicated by the first weakly illuminated LED in the cascade.

Small and space-saving, the BES 113-FD-1 can be attached to a DIN rail per DIN EN 50022-35.

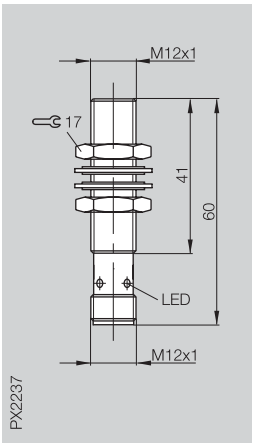


Cascading





Housing size	**M12×1**
Installation type (see installation dimensions below)	quasi flush
Rated operating distance s_n	**6 mm**
Assured operating distance s_a	0...4.9 mm



PNP	NO	①	BES M12EG1-PSC60Z-S04G-S11
NPN	NO	④	BES M12EG1-NSC60Z-S04G-S11

Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 2 V
Rated insulation voltage U_i	75 V DC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 16 mA
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	400 Hz
Utilization category	DC 13
Function indicator (flashes at between approx.. 70 and 100 % of effective operating distance s_r)	yes
Degree of protection per IEC 60529	IP 67
Housing material	Stainless steel
Material of sensing face	Stainless steel
Connection	Connector
Recommended connector	BKS-_ 19/BKS-_ 20/ BKS-S 20E
Pressure rated to	**80 bar**

① Wiring diagrams see page **1.0.**6

Inductive Steelface sensors with extended switching distance

are used in especially harsh environments and applications which are too extreme for standard sensors.

Here is where they show their strengths:

- Resistance to abrasive media and aggressive cleaners and solvents
- Rugged sensing face
- Long switching distance for more function reserve – applies especially to non-flush mountable sensors

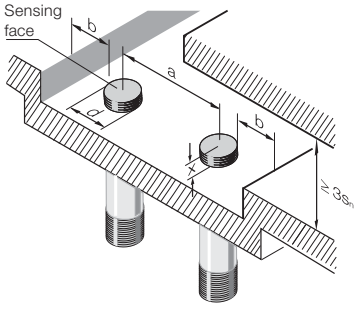
Installation dimensions for quasi flush sensors (please note)

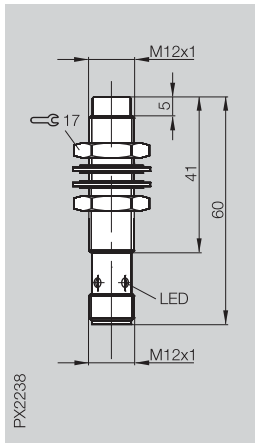
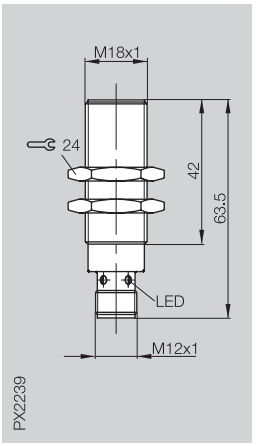
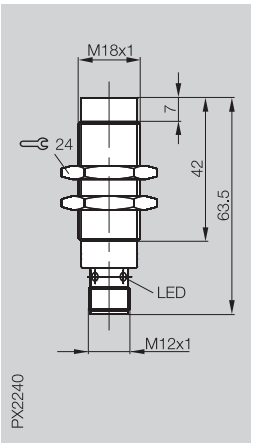
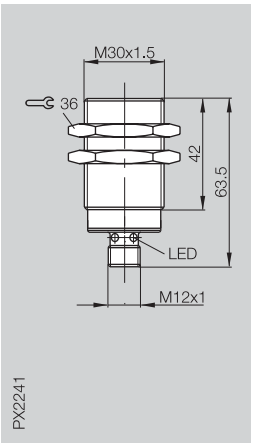
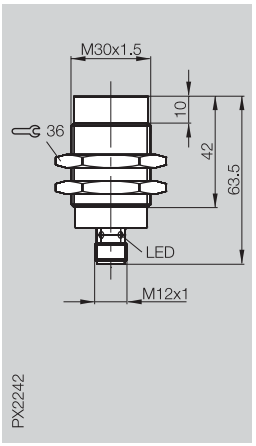
Housing size	Dimension a	Dimension b	Dimension x	For installation in
M12	≥ 50 mm	≥ 6 mm	≥ 7 mm	Steel Fe 360
			≥ 12 mm	Aluminum
			≥ 12 mm	Brass
			≥ 10 mm	Stainless steel
M18	≥ 60 mm	≥ 16 mm	≥ 14 mm	Steel Fe 360
			≥ 12 mm	Aluminum
			≥ 14 mm	Brass
			≥ 16 mm	Stainless steel
M30	≥ 90 mm	≥ 30 mm	≥ 28 mm	Steel Fe 360
			≥ 28 mm	Aluminum
			≥ 28 mm	Brass
			≥ 35 mm	Stainless steel

Failure to observe the mounting dimensions or flush mounting may result in significant reductions in switching distance!

Reduction factor (referenced to detection object)

Housing size	Factor	When mounted in
M12	1	Steel Fe 360
	0.8...1	Aluminum
	0.7...0.85	Copper
	0.85...1.3	Brass
	0.5/0.9	Stainless 1 mm/≥ 2 mm thick
M18	1	Steel Fe 360
	0.8...1	Aluminum
	0.7...0.85	Copper
	0.85...1.3	Brass
	0.5/0.8	Stainless 1 mm/≥ 2 mm thick
M30	1	Steel Fe 360
	0.7...1	Aluminum
	0.7...0.9	Copper
	0.9...1.2	Brass
	0.5/1	Stainless 1 mm/≥ 2 mm thick



	M12×1	M18×1	M18×1	M30×1.5	M30×1.5
	non-flush	quasi flush	non-flush	quasi flush	non-flush
	10 mm	**10 mm**	**20 mm**	**20 mm**	**40 mm**
	0...8.1 mm	0...8.1 mm	0...16.2 mm	0...16.2 mm	0...32.4 mm
					
	BES M12EF1-PSC10F-S04G-S	BES M18EG1-PSC10Z-S04G-S11	BES M18EF1-PSC20F-S04G-S	BES M30EG1-PSC20Z-S04G-S11	BES M30EE1-PSC40F-S04G-S
	BES M12EF1-NSC10F-S04G-S	BES M18EG1-NSC10Z-S04G-S11	BES M18EF1-NSC20F-S04G-S	BES M30EG1-NSC20Z-S04G-S11	BES M30EE1-NSC40F-S04G-S
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 12 mA	≤ 16 mA	≤ 12 mA	≤ 16 mA	≤ 12 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	350 Hz	200 Hz	150 Hz	200 Hz	100 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 67	IP 67	IP 67	IP 67	IP 67
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	Connector	Connector	Connector	Connector	Connector
	BKS-_ 19/BKS-_ 20/ BKS-S 20E	BKS-_ 19/BKS-_ 20/ BKS-S 20E	BKS-_ 19/BKS-_ 20/ BKS-S 20E	BKS-_ 19/BKS-_ 20/ BKS-S 20E	BKS-_ 19/BKS-_ 20/ BKS-S 20E
	80 bar	**60 bar**	**60 bar**	**40 bar**	**40 bar**

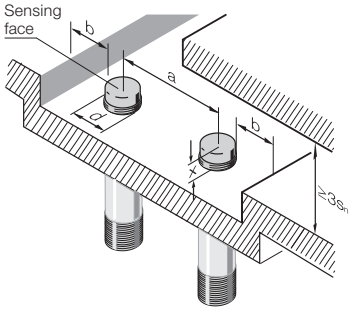
Installation dimensions for non-flush sensors (please note)

Housing size	Dimension a	Dimension b	Dimension x	When mounted in
M12	≥ 105 mm	≥ 30 mm	≥ 25 mm	Steel Fe 360
			≥ 15 mm	Aluminum
			≥ 17 mm	Brass
			≥ 25 mm	Stainless
M18	≥ 200 mm	≥ 50 mm	≥ 45 mm	Steel Fe 360
			≥ 25 mm	Aluminum
			≥ 25 mm	Brass
			≥ 45 mm	Stainless
M30	≥ 370 mm	≥ 90 mm	≥ 70 mm	Steel Fe 360
			≥ 40 mm	Aluminum
			≥ 40 mm	Brass
			≥ 70 mm	stainless steel

Not observing the installation dimensions may result in a significant reduction in switching distance!

Reduction factor (referenced to detection object)

Housing size	Factor	When mounted in
M12	1	Steel Fe 360
	1	Aluminum
	0.8	Copper
	1	Brass
	1	Stainless ≥ 5 mm thick
M18	1	Steel Fe 360
	0.7	Aluminum
	0.7	Copper
	0.7	Brass
	1	Stainless ≥ 5 mm thick
M30	1	Steel Fe 360
	0.7	Aluminum
	0.7	Copper
	1	Brass
	1	Stainless ≥ 5 mm thick



pressure rated
high pressure rated

Inductive Sensors – pressure rated up to 100 bar and high pressure rated up to 500 bar.

In the wide range of hydraulic applications, high pressure proximity switches are exposed to many hostile environments.

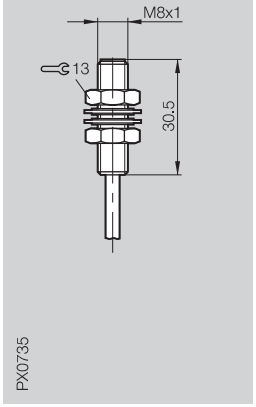
Numerous applications in hydraulic cylinders and valves have resulted in this model-rich sensor line. What are your requirements?

Medium-resistant housing materials and a special sealing process result in pressure ratings from 3 to 500 bar depending on the model.

The various housing diameters and thread sizes are based on application-specific requirements.

The output amplifier is built in so that no accessory devices are necessary and the switch may be connected directly to the coil of a relay. Pressure-tight proximity switches are available with molded-in cable or with plug-in connector.

Housing size	**M8×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**1.2 mm**
Assured operating distance s_a	0...1 mm



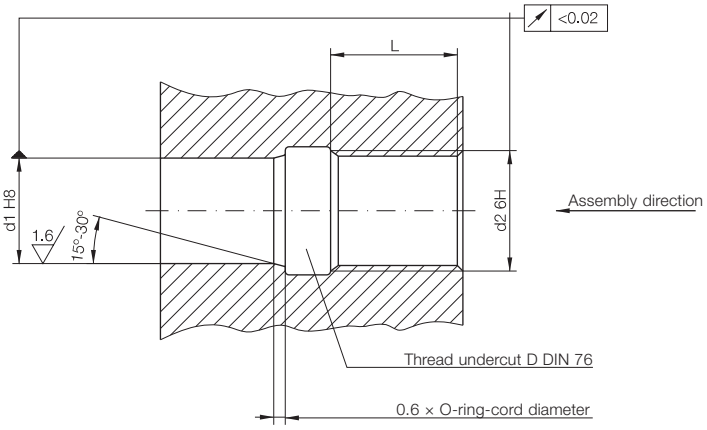
PNP	NO	①	BES 516-324-SA17-05
	NC	②	

Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 1.5 V
Rated insulation voltage U_i	75 V DC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 20 mA
Polarity reversal protected	yes
Short circuit protected	no
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	1500 Hz
Utilization category	DC 13
Function indicator	no
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20
Housing material	Stainless steel
Material of sensing face	PA 12
Connection	5 m PVC cable
No. of wires × cross-section	3×0.14 mm²
Approval	
Recommended connector	
O-Ring/spare part number	
Support ring/spare part number	
Pressure rated to	**10 bar**

① Wiring diagrams see page **1.0.**6

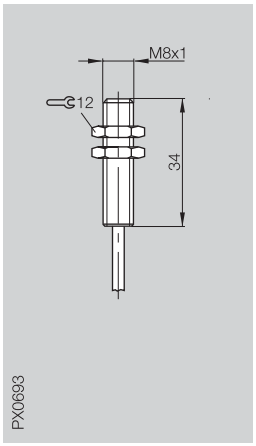
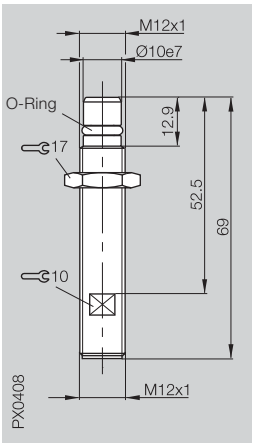
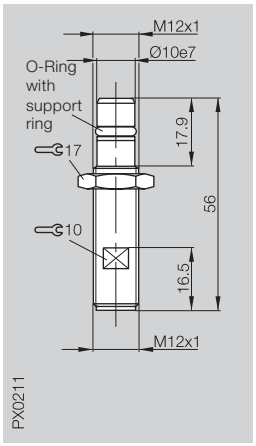
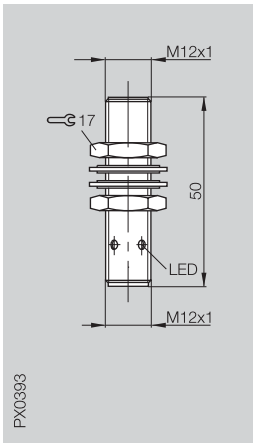
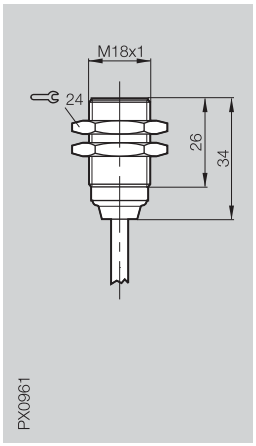
Other cable lengths on request.

Installation note for pressure/high-pressure rated sensors with O-ring

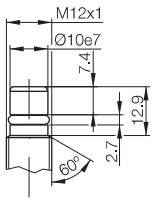


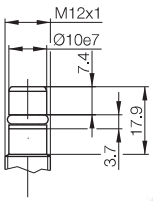
Example using BES 516-300-S270-S4-D:

d1: Ø of bore for switch head
Ø 10^{H8} = Ø $10^{+0.022}$
d2: nominal thread diameter M12×1 6H
L: recommended insertion depth L ≥ 0.8×d_2
0.8×12 = 9.6

	M8×1	M12×1	M12×1	M12×1	M18×1
	flush	flush	flush	flush	flush
	1.5 mm	**1.5 mm**	**1.5 mm**	**2 mm**	**5 mm**
	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.6 mm	0...4.1 mm
					
	BES 516-300-S289-B0-D-PU-05 BES 516-300-S292-B0-D-PU-05	BES 516-300-S270-S4-D	BES 516-300-S291-S4-D	BES 516-370-SA9-E5-C-S4	BES 516-326-SA23-03
	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	≤ 2 V	≤ 2 V	≤ 3.5 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA	130 mA
	≤ 25 mA	≤ 8 mA	≤ 8 mA	≤ 10 mA	≤ 20 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+80 °C	–25...+80 °C	–25...+70 °C	–25...+70 °C
	1000 Hz	2000 Hz	2000 Hz	5000 Hz	500 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	no	no	no	yes	no
	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
	Stainless steel	Stainless steel	Stainless steel	CuZn coated	CuZn coated
	Ceramic	EP	EP	PEEK	PA 12
	5 m Cable PUR	Connector	Connector	Connector	3 m cable, PVC
	3×0.14 mm²				3×0.34 mm²
	cULus				
		BKS-_ 19/BKS-_ 20 5.3×2.4/631753	BKS-_ 19/BKS-_ 20 5.3×2.4/631753 10×5.9×1/705918	BKS-_ 19/BKS-_ 20	
	100 bar	**100 bar**	**50 bar**	**10 bar**	**10 bar**

For accessories and installation note for seal nut BES 08-DM-1 see page **5.**73





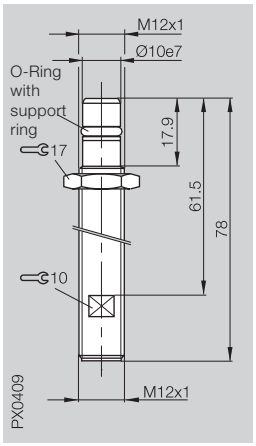
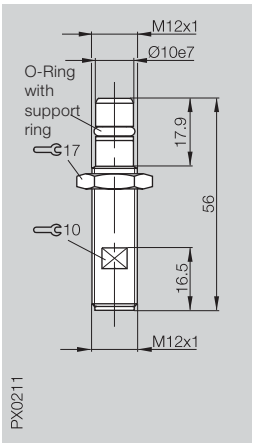
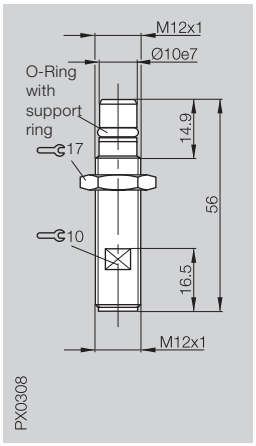
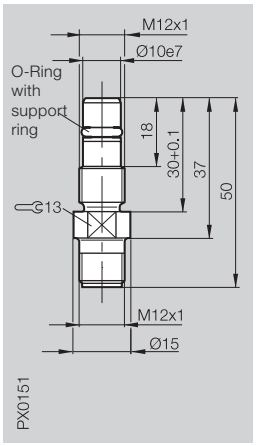
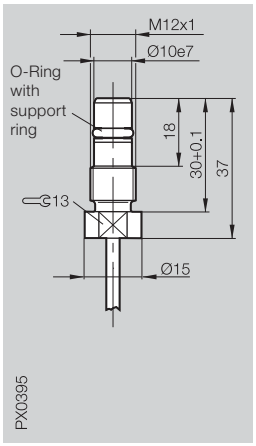
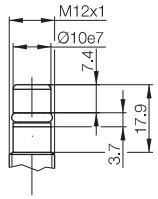
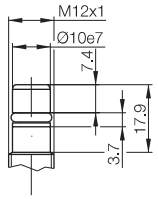
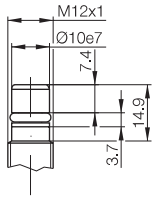
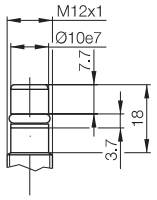
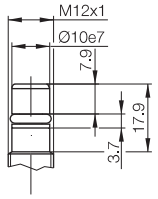
Housing size	
Mounting (see notes starting p. **1.0.**11)	
Rated operating distance s_n	
Assured operating distance s_a	

CE

PNP	NO	①
Supply voltage U_B		
Voltage drop U_d at I_e		
Rated insulation voltage U_i		
Rated operational current I_e		
No-load supply current I_0 max.		
Polarity reversal protected		
Short circuit protected		
Repeat accuracy R		
Ambient temperature range T_a		
Switching frequency f		
Utilization category		
Function indicator		
Degree of protection per IEC 60529		
Housing material		
Material of sensing face		
Connection		
No. of wires × cross-section		
Recommended connector		
O-Ring/spare part number		
Support ring/spare part number		
High pressure rated to		

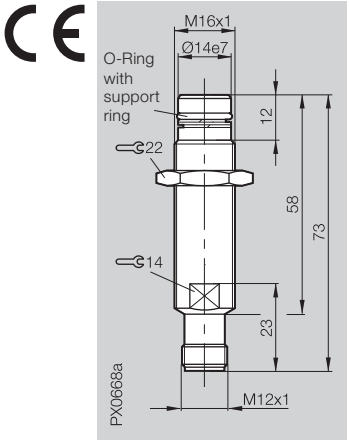
① Wiring diagrams see page **1.0.**6

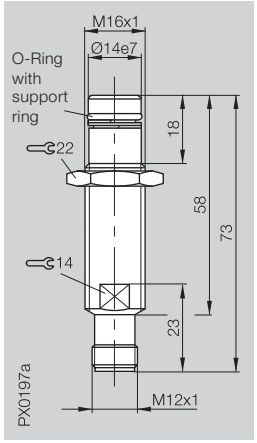
Other cable lengths on request.

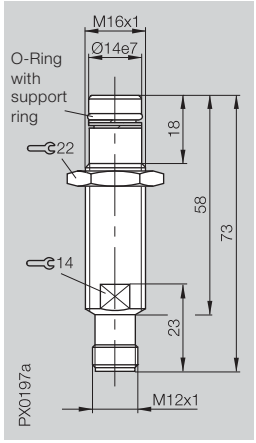
M12×1	**M12×1**	**M12×1**	**M12×1**	**M12×1**	
flush	flush	flush	flush	flush	
1.5 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**	
0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	
					
BES 516-300-S321-S4-D	BES 516-300-S322-S4-D	BES 516-300-S323-S4-D	BES 516-300-S324-S4-D	BES 516-300-S205-D-PU-03	
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	
75 V DC	75 V DC	75 V DC	75 V DC	75 V DC	
200 mA	200 mA	200 mA	200 mA	200 mA	
≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA	
yes	yes	yes	yes	yes	
yes	yes	yes	yes	yes	
≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	
–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C	
1000 Hz	1000 Hz	1000 Hz	1000 Hz	2000 Hz	
DC 13	DC 13	DC 13	DC 13	DC 13	
no	no	no	no	no	
IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	
Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	
EP	EP	EP	EP	EP	
Connector	Connector	Connector	Connector	3 m Cable PUR	
				3×0.14 mm²	
BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20		
5.85×2.4/636594	5.85×2.4/636594	5.85×2.4/636594	5.85×2.4/636594	5.3×2.4/631753	
10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	
350 bar	**350 bar**	**350 bar**	**350 bar**	**350 bar**	
					

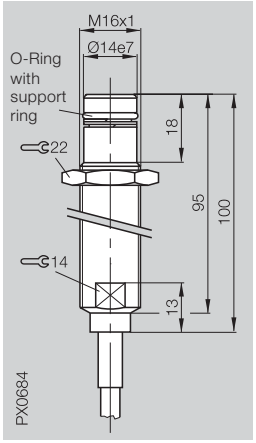
5
Connectors, Holders ...
Page 5.2 ...

Housing size	**M16×1**	**M16×1**	**M16×1**	**M16×1**
Mounting (see notes starting p. **1.0.**11)	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





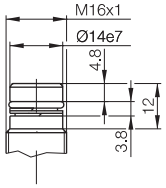


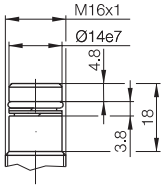


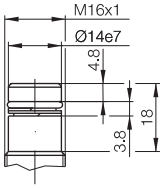
PNP						
	NO	①	BES 516-300-S152-S4-D	BES 516-300-S149-S4-D		
	NC	②			BES 516-300-S156-S4-D	BES 516-300-S237-D-PU-05
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 1.5 V	≤ 1.5 V	≤ 1.5 V	≤ 1.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e			200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
Switching frequency f			1000 Hz	1000 Hz	1000 Hz	1000 Hz
Utilization category			DC 13	DC 13	DC 13	DC 13
Function indicator			no	no	no	no
Degree of protection per IEC 60529			IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Housing material			Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material of sensing face			EP	EP	EP	EP
Connection			Connector	Connector	Connector	5 m Cable PUR
No. of wires × cross-section						3×0.34 mm²
Approval				cULus		
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	
O-Ring/spare part number			11×1.8/703843	11×1.5/709137	11×1.5/709137	11×1.8/703843
Support ring/spare part number			14×11.1×0.7/505953	14×11.6×1.5/709136	14×11.6×1.5/709136	14×11.1×0.7/505953
High pressure rated to			**350 bar**	**350 bar**	**350 bar**	**350 bar**

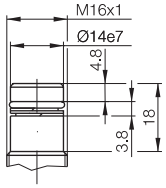
① Wiring diagrams see page **1.0.**6

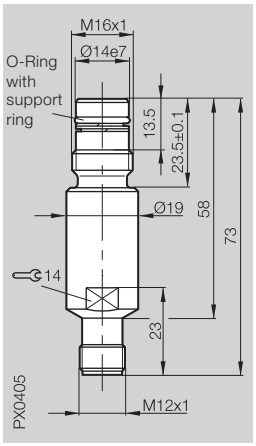
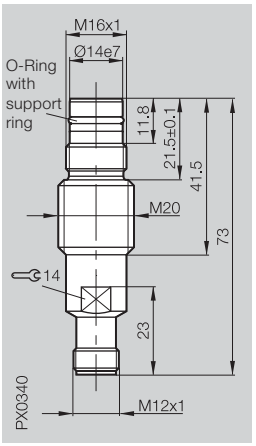
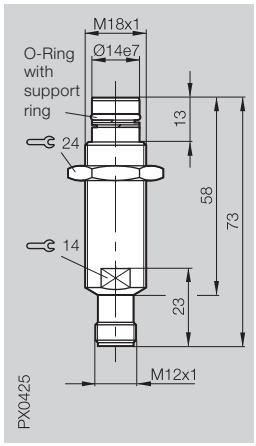
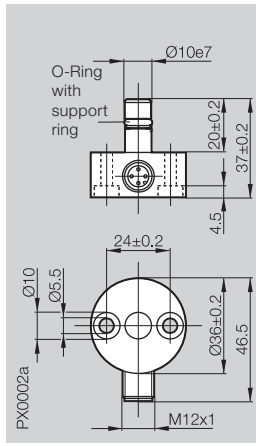
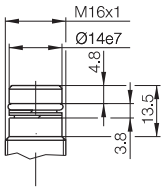
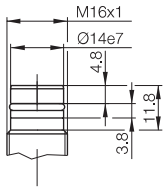
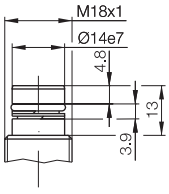
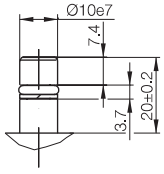
Other cable lengths on request.









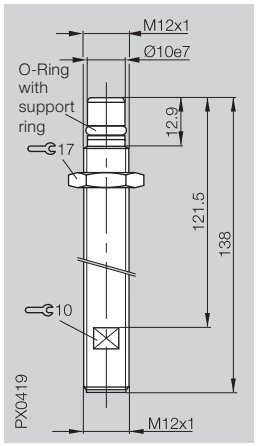
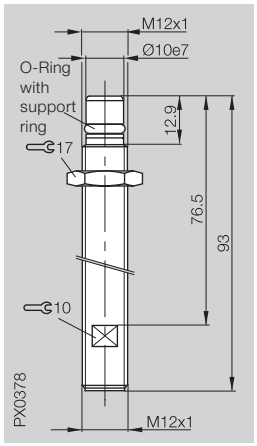
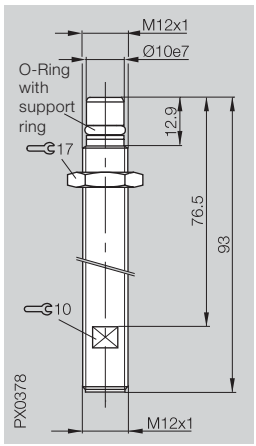
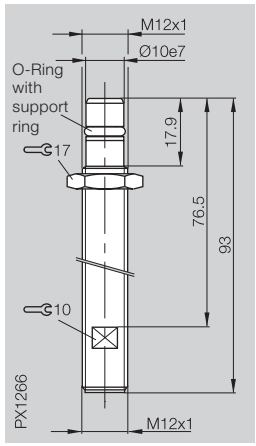
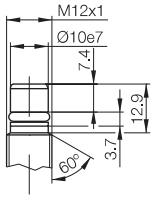
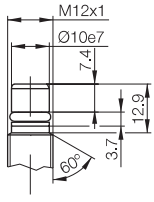
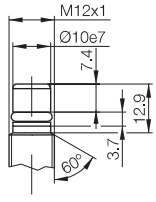
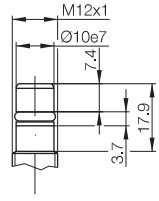
	M16×1/Ø 19 mm	**M16×1/M20**	**M18×1**	**Ø 10 mm/Ø 36 mm**
	flush	flush	flush	flush
	1.5 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**
	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
				
	BES 516-300-S129-S4-D	BES 516-300-S128-S4-D	BES 516-300-S144-S4-D	BES 516-300-S260-S4-D
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 1.5 V	≤ 1.5 V	≤ 1.5 V	≤ 2 V
	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA
	≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 8 mA
	yes	yes	yes	yes
	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
	1000 Hz	1000 Hz	1000 Hz	2000 Hz
	DC 13	DC 13	DC 13	DC 13
	no	no	no	no
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	EP	EP	EP	EP
	Connector	Connector	Connector	Connector
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20
	11×1.8/703843	11×1.8/703843	11×1.8/703843	5.85×2.4/636594
	14×11.1×0.7/505953	14×11.1×0.7/505953	14×11.1×0.7/505953	10×5.9×1/705918
	350 bar	**350 bar**	**350 bar**	**350 bar**
				

1.5

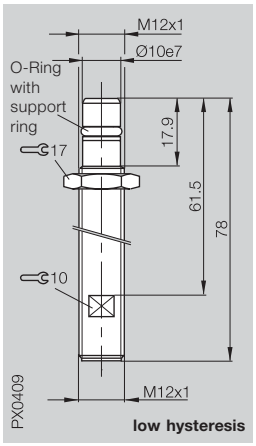
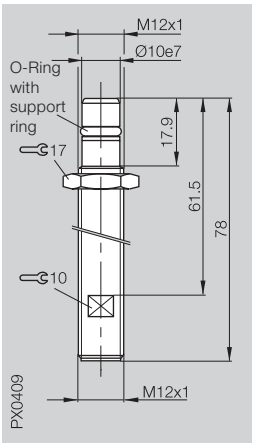
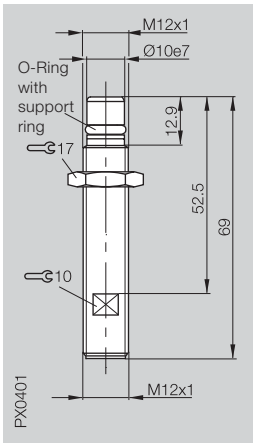
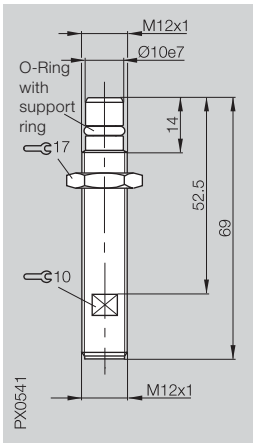
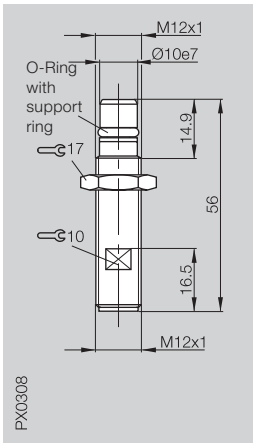
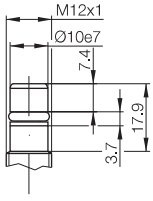
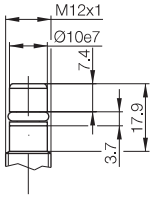
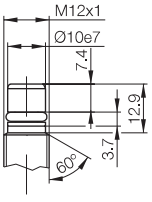
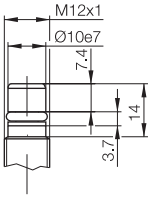
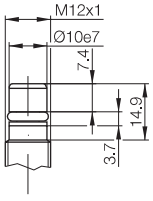
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5

Connectors, Holders ... Page 5.2 ...

Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		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	NO ①	BES 516-300-S164-S4-D	BES 516-300-S163-S4-D		BES 516-300-S300-S4-D
	complementary ③				
NPN	NO ④			BES 516-300-S242-S4-D	
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e		≤ 1.5 V	≤ 1.5 V	≤ 1.5 V	≤ 1.5 V
Rated insulation voltage U_i		75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.		≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA
Polarity reversal protected		yes	yes	yes	yes
Short circuit protected		yes	yes	yes	yes
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a		–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
Switching frequency f		1000 Hz	1000 Hz	1000 Hz	1000 Hz
Utilization category		DC 13	DC 13	DC 13	DC 13
Function indicator		no	no	no	no
Degree of protection per IEC 60529		IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Housing material		Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material of sensing face		EP	EP	EP	EP
Connection		Connector	Connector	Connector	Connector
Approval		cULus	cULus		cULus
Recommended connector		BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20
O-Ring/spare part number		5.3×2.4/631753	5.3×2.4/631753	5.3×2.4/631753	5.3×2.4/631753
Support ring/spare part number		10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918
High pressure rated to		**500 bar**	**500 bar**	**500 bar**	**500 bar**
					

① Wiring diagrams see page **1.0.**6

	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-S298-S4-D	BES 516-300-S135-S4-D BES 516-100-S45-S4-D	BES 516-300-S162-S4-D	BES 516-300-S281-S4-D	BES 516-300-S265-S4-D
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 1.5 V	≤ 1.5 V	≤ 2 V	≤ 1.5 V	≤ 2 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 10 mA	≤ 10 mA	≤ 8 mA	≤ 10 mA	≤ 8 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
	1000 Hz	1000 Hz	2000 Hz	1000 Hz	2000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	no	no	no	no	no
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	EP	EP	EP	EP	EP
	Connector	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20
	5.85×2.4/636594	5.85×2.4/636594	5.3×2.4/631753	5.3×2.4/631753	5.3×2.4/631753
	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918
	500 bar	**500 bar**	**500 bar**	**500 bar**	**500 bar**
					

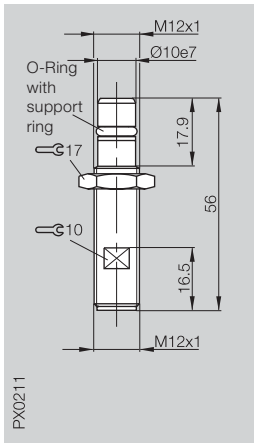
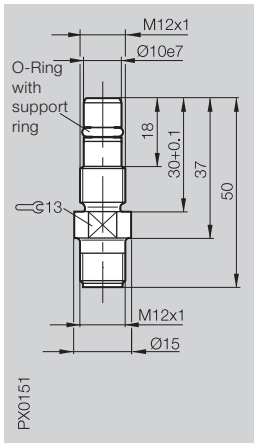
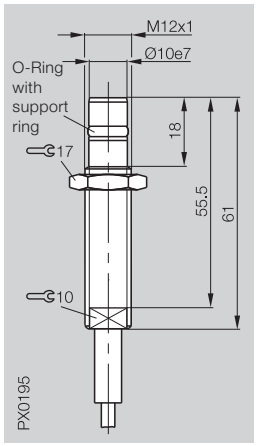
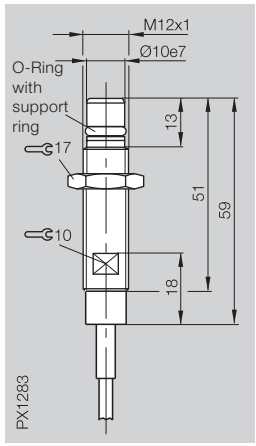
Also available as inductive **diagnostics capable sensor,** see page **1.5.**16

1.5

Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

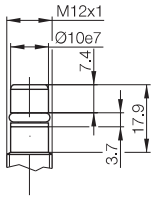
5

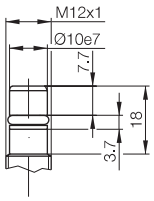
Connectors, Holders ... Page 5.2 ...

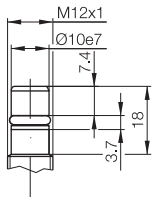
Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush
Rated operating distance s_n		**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a		0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
PNP	NO ①	BES 516-300-S249-S4-D	BES 516-300-S262-S4-D	BES 516-300-S135-D-PU-05	BES 516-300-S162-D-PU-05
	NC ②	BES 516-300-S305-S4-D		BES 516-300-S178-D-PU-05	
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V	≤ 1.5 V	≤ 2 V
Rated insulation voltage U_i		75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e		200 mA	200 mA	200 mA	200 mA
No-load supply current I_0 max.		≤ 8 mA	≤ 8 mA	≤ 10 mA	≤ 8 mA
Polarity reversal protected		yes	yes	yes	yes
Short circuit protected		yes	yes	yes	yes
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a		–25...+80 °C	–25...+90 °C	–25...+80 °C	–25...+80 °C
Switching frequency f		2000 Hz	2000 Hz	1000 Hz	2000 Hz
Utilization category		DC 13	DC 13	DC 13	DC 13
Function indicator		no	no	no	no
Degree of protection per IEC 60529		IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Housing material		Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material of sensing face		EP	EP	EP	EP
Connection		Connector	Connector	5 m Cable PUR	5 m Cable PUR
No. of wires × cross-section				3×0.14 mm²	3×0.14 mm²
Approval		cULus	cULus	cULus	
Recommended connector		BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20		
O-Ring/spare part number		5.3×2.4/631753	5.3×2.4/631753	5.85×2.4/636594	5.3×2.4/631753
Support ring/spare part number		10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918
High pressure rated to		**500 bar**	**500 bar**	**500 bar**	**500 bar**

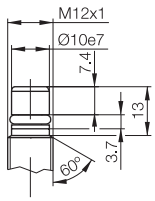
① Wiring diagrams see page **1.0.**6

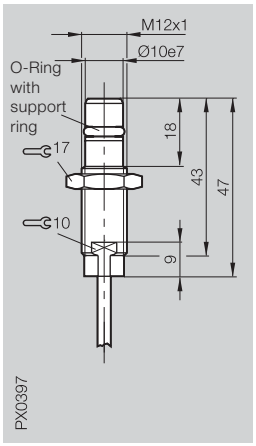
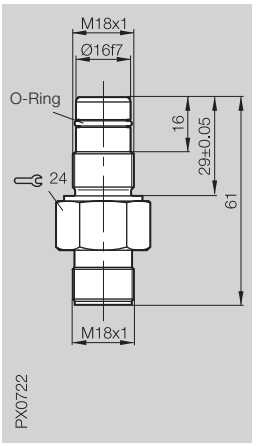
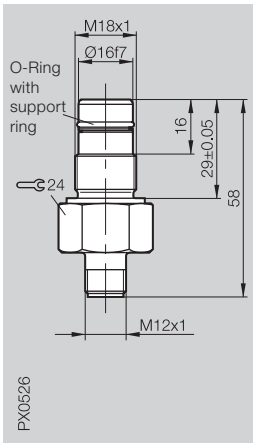
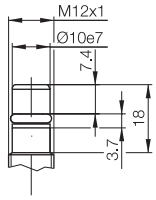
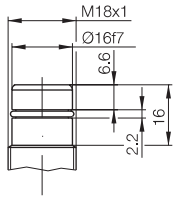
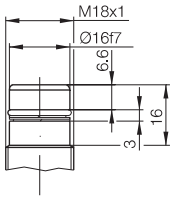
Other cable lengths on request.





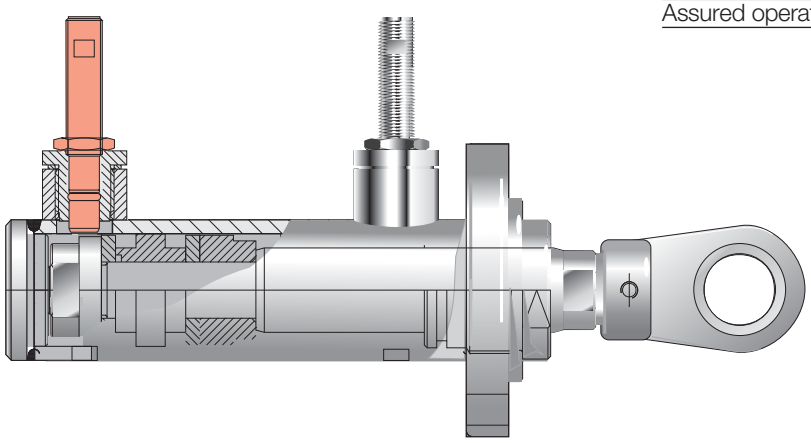




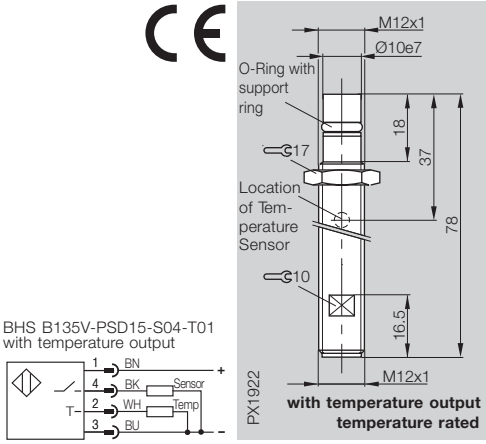
	M12×1	**M18×1**	**M18×1**
	flush	flush	flush
	1.5 mm	**3 mm**	**3 mm**
	0...1.2 mm	0...2.1 mm	0...2.1 mm
			
	BES 516-300-S240-D-PU-03	BES 516-300-S203	BES 516-300-S190-S4
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 3.5 V	≤ 3.5 V
	75 V DC	75 V DC	75 V DC
	200 mA	130 mA	130 mA
	≤ 8 mA	≤ 20 mA	≤ 25 mA
	yes	yes	yes
	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+80 °C	–25...+80 °C	–25...+80 °C
	2000 Hz	1000 Hz	400 Hz
	DC 13	DC 13	DC 13
	no	no	no
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	Stainless steel	Stainless steel	Stainless steel
	EP	PEEK	PEEK
	3 m Cable PUR	Connector	Connector
	3×0.14 mm²		
	cULus		
		BKS-S 7-1	BKS-_ 19/BKS-_ 20
	5.85×2.4/636594	13×1.5/619531	13×1.5/619531
	10×5.9×1/705918		16×13.8×0.5/635431
	500 bar	**500 bar**	**500 bar**
			

5

Connectors, Holders ...
Page 5.2 ...



Housing size	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**1.5 mm**
Assured operating distance s_a	0...1.2 mm



BHS B135V-PSD15-S04-T01
with temperature output

High-End versions of the **high pressure rated sensors** are available in two series:

- Long switching distances to 2.5 mm (max. 90 °C ambient temperature) or
- High temperatures to 120° C (switching distance 1.5 mm)
- Both versions pressure rated to 500 bar just like our traditional high-pressure models

Ambient temperatures to +120 °C

- Especially suited for modern high-performance hydraulic systems
- For newer hydraulic fluids that can become hot
- For hydraulic cylinders on high-temperature injection molds

Temperature output

To measure temperature changes inside the cylinder the BHS ...T01 has an integrated temperature sensor that outputs the measured temperature as a voltage.

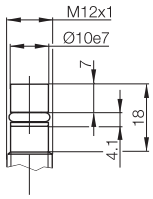
Part numbering

BHS ...-PSD**15**-S04
Rated operating distance **1.5** mm
Ambient temperature range –25...**+120 °C**

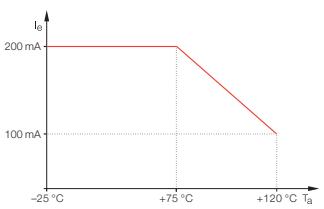
BHS ...-PSD15-S04-**T01**
with additional temperature output

PNP	NO	①	BHS B135V-PSD15-S04-T01
Supply voltage U_B			10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V
Rated insulation voltage U_i			75 V DC
Rated operational current I_e			200 mA
No-load supply current I_0 max.			≤ 8 mA
Polarity reversal protected			yes
Short circuit protected			yes
Repeat accuracy R			≤ 5 %
Ambient temperature range T_a			**–25...+120 °C**
Switching frequency f			400 Hz
Utilization category			DC 13
Function indicator			no
Degree of protection per IEC 60529			IP 68 per BWN Pr. 20
Housing material			Stainless steel
Material of sensing face			Ceramic
Connection			Connector
Approval			cULus
Recommended connector			BKS-S 19-3-PY/S 20-3-PY
O-Ring/spare part number			6.75×1.78/149621
Support ring/spare part number			10×7×1.8/150229
High pressure rated to			**500 bar**

① Wiring diagrams see page **1.0.**6
Exception:
BHS B135V-PSD15-S04-T01 see above

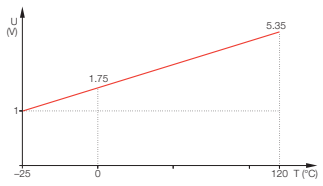


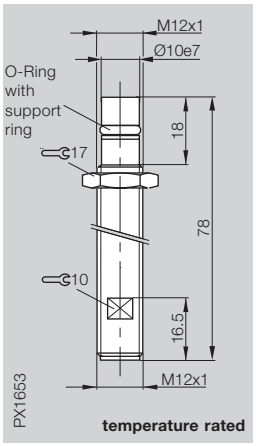
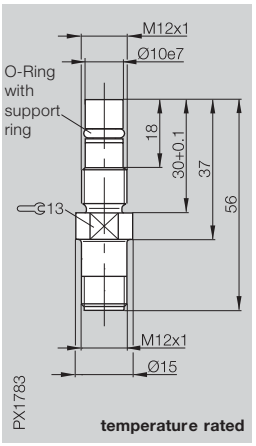
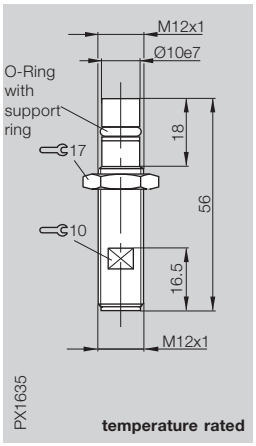
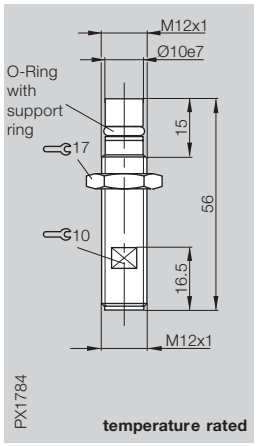
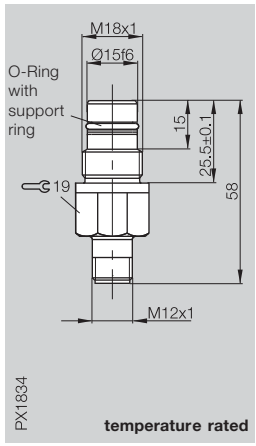
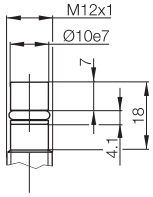
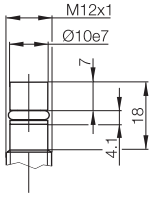
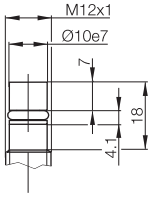
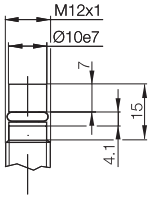
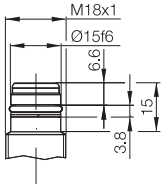
Current reduction as a function of ambient temperature range

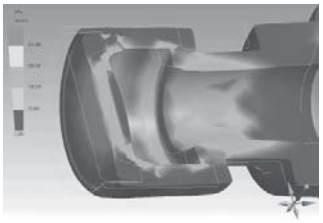


Temperature output

U (V) = 1+0.03×(T +25)



	M12×1	**M12×1**	**M12×1**	**M12×1**	**M18×1**
	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
					
	BHS B135V-PSD15-S04	BHS B400V-PSD15-S04	BHS B249V-PSD15-S04	BHS B265V-PSD15-S04	BHS E308V-PSD15-S04
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 8 mA	≤ 8 mA	≤ 8 mA	≤ 8 mA	≤ 8 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+120 °C	**–25...+120 °C**	**–25...+120 °C**	**–25...+120 °C**	**–25...+120 °C**
	400 Hz	400 Hz	400 Hz	400 Hz	400 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	no	no	no	no	no
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic
	Connector	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus	cULus
	BKS-B 19/B 20-1-PU2	BKS-B 19/B 20-1-PU2	BKS-B 19/B 20-1-PU2	BKS-B 19/B 20-1-PU2	BKS-B 19/B 20-1-PU2
	6.75×1.78/149621	6.75×1.78/149621	6.75×1.78/149621	6.75×1.78/149621	12.42×1.78/130654
	10×7×1.8/150229	10×7×1.8/150229	10×7×1.8/150229	10×7×1.8/150229	15×12.2×0.7/642827
	500 bar	**500 bar**	**500 bar**	**500 bar**	**500 bar**
					

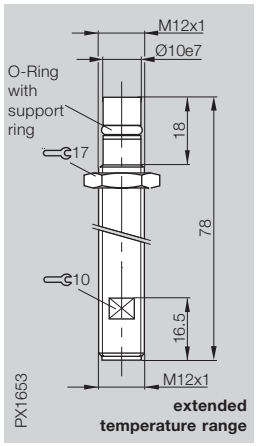


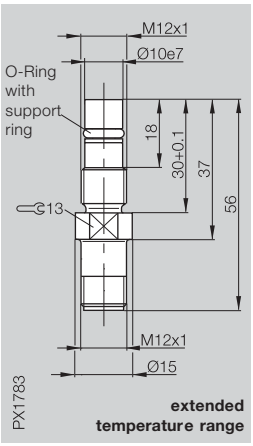
Simulation (FEM method) of the stress distribution under high pressure on housing and ceramic cap

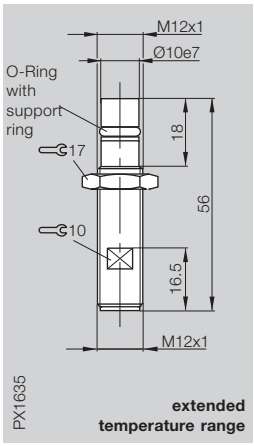
1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5
Connectors, Holders ...
Page 5.2 ...

Housing size	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush
Rated operating distance s_n	**2.5 mm**	**2.5 mm**	**2.5 mm**
Assured operating distance s_a	0...2 mm	0...2 mm	0...2 mm



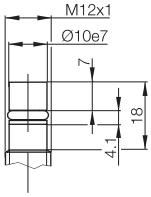


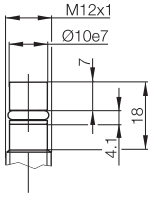


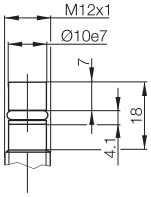
PNP NO ①	BHS B135V-PSD25-S04-003	BHS B400V-PSD25-S04-003	BHS B249V-PSD25-S04-003
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i	75 V DC	75 V DC	75 V DC
Rated operational current I_e	200 mA	200 mA	200 mA
No-load supply current I_0 max.	≤ 8 mA	≤ 8 mA	≤ 8 mA
Polarity reversal protected	yes	yes	yes
Short circuit protected	yes	yes	yes
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	**–25...+90 °C**	**–25...+90 °C**	**–25...+90 °C**
Switching frequency f	400 Hz	400 Hz	400 Hz
Utilization category	DC 13	DC 13	DC 13
Function indicator	no	no	no
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Housing material	Stainless steel	Stainless steel	Stainless steel
Material of sensing face	Ceramic	Ceramic	Ceramic
Connection	Connector	Connector	Connector
Approval	cULus	cULus	cULus
Recommended connector	BKS-B 19/B 20-1-PU2	BKS-B 19/B 20-1-PU2	BKS-B 19/B 20-1-PU2
O-Ring/spare part number	6.75×1.78/149621	6.75×1.78/149621	6.75×1.78/149621
Support ring/spare part number	10×7×1.8/150229	10×7×1.8/150229	10×7×1.8/150229
High pressure rated to	**500 bar**	**500 bar**	**500 bar**

① Wiring diagrams see page **1.0.**6

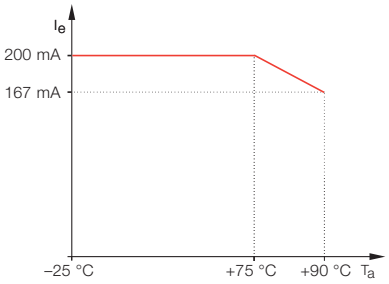
Other cable lengths on request.

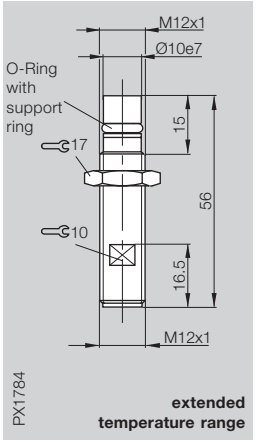
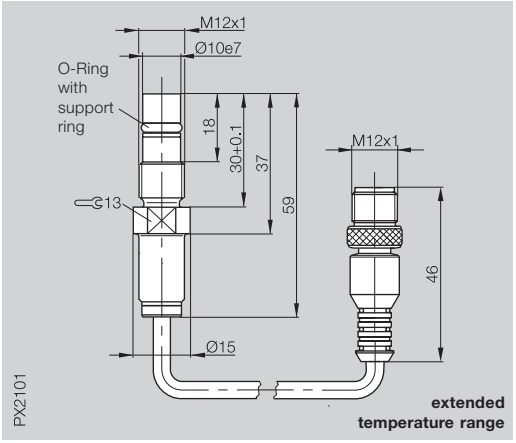
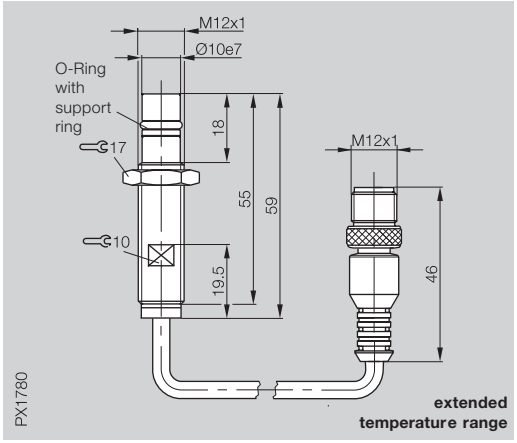
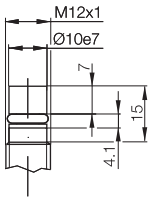
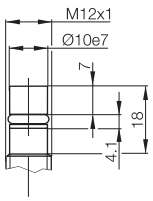
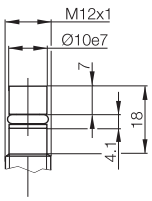


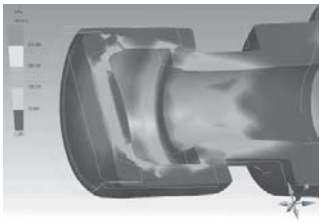




Current reduction as a function of ambient temperature range



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
		
BHS B265V-PSD25-S04-003	BHS B400V-PSD25-BP00,2-S04-003	BHS B249V-PSD25-BP00,2-S04-003
10...30 V DC	10...30 V DC	10...30 V DC
≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
75 V DC	75 V DC	75 V DC
200 mA	200 mA	200 mA
≤ 8 mA	≤ 8 mA	≤ 8 mA
yes	yes	yes
yes	yes	yes
≤ 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 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67
Stainless steel	Stainless steel	Stainless steel
Ceramic	Ceramic	Ceramic
Connector	0.2 m PUR cable with connector	0.2 m PUR cable with connector
cULus	cULus	cULus
BKS-B 19/B 20-1-PU2	BKS-B 19-1-PU2	BKS-B 19-1-PU2
6.75×1.78/149621	6.75×1.78/149621	6.75×1.78/149621
10×7×1.8/150229	10×7×1.8/150229	10×7×1.8/150229
500 bar	**500 bar**	**500 bar**
		



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

1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5
Connectors, Holders ...
Page 5.2 ...

Sensors with ATEX approval Category 3G

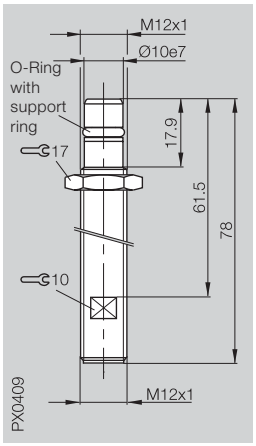
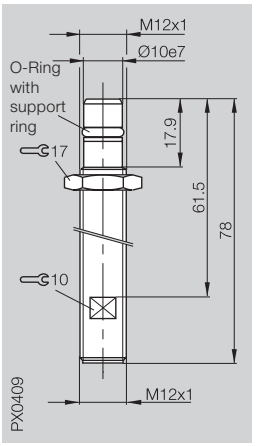
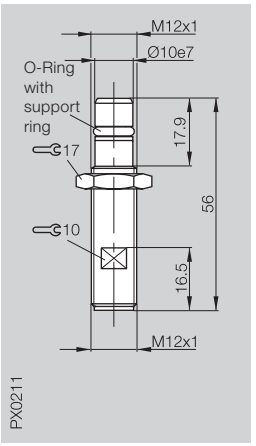
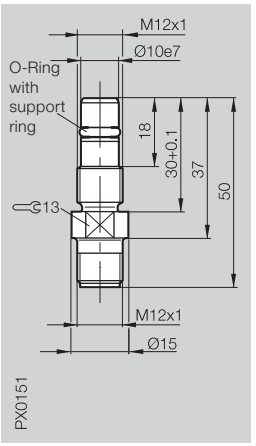
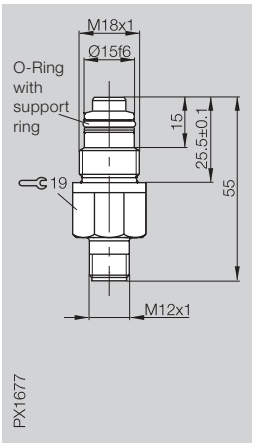
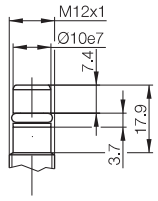
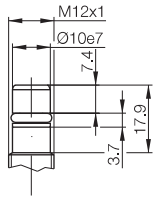
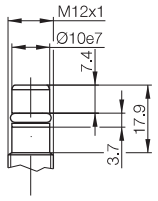
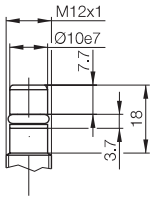
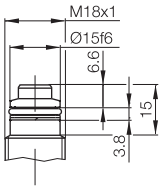
Devices in this category are designed for use in areas where explosive atmospheres occur infrequently.

Note!

Before design, installation and startup, please read the operating manual found at www.balluff.com.

Housing size	
Mounting (see notes starting p. **1.0.**11)	
Rated operating distance s_n	
Assured operating distance s_a	
PNP NO ①	
Supply voltage U_B	
Voltage drop U_d at I_e	
Rated insulation voltage U_i	
Rated operational current I_e	
No-load supply current I_0 max.	
Polarity reversal protected	
Short circuit protected	
Repeat accuracy R	
Ambient temperature range T_a	
Switching frequency f	
Utilization category	
Function indicator	
Degree of protection per IEC 60529	
Housing material	
Material of sensing face	
Connection	
Recommended connector	
O-Ring/spare part number	
Support ring/spare part number	
Pressure rated (hydraulic) up to	
Ex-Zone	
Conformity	
Designation	

① Wiring diagrams see page **1.0.**6

M12×1	**M12×1**	**M12×1**	**M12×1**	**M18×1**
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-S321-NEX-S4-D	BES 516-300-S135-NEX-S4-D	BES 516-300-S249-NEX-S4-D	BES 516-300-S262-NEX-S4-D	BES 516-300-S308-NEX-S4-D
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
200 mA	200 mA	200 mA	200 mA	200 mA
≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA	≤ 10 mA
yes	yes	yes	yes	yes
yes	yes	yes	yes	yes
≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
–25...+80 °C	–25...+80 °C	–25...+80 °C	–25...+90 °C	–25...+80 °C
1000 Hz	1000 Hz	2000 Hz	2000 Hz	2000 Hz
DC 13	DC 13	DC 13	DC 13	DC 13
no	no	no	no	no
IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
EP	EP	EP	EP	EP
Connector	Connector	Connector	Connector	Connector
BKS-S 19-1/BKS-S 20-1	BKS-S 19-1/BKS-S 20-1	BKS-S 19-1/BKS-S 20-1	BKS-S 19-1/BKS-S 20-1	BKS-S 19-1/BKS-S 20-1
5.85×2.4/636594	5.85×2.4/636594	5.3×2.4/631753	5.3×2.4/631753	12.42×1.78/642828
10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	10×5.9×1/705918	15×12.2×0.7/642827
350 bar	**500 bar**	**500 bar**	**500 bar**	**500 bar**
DIN EN 60079-0: 2004 DIN EN 60079-15: 2003 Ex II 3G Ex nA II T4 X	DIN EN 60079-0: 2004 DIN EN 60079-15: 2003 Ex II 3G Ex nA II T4 X	DIN EN 60079-0: 2004 DIN EN 60079-15: 2003 Ex II 3G Ex nA II T4 X	DIN EN 60079-0: 2004 DIN EN 60079-15: 2003 Ex II 3G Ex nA II T4 X	DIN EN 60079-0: 2004 DIN EN 60079-15: 2003 Ex II 3G Ex nA II T4 X
				

1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5
Connectors, Holders ...
Page 5.2 ...

high pressure rated NAMUR

Ignition protection type "Intrinsically Safe"

Ignition protection type „intrinsically safe“ used with switching amplifier outside the hazardous area

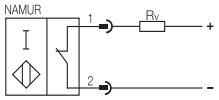
Inductive sensors to NAMUR specification consist essentially of an oscillator with a dampable oscillator coil and a demodulator.

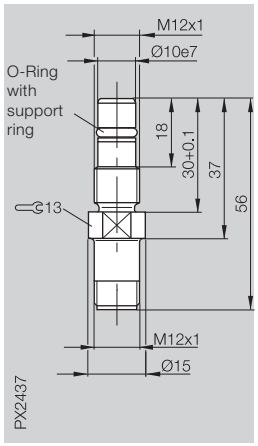
These high pressure sensors are used, for example, in end-of-travel monitoring on hydraulic cylinders or position detection on valves.

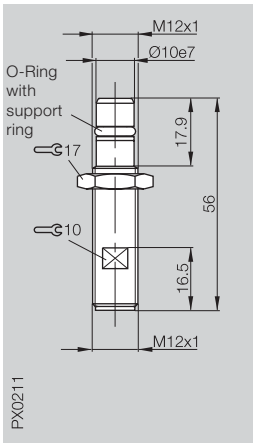
They can be used in conjunction with suitable switching amplifiers such as from Steel (see next page) in explosive systems or Zone 1 and Zone 2 areas. The switch amplifier must be installed outside the explosive area.

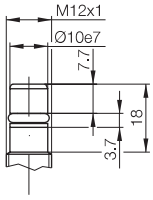
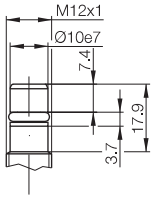
Note!

Before design, installation and startup, please read the operating manual found at www.balluff.com.
You must also observe the requirements for the EC Type Examination Certificate of the PTB.

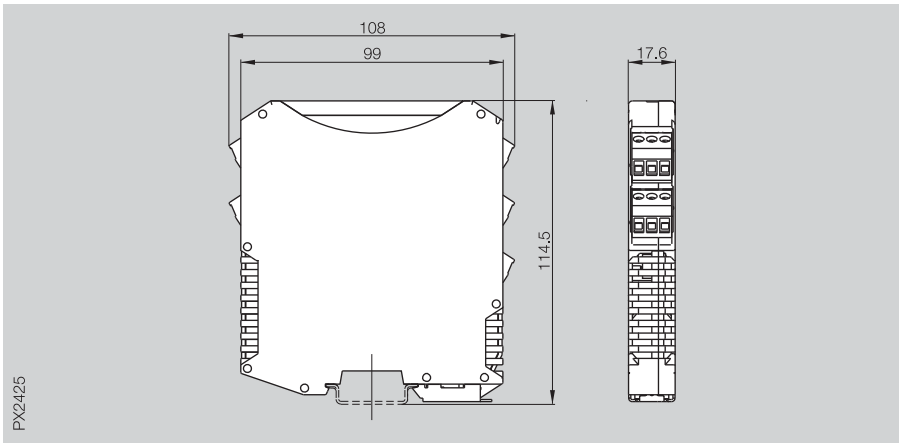






Housing size	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush	flush
Rated operating distance s_n	**1.5 mm**	**1.5 mm**
Assured operating distance s_a	0...1.2 mm	0...1.2 mm
NAMUR	BES 516-300-S318-S4-N	BES 516-300-S315-S4-N
Rated operational voltage U_e	8.2 V DC	8.2 V DC
Supply voltage U_B	7.7...9 V DC	7.7...9 V DC
Rated insulation voltage U_i	75 V DC	75 V DC
Current draw at $s_r = 0$	≤ 1 mA	≤ 1 mA
Current draw at $s_r = \infty$	≥ 4 mA	≥ 4 mA
Rated series resistance R_V	1000 Ω	1000 Ω
Permissible series resistance R_V	550...1100 Ω	550...1100 Ω
Output signal:	Current change (no trigger response)	Current change (no trigger response)
Fully undamped	≥ 4 mA	≥ 4 mA
Fully damped	≤ 1 mA	≤ 1 mA
Polarity reversal protected < 9 V	yes	yes
Repeat accuracy R	≤ 5 %	≤ 5 %
Ambient temperature range T_a	**–25...+70 °C**	**–25...+70 °C**
Switching frequency f	1000 Hz	1000 Hz
Function indicator	no	no
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Housing material	Stainless steel	Stainless steel
Material of sensing face	POM	POM
Connection	Connector	Connector
Recommended connector	BKS-S 10-3/BKS-S 8-3/ BKS-S220-12-PB/ BKS-S221-12-PB	BKS-S 10-3/BKS-S 8-3/ BKS-S220-12-PB/ BKS-S221-12-PB
O-Ring/spare part number	5.85×2.4/636594	5.85×2.4/636594
Support ring/spare part number	10×5.9×1/705918	10×5.9×1/705918
Pressure rated (hydraulic) up to	**500 bar**	**500 bar**
Ex-Zone		
Conformity	EN 60079-0:2004 EN 50020:2002	EN 60079-0:2004 EN 50020:2002
EC Type Examination Certificate	PTB 01 ATEX 2207 X	PTB 01 ATEX 2207 X
Designation	Ex II 2 G Ex ia IIC T6	Ex II 2 G EEx ia IIC T6
Effective internal capacitance	≤ 30 nF	≤ 30 nF
Effective internal inductance	0.5 mH	0.5 mH
Maximum input power P_i	200 mW	200 mW
For additional data see EC Type Examination Certificate.		

Housing size	**99×17.6×114.5 mm**



Ordering code	STAHL 9170/20-12-11S	STAHL 9170/20-12-21S
Input	NAMUR specification	
Output relay	2-channel, 1 change-over Switching voltage 250 V AC Switching current 4 A AC Switching capacity 50 W/1000 VA	
Function change	via switch	
Supply voltage U_B	24 V DC	120...230 V AC
Ambient temperature range T_a	–20...+60 °C	
relative humidity	≤ 95 %, non-condensing	
Ex-Zone		
Designation	Ex II (1) GD [EEx ia] IIC/IIB and Ex II 3 G EEx nAC II T4	
EC Type Examination Certificate	DMT 02 ATEX E 195 X	

For safety and other data see EC Type Examination Certificate.

The switching amplifier with relay output serves as the interface between electrical signals from the hazardous area (Ex zone) and the non-hazardous area (safe zone).

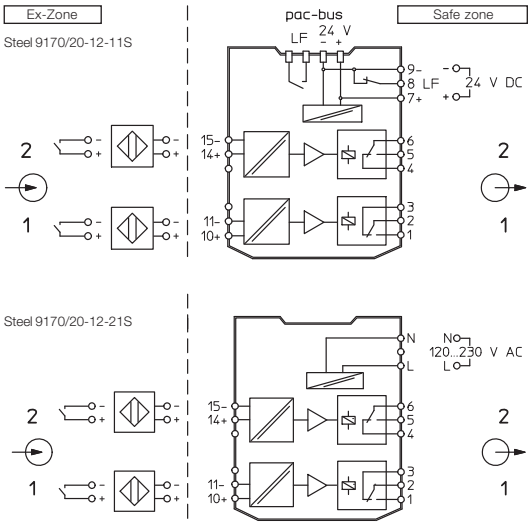
The input signals from NAMUR sensors are converted using relay switching contacts on the outputs. Input, output and auxiliary power circuits are galvanically isolated.

Note!

Before design, installation and startup, please read the operating manual found at www.stahl.de.

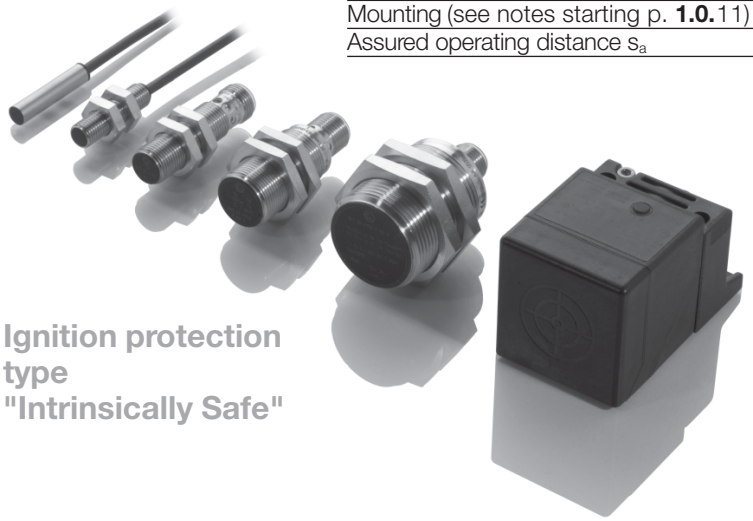
You must also observe the requirements for the EC Type Examination Certificate.

Wiring diagrams



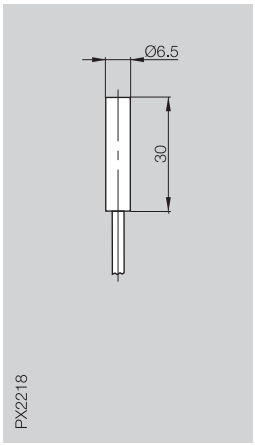
5
Connectors, Holders ...
Page 5.2 ...

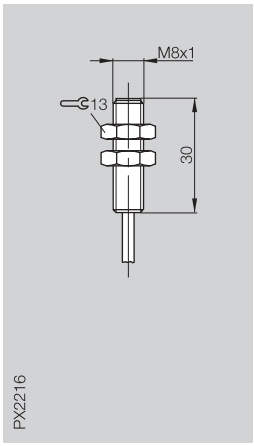
DC 2-wire
∅ 6.5 mm, M8
s_n 1 mm



Ignition protection type "Intrinsically Safe"

Housing size	**∅ 6.5 mm**	**M8×1**
Mounting	flush	flush
Mounting (see notes starting p. **1.0.**11)	**1 mm**	**1 mm**
Assured operating distance s_a	0.8 mm	0...0.8 mm





Ignition protection type „intrinsically safe“ used with switching amplifier outside the hazardous area

Inductive sensors to NAMUR specification consist essentially of an oscillator with a dampable oscillator coil and a demodulator.

These sensors can be used in conjunction with suitable switching amplifiers such as from Steel (see page **1.5.**39) in explosive systems or zones (see ATEX marking). The switching amplifier must be installed only outside the explosive area.

Note!

Before design, installation and startup, please read the operating manual found at www.balluff.com.
You must also observe the requirements for the EC Type Examination Certificate of the BVS and PTB.

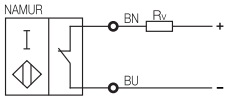
NAMUR	BES G06MD-GNX10B-EV02-EEX	BES M08MD-GNX10B-EV02-EEX
Rated operational voltage U_e	8.2 V DC	8.2 V DC
Supply voltage U_B	7.7...9 V DC	7.7...9 V DC
Rated insulation voltage U_i	75 V DC	75 V DC
Current draw:	Current change (no trigger response)	Current change (no trigger response)
Open (undamped)	≤ 1 mA	≤ 1 mA
Conducting (damped)	≥ 2.1 mA	≥ 2.1 mA
Rated series resistance R_V	1000 Ω	1000 Ω
Polarity reversal protected	no*	no*
Ambient temperature range T_a	–20...+70 °C	–20...+70 °C
Switching frequency f	2000 Hz	2000 Hz
Function indicator	no	no
Degree of protection per IEC 60529	IP 67	IP 67
Housing material	CuZn coated	CuZn coated
Material of sensing face	PBT	PBT
Connection	2 m PVC cable	2 m PVC cable
No. of wires × cross-section	2×0.14 mm²	2×0.14 mm²
Recommended connector		
Ex-Zone		
Conformity	EN 50014:1997+A1+A2 EN 50020	EN 50014:1997+A1+A2 EN 50020
EC Type Examination Certificate	BVS 05 ATEX E 163 PTB 05 ATEX 2075	BVS 05 ATEX E 163 PTB 05 ATEX 2075
Designation	Ex II 2G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C	Ex II 2G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C
Maximum internal capacitance	≤ 80 nF	≤ 80 nF
Maximum internal inductance	0.07 mH	0.07 mH
Connected to approved intrinsically safe circuits with the highest values	U = 15 V I = 50 mA P = 120 mW	U = 15 V I = 50 mA P = 120 mW

*Power restriction when using an approved intrinsically safe switching amplifier

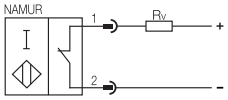
Switching distance ■■ see page **1.0.**10

Wiring diagrams

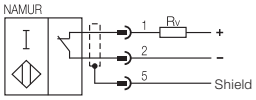
BES G06.../M08...



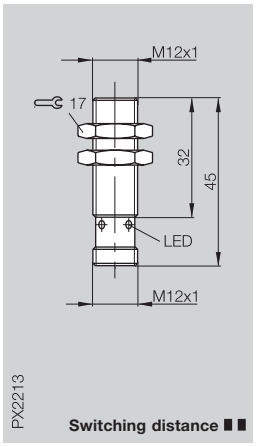
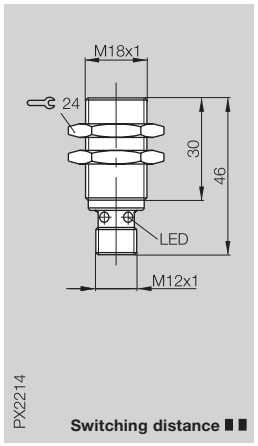
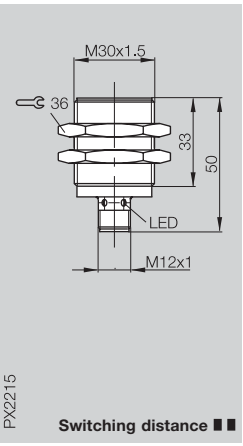
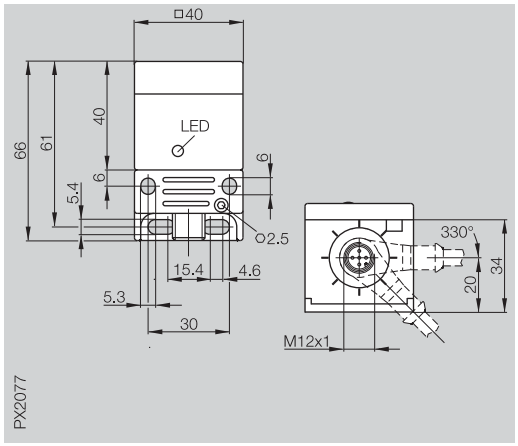
BES M12.../M18.../M30...



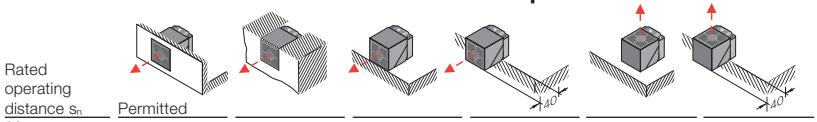
Unicompact



1 Connected to NAMUR switching amplifier
2 Connected to NAMUR switching amplifier
5 Connector body potential compensation

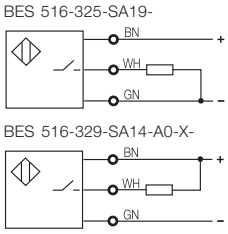
	M12×1	**M18×1**	**M30×1.5**	**40×40×66 mm** Unicompact	**40×40×66 mm** Unicompact
	flush	flush	flush	flush	non-flush
	4 mm	**8 mm**	**15 mm**	**20 mm**	**35 mm**
	0...3.2 mm	0...6.5 mm	0...12.2 mm	0...16.2 mm	0...28.4 mm
	 PX2213 Switching distance ■■	 PX2214 Switching distance ■■	 PX2215 Switching distance ■■	 PX2077	
	BES M12ME-GNX40B-S04G-EEX	BES M18ME1-GNX80B-S04G-EEX	BES M30ME1-GNX15B-S04G-EEX	BES Q40KFU-GNX20B-S92G-EEX	BES Q40KFU-GNX35F-S92G-EEX
	8.2 V DC	8.2 V DC	8.2 V DC	8.2 V DC	8.2 V DC
	7.7...9 V DC	7.7...9 V DC	7.7...9 V DC	7.7...9 V DC	7.7...9 V DC
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	Current change (no trigger response)	Current change (no trigger response)	Current change (no trigger response)	Current change (no trigger response)	Current change (no trigger response)
	≤ 1 mA	≤ 1 mA	≤ 1 mA	≤ 1 mA	≤ 1 mA
	≥ 2.1 mA	≥ 2.1 mA	≥ 2.1 mA	≥ 2.1 mA	≥ 2.1 mA
	1000 Ω	1000 Ω	1000 Ω	1000 Ω	1000 Ω
	no*	no*	no*	no*	no*
	–20...+70 °C	–20...+70 °C	–20...+70 °C	–20...+70 °C	–20...+70 °C
	700 Hz	400 Hz	100 Hz	200 Hz	100 Hz
	yes	yes	yes	no	no
	IP 67	IP 67	IP 67	IP 67	IP 67
	CuZn coated	CuZn coated	CuZn coated	PPE/PPS	PPE/PPS
	PBT	PBT	PBT	PPE	PPE
	Connector	Connector	Connector	Connector	Connector
	BKS-S 10-3/BKS-S 8-3/ BKS-S220-12-PB/ BKS-S221-12-PB	BKS-S 10-3/BKS-S 8-3/ BKS-S220-12-PB/ BKS-S221-12-PB	BKS-S 10-3/BKS-S 8-3/ BKS-S220-12-PB/ BKS-S221-12-PB	BKS-S 92-00	BKS-S 92-00
	EN 50014:1997+A1+A2 EN 50020	EN 50014:1997+A1+A2 EN 50020	EN 50014:1997+A1+A2 EN 50020	EN 50014:1997+A1+A2 EN 50020	EN 50014:1997+A1+A2 EN 50020
	BVS 05 ATEX E 162 X	BVS 05 ATEX E 162 X	BVS 05 ATEX E 162 X	BVS 05 ATEX E 162 X	BVS 05 ATEX E 162 X
	Ex II 2G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C	Ex II 2G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C	Ex II 2G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C	Ex II 2G EEx ia IIB T6 Ex II 1D Ex iaD 20 T90°C	Ex II 2G EEx ia IIB T6 Ex II 1D Ex iaD 20 T90°C
	≤ 210 nF	≤ 200 nF	≤ 230 nF	≤ 250 nF	≤ 220 nF
	0.115 mH	0.19 mH	0.21 mH	0.45 mH	0.71 mH
	U = 15 V I = 50 mA P = 120 mW	U = 15 V I = 50 mA P = 120 mW	U = 15 V I = 50 mA P = 120 mW	U = 15 V I = 50 mA P = 120 mW	U = 15 V I = 50 mA P = 120 mW

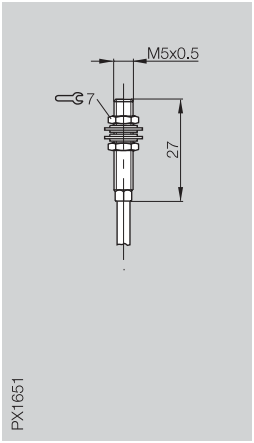
Permissible installation variations for Unicompact

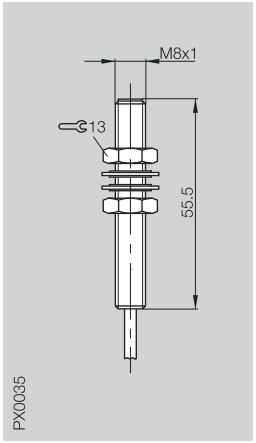


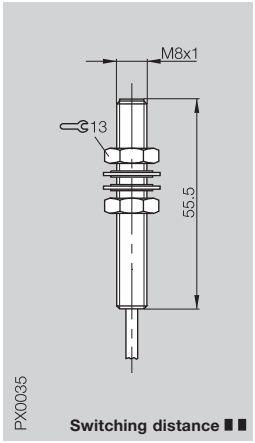
Rated operating distance s_n	Permitted					
20 mm	yes	yes	yes	yes	yes	yes
35 mm	no	no	no	yes	no	yes

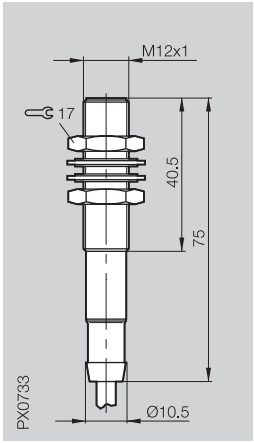
Housing size		**M5×0.5**	**M8×1**	**M8×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush
Rated operating distance s_n		**0.5 mm**	**1 mm**	**2 mm**	**2 mm**
Assured operating distance s_a		0...0.4 mm	0...0.8 mm	0...1.6 mm	0...1.6 mm
PNP	NO ①	BES M05ED-PSD05B-ES02-T01	BES 516-324-SA8-02	BES 516-324-SA26-02	BES 516-325-SA19-03
	complementary ③				
NPN	NO ④				BES 516-329-SA14-A0-X-03
	complementary ⑥				
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e		≤ 1 V	≤ 1.5 V	≤ 1.5 V	PNP ≤ 1.8 V, NPN ≤ 1.5 V
Rated insulation voltage U_i		75 V DC	75 V DC	75 V DC	75 V DC
Rated operational current I_e		≤ 150 mA (see Fig. 1)	≤ 200 mA (see Fig. 2)	≤ 200 mA (see Fig. 3)	≤ 200 mA (see Fig. 3)
No-load supply current I_0 max.		≤ 10 mA	≤ 20 mA	≤ 20 mA	≤ 25 mA
Polarity reversal protected		yes	yes	yes	yes
Short circuit protected		yes	no	no	no
Repeat accuracy R		≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a		**–25...+120 °C**	**–25...+100 °C**	**–25...+120 °C**	**–25...+120 °C**
Switching frequency f		1000 Hz	2000 Hz	1500 Hz	1000 Hz
Utilization category		DC 13	DC 13	DC 13	DC 13
Function indicator		no	no	no	no
Degree of protection per IEC 60529		IP 67	IP 67	IP 67, IP 60 cable exit	IP 68 per BWN Pr. 20, IP 60 cable exit
Housing material		Stainless steel	Stainless steel	Stainless steel	CuZn coated
Material of sensing face		PA 6	PBT	PBT	PEEK
Connection		2 m silicon cable	2 m PVC/105 °C cable	2 m Teflon cable	3 m silicon cable
No. of wires × cross-section		3×0.15 mm²	3×0.14 mm²	3×0.14 mm²	3×0.5 mm²
Recommended connector					
Pressure rated to					**3 bar**









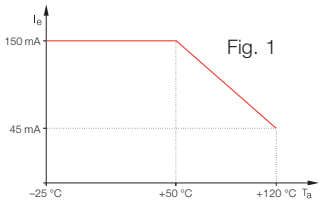


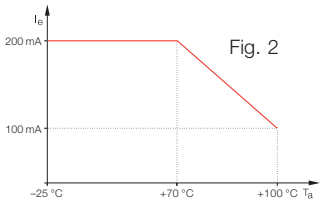
① Wiring diagrams see page **1.0.**6
Exception: BES 516-325-SA19- and BES 516-329-SA14-A0-X- see above

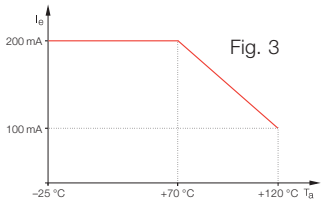
Switching distance ■■ see page **1.0.**10

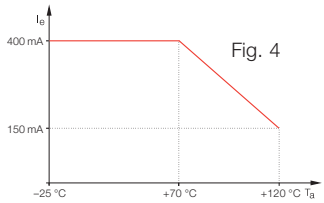
Other cable lengths on request.

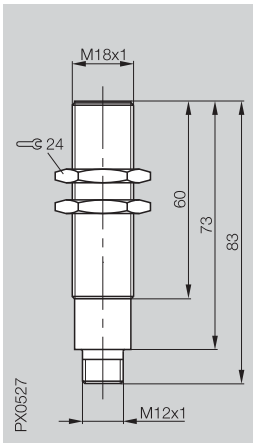
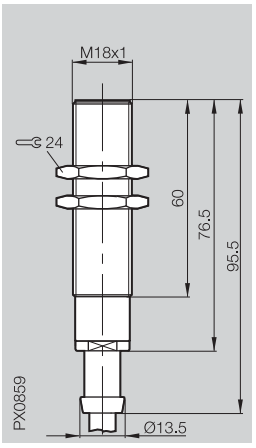
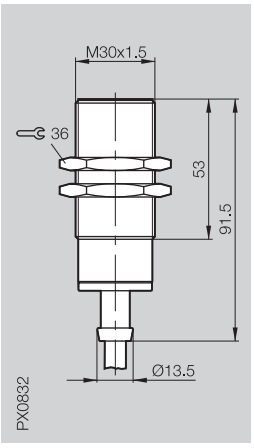
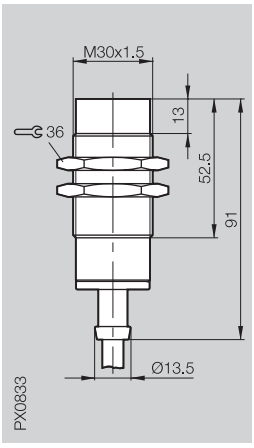
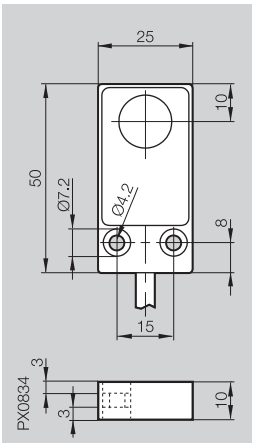
Current reduction as a function of ambient temperature range









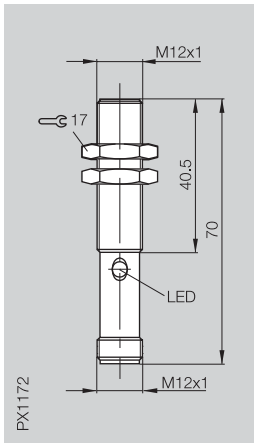
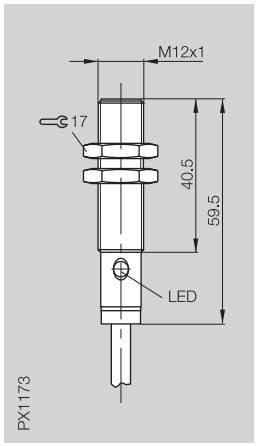
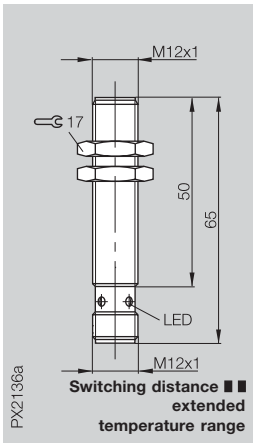
	M18×1	M18×1	M30×1.5	M30×1.5	25×50×10 mm
	flush	flush	flush	non-flush	flush
	5 mm	**5 mm**	**10 mm**	**15 mm**	**5 mm**
	0...4.1 mm	0...4.1 mm	0...8.1 mm	0...12.2 mm	0...4.1 mm
					
	BES 516-105-SA5	BES 516-105-SA2-05	BES 516-114-SA1-05	BES 516-125-SA1-05	BES 516-347-SA2-03
			BES 516-120-SA2		
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	24 V DC ±10 %
	≤ 1.5 V	≤ 1.5 V	≤ 1.5 V	≤ 1.5 V	≤ 2.5 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	≤ 400 mA (see Fig. 4)	≤ 400 mA (see Fig. 4)	≤ 400 mA (see Fig. 4)	≤ 400 mA (see Fig. 4)	≤ 25 mA
	≤ 20 mA	≤ 20 mA	≤ 15 mA	≤ 15 mA	≤ 25 mA
	yes	yes	yes	yes	yes
	no	no	no	no	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–25...+120 °C	**–25...+120 °C**	**–25...+120 °C**	**–25...+120 °C**	**–25...+100 °C**
	500 Hz	500 Hz	300 Hz	100 Hz	500 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	no	no	no	no	no
	IP 67	IP 67, IP 60 cable exit	IP 67, IP 60 cable exit	IP 67, IP 60 cable exit	IP 65, IP 60 cable exit
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	GD-Al
	PBT	PBT	PBT	PA 12	PBT
	Connector	5 m silicon cable	Silicon cable 5 m for BES 516-114-SA1-05 9 m for BES 516-120-SA2	5 m silicon cable	3 m silicon cable
		4×0.75 mm²	4×0.75 mm²	4×0.75 mm²	3×0.75 mm²
	BKS-S 23-3/BKS-S 24-3/BKS-S144				

Temperature rated sensors to +120 °C

More and more industrial processes are running at higher temperatures. This increases the demands on the sensor. With high temperature rated sensors from Balluff you are on the safe side even under high temperatures.

Applications

- Television picture tube and display manufacturing
- Motor function monitoring
- Glass manufacturing

Housing size			**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush
Rated operating distance s_n			**2 mm**	**2 mm**	**4 mm**
Assured operating distance s_a			0...1.6 mm	0...1.6 mm	0...3.2 mm
					
			stainless steel		
PNP	NO	①	BES 515-325-S4-C	BES 515-325-B0-C-PU-03	BES M12EI-PSC40B-S04G
	NC	②			BES M12EI-POC40B-S04G
NPN	NO	④			BES M12EI-NSC40B-S04G
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 1.5 V	≤ 1.5 V	≤ 2.5 V
Rated insulation voltage U_i			250 V AC	250 V AC	250 V AC
Rated operational current I_e			200 mA	200 mA	200 mA
No-load supply current I_0 max.			≤ 8 mA	≤ 8 mA	≤ 14 mA
Polarity reversal protected			yes	yes	yes
Short circuit protected			yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a			–25...+70 °C	–25...+70 °C	–25...+85 °C
Switching frequency f			≤ 3000 Hz	≤ 3000 Hz	≤ 1000 Hz
Utilization category			DC 13	DC 13	DC 13
Function indicator			yes	yes	yes
Degree of protection per IEC 60529			IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Insulation class			⧈	⧈	⧈
Housing material			Stainless steel	Stainless steel	Stainless steel
Material of sensing face			PA 12	PA 12	LCP
Connection			Connector	3 m PUR cable	Connector
No. of wires × cross-section				3×0.34 mm²	
Approval			cULus	cULus	cULus
Recommended connector			BKS-S 20E		BKS-S 20E

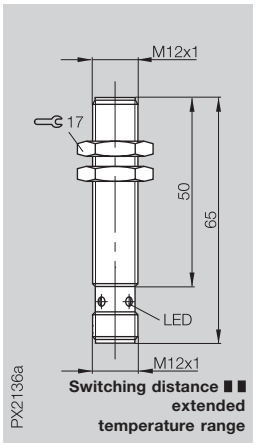
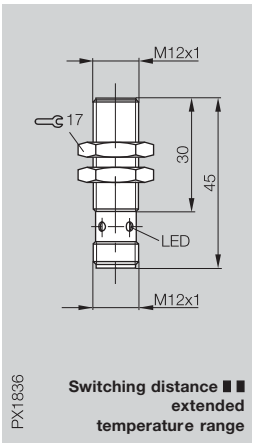
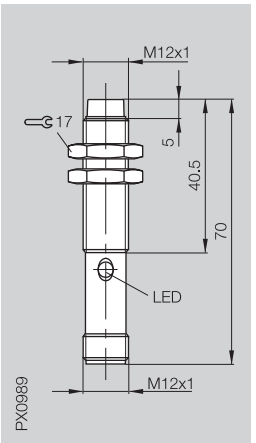
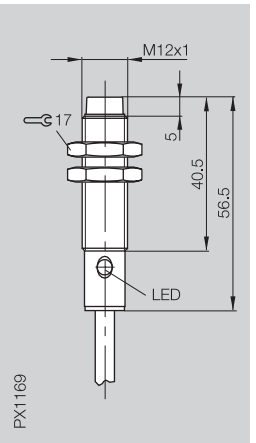
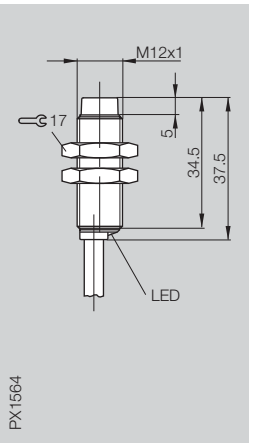
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

A tough player – Stainless steel housing stops aggressive media in its tracks.

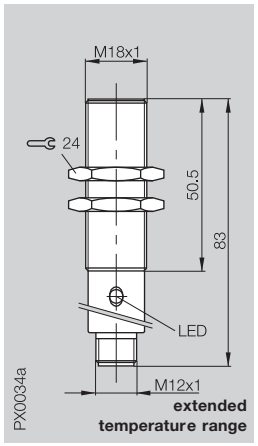
Inductive proximity switches are being increasingly used in aggressive environments. This applies especially to the working zone of machine tools or in the chemical industry, on packaging machines and in the food industry. The main elements at work are aggressive cleaning agents combined with high-pressure cleaning equipment.

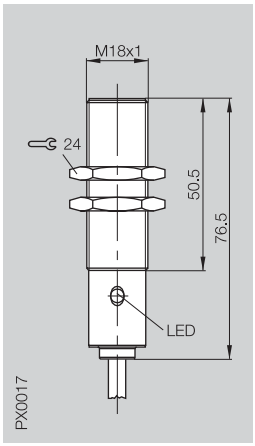
The solution = PROXINOX®

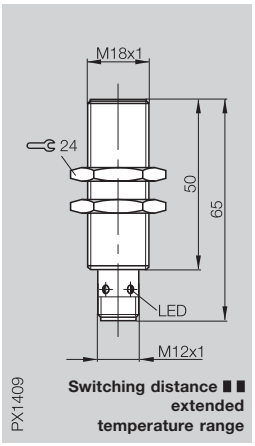
	M12×1	M12×1	M12×1	M12×1	M12×1
	flush	flush	non-flush	non-flush	non-flush
	4 mm	**4 mm**	**4 mm**	**4 mm**	**4 mm**
	0...3.2 mm	0...3.2 mm	0...3.2 mm	0...3.2 mm	0...3.2 mm
					
	BES M12EI-PSC40B-S04G-009	BES M12EE-PSC40B-S04G BES M12EE-POC40B-S04G	BES 515-356-S4-C	BES 515-356-B0-C-03	BES 515-356-E4-C-03
	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	250 V AC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 10 mA	≤ 10 mA	≤ 8 mA	≤ 8 mA	≤ 10 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–40...+85 °C	–25...+85 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	≤ 2000 Hz	≤ 2000 Hz	≤ 1500 Hz	≤ 1500 Hz	≤ 2000 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	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
	⊡	⊡	⊡	⊡	⊡
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	LCP	LCP	PA 12	PA 12	PBT
	Connector	Connector	Connector	3 m PVC cable	3 m PVC cable
				3×0.34 mm²	3×0.34 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-S 20E	BKS-S 20E	BKS-S 20E		

Housing size	**M18×1**	**M18×1**	**M18×1**	
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	
Rated operating distance s_n	**5 mm**	**5 mm**	**8 mm**	
Assured operating distance s_a	0...4.1 mm	0...4.1 mm	0...6.5 mm	

stainless steel





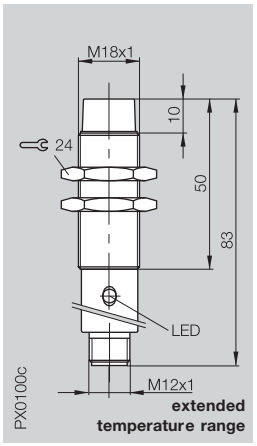
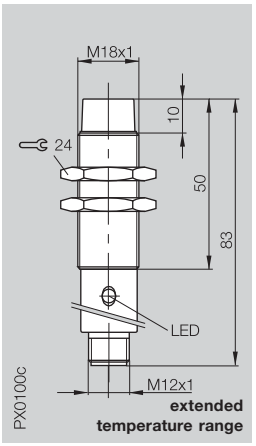
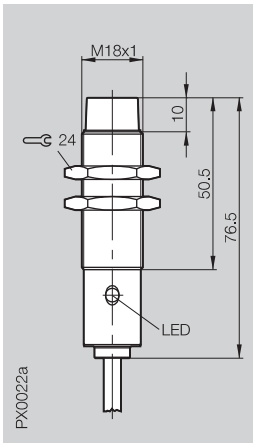
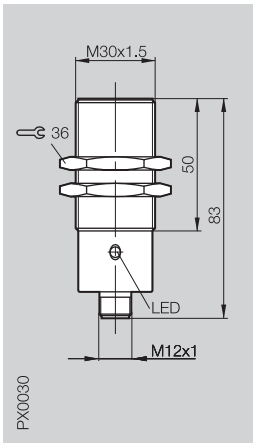
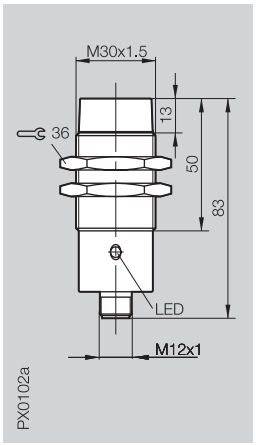


PNP					
	NO	①	BES 515-326-S4-C	BES 515-326-B0-C-PU-03	BES M18EI-PSC80B-S04G
	NC	②			BES M18EI-POC80B-S04G
	complementary	③			

Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e	≤ 1.5 V	≤ 1.5 V	≤ 2.5 V
Rated insulation voltage U_i	250 V AC	250 V AC	250 V AC
Rated operational current I_e	200 mA	200 mA	200 mA
No-load supply current I_0 max.	≤ 12 mA	≤ 12 mA	≤ 10 mA
Polarity reversal protected	yes	yes	yes
Short circuit protected	yes	yes	yes
Repeat accuracy R	≤ 5 %	≤ 5 %	≤ 5 %
Ambient temperature range T_a	–40...+85 °C	–25...+70 °C	–40...+85 °C
Switching frequency f	900 Hz	900 Hz	700 Hz
Utilization category	DC 13	DC 13	DC 13
Function indicator	yes	yes	yes
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
Insulation class	⧈	⧈	⧈
Housing material	Stainless steel	Stainless steel	Stainless steel
Material of sensing face	PA 12	PA 12	PBT
Connection	Connector	3 m Cable PUR	Connector
No. of wires × cross-section		3×0.34 mm²	
Approval	cULus	cULus	cULus
Recommended connector	BKS-S 20E		BKS-S 20E

① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.

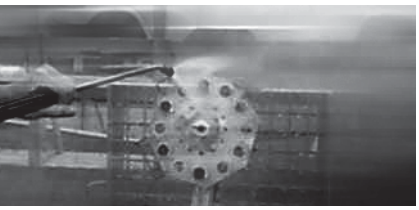
	M18×1	M18×1	M18×1	M30×1.5	M30×1.5
	non-flush	non-flush	non-flush	flush	non-flush
	8 mm	**8 mm**	**8 mm**	**10 mm**	**15 mm**
	0...6.5 mm	0...6.5 mm	0...6.5 mm	0...8.1 mm	0...12.2 mm
					
	BES 515-360-S4-C	BES 515-123-S4-C	BES 515-360-B0-C-PU-03	BES 515-327-S4-C	BES 515-362-S4-C
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 1.5 V	≤ 2.5 V	≤ 1.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA	200 mA	200 mA
	≤ 12 mA	≤ 30 mA	≤ 12 mA	≤ 25 mA	≤ 25 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–40...+85 °C	–40...+85 °C	–25...+70 °C	–25...+70 °C	–25...+70 °C
	600 Hz	200 Hz	600 Hz	≤ 300 Hz	≤ 100 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
	⊡	⊡	⊡	⊡	⊡
	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
	PA 12	PA 12	PA 12	PA 12	PA 12
	Connector	Connector	3 m Cable PUR	Connector	Connector
			3×0.34 mm²		
	cULus	cULus	cULus	cULus	cULus
	BKS-S 20E	BKS-S 20E		BKS-S 20E	BKS-S 20E

1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5
Connectors, Holders ...
Page 5.2 ...

PROXINOX® Sensors – withstands the harshest cleaning processes

In the food and beverage industry, the chemical industry, and even conveying operations, inductive proximity sensors are routinely cleaned with more and more aggressive agents. Whether it's acids, bases, steam, foam or high pressure cleaning equipment – the technology in the new PROXINOX ®-stainless steel sensors is especially designed for these harsh conditions.



+ Steam blast tested

Features

- No function display directly on sensor: the hole for the LED is a potential source of danger when cleaning, as well as a possible entry for bacteria. The function display is completely wrapped in the transparent plastic of the connector.
- Housing of stainless steel (type 1.4571): type 1.4571 stainless steel is what the food and beverage industry demands. The connector plug must also be capable of withstanding cleaning and disinfecting agents.
- Gold contacts: harsh conditions demand gold plated contacts in order to avoid connector corrosion.
- Laser etched part number: cleaning agents and disinfectants can remove a label. Etched part numbers are there to stay.
- Additional O-ring seals: temperature shock, caused by cleaning and disinfection, lead to strongly different expansions of a steel housing and the internal epoxy.

Housing size	
Mounting (see notes starting p. **1.0.**11)	
Rated operating distance s_n	
Assured operating distance s_a	

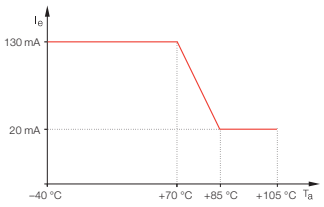
CE

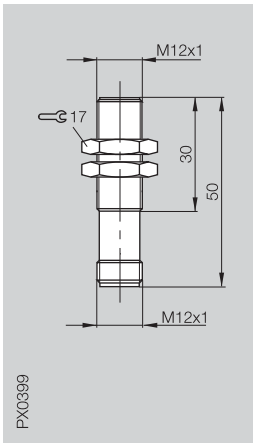
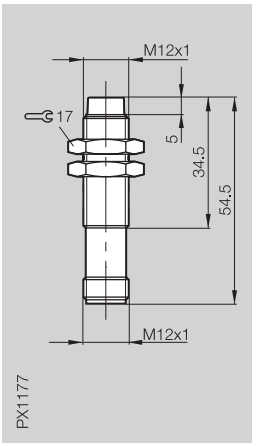
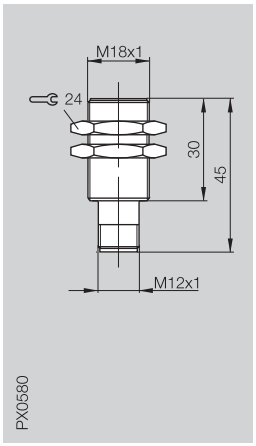
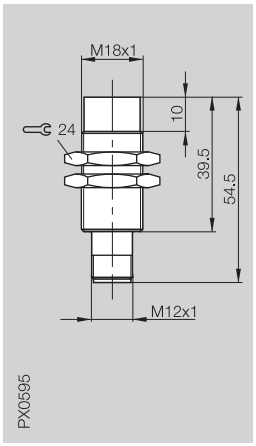
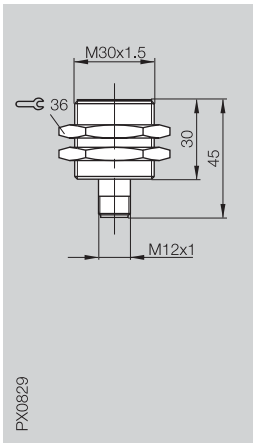
stainless steel

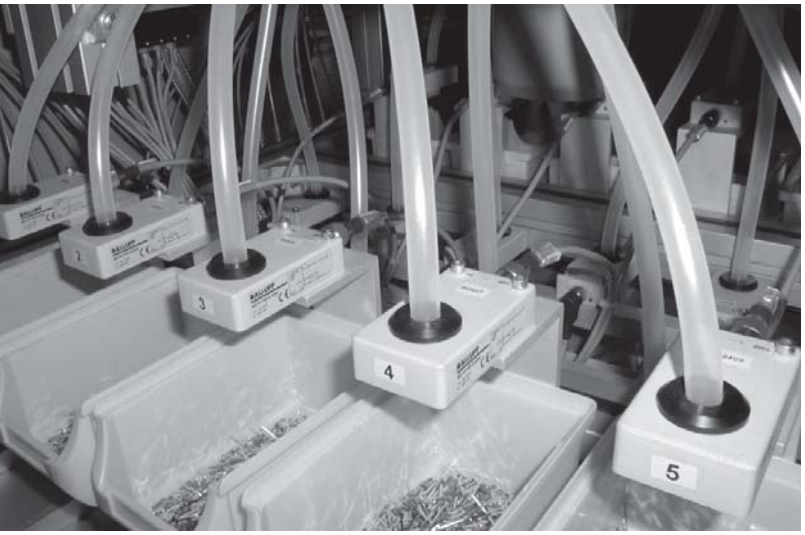
PNP	NO	①	
Supply voltage U_B			
Voltage drop U_d at I_e			
Rated insulation voltage U_i			
Rated operational current I_e			
No-load supply current I_0 max.			
Polarity reversal protected			
Short circuit protected			
Repeat accuracy R			
Ambient temperature range T_a			
Ambient temperature T_a at load current ≤ 20 mA			
Ambient temperature range T_a short-time 30 min			
Switching frequency f			
Utilization category			
Function indicator			
Degree of protection per IEC 60529			
Housing material			
Material of sensing face			
Connection			
Approval			
Recommended connector			

① Wiring diagrams see page **1.0.**6

Current reduction as a function of ambient temperature range



	M12×1	M12×1	M18×1	M18×1	M30×1.5
	flush	non-flush	flush	non-flush	flush
	2 mm	**4 mm**	**5 mm**	**8 mm**	**10 mm**
	0...1.6 mm	0...3.2 mm	0...4.1 mm	0...6.5 mm	0...8.1 mm
					
	BES 515-325-E5-T-S4	BES 515-356-E5-T-S4	BES 515-326-E5-T-S4	BES 515-360-E5-T-S4	BES 515-327-E5-T-S4
	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	≤ 3.5 V	≤ 3.5 V	≤ 3.5 V
	75 V DC	75 V DC	75 V DC	75 V DC	75 V DC
	130 mA	130 mA	130 mA	130 mA	130 mA
	≤ 25 mA	≤ 25 mA	≤ 25 mA	≤ 25 mA	≤ 20 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
	–40...+70 °C	–40...+70 °C	–40...+70 °C	–40...+70 °C	–40...+70 °C
	–40...+85 °C	–40...+85 °C	–40...+85 °C	–40...+85 °C	–40...+85 °C
	+105 °C	+105 °C	+105 °C	+105 °C	+105 °C
	≤ 800 Hz	400 Hz	500 Hz	200 Hz	200 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	no	no	no	no	no
	IP 69K and IP 68 per BWN Pr. 27	IP 69K and IP 68 per BWN Pr. 27	IP 69K and IP 68 per BWN Pr. 27	IP 69K and IP 68 per BWN Pr. 27	IP 69K and IP 68 per BWN Pr. 27
	Stainless steel 1.4571	**Stainless steel 1.4571**	**Stainless steel 1.4571**	**Stainless steel 1.4571**	**Stainless steel 1.4571**
	PEEK	PEEK	PA 12	PA 12	PA 12
	Connector	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus	cULus
	BKS-S260-3	BKS-S260-3	BKS-S260-3	BKS-S260-3	BKS-S260-3



Ring sensors are used for feed control with screws, nails etc.

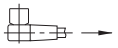
The output is static, i. e., it remains active as long as a metal part is located in the sensing range.

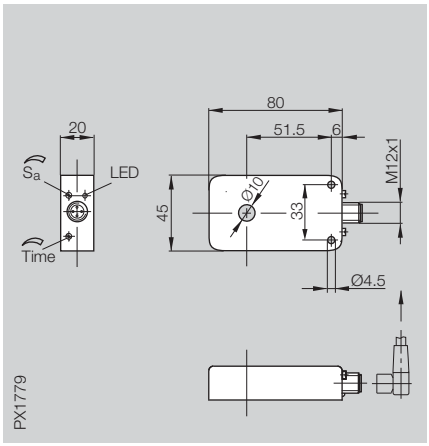
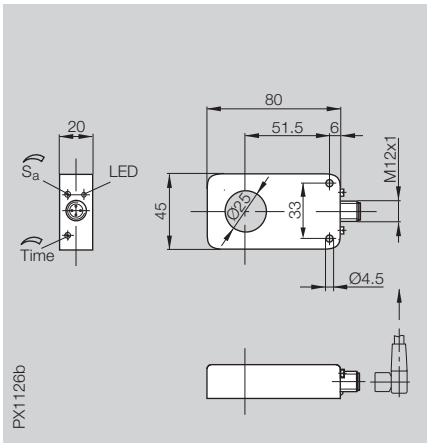
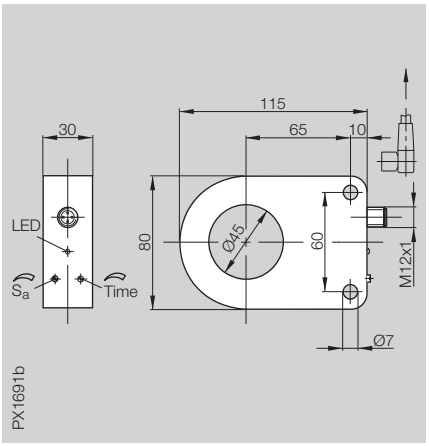
Housing size	
Inside diameter d_w	
Minimum object size steel taper (St 37)	

CE

PNP	NO	①
Supply voltage U_B		
Voltage drop U_d at I_e		
Rated insulation voltage U_i		
Rated operational current I_e		
No-load supply current I_0 max.		
Output resistance R_a		
Polarity reversal protected		
Short circuit protected		
Ambient temperature range T_a		
Utilization category		
Function indicator		
Degree of protection per IEC 60529		
Housing material		
Material of sensing face		
Connection		
Recommended connector		
Pulse extension		

① Wiring diagrams see page **1.0.**6

 Connector orientation

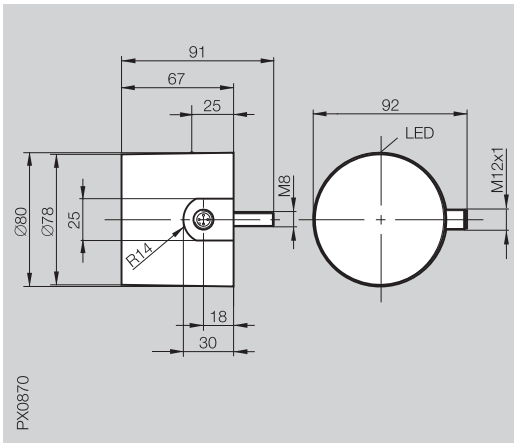
	80×45×20 mm	80×45×20 mm	115×80×30 mm
	Ø 10 mm	**Ø 25 mm**	**Ø 45 mm**
	Ø 2 mm	**Ø 4 mm**	**Ø 9 mm**
			
	BES IKV-010.23-G-Z-S4	BES IKV-025.23-G-Z-S4	BES IKV-045.23-G-Z-S4
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V
	75 V DC	75 V DC	75 V DC
	200 mA	200 mA	200 mA
	≤ 10 mA	≤ 10 mA	≤ 10 mA
	Open collector	Open collector	Open collector
	yes	yes	yes
	yes	yes	yes
	–25...+70 °C	–25...+70 °C	–25...+70 °C
	DC 13	DC 13	DC 13
	yes	yes	yes
	IP 65	IP 65	IP 65
	Plastic	Plastic	Plastic
	Plastic	Plastic	Plastic
	Connector	Connector	Connector
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20
	2.5...250 ms adjustable	2.5...250 ms adjustable	2.5...250 ms adjustable

Ring sensor housing size 80×45×20 mm
also available as **analog distance sensor**.

1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5
Connectors ... page 5.2 ...

Housing size	**Ø 80×67 mm**
Mounting (see notes starting p. **1.0.**11)	non-flush
Rated operating distance s_n	**50 mm**
Assured operating distance s_a	0...40.5 mm



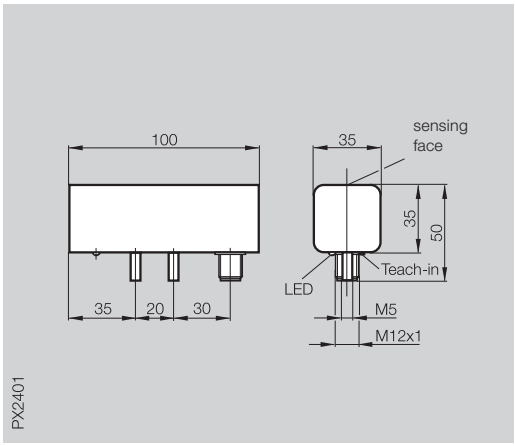
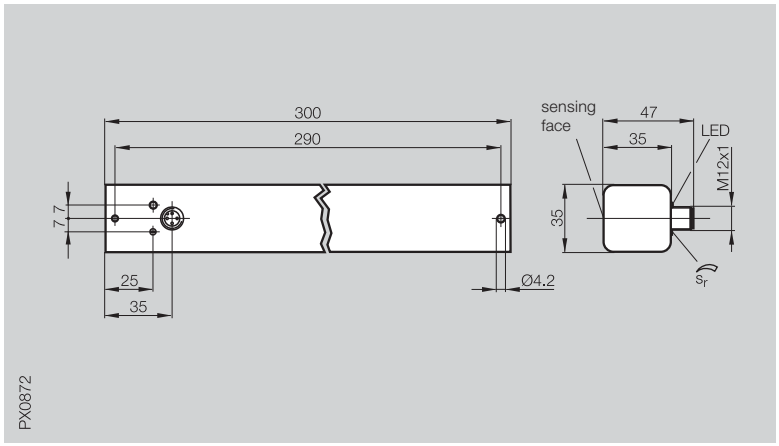
PNP		
NO ①	BES IKJ-S-050-P-2-S-S4-C	
complementary ③		

Supply voltage U_B	10...55 V DC
Voltage drop U_d at I_e	≤ 2 V
Rated insulation voltage U_i	75 V DC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 10 mA
Output resistance R_a	Open collector
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency f	100 Hz
Utilization category	DC 13
Function indicator	yes
Degree of protection per IEC 60529	IP 67
Housing material	Plastic
Material of sensing face	Plastic
Connection	Connector
Recommended connector	BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6

Application

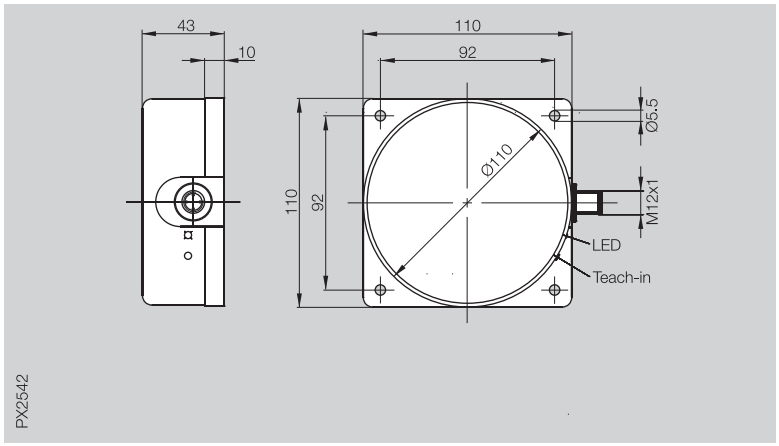
These sensors are used when longer switching distances are required. The IKU style is especially preferred for non-contact sensing of conveyor belts, e.g. in monitoring the width of narrow conveyed material or checking dispensing lines.

	35×35×100 mm	35×35×300 mm
	non-flush	non-flush
	30 mm (adjustable with teach-in key)	**30 mm (adjustable)**
	0...24.3 mm	0...24.3 mm
		
	BES IKU-011T.28-G-S4	BES IKU-031.28-S4
	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V
	75 V DC	75 V DC
	400 mA	200 mA
	≤ 10 mA	≤ 10 mA
	Open collector	Open collector
	yes	yes
	yes	no
	≤ 5 %	≤ 5 %
	–25...+70 °C	–25...+70 °C
	50 Hz	50 Hz
	DC 13	DC 13
	yes	yes
	IP 65	IP 65
	Plastic	Plastic
	Plastic	Plastic
	Connector	Connector
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

5
Connectors ... page 5.2 ...

Housing size	**110×110×43 mm**
Mounting (see notes starting p. **1.0.**11)	non-flush
Rated operating distance s_n	**70 mm (adjustable with teach-in key)**
Assured operating distance s_a	0...56.7 mm



PNP	complementary	③	BES IKN-070T.38-G-S4

Supply voltage U_B	10...55 V DC
Voltage drop U_d at I_e	≤ 2 V
Rated insulation voltage U_i	75 V DC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 10 mA
Output resistance R_a	Open collector
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	0...+70 °C
Switching frequency f	50 Hz
Utilization category	DC 13
Function/Supply voltage indicator	yes/yes (1 LED with changing color)
Degree of protection per IEC 60529	IP 67
Housing material	PBT
Material of sensing face	PBT
Connection	Connector
Recommended connector	BKS-_ 19/BKS-_ 20

③ Wiring diagram see page **1.0.**6

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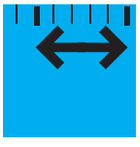
sensors worldwide

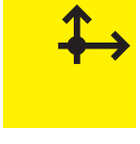
Object Detection

Object Detection



Linear Position Sensing

Industrial Identification



Industrial Networking and Connectivity

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