

BALLUFF

ATEX Approved Inductive Sensors

... for hydraulic and general applications in hazardous areas



Ex II 2 G EEx ia IIC T6
Ex II G D [EEx ia] IIC
Ex II 3G EEx nA II T4 X

Type of protection "n"

Devices in this category are for use in areas where an explosive atmosphere cannot be formed under normal conditions. If it does occur, then it must be only seldom and for a short period of time.

These sensors are rated Class II Category 3G.

Note!

Before construction, installation and startup please familiar yourself with the user's guide to be found at www.balluff.com.



Type of protection "n"

Housing size	
Mounting	
Rated operating distance s_n	
Assured operating distance s_a	



PNP	NO
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Rated operational voltage U_o	
Supply voltage U_B	
Voltage drop U_d at I_o	
Rated insulation voltage U_i	
Rated operational current I_o	
No-load supply current I_o max.	
Off-state current I_r	
Polarity reversal protected	
Short circuit protected	
Permissible load capacitance	

Repeat accuracy R	
Ambient temperature range T_a	
Frequency of operating cycles f	
Utilization category	
Function indicator	

Degree of protection per IEC 60529	
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Housing material	
Material of sensing face	
Connection	

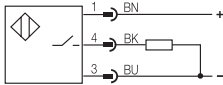
Recommended connector	
O-Ring/spare part number	
Support ring/spare part number	

Pressure rated (for hydraulics) up to	
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Ex-Zone	
Conformity	

Designation	
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Wiring diagram



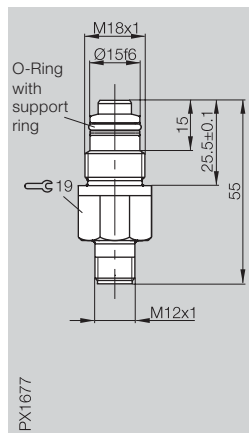
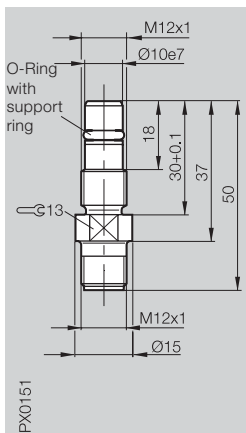
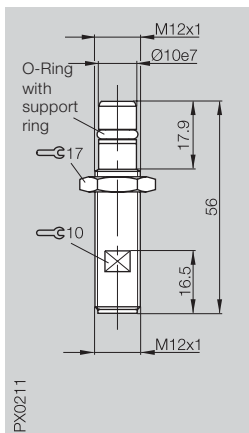
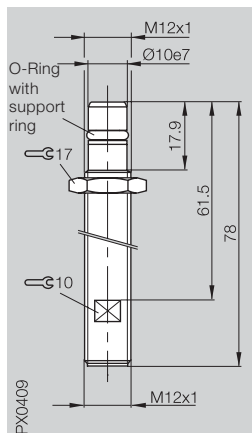


high pressure rated

Inductive Sensors

DC 3-wire
M12, M18
S_n 1.5 mm

M12x1	M12x1	M12x1	M18x1
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-S 135-NEX-S4-D	BES 516-300-S 249-NEX-S4-D	BES 516-300-S 262-NEX-S4-D	BES 516-300-S 308-NEX-S4-D
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24 V DC	24 V DC	24 V DC	24 V DC
10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
≤ 1.5 V	≤ 2 V	≤ 2 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	≤ 8 mA	≤ 8 mA	≤ 8 mA
≤ 10 µA	≤ 10 µA	≤ 10 µA	≤ 10 µA
yes	yes	yes	yes
yes	yes	yes	yes
≤ 0.5 µF	≤ 1 µF	≤ 1 µF	≤ 1 µF
≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
-25...+80 °C	-25...+80 °C	-25...+90 °C	-25...+80 °C
1000 Hz	2000 Hz	2000 Hz	2000 Hz
DC 13	DC 13	DC 13	DC 13
no	no	no	no

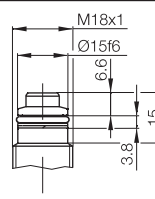
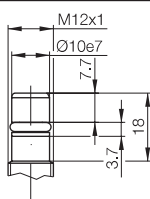
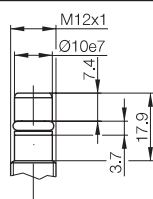
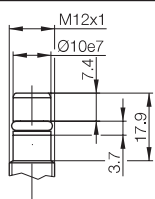
IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20
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stainless steel	stainless steel	stainless steel	stainless steel
EP	EP	EP	EP
connector	connector	connector	connector

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
5.85x2.4/636594	5.3x2.4/631753	5.3x2.4/631753	12.42x1.78/642828
10x5.9x1/705918	10x5.9x1/705918	10x5.9x1/705918	15x12.2x0.7/642827

500 bar	500 bar	500 bar	500 bar
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DIN EN 50014:2000 DIN EN 60079-15 Ex II 3G EEx nA II T4 X	DIN EN 50014:2000 DIN EN 60079-15 Ex II 3G EEx nA II T4 X	DIN EN 50014:2000 DIN EN 60079-15 Ex II 3G EEx nA II T4 X	DIN EN 50014:2000 DIN EN 60079-15 Ex II 3G EEx nA II T4 X
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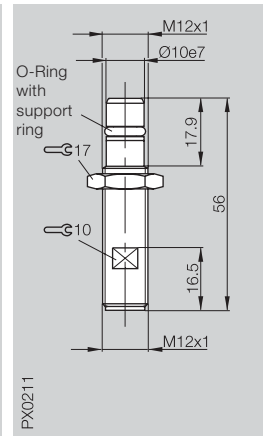
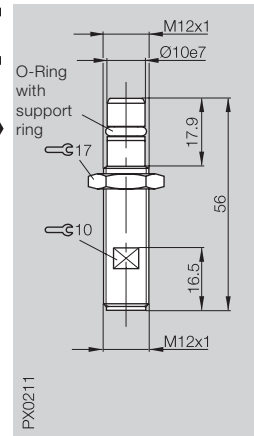




Type of protection
"intrinsically safe"



Housing size	M12x1	M12x1
Mounting	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



Type of protection
"intrinsically safe" when
used with a safety
switching amplifier out-
side the explosive area

Inductive NAMUR sensors consist essentially of an oscillator with an oscillator coil which can be damped on a demodulator.

These high-pressure rated sensors are used among other things for end-of-stroke monitoring on hydraulic cylinders or position sensing on valves.

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

Note!

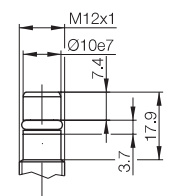
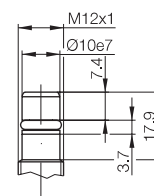
Before construction, installation and startup please familiar yourself with the user's guide to be found at www.balluff.com. You must also follow the instructions contained in the EU Type Examination Certificate of the PTB.

NAMUR	BES 516-300-S 266-S 4	BES 516-300-S 315-S 4-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
$s_r = \infty$	≥ 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 function)	current change (no trigger function)
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
Frequency of operating cycles 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-S 10-3/BKS-S 8-3/ BKS-S 23-12-PB/ BKS-S 24-12-PB
O-Ring/spare part number	5.3x2.4/631753	5.3x2.4/631753
Support ring/spare part number	10x5.9x1/705918	10x5.9x1/705918
Pressure rated (for hydraulics) up to	500 bar	500 bar

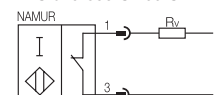
Ex-Zone		
Conformity	EN 50014:1997+A1+A2 EN 50020:1994	EN 50014:1997+A1+A2 EN 50020:1994
EC Type Examination Certificate	PTB 01 ATEX 2207 X	PTB 01 ATEX 2207 X
Designation	Ex II 2 G EEx ia IIC T6	Ex II 2 G EEx ia IIC T6
Effective internal capacitance	≤ 30 nF	≤ 30 nF
Effective internal inductance	0.5 mH	0.5 mH
maximum input power P_i	200 mW	200 mW

Protected against reversal of plus and minus to $U_B = 9$ V.

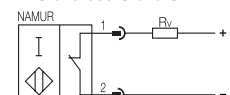
For additional data see
EC Type Examination Certificate.



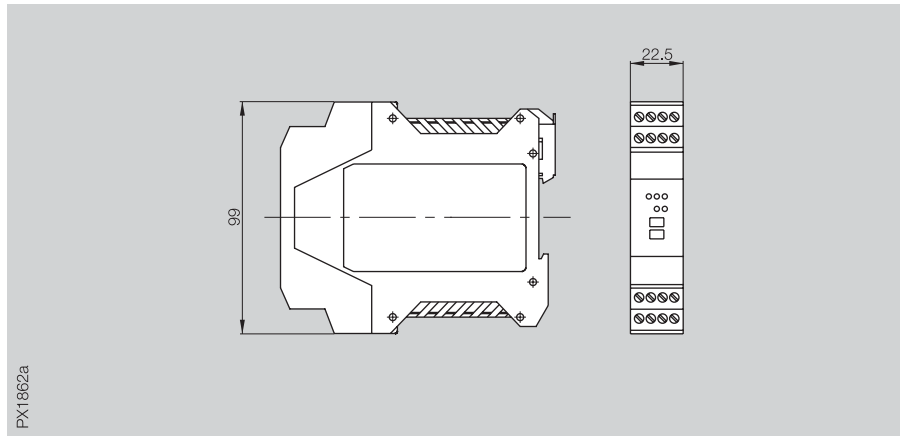
BES 516-300-S 266-S 4



BES 516-300-S 315-S 4-N



Housing size	99×22.5×114.5 mm



Ordering code	BARTEC 17-584D-220D/0000	BARTEC 17-584D-230D/0000
Input	NAMUR specification	
Output relay	1 changeover	
	switching voltage 250 V AC/100 V DC	
	switching current 5 A AC/2 A DC	
	switching power 100 VA/50 W	
	mechanical life expectancy 10 mil. cycles (max. 20 Hz)	
Function change	via switch	
Power draw	120 V AC, 2.2 VA per channel	230 V AC, 2.2 VA per channel
Ambient temperature range T_a	-20...+60 °C	
relative humidity	< 95 %, non-condensing	
Ex-Zone		
Conformity	EN 50014:1997 and EN 50020:1994	
Designation	Ex II (1) G D [EEx ia] IIC	
EC Type Examination Certificate	TÜV 02 ATEX 1911	
Safety-relevant data	$U_0 \leq 10.5$ V	
	$I_k \leq 26$ mA	
	$P_0 \leq 67$ mW, linear	

For additional data see EC Type Examination Certificate.

The switch amplifier with relay output 2/942 serves as the interface between electrical signals from the hazardous area (Ex zone) and the non-hazardous area (safe zone).

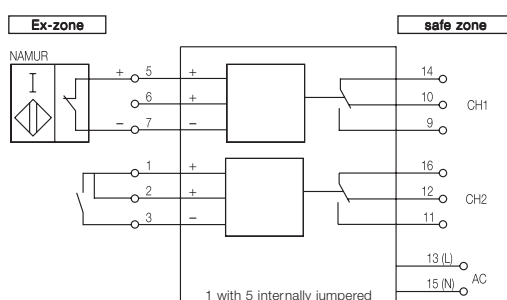
The input signals from NAMUR sensors, mechanical contacts or

optocouplers are converted through relay switching contacts on the outputs. Input, output and auxiliary power circuits are galvanically isolated.

Note!

Before construction, installation and startup please familiar yourself with the user's guide to be found at www.balluff.com and www.bartec.de. You must also follow the instructions contained in the EU Type Examination Certificate of the TÜV.

Wiring diagram



Inductive Sensors

DC 2-wire
 $\varnothing$ 6.5 mm, M8
 s_n 1 mm

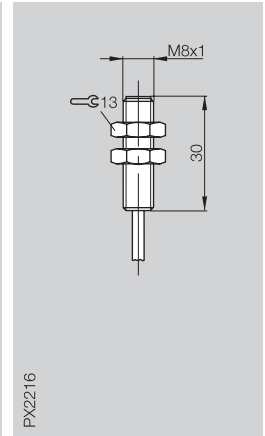
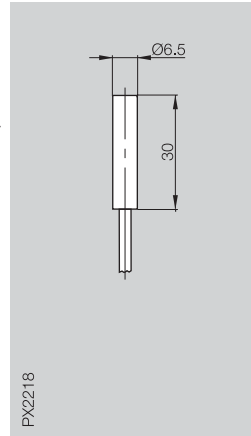
Housing size
 Mounting
 Rated operating distance s_n
 Assured operating distance s_a

$\varnothing$ 6.5 mm
 flush
 1 mm
 0.8 mm

M8x1
 flush
 1 mm
 0...0.8 mm



Type of protection
 "intrinsically safe"



Type of protection „intrinsically safe“ when used with a safety switching amplifier out- side the explosive area

Inductive NAMUR sensors consist essentially of an oscillator with an oscillator coil which can be damped by a demodulator.

These sensors can be used in conjunction with suitable switch amplifiers such as from BARTEC (see page 5) in explosion risk systems or areas (see ATEX category). The switching amplifier must be installed outside the explosive area.

Note!

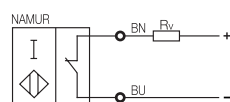
Before construction, installation and startup please familiar yourself with the user's guide to be found at www.balluff.com. You must also follow the instructions contained in the EU Type Examination Certificate of the PTB.

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:		
Open (undamped)	current change (no trigger function) ≤ 1 mA	current change (no trigger function) ≤ 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
Frequency of operating cycles f	2000 Hz	2000 Hz
Function indicator	no	no
Degree of protection per IEC 60529	IP 67	IP 67
Housing material	CuZn nickel-free coating	CuZn nickel-free coating
Material of sensing face	PBT	PBT
Connection	2 m cable PVC	2 m cable PVC
No. of wires x cross-section	2x0.14 mm ²	2x0.14 mm ²
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 2 G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C	Ex II 2 G 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
Connection 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

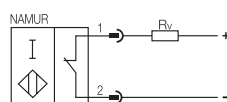
*Power limited through use of an approved intrinsically safe switching amplifier

Wiring diagrams

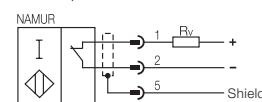
BES G06.../M08...



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



Unicompact



1 Connection to NAMUR safety switching amplifier
 2 Connection to NAMUR safety switching amplifier
 5 Potential compensation, connector body



NAMUR

Inductive Sensors

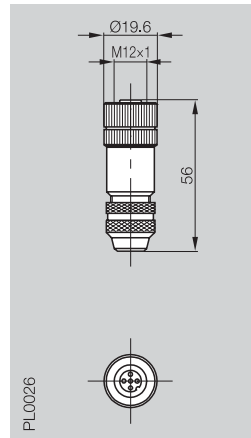
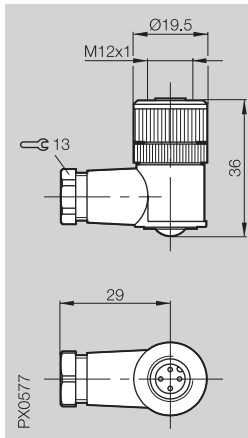
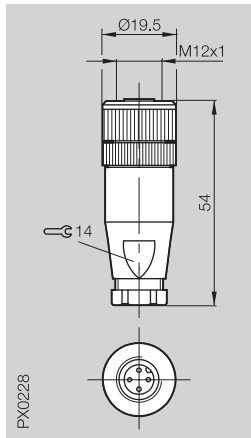
DC 2-wire, M12, M18, M30, block styles
S_n 4, 8, 15, 20, 35 mm

	M12x1 flush 4 mm 0...3.2 mm	M18x1 flush 8 mm 0...6.5 mm	M30x1.5 flush 15 mm 0...12.2 mm	40x40x66 mm Unicomact flush 20 mm 0...16.2 mm	40x40x66 mm Unicomact non-flush 35 mm 0...28.4 mm
	PX2213	PX2214	PX2215	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 7.7...9 V DC 75 V DC current change (no trigger function) ≤ 1 mA ≥ 2.1 mA 1000 Ω no*	8.2 V DC 7.7...9 V DC 75 V DC current change (no trigger function) ≤ 1 mA ≥ 2.1 mA 1000 Ω no*	8.2 V DC 7.7...9 V DC 75 V DC current change (no trigger function) ≤ 1 mA ≥ 2.1 mA 1000 Ω no*	8.2 V DC 7.7...9 V DC 75 V DC current change (no trigger function) ≤ 1 mA ≥ 2.1 mA 1000 Ω no*	8.2 V DC 7.7...9 V DC 75 V DC current change (no trigger function) ≤ 1 mA ≥ 2.1 mA 1000 Ω no*
	-20...+70 °C 700 Hz no	-20...+70 °C 400 Hz no	-20...+70 °C 100 Hz no	-20...+70 °C 200 Hz no	-20...+70 °C 100 Hz no
	IP 67 CuZn nickel-free coating PBT connector	IP 67 CuZn nickel-free coating PBT connector	IP 67 CuZn nickel-free coating PBT connector	IP 67 PPE/PPS PPE connector	IP 67 PPE/PPS PPE connector
	BKS-S 10-3/BKS-S 8-3/ BKS-S 23-12-PB/ BKS-S 24-12-PB	BKS-S 10-3/BKS-S 8-3/ BKS-S 23-12-PB/ BKS-S 24-12-PB	BKS-S 10-3/BKS-S 8-3/ BKS-S 23-12-PB/ BKS-S 24-12-PB	BKS-S 92-00	BKS-S 92-00
	EN 50014:1997+A1+A2 EN 50020 BVS 05 ATEX E 162 X	EN 50014:1997+A1+A2 EN 50020 BVS 05 ATEX E 162 X	EN 50014:1997+A1+A2 EN 50020 BVS 05 ATEX E 162 X	EN 50014:1997+A1+A2 EN 50020 BVS 05 ATEX E 162 X	EN 50014:1997+A1+A2 EN 50020 BVS 05 ATEX E 162 X
	Ex II 2 G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C ≤ 210 nF 0.115 mH U = 15 V I = 50 mA P = 120 mW	Ex II 2 G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C ≤ 200 nF 0.19 mH U = 15 V I = 50 mA P = 120 mW	Ex II 2 G EEx ia IIC T6 Ex II 1D Ex iaD 20 T90°C ≤ 230 nF 0.21 mH U = 15 V I = 50 mA P = 120 mW	Ex II 2G EEx ia IIB T6 Ex II 1D Ex iaD 20 T90°C ≤ 250 nF 0.45 mH U = 15 V I = 50 mA P = 120 mW	Ex II 2G EEx ia IIB T6 Ex II 1D Ex iaD 20 T90°C ≤ 220 nF 0.71 mH U = 15 V I = 50 mA P = 120 mW

Permissible installation types for Unicomact

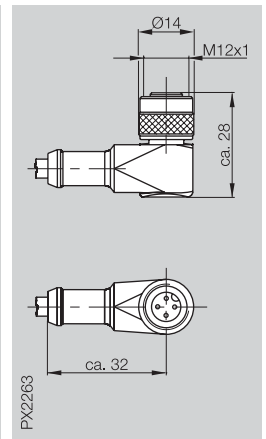
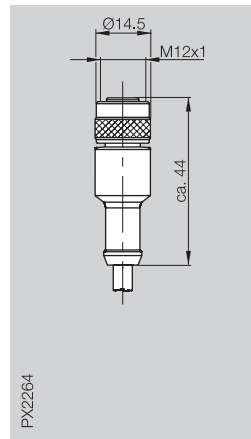
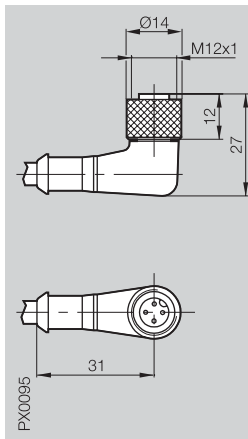
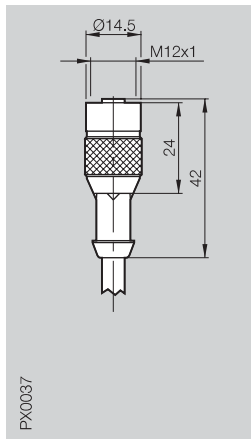
Rated operating distance	permitted	yes	yes	yes	yes	yes
S _n						
20 mm	yes	yes	yes	yes	yes	yes
35 mm	no	no	no	yes	no	yes

Connector	BKS-S 10	BKS-S 8	BKS-S 92-00	
Type	straight female	angle female	straight female	
Application	tubular plug-in connectors S 4 (max. 4-pin)	tubular plug-in connectors S 4 (max. 4-pin)	plug-in sensors BES Q40-...-EEX	



No LED	BKS-S 10-3	BKS-S 8-3	BKS-S 92-00	
Manufacturer	Binder	Binder	Binder	
Supply voltage U_B	7...30 V DC	7...30 V DC	7...30 V DC	
Cable	for user assembly	for user assembly	for user assembly	
No. of wires × cross-section	4×max. 0.75 mm ²	4×max. 0.75 mm ²	5×max. 0.75 mm ²	
Cable diameter min.	Ø 4...6 mm	Ø 4...6 mm	Ø 6...8 mm	
Connection	screw terminals	screw terminals	screw terminals	
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	
Ambient temperature range T_a	-40...+85 °C	-40...+85 °C	-40...+85 °C	

Connector	BKS-S 19	BKS-S 20	BKS-S 23	BKS-S 24
Type	straight female	angle female	straight female	angle female
Application	tubular plug-in sensors NEX-S 4	tubular plug-in sensors NEX-S 4	tubular NAMUR plug-in sensors S 4*	tubular NAMUR plug-in sensors S 4*



No LED, NO	BKS-S 19-1-PU-03	BKS-S 20-1-PU-03	BKS-S 23-12-PB-02	BKS-S 24-12-PB-02
Manufacturer	Lumberg	Lumberg	Binder	Binder
Supply voltage U_B	10...30 V DC	10...30 V DC	7...30 V DC	7...30 V DC
Cable	3 m molded-in	3 m molded-in	2 m molded-in	2 m molded-in
Cable color	black	black	blue	blue
No. of wires × cross-section	3×0.34 mm ²	3×0.34 mm ²	2×0.34 mm ²	2×0.34 mm ²
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 67	IP 67
Ambient temperature range T_a	-25...+70 °C	-25...+70 °C	-25...+80 °C	-25...+80 °C
*except BES 516-300-S 266-S4				

Cable length 10 m on request.

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